

Minnesota Attorney General: Administrative Rules Proceedings

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State of Minnesota
Minnesota Department of Health

STATEMENT OF NEED AND REASONABLENESS

In the Matter of Proposed Permanent Rules of the Minnesota Department of Health Relating to Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970

The Minnesota Department of Health, pursuant to Minnesota Statutes, section 14.05 to 14.12 and 14.22 to 14.28, presents the facts establishing the need for and reasonableness of the above-captioned proposed permanent rules.

To adopt the proposed rules, the Department must demonstrate it has complied with all the procedures and substantive requirements of rulemaking. Those requirements are that: 1) there is statutory authority to adopt the rule; 2) all necessary procedural steps have been taken; 3) the rules are needed; 4) the rules are reasonable; and 5) any additional requirements imposed by law have been satisfied. This statement demonstrates that the Department has met these requirements.

I. STATUTORY AUTHORITY AND NEED FOR THE RULES

The amendments to and new rule parts contained in Chapter 4720 are proposed by the Commissioner of Health to comply with requirements contained in federal safe drinking water laws and rules and the state's Safe Drinking Water Act.

The state's Safe Drinking Water Act (SDWA) was adopted by the legislature in 1977 (Minnesota Statutes, sections 144.381 to 144.387). It authorizes the Commissioner of Health to promulgate rules which are no less stringent than federal regulations governing public water supplies [Minnesota Statutes, section 144.383, paragraph (e)]. This authority was granted by the legislature to allow the state, under the federal Safe Drinking Water Act of 1974 (Public Law 93-523 and amendments thereto), to assume primacy for enforcement of the U.S. Environmental Protection Agency (EPA) safe drinking water regulations. Federal law requires that a state which assumes primacy meet requirements prescribed in federal rules to be eligible to receive federal grant monies to support state administration of the federal program.

The Commissioner of Health initially promulgated Minnesota Rules, Chapter 4720 in 1977 and the U.S. EPA granted primary enforcement responsibility to the state that year. Since 1977, the U.S. EPA has amended its federal rules. Minnesota must now amend its rules again to retain primacy. Amendments to and new parts proposed in Minnesota Rules chapter 4720 are needed to comply with the federal requirements published June 29, 1989 in the Federal Register, volume 54, pages 27526 to 27540, and pages 27562 to 27568.

(State and federal laws, rules and codes referenced in this document are available at county libraries, through the Minitex interlibrary system or are available from the Minnesota Department of Health or Office of Administrative Hearings.)

II. COMPLIANCE WITH RULEMAKING PROCEDURES

Minnesota Statutes, sections 14.05 to 14.12 and 14.22 to 14.28 specify procedures to be followed when a department adopts or amends rules. Procedures applicable to all rules (Minnesota Statutes, sections 14.04 to 14.15) have been complied with by the commissioner.

Minnesota Statutes, section 14.10 requires an agency that seeks information or opinions from persons outside the agency for adoption of rules to publish notice of such action in the State Register. This serves to notify interested persons in the community of the opportunity to submit comment or data on the subject of the rules. A Notice of Solicitation of Outside Information or Opinions on this matter appeared in the State Register on January 22, 1990 at 14 S.R. 1879 to 1880.

A copy of the statement of need and reasonableness was sent to the Legislative Commission to Review Administrative Rules before the rule was published in the State Register.

III. EFFECT ON SMALL BUSINESS

Minnesota Statutes, section 14.115 requires that an agency consider the impact of proposed rules on small businesses. Small business is defined in statute as "....a business entity, including its affiliates, that (a) is independently owned and operated; (b) is not dominant in its field; and (c) employs fewer than 50 full time employees or has gross annual sales of less than four million dollars...."

Minnesota Statutes, section 14.115 requires that an agency consider five factors for reducing the impact of proposed rules on small businesses, these are:

1. less stringent compliance or reporting requirements;

2. less stringent schedules or deadlines for compliance or reporting requirements;
3. consolidation or simplification of compliance on reporting requirements;
4. design standards for small businesses; and
5. exemption of small business from the proposed rules.

The surface water treatment facility standards proposed in parts 4720.3920 to 4720.3970 and the sampling procedures in part 4720.0550 may impact some public water supply suppliers who meet the definition of small business.

A "supplier" is defined in adopted part 4720.0100, subpart 20 as "any person who owns, manages, or operates a public water supply, whether or not he is an operator certified pursuant to Minnesota Statutes, sections 115.71 to 115.82."

As defined in adopted part 4720.0100, subpart 16, a "public water supply" means

a system providing piped water for human consumption, and either containing a minimum of 15 service connections or 15 living units, or serving at least 25 persons daily for 60 days of the year. Such term includes:

A. Any collection, treatment, storage, and distribution facilities under control of the operator of the supply and used primarily in connection with the supply; and

B. Any collection or pretreatment storage facilities used primarily in connection with the supply but not under control of the operator. A public water supply is either a community or a noncommunity water supply.

(1) "Community water supply" means a public water supply or system which serves at least 15 service connections or living units used by year-round residents, or regularly services at least 25 year-round residents.

(2) "Noncommunity water supply" means any public water supply that is not a community water supply. The following are given as examples of noncommunity water supplies and are in no way meant to be an exhaustive list: seasonal facilities such as children's camps, recreational camping areas, resorts, or year-round facilities which serve at least 25 persons who are not residents thereof, such as churches, entertainment facilities, factories, gasoline service stations, marinas, migrant labor camps, office buildings, parks, restaurants, schools.

The current community water suppliers impacted by these regulations are all public entities, thus they do not meet the definition of a small business.

Some noncommunity water suppliers, however, likely are small businesses and will be impacted by the proposed rules. For the noncommunity water suppliers who may be a small business, the department has considered each of the five factors in Minnesota Statutes, section 14.115.

To the extent that surface water is the noncommunity water supplier's source of public drinking water the noncommunity water supplier must follow the new federal coliform bacteria standards, new surface water performance standards, and surface water treatment requirements. Federal safe drinking water laws provide that state standards be as strict as or stricter than federal law. Minnesota Statutes, sections 144.383, paragraph (e) authorizes the Commissioner of Health to promulgate rules which are no less stringent than federal regulations governing public water supplies. No provision is made in state or federal law for less stringent application of the federal standards based on whether a supply meets the definition of a small business or expressly exempts small businesses from meeting the requirements of the Safe Drinking Water Act.

The standards specified in the proposed rules are consistent with federal regulations. The federal regulations are designed to ensure safe drinking water for public consumption. Less stringent state compliance or reporting requirements, deadlines or schedules would not afford adequate protection to the public or be consistent with federal law and regulations. Some performance standards, such as those for coliform bacteria, are essential to maintain. Less stringent compliance with these standards can cause serious illness or death. The standards for surface water supply treatment facilities specify essential design criteria. While these design criteria are equally applicable to all public water supplies, there is latitude within the standards. Provision is made within part 4720.3920 for variation from the surface water treatment facility design criteria in cases where experimental, pilot, or full scale studies demonstrate that acceptable results can be obtained. The department recognizes that for some public water suppliers, the standards in parts 4720.3920 to 4720.3970 may not be the only method or technology that meets potable water standards. Exemption of a business on the basis of size is not acceptable because the public can become seriously ill from contaminated water provided by a small business as well as a large business. The rule as proposed is necessary to protect public health with respect to public drinking water.

FISCAL IMPACT

The proposed rules: 1) revise the adopted coliform bacteria standards for consistency with adopted federal standards; 2) add new performance standards for surface water supplies which are consistent with new federal standards adopted June 1989; and 3) add surface water treatment facility standards.

The revised coliform provisions will have no financial impact on community public water suppliers. Coliform is presently tested for and no significant changes are proposed for the number of samples. Changes are being made to follow-up procedures and notification requirements.

The new performance standards and treatment facility standards for surface water supplies will not have a fiscal impact on state or local public entities in excess of $100,000 in either of the two years following adoption of the proposed rules. New federal code (section 141.73) as published in the Federal Register on June 29, 1989 (Vol. 54, pages 27530) gives public water suppliers until June 29, 1993 to comply with adopted federal and state performance standards.

The proposed surface water supply treatment facility standards in parts 4720.3920 to 4720.3970 have been used by the Minnesota Department of Health in the past as guidelines for the construction of community public water supply treatment facilities. The proposed treatment facility standards should therefore not present substantially new requirements from those previously imposed by the department. Also because state drinking water performance standards must meet or exceed federal standards, if the treatment facility standards proposed are not adopted by the department as the state standard, the performance requirements contained in federal and state rules are still effective and would be enforceable by the U.S. EPA.

V. EFFECT ON AGRICULTURAL LAND

The adoption of the proposed rules will not have any impact on agricultural land (Minnesota Statutes, section 14.11).

VI. NEED FOR AND REASONABLENESS OF PROPOSED RULES

The proposed rules:

1) revise the adopted coliform bacteria monitoring, reporting and maximum contaminant levels;

2) add performance requirements for public drinking water suppliers who use surface water as their source of drinking water; and

3) add construction standards for surface water treatment facilities.

The chapter has also been reformatted to incorporate by reference the National Primary Drinking Water Regulations as specified in Code of Federal Regulations, title 40, parts 141 and 142.40 to 142.64, as amended through June 29, 1989. In the past the EPA's National Primary Drinking Water Regulations were rewritten by the Department in their entirety and promulgated as state drinking water rules. However, considerable staff time and effort was necessary to rewrite the federal codes into acceptable language. By directly incorporating the federal drinking water regulations by reference into Chapter 4720, the state is expediting the process of keeping state safe drinking water standards consistent with federal standards and assuring that state rules remain at least as stringent as federal code.

4720.0200 JUSTIFICATION.

The amendments proposed to this part are necessary to ensure proper reference to the entire range of state safe drinking water rules. The proposed amendment to the range of rules cited is necessary so the range of rules relating to safe public water supplies includes the proposed surface water treatment standards now required by the EPA's regulations. The change in reference from Laws of Minnesota to Minnesota Statutes is necessary because the laws have now been codified into statute.

4720.0300 SCOPE AND COVERAGE.

The proposed amendments to this part are necessary to ensure that the state safe drinking water standards are consistent with the laws and rules on safe drinking water promulgated by the Environmental Protection Agency. New EPA regulations adopted in 1989 [Section 142.16 (b)] require the state to develop and adopt standards for the treatment of surface water and for public water suppliers to comply with the surface water standards. The change in rule part reference is so the range of rules relating to safe public drinking water supplies includes the proposed surface water treatment standards.

Surface water supplies such as lakes, streams and rivers collect water in large part from surface run off. The water that moves over the surface to these receiving bodies contains contaminants that are found in the environment. Water is a solvent and picks up these contaminants, depositing and collecting them in the lake, stream or river from which the public water is then drawn. A body of surface water may look clear and clean, but may contain microbiological contaminants, such as bacteria, viruses and toxic chemicals that are particularly threatening to human health.

The proposed addition of the language "(and does not have any collection and treatment facilities)" to item A and "interstate" to item D has been added to make the applicability of the rules consistent with adopted federal standards. The proposed

additional changes were recommended by James Lucari, assistant regional counsel for the EPA, who has reviewed the proposed rules.

4720.0350 RULES AND STANDARDS ADOPTED BY REFERENCE.

This new rule part adopts the federal drinking water regulations by reference. The standards are contained in Code of Federal Regulations, title 40. Part 141 contains performance standards and part 142 governs administrative standards including those pertaining to variances and exemptions.

4720.0450 DEFINITIONS; SECTION 141.2 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

The definitions contained in this part are definitions currently contained in adopted part 4720.0100 which are not contained in the definitions section 141.2 of the National Primary Drinking Water Regulations. The department is proposing to repeal part 4720.0100 entirely and is replacing the part with proposed part 4720.0450. Subparts 1 to 10 are being retained and added to those definitions already in federal code to clarify the federal code as it is applied in the state. The definitions as proposed are reasonable because they are currently in adopted rule.

4720.0550 SECTION 141.21 MICROBIOLOGICAL CONTAMINANT SAMPLING AND ANALYTICAL REQUIREMENTS OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Section 141.21, paragraph (b), clause (1), of the National Primary Drinking Water Regulations is amended to make the state rule more stringent than the federal code. The federal code requires that a water supplier who collects more than one coliform bacteria sample per month collect three repeat samples when the initial sample is positive. The federal code requires a water supplier who collects one or fewer samples per month to collect four repeat samples when the initial sample is positive. To provide consistency statewide, the department proposes to amend the federal code to require all suppliers, regardless of the number of routine samples initially collected, to collect four repeat samples when any routine sample is positive.

4720.2300 ADDITIONAL MONITORING REQUIREMENTS.

The proposed amendments to this part are to reference the federal regulations which have been incorporated by reference in place of parts of Chapter 4720 that are proposed for repeal.

4720.3920 to 4720.3970 GENERAL REQUIREMENTS FOR CONSTRUCTION OF SURFACE WATER TREATMENT FACILITIES.

Parts 4720.3920 to 4720.3970 establish construction standards for water treatment facilities which use surface water as their source water. Code of Federal Regulations, section 142.16 SPECIAL PRIMACY REQUIREMENTS, requires the state, as a condition to retain primacy, to have enforceable design and operating criteria for technologies used to treat surface water for drinking water use. However the federal code contains no design and operating criteria which could be incorporated by reference. Therefore state rules governing the design and operation of surface water treatment facilities are proposed.

The treatment facility standards proposed in parts 4720.3920 to 4720.3970 are based on the document "Recommended Standards for Water Works" prepared by the Water Supply Committee of the Great Lakes-Upper Mississippi River Board of Public Health and Environmental Managers of which Minnesota is a contributing member. These standards are commonly referred to as the "10 States Standards for Water Works" and have been used for the construction of the 23 community public water supply facilities in the state.

The standards were first adopted in 1953 by the member states and have been periodically updated and revised. The most recent addition is the 1987 edition. Copies of this standard are available for copy, review or purchase from the department or the Great Lakes Upper Mississippi River Board of Public Health and Environmental Managers.

The standards consist of proven technology that is intended to be used to set design and operation criteria for the construction of surface water treatment facilities. Lacking U.S. EPA-mandated construction standards, a number of states across the country use the 10 States Standards as their enforceable construction standards. In the midwest, Michigan, Wisconsin and Ohio have adopted the 10 States Standards as their enforceable construction standards for surface water treatment facilities.

In Minnesota the 10 States Standards have been used since their development by the MDH to determine the adequacy of design plans for community surface water treatment plants. The Minnesota Department of Health has had for decades a rule (Part 4720.0010) requiring that plans and specifications for public water supply facilities be submitted to and approved by the MDH before a facility can be constructed. MDH staff review surface water treatment projects for conformance with the 10 States Standards and require changes to the plans when necessary to obtain compliance with the 10 States Standards. Projects are not approved for construction until the design is in conformance with the 10 States Standards.

Based on past practice, public water suppliers and design engineers in Minnesota are familiar with the requirements of the

10 States Standards and have been designing and constructing surface water treatment plants that conform to these standards for decades.

4720.3920 GENERAL REQUIREMENTS.

Part 4720.3920 requires that a water supplier use surface water which is of high quality before installing the necessary treatment processes, equipment, and structures specified in rule. This provision is consistent with part 3.0 of 10 States Standards. The commissioner may approve variations from specific design criteria if preliminary experimental, pilot or full scale studies demonstrate that the varied design produces acceptable results.

4720.3922 INTAKES.

The proposed standards for intake structures are intended to improve the operation and maintenance of structures. Formation of frazil ice which is needle-like or thin disks of ice formed in turbulent water is minimized if water flow is maintained. A flow rate of one quarter to one half feet per second has been demonstrated to be a rate which reduces the build up of frazil ice. Water treatment should be minimized, thus drawing water from the best quality source is necessary to reduce the amount of treatment to the supply. Manholes need to be positioned at regular intervals to allow for frequent access of the supply line for cleaning purposes. Positioning the openings every 1,000 feet allows for adequate access for cleaning. This requirement is specified in 10 States Standard, part 3.1.4.1.

4720.3925 SHORE WELLS.

Requirements for shore wells are necessary so they are properly located, accessible for operation and maintenance, equipped with protective devices and provided with chemical addition facilities so disinfectants can be added before the water reaches the water treatment plant. Depending on the quality of the source water and fluctuations in the quality of the source, chemicals may need to be added before the treatment plant to obtain the required quality of water from the treatment facility. Backflushing is needed to provide a means of cleaning the equipment of unwanted build-up of debris from the source water. Surge controls are needed because surges of water may damage equipment if the equipment is not secured. This provision is consistent with 10 States Standards, part 3.1.4.2.

4720.3927 PUMPING STATIONS; DESIGN REQUIREMENTS.

Subpart 1. General. Pumping stations must be designed with a number of features to prevent them from flooding and to minimize damage if they are flooded. Water from surface drainage or

flooding may introduce contaminants into the supply for which treatment has not been provided. Outward opening doors allow for access to the station in the event of an interior water build up. Drainage from pump glands to a suitable outlet and not to the floor is needed as a safety measure so the operator will not be walking on a wet surface. This provision is consistent with 10 States Standards, part 6.2.

Subpart 2. Pumping station suction well. Pumping station suction wells need to be constructed so surface drainage does not enter the structure. Surface water drainage may introduce contaminants into the water supply for which treatment is not provided. They must be vented to prevent contaminants from entering the suction well if less than atmospheric pressure conditions are experienced. This provision is consistent with 10 States Standards, part 6.2.1.

Subpart 3. Pumping station pumps. Pumping stations must have at least two pumps so if one is out of service, there is still a pump available to provide water as needed. Also, two independent power sources must serve the pumping station so service will not be completely interrupted if one power source is lost. Pump bearings must be lubricated to avoid unnecessary wear that would lead to breakdown. If the automatic lubrication is not operating, then the valve bypass allows for manual lubrication. This provision is consistent with 10 States Standards, part 6.3.

Subpart 4. Pumping station suction lift. A limitation of less than 15 feet is placed on the suction lift to reduce the possibility of drawing contaminants into the water supply. The 15 foot limit is specified in the 10 States Standards, part 6.3.1.

Subpart 5. Pumping station priming. When priming a pump it is necessary to use water of sanitary quality equal to that being pumped so additional contaminants are not introduced into the water supply. If an air-operated ejector pump is used, the air intake must be vented at 10 feet above the ground or other source of contamination to prevent airborne contaminants from entering the water supply. This provision is specified in 10 States Standards, part 6.3.2.

4720.3930 WATER CLARIFICATION PROCEDURES.

Subpart 1. Duplicate systems. Duplicate flocculation and sedimentation systems must be provided so water can still be processed even if one of the systems is not operable. This requirement is specified in 10 States Standards, part 4.1.a.

Subpart 2. Pretreatment. For source waters having unusually difficult water to treat, pretreatment by means of additional sedimentation or detention is necessary. A minimum detention

time in the sedimentation basins of three hours is necessary to allow adequate settling of the suspended materials in the water. However, if chemicals must be added to aid the settling process then a detention time of more than three hours may be needed. The required additional detention time is determined by pilot testing. This requirement is specified in 10 States Standards, part 4.1.1.

Subpart 3. Flash or rapid mixing. Flash or rapid mixing refers to the part of the water treatment process where chemicals called coagulants are added to the water and then mixed vigorously for uniform dispersion of the coagulants. The coagulants destabilize the electric charge on the suspended particles in the water allowing them to attach to each other so they are easier to remove in the following treatment processes. Detention time in a mixing basin needs to be kept as short as possible so suspended particles do not begin to settle out in the mixing basins. This requirement is specified in 10 States Standards, part 4.1.2.

4720.3932 FLOCCULATION (SLOW MIXING).

Subpart 1. Basin design. Flocculation is the gentle mixing of water that contains coagulants so contact among particles is enhanced. Particles attach to each other building larger particles (floc) that is then more readily removed in the subsequent processes of sedimentation and filtration. The design criteria specified in this part are based on current practice and procedures used in the industry and contained in 10 State's Standards. "Short circuiting" is a term that describes the situation where water with particulates flows quickly through the basin without allowing for the removal (sedimentation) of the particulates. Water must be retained in the sedimentation basin long enough for floc to develop. A drain is needed to allow the basin to be cleaned to remove particles that do settle to the bottom. This provision is specified in 10 States Standards, part 4.1.3.a.

Subpart 2. Detention. The time water is detained in the basin must be sufficient to allow for the coagulation of particles into floc but not so long that they begin to settle out in the flocculation basin. Water must move at a velocity that allows the particles to come into contact with each other and attach to each other. However, the velocity must not be so great that particles or masses of particles (floc) are broken apart. Previously tested and surveyed systems show that a velocity of 0.5 feet per minute is the minimum necessary to gently move water around so particles may coagulate and not settle out. At a velocity of greater than 1.5 feet per minute, however, floc formation is inhibited. Current coagulants in use such as aluminum sulfate and ferric chloride generally require at least 30 minutes for maximum floc formation. If this time is reduced, floc is not as large and consequently does not readily and

properly settle out. This provision is consistent with 10 States Standards, part 4.1.3.b.

Subpart 3. Equipment. This requirement is specified in 10 States Standards, part 4.1.3.c. The speed of the paddles determines the amount of agitation in the water. The amount of agitation maximizes the collision of particles which in turn causes floc to become larger.

Subpart 4. Piping. The velocity specified is reasonable because at less than .5 feet per second particles start to settle and at greater than 1.5 feet per second the floc starts to break up. This provision is specified in 10 States Standards, part 4.1.3.d.

Subpart 5. Baffling; other designs. Baffling is used to prevent short circuiting of water through the basin. However, baffling designs may vary. Review is needed prior to construction to ensure that necessary water velocity and flow is maintained. This provision is specified in 10 States Standards, part 4.1.3.e.

4720.3935 SEDIMENTATION.

Subpart 1. General. Sedimentation follows flocculation and occurs in large basins or tanks under essentially quiescent conditions that allow the larger particles (floc) in the water to settle to the bottom of the sedimentation basin as the water slowly passes through the basin. The variables of basin design and the characteristics of raw water which include turbidity, color, colloidal matter, taste and odor causing compounds, need to be considered.
The provisions in this subpart are specified in 10 States Standards, part 4.1.4.

Subpart 2. Detention time. Detention time is critical to the sedimentation process. It is necessary to allow sufficient time for particles to settle and be removed. Conventional sedimentation is the practice of using long and narrow rectangular basins which rely on the force of gravity to settle particles as they slowly pass through the basin along the long axis. The 10 States Standard specified in part 4.1.4.a stipulates a four hour settling time.

Subpart 3. Inlet devices. Subpart 4. Outlet devices. The design criteria in subparts 3 and 4 is intended to provide adequate detention time and quiescent conditions to enhance the settling process. The design criteria is also intended to prevent short circuiting. The standards specified in these subparts are consistent with 10 States Standards, parts 4.1.4.b and 4.1.4.c.

Subpart 5. Weir overflow rate. Basins are usually provided with a weir at the far end (outlet) of the basin that allows a small

amount of water to flow out. The maximum flow rate specified is taken from the 10 States Standards, part 4.1.4.d. The outlet weir overflow rate is limited to promote the maximum settling of particles. Where submerged ports are used, they need to be no deeper than three feet so they receive water from the upper part of the basin that contains the least amount of particles.

Subpart 6. Drainage. Basins are emptied and sedimentation regularly removed. It is thus necessary and reasonable that the basin have a drain to remove water. The bottom must slope toward the drain so all water can be effectively removed during cleaning. The standard specified in this subpart is specified in 10 States Standards, part 4.1.4.i.

Subpart 7. Covers. Covers are necessary to prevent airborne contaminants from entering the settling basins. This provision is consistent with 10 States Standards, part 4.1.4.g.

Subpart 8. Velocity. Movement through the sedimentation basin must be slow, therefore a maximum velocity is established to enhance the settling process. This part is consistent with in 10 States Standards, part 4.1.4.e.

Subpart 9. Overflow. Since water flows by gravity from the sedimentation basin to the top of the filter, it is necessary to place an overflow pipe in the sedimentation basin that establishes the maximum depth of water allowed on top of the filters. A minimum three foot depth of water as specified in part 4720.3945, subpart 4, item f, is needed to provide sufficient pressure to force the water through the filter. However, too much water depth over the filters will push the water through a filter too quickly and diminish the efficiency of the filter. This subpart is consistent with 10 States Standards, part 4.1.4.f.

Subpart 10. Safety. It is necessary that guard rails be provided around openings that personnel could fall through and thus prevent accidents or drowning. Surface conditions may be slippery or sloped. The provisions of this subpart are consistent with 10 States Standards, part 4.1.4.k.

Subpart 11. Sludge disposal. Observation by the operator of the size and density of the floc and testing of the chemical composition of settled floc (which is called sludge) is the quality control method used to determine if coagulant dosages are sufficient to produce floc. The provisions of this subpart are consistent with 10 States Standards, part 4.1.4.l and m.

Subpart 12. Cross connection control. The requirements in this subpart are consistent with the standards in part 4715.2000 WATER OUTLETS of the Minnesota Plumbing Code.

4720.3940 SOLIDS CONTACT UNIT.

Subpart 1. General. A solids contact unit is a water treatment process that combines flocculation and sedimentation (which are necessary parts of the overall potable water treatment process) with water softening, a process that is not critical to achieving potable water but is often desirable. The unit must be designed to be compatible with the maximum uniform flow rate of the overall water treatment plant so the unit will not be overloaded and will produce water of an acceptable quality. Solids contact units must be based on site specific conditions so few design parameters are given in this part.
The provisions in this subpart are consistent with 10 States Standards, part 4.1.5.

Subpart 2. Installation supervision. Supervision of the installation of the mechanical equipment by a representative of the manufacturer is necessary so the equipment, which is very complex, is installed according to manufacturer's specifications. This subpart is consistent with 10 State Standards, part 4.1.5.1.

Subpart 3. Sampling taps. Sampling taps are necessary to maintain the quality control process. This subpart is the based on 10 States Standards, part 4.1.5.2.c.

Subpart 4. Chemical feed. Chemicals must be added at points that ensure good mixing so sufficient floc is formed. This subpart is consistent with 10 States Standards, part 4.1.5.3.

Subpart 5. Mixing devices. Mixing devices in a solids contact unit must be designed to mix raw water with previously formed floc. Using previously formed floc to treat the raw water enhances the floc formation process and reduces the amount of coagulants used. This subpart is consistent with 10 States Standards, part 4.1.5.4.

Subpart 6. Flocculation. Since a solids contact unit is a single basin, it is necessary to isolate the flocculation process (flocculation requires quiescent conditions) from the sedimentation process in the remaining part of the basin. The flocculation and mixing minimum time of 30 minutes is specified in the 10 States Standards part 4.1.5.5.c.

Subpart 7. Sludge concentrators. One of the features of a solids contact unit is the use of a sludge concentrator which collects the largest and heaviest floc and discharges it to waste. The lighter floc is recycled back into the basin to mix with the raw water and help form more floc. The provisions of this subpart are consistent with 10 States Standards, part 4.1.5.6.

Subpart 8. Sludge removal. The provisions of this subpart are necessary to provide for the removal of floc and suspended particles that are the waste produce of the water cleaning process conducted in a solids contact unit. The specific design criteria are specified in 10 States Standards, part 4.1.5.7 and are intended to make routine maintenance and process control easier for the operator. The provisions in this subpart are consistent with 10 States Standards, part 4.1.5.7.

Subpart 9. Cross connections. This provision is consistent with part 4715.2000 WATER OUTLETS of the Minnesota Plumbing Code and part 4.1.5.8 of the 10 States Standards.

Subpart 10. Detention period. The minimum detention times specified in this part are consistent with those contained in 10 States Standards, part 4.1.5.9. The detention times are less than conventional sedimentation basin times because the previously formed floc is recycled to mix with raw water. This shortens the time required to form larger floc which in turn settles faster.
This provision is specified in 10 States Standards, part 4.1.5.8.

Subpart 11. Suspended slurry concentrate. The specific concentrate percentage specified in this subpart is found in 10 States Standards, part 4.1.5.10. Where softening is also conducted in a solids contact unit, previously accepted practice has established that at least a one percent by weight of lime slurry must be continuously maintained in the solids contact basin to the optimize softening process and floc formation.

Subpart 12. Weirs or orifices. The specific requirements in this subpart are consistent with those found in 10 States Standards, part 4.1.5.12.a. Overflow weirs or orifices are designed to skim water that has already completed the settling process from the top of the solids contact unit. The amount of weir and its location in the unit are specified to enhance the skimming process and prevent the channeling of water to one area of the unit thus creating excess velocity which in turn disturbs the settling process.

Subpart 13. Weir; orifice loading. The specific requirements in this subpart are consistent with those found in 10 States Standards. This intent of the standards specified in this subpart is to provide for the slow uniform skimming of treated water off the top of the tank. This subpart is consistent with 10 States Standards, part 4.1.5.12.b and c.

Subpart 14. Upflow rates. The rates specified in this subpart are taken from 10 States Standards, part 4.1.5.13. Because the raw water in a solids contact unit moves upward through a suspended layer of previously formed floc (sometimes referred to as slurry), the upflow rate of the raw water must be carefully

controlled to keep the suspended layer of floc in the proper position in the basin where it will contact the raw water to remove suspended particles.

4720.3942 FILTRATION.

This part requires the water supplier to obtain data about the raw water quality of the proposed surface water and then apply the appropriate filter and media for the anticipated raw water quality. This provision is specified in 10 State Standards, part 4.2.

4720.3945 RAPID GRAVITY FILTERS

Subpart 1. Pretreatment. Rapid rate gravity filters are the most commonly used filters in water treatment. After water has gone through coagulation, flocculation and sedimentation, it passes through the filters for final removal of suspended particles. This subpart is consistent with 10 States Standards, part 4.2.1.1.

Subpart 2. Number. As with the other treatment processes, multiple filters must be provided so if a filter out of service the water supplier can still treat and deliver safe water to consumers. Two filter units is the minimum that must be provided to ensure that a continuous potable water supply is maintained. The provisions in this subpart are specified in 10 States Standards, part 4.2.1.3.

Subpart 3. Rate of filtration. The rate of filtration is important. If the rate of filtration is too great, particles may move through the filter media too quickly or with too much force to be trapped in the filter media. The optimal rate must be determined on a case by case basis and approved by a registered engineer after considering the raw water quality characteristics.

The provisions in this subpart are specified in 10 States Standards, part 4.2.1.2.

Subpart 4. Structural details and hydraulics. A number of structural and hydraulic design criteria are necessary to assure a filter system that is sound and operable. It is critical to the filtration process that the filter media be of the proper size, type, and depth to enhance the filtration process. The size, type, and depth of filter media required by this part are based on successful use of these design criteria in existing water treatment plants. Filter media must meet the size, depth, and type specified in this part so particles to be trapped in the filter are distributed throughout the depth of the filter. Even distribution makes for more efficient filtering and allows the filter to be in use for longer periods of time before backwashing

is required. The provisions in items A to N are taken from 10 States Standards, part 4.2.1.4.a to n.

A. The filter wall must be vertical and not slanted so the top area of the filter is the same size as the bottom area of the filter.

B. Protrusions must be avoided because the filtration and backwashing process require uniform application of water through the filter. Any protrusions will disturb the uniformity of the water movement and reduce the effectiveness of the process.

C. A superstructure is needed to prevent airborne contaminants from entering the filter.

D. The superstructure must be built with enough vertical clearance to allow operators to readily inspect and maintain filters.

E. A minimum filter depth is specified to allow sufficient room for the filter media, the drainage system, washwater troughs, and a minimum three feet of water on top of the filter as specified.

F. A minimum of three feet of water is required to impart sufficient force to the water to move it through the filter.

G. The filter effluent pipe or conduit must be provided with a trap, such as the type provided on plumbing fixtures, which serves as a water seal to prevent the movement of air back into the bottom of the filter media. Air entering the bottom of the filter media gets caught in the filter and inhibits the filtration process by disrupting the uniform flow of water through the filter.

H. A curb is specified to prevent washwater or standing water from the filter floor from inadvertently entering the filters.

I. Overflow pipe is needed to drain excess water from the filter and prevent flooding of the filter room.

J. A maximum velocity for water entering the filter is specified to prevent water from entering at a rate that disturbs the filter media.

K. A maintenance provision is necessary to allow access to clean lines where solids may deposit.

L. The wash water drain capacity, including the size of the washwater pipes or troughs, must be sufficient to accommodate the amount of water used in the backwash process.

M. Walkways must be provided so the operator can access the operation and observe the filters in operation.

N. Safety handrails or walls around the filter area are necessary to protect the operator from accidentally falling into the filter.

Subpart 5. Wash water troughs. The provisions of this subpart are specified in 10 States Standards, part 4.2.1.5.

As specified in item A, the bottom of a washwater trough must not come into contact with the filter media as it expands in the backwash process. Such contact would prevent complete expansion of the bed and inhibit cleaning of the filter during backwash.

Successful practice has shown the need to set a maximum height above the filter for washwater troughs (Item B). If the troughs are higher than 30 inches, excessive backwash flow rates are then needed to lift the water. If backwash flow rates are too high they disrupt the different types of filter media used so that when the backwash cycle is finished the different types of filter media may not settle into their original vertical placement.

The two-inch freeboard requirement in item C is necessary as a safety factor. The washwater trough is designed to handle maximum backwash flow with two inches of trough volume as a safety factor. If the troughs cannot carry away the maximum backwash flow, then the benefits of the cleaning provided by the backwash are diminished.

As specified in item D the top edge of the troughs must be level so there is uniform discharge of the backwash water into the troughs. This maximizes the cleaning process over the entire filter area.

The requirement in item E is also designed to ensure that the entire area of the filter receives the benefit of the cleaning process.

The requirements in item F help increase the efficiency of the cleaning cycle by providing sufficient troughs so the backwash water does not travel too far horizontally. The farther the backwash water travels horizontally, the greater the probability that suspended particles will begin to settle and not be removed from the filter.

Subpart 6. Filter media. The provisions in items A to D of this subpart are taken from 10 States Standards, part 4.2.1.6.a to d. The specifications in item A for the size and depth of sand are all based on successful application of these criteria in existing water treatment facilities. The choice of the size and depth of sand must strike a balance between small grains of sand that trap

more particles from the water but become clogged quickly and require frequent backwashing and large grains of sand that may not filter out as many particles but do not require frequent backwashing.

The same considerations for sizing anthracite filter media must be used as with sand (item B). When placed on top of sand, anthracite must be sized larger than the sand so that larger particles are trapped in the anthracite and smaller particles are trapped in the sand. If more of the depth of the media can be used for filtration, longer filter runs between backwashing can be obtained.

Because granular activated carbon does not have a proven track record as a filter media, (item C), pilot plant studies must be conducted to determine if it will be effective before it is approved as a filter media.

The provisions in item E are taken from 10 States Standards, part 4.2.1.6.e.5-6. The specifications for the size and amount of sand and gravel used at the bottom of the filter to support the filter media and expedite the collection of the filtered water from the bottom of the filter are based on successful applications in existing treatment plants.

In lieu of following the criteria in item E for filter support media, proprietary filter bottoms (those owned by a private individual or corporation under a trademark or patent) may be used if information is provided to the commissioner that shows the proprietary filter bottom to perform as well as the sand and gravel bottom specified in item E.

Subpart 7. Filter bottoms and strainer systems. When proprietary filter bottoms are used they must be approved on a case-by-base basis so a determination can be made as to their effectiveness in conjunction with the overall design of the filter. The provisions of this subpart for a manifold-type collection system are consistent with the 10 States Standards, part 4.2.1.7 and are based on successful application in existing treatment plans.

Subpart 8. Surface wash. The requirements in this subpart are taken from 10 States Standards, part 4.2.1.8 and represent successful applications. More particles are trapped at or near the surface of a filter. Surface wash facilities must be provided to improve the removal of the heavier concentrations of particles found at the top of a filter. Additional cleaning is necessary for the surface and subsurface of the filter besides the normal backwashing of the filter to remove the heavier particles.

Subpart 9. Appurtenances. The sampling tap, loss-of-head gauge, flowrate indicator and turbidimeter are all needed as quality

control measures so the performance of each filter can be determined and adjustments in the treatment process made as necessary. Each filter must be piped so water from the filter can be discharged to waste if the filter is not performing properly. The provisions in this subpart are specified in 10 States Standards, part 4.2.1.10.

Subpart 10. Backwash. Backwashing is the cleaning process for a filter in which the direction of water flow is reversed. Water enters the bottom of the filter rather than the top and at a sufficient rate to lift the filter media and remove the trapped particles around the media. Since the particles are not as heavy as the filter media they are carried upward to washwater troughs and then removed to waste. The design criteria for backwash facilities are intended to enhance the cleaning process while using as little treated water as possible. This standard is specified in 10 States Standards, part 4.2.1.11.

Subpart 11. Roof drains. This provision is necessary to prevent the introduction of contaminants into the water supply during treatment. It is consistent with 10 States Standards, part 4.2.1.12.

4720.3947 SLOW RATE GRAVITY FILTERS.

Slow rate gravity filters depend largely on biological mechanisms within the filter to treat water. (Rapid rate gravity filters depend largely on the physical screening of particles from the water.) Slow rate gravity filtration is a process that:

1. generally uses small sand and gravel particles as the filtration media;
2. does not employ backwashing;
3. uses a cleaning method that removes the surface media and replaces it with new media;
4. has much longer run times between cleanings; and
5. requires a ripening period at the beginning of each filter run to establish sufficient numbers of biological organisms in the filter media to obtain the necessary treatment for water passing through the media.

Subpart 1. Demonstration study. Because the filter media used in slow rate gravity filtration is much smaller than that used in rapid rate filtration and there is no backwashing, slow rate gravity filtration is applicable to source water that does not have a lot of suspended particles needing removal. For this reason a preliminary study of the source water quality is necessary to determine if slow rate gravity filtration is the appropriate technology for the raw water quality characteristics present. The provisions in this subpart are specified in 10 States Standards, part 4.2.4.

Subpart 2. Quality of raw water. As specified in subpart 1, the filter media used in slow rate gravity filtration is much smaller than that used in rapid rate filtration and there is no backwashing. Slow rate filtration thus is applicable to source water that does not have a lot of suspended particles to be removed. Past practice has shown that slow rate filtration is effective when the source water does not exceed 50 turbidity units and 30 color units. The provisions in this subpart are specified in 10 States Standards, part 4.2.4.1.

Subpart 3. Structural details and hydraulics. Other design criteria require at least two filter units so the provision of potable water will not be interrupted if one filter unit is out of service. A cover or superstructure is necessary so airborne contaminants do not enter the water supply being treated. Access to replace the media is necessary because that is part of the filtration process. A means to filter the water to waste after new media is placed in the filters is necessary to allow the biological buildup in the filters that is necessary for proper treatment of the water. The provisions in this part are specified in 10 States Standards, part 4.2.4.3.

Subpart 4. Rates of filtration. The rate of filtration is very low compared to rapid rate filtration and must be determined based on the site specific characteristics of the raw water. The rates specified in this part are from 10 States Standards, part 4.2.4.4.

Subpart 5. Underdrains. It is necessary to specify that drains be provided under the filter media because the filtered water must be collected after it has gravitationally passed through the filter media. The velocity limits and lateral spacing criteria for underdrains is necessary so water drains at a slow rate through the filter media allowing the biological organisms to perform their task and potable water of acceptable quality is obtained. The specific velocity limits and lateral underdrain spacing requirements are specified in 10 States Standards, part 4.2.4.5.

Subpart. 6. Filtering material. A minimum depth is established to increase the probability of trapping particles as they pass vertically through the filter media. The size of sand needs to be specified so the proper void space is created between sand grains to trap particles in the water that must be removed. The provisions in this subpart are specified in 10 States Standards, part 4.2.4.6.

Subpart 7. Filter gravel. The reason for this provision is the same as for part 4720.4945, subpart 6, item E. It is based on 10 States Standards, part 4.2.4.7.

Subpart 8. Depth of water on filter beds. At least three feet of water must be maintained over the filters to provide adequate pressure to move the water through the filters. This provision is based on 10 States Standards, part 4.2.4.8.

Subpart 9. Control appurtenances. Control devices are needed to assist in the operation of the filters and determine when cleaning is necessary. This provision is based on 10 States Standards, part 4.2.4.9.

4720.3950 DIATOMACEOUS EARTH FILTRATION.

Subpart 1. Applicability. Diatomaceous earth filtration consists of applying a thin layer of diatomaceous earth, a natural silicious fossil material, on a filter element or septum. The thin layer of diatomaceous earth must be supplemented by a continuous body feed of diatomaceous earth, which is used to maintain the porosity of the filter cake. The problems inherent in maintaining the proper film of diatomaceous earth on the septum restrict the use of diatomaceous earth filters to source waters with favorable raw water quality conditions, such as low turbidity (few suspended particles) and good bacteriological quality. The provisions in this subpart are specified in 10 States Standards, parts 4.2.3 and 4.2.3.1.

Subpart 2. Pilot plant study. A pilot plant study must be conducted to determine if diatomaceous earth filtration will filter the source water under consideration and also to determine a number of criteria for successful operation of the filter including the rate of filtration, body feed rate, and optimal length of filter runs. The standards specified in this part are specified in 10 States Standards, part 4.2.3.2.

Subpart 3. Treated water storage capacity. Treated water storage must be provided to allow the bypassing of the diatomaceous earth filters when raw water contains too much turbidity or biological growth for the diatomaceous earth filters to adequately filter. The provisions of this subpart are consistent with 10 States Standards, part 4.2.3.4.

Subpart 4. Number of filters. Multiple filter units are required to allow one filter to be out of service and still be able to provide water to the consumers. This subpart is consistent with 10 States Standards, part 4.2.3.5.

Subpart 5. Precoat. Before a diatomaceous earth filter can produce water for consumption a coating of diatomaceous earth must be put on the septum or filter element. Once the septum has been coated, the filtration process can begin. The amount of earth per square foot of filter area specified are consistent with the amounts specified in 10 States Standards, part 4.2.3.6.

Subpart 6. Body feed. A body feed system is needed to provide for the continuous addition of diatomaceous earth to the filter element for proper filtration. The diatomaceous earth is mixed with water and fed as a slurry onto the filter elements. Head loss is the same as pressure loss which occurs as the filter gets clogged with the particles it traps. By continually adding more diatomaceous earth slurry more filtering area is made available thereby increasing the amount of time the filter can operate between cleanings. The standards specified in this part are consistent with those specified in part 4.2.3.7 of the 10 States Standards.

Subpart 7. Rate of filtration. The minimum and maximum filtration rates specified in this subpart are based on studies of the successful operation of diatomaceous earth filters which have operated within this filtration rate range. The standards specified are the same as those in 10 States Standards part 4.2.3.8.a.

Subpart 8. Recirculation. A recirculation pump is required to maintain pressure on the filter elements to prevent the diatomaceous earth from dropping off the filter elements when there is no demand for treated water.
This provision is consistent with 10 States Standards, part 4.2.3.8.c.

Subpart 9. Septum or filter element. The septum or filter elements must be made of materials that withstand the forces they are subjected to in operation. The maximum spacing requirement specified is necessary to ensure that each filter element receives uniform loading without excessive pressure which is caused by larger spacing. This subpart is consistent with 10 States Standards, part 4.2.3.8.d.

Subpart 10. Inlet design. Because the diatomaceous earth is held onto the filter element by the force of the water moving through the filter, it is important that the water first entering the filter, normally at a greater velocity than water in the filter, not strike the filter elements directly, but be deflected to reduce velocity. Water moving at too high a velocity will "scour" or remove the diatomaceous earth from the filter. This subpart is consistent with 10 States Standards, part 4.2.3.8.e.

Subpart 11. Backwash. There is no one standard method for backwashing or cleaning diatomaceous earth filters so none is specified. However, since cleaning must be accomplished a method must be employed at each installation that thoroughly removes and disposes of spent filter cake. This subpart is consistent with 10 States Standards, part 4.2.3.9.

Subpart 12. Appurtenances. Subpart 13. Monitoring turbidimeter. Control devices or appurtenances must be provided to assist the

operator in determining if the filter is operating properly and when it is necessary to clean. The standards specified in these subparts are specified in 10 States Standards parts 4.2.3.10 and 4.2.3.11.

4720.3955 DIRECT FILTRATION PLANTS.

Subpart 1. Studies. Direct filtration refers to the water treatment process which uses the addition of coagulants in a mixing basin followed directly by filtration. This process differs from conventional treatment (coagulation addition, mixing basin, flocculation, sedimentation, filtration) by eliminating the flocculation and sedimentation steps in the process. Because the flocculation and sedimentation steps are eliminated in direct filtration, the source water must be of a higher quality than that for which conventional treatment would be needed. Pilot plant or in-plant demonstration studies must be conducted to determine if direct filtration is applicable to the particular source water being considered and also to determine many of the design and operation criteria necessary for a successful treatment process. This subpart is consistent with 10 States Standards, part 4.2.5.

Subpart 2. Engineering report. Because the flocculation and sedimentation steps are eliminated in direct filtration, the source water must be of a higher quality than that for which conventional treatment would be needed. To properly evaluate if direct filtration is feasible, an engineering report focusing on the source water quality characteristics must be conducted. This standards is consistent with that specified in 10 States Standards, part 4.2.5.1.

Subpart 3. Pilot plant or in-plant demonstration studies. As specified in 10 States Standards, part 4.2.5.2 if the conclusions of the engineering report indicate the source water quality is favorable to direct filtration, then a pilot plant or in-plant demonstration study must be conducted to determine the design and operational specifics for successful operation of the direct filtration plant.

Subpart 4. Pretreatment - rapid mix and flocculation. If pretreatment is determined to be necessary by the pilot plant or in-plant demonstration study, the basins must be designed incorporating the information gained from the studies and augmented by the applicable design standards contained in parts 4720.3930, subpart 3 and 4720.3932. This requirement is consistent with 10 States Standards, part 4.2.5.3.

Subpart 5. Filtration. The design of the filter beds including size, type and depth of media are the same as the requirements in part 4720.3945, subparts 1 to 8. Surface wash and backwash requirements are also the same as those specified in part

4720.3945. The provisions of this subpart are consistent with 10 States Standards, part 4.2.5.4.

Subpart 6. Siting requirements. A siting requirement is included that requires the water supplier to have sufficient space to install sedimentation basins if the installation of a direct filtration process does not achieve the necessary treated water quality. This provision is based on 10 States Standards, part 4.2.5.6.

4720.3957 CHEMICAL ADDITION.

Subpart 1. Feed equipment required. Multiple units of feed systems are required to assure continuous operation with one unit or system out of service. This requirement is consistent with 10 States Standards, part 5.1.1.

Subpart 2. Design and capacity. Separate feed systems for each chemical being used is required to avoid any adverse chemical reactions occurring in the feed system or piping. Proportioning of chemical feed to the rate of flow of the water being treated is necessary to avoid overfeeding a chemical when the rate of flow of water is decreased. Requirements are included to prevent back-siphoning of chemicals into the water being treated. The materials and surfaces in contact with chemicals must be resistant to the chemicals being used to prevent deterioration of those surfaces and materials. Dry feeders must have a means to measure the chemicals being used and effectively dissolve the chemical in the solution pot to ensure that the proper amount is applied. Dry feeders must be completely enclosed to prevent the emission of chemical dust in the operation area. This subpart is consistent with the provisions in 10 States Standards, parts 5.1.1, 5.1.2 and 5.1.3.

Subpart 3. Location of feed equipment. Chemical feed equipment must be located to make it readily accessible for operation and maintenance and provided with protective curbing to prevent spills or other accidental discharges from entering the water being treated. This part is consistent with the provisions in 10 States Standards, part 5.1.7.

Subpart 4. Controls. The controls for chemical feeders must be consistent with the type of controls used for water supply pumps so chemicals are fed only when water is pumped thus avoiding the overfeed of chemicals. This provision is consistent with 10 States Standards, part 5.1.2 (a) (b) and (c).

Subpart 5. Weighing scales. The easiest way to measure how much of a chemical
is needed or has been used is to weigh the chemical. To be useful, the scales must be accurate to a specified tolerance. This provision is consistent with 10 States Standards, part 5.1.2 (f).

Subpart 6. Feed lines. The piping materials for chemical feed lines need to be durable and resistant to and compatible with the chemical that they are carrying to prevent failure or clogging. They need to be easily accessible for repair and maintenance. This provision is consistent with 10 States Standards, part 5.1.12.

Subpart 7. Service water supply. Water which is mixed with chemicals needs to be treated water to avoid any adverse chemical reaction between chemicals and possible contaminants in untreated or partially treated water. Backflow prevention is necessary to prevent contamination of the treated water supply by large amounts of treatment chemicals. This subpart is consistent with 10 States Standards, part 5.1.8.

4720.3960 CHEMICAL STORAGE.

Subpart 1. Storage space. Chemical storage facilities must be sized to maintain at least 30 days of chemicals in an efficient and dry setting so water service will not be interrupted due to a shortage of treatment chemicals. This provision is consistent with 10 States Standards, part 5.1.9 a.

Subpart 2. Containers. All chemical containers must be properly covered to avoid any adverse exposure to chemicals by water plant personnel. This subpart is consistent with 10 States Standards, part 5.1.9 c.

Subpart 3. Capacity. Solution storage or day tanks directly supplying feeders must have sufficient capacity for one day of operation so the feeders need only be checked and replenished once a day. This provision is consistent with 10 States Standards, parts 5.1.11 c and 5.1.10 b.

Subpart 4. Storage containers. Containers which are compatible with the chemicals stored in them is essential to prevent the decomposition of the container and potential leakage or spillage of the chemical into the water supply or on personnel. This standard is consistent with 10 States Standards, part 5.1.9 b.

Subpart 5. Mixing equipment. Mixing equipment is needed in those cases where constant agitation is necessary to keep the chemical mix at a uniform strength. If not continually mixed, some chemicals will not stay evenly distributed in the solution tank and uneven amounts of chemicals could be fed.
This provision is consistent with 10 States Standards, part 5.1.10 a.

Subpart 6. Measurements. The requirement for measuring devices to determine the amount of chemical being used is necessary so the correct amount of chemical enters the water supply system.

Measuring devices alert the supplier to any significant overfeed of chemical. This provision is consistent with 10 States Standards, parts 5.1.9.d.1 and 5.1.2.f.

Subpart 7. Drainage. Chemical storage tanks must be provided with a means to drain the tanks without being directly connected with a sewer which could backup and contaminate the chemical or water supply. This provision is consistent with 10 States Standards, part 5.1.9.d.2.

Subpart 8. Overflow pipes. An overflow pipe is necessary to relieve any pressure which could be caused by overfilling the tanks. This provision is consistent with 10 States Standards, part 5.1.10 f.

Subpart 9. Subsurface storage.If subsurface locations are used to store chemicals, then a means to prevent spills and water from being retained in the storage area must be provided. Retention can occur more easily in subsurface areas where drainage by gravity may not be possible. Then pumps are needed to pump out any water or chemicals. This provision is consistent with 10 States Standards, part 5.1.10 e.

Subpart 10. Compatibility of chemicals. Incompatible chemicals must not be stored in common areas to prevent the possibility of adverse chemical reactions occurring if the chemicals inadvertently come into contact with each other. This provision is consistent with 10 States Standards, part 5.0.3.d.

Subpart 11. Venting. Gases from feeders and storage areas need to be vented to the outside atmosphere to reduce the possibility of human exposure to the gases and reduce the damage caused by gases which can be caustic coming into contact with equipment and other interior surfaces and materials. This provision is consistent with 10 States Standards, part 5.1.10.g.

4720.3962 CHEMICAL HANDLING.

Subpart 1. Measuring equipment. Measuring equipment must be provided to assure that chemical solutions and mixtures are prepared in the proper concentrations. This subpart is consistent with 10 States Standards, part 5.1.13.d.

Subpart 2. Piping. Chemical piping must be compatible with the chemical being transmitted to prevent deterioration or failure of the piping. This provision is specified in 10 States Standards, part 5.0.3.b.

Subpart 3. Dust control. To protect workers from chemical dust exposure it is necessary to employ one of the three dust control measures contained in the rule. These measures are specified in 10 States Standards, part 5.1.13.c.

Subpart 4. Acids. To prevent incidental contact to workers from chemicals that are acidic, the chemicals must be stored in acid-resistant containers and the transfer of the chemicals from storage containers to feed equipment must be done by pump to limit worker exposure. This provision is specified in 10 States Standards, part 5.1.11.e.

4720.3965 DISINFECTION.

Subpart 1. Chlorine. Chlorine has been successfully used as a disinfectant in water treatment for nearly a century. Because of its history of use much is known about chlorine and its effectiveness in a large variety of water quality conditions. Chlorine can also be measured accurately by easy to use field test kits so water operators can closely monitor the chlorine levels in the water. Other disinfectants are available but they do not have the proven track record of chlorine and therefore more preliminary study concerning the appropriateness of their use must be done before they can be approved by the Commissioner. This provision is consistent with 10 States Standards, part 4.3.

Subpart 2. Equipment. Gas chlorinators and hypochlorite positive displacement pumps are required for feeding chlorine since both of these methods have been shown to be effective at feeding accurate dosages of chlorine as needed in the treatment process. This provision is recommended in 10 States Standards, section 4.3.1.1.

Subpart 3. Capacity. The chlorinator capacity must be capable of feeding sufficient chlorine to maintain a free chlorine residual of two milligrams per liter after a contact time of at least 30 minutes at maximum flow rate and maximum water demand. These criteria describe a worst case situation as far as the amount of chlorine that might ever need to be delivered. If the chlorination equipment can meet these worst case conditions, then it will easily meet normal chlorination demands. This provision is specified in 10 States Standards, part 4.3.1.2.

Subpart 4. Standby equipment. Multiple chlorination units are required so that if one unit is out of service, the water plant can still stay in service producing safe water for its consumers. This standards is consistent with part 4.3.1.3 of 10 States Standards.

Subpart 5. Automatic proportioning. In situations where the rate of flow of water through the treatment plant is not reasonably constant or not manually controlled, automatic proportioning chlorinators are required so they can adjust to changes in the water flow and feed the correct dosage of chlorine thereby eliminating the possibility of an underfeed or overfeed

of chlorine. This provision is specified in 10 States Standards, part 4.3.1.5.

Subpart 6. Contact time and point of application. The amount of chlorine that must be fed is dependent on the quality of the source water. The quality and characteristics of the water must be determined during preliminary studies to determine chlorine needs. For flexibility in operation of the water treatment plant, a number of different points of application for chlorine must be provided throughout the treatment process. Chlorine contact time refers to the amount of time the chlorine is in contact with water that has completed the treatment process through the filtration stage. The longer the chlorine is in contact with the water the more complete the reduction and/or inactivation of microbiological contaminants found in water. The contact times specified in this subpart have shown through decades of successful applications to provide the necessary disinfection to provide microbiologically safe water. The provisions in this subpart are consistent with 10 States Standards, part 4.3.2.

Subpart 7. Residual testing equipment. Residual chlorine testing equipment must be provided so the water supplier can test the treated water to determine if there is any chlorine residual remaining after the treatment process. If there is no measurable chlorine residual after the treatment process, more chlorine will need to be added so a chlorine residual is always present in case any microbiological contaminants are somehow introduced into the water as it is being delivered to the consumers. A chlorine residual is specified in Code of Federal Regulations, title 40, part 141.72 (b) (2) as amended through June 29, 1989. The provisions of this subpart are consistent with 10 States Standards, part 4.3.4.

Subpart 8. Chlorinator piping. Chlorine is fed into the water in a treatment plant by means of a small diameter water line that branches off of the water treatment process and receives relatively high concentrations of chlorine. This concentrated solution of water and chlorine is then piped back into the large volume of water going through the treatment process and in so doing diluting the chlorine to desireable concentrations. The water supply piping must be equipped with appropriate backflow preventive devices so large amounts of chlorine cannot flow back into the water being treated in the plant.

Subpart. 9. Housing. Because chlorine gas is a highly toxic substance special requirements are necessary to protect water treatment plant personnel. The chlorine gas must be housed in a separate gas-tight enclosure that is provided with mechanical ventilation to quickly remove any chlorine gas that may leak into the enclosure. The enclosure or room must have an exterior inspection window so the water operator can check the condition

of the room before entering it and must be equipped with emergency or panic hardware that will allow an operator easy exit in case of an emergency. This provision is consistent with 10 States Standards, part 5.4.1.a.b.d and e.

Subpart 10. Ventilation of chlorine rooms. Since chlorine is heavier than air and sinks to the floor, the exhaust fan suction must be located near the floor to evacuate any chlorine gas that has accumulated. This provision is contained in 10 States Standards, part 5.4.1.c.

Subpart 11. Ammoniation. Because ammonia gas is a toxic substance, if it is used in the water treatment process it must be housed and ventilated in the same manner as chlorine gas. It must be housed separately from the chlorine gas, however, because of the combustion hazard if the two chemicals are mixed.

4720.3970 VARIANCE PROCEDURES AND CRITERIA FOR SURFACE WATER CONSTRUCTION STANDARDS.

Minnesota Statutes, section 14.05, subdivision 4 requires that an agency:

> adopt rules setting forth procedures and standards by which variances shall be granted and denied. An agency receiving a request for a variance shall set forth in writing its reasons for granting or denying the variance.

The environmental health division of the department has proposed a general variance rule that specifies the procedures and criteria for requesting and granting variances. These rules are contained in parts 4717.7000 to 4717.7050 as proposed in Volume 15 of the State Register, No. 18, pages 985 to 992, published October 29, 1990. The proposed variance rule as adopted would be used as the standard for requesting a variance from proposed parts 4720.3920 to 4720.3965.

In the course of enforcing adopted standards, there may be a case where not all applicable standards can be met. The Department is then asked if the standard can be varied so the project or procedure can legally take place. In some cases, there may be alternative means which accomplish the same purpose as the original standard. If alternatives exist, they should be considered and perhaps substituted for the standard prescribed.

The proposed environmental health division general variance procedures and criteria provide that a request for a variance contain:

A. the specific language of the adopted rule from which the variance is requested:

B. the reasons why the rule cannot be met;

C. the alternative measures that will be taken to assure a comparable degree of protection to health or the environment if a variance is granted;

D. the length of time for which the variance is requested;

E. a statement that the party applying for the variance will comply with the terms of the variance, if granted; and

F. other relevant information necessary to properly evaluate the request for the variance.

The decision to grant or deny a variance will be based on an evaluation by the commissioner of whether:

A. the variance was requested in the manner prescribed;

B. the variance will have no potential adverse effect on public health, safety or the environment;

C. the alternative measures to be taken, if any, are equivalent to or superior to that prescribed in the adopted rule;

D. strict compliance with the rule will impose an undue burden on the applicant; and

E. the variance does not vary a statutory standard.

The applicant for a variance is notified in writing of the commissioner's decision and if a variance is granted, the notice specifies the period of time for which the variance is effective and the alternative measures or conditions, if any, that the applicant must meet.

The alternative measures or conditions attached to the variance have the force and effect of the applicable rule. If the registrant violates the alternative measures or conditions, the registrant is subject to any enforcement actions or penalties specified by chapter 4730. A variance may be renewed. Denial, revocation or refusal to renew a variance is subject to a contested case hearing under Minnesota Statutes, chapter 14.

The general information requirements specified to request a variance are reasonable to assure that the Department has sufficient information to make a well founded determination and make it without having to make further inquiries. A written request is reasonable to assure that there is a hard copy record of the request and no error occurs because terms are not heard correctly. All of the information is requested at once so the amount of time required to prepare a response is as short as possible. Further information is necessary so the Department can determine whether the need for the variance has been sufficiently documented. The information requested is necessary so the Department can be assured that the public health purpose underlying the variance will work, and that the requestor bears the responsibility for complying with the terms of the variance, if granted. The requestor is encouraged to provide any additional information if such information would help the Department arrive at a decision.

Specifying the criteria to be used by the Department to make a variance decision is necessary so the parties involved know what the standard is that will be used to determine whether a project or procedure can continue or proceed. Specifying the criteria commits the Department to weighing each request according to a set of minimum criteria, all of which underlie the public health protection goals of the variance standards. Specifying the criteria makes the process visible and helps assure that every request is reviewed fairly while assuring that protection of the public health remains as the ultimate goal in applying certain standards.

Whether a variance was requested in the manner prescribed is a reasonable criteria to ensure that the Department receives the information needed to weigh the request. The variance cannot adversely effect public health, safety or the environment. The adopted standard to which a variance is requested is justified on the basis of its need to protect public health, or the environment. These protections should not be compromised once established. The alternative measures proposed thus must provide equivalent or superior means to protect public health, safety or the environment and should not conflict with the adopted standard. In some cases strict compliance may pose an undue burden on the applicant. While it is sometimes difficult to weigh the health, safety and environmental costs against the costs of an individual party, it is reasonable that no one party's burden be unduly excessive. Minnesota Statutes, section 14.05, subdivision 4 prohibits an agency from granting a variance to statutory standards.

It is necessary that the applicant be notified in writing of the commissioner's decision so all parties have a clear understanding of what is expected of each and to specify with certainty what the terms and conditions of the variance are. Part 4717.7030 also makes it clear that the effect of a variance is that it is as binding on the grantee as was the original adopted standard.

REPEALER. The rule parts cited for repeal are those which have been proposed for replacement by the incorporation of the Code of Federal Regulations, title 40, parts 141 and 142.40 to 142.64. This provision also repeals parts 4717.6000 to 4717.6900 which are standards for the water purification and filtration plants grants program which is no longer funded.

Effective Date: The proposed rules shall be effective five working days after publication of a notice of adoption in the State Register.

BIBLIOGRAPHY

The material cited below and reference in the Statement of Need and Reasonableness, including state and federal laws, rules and codes are available through the Minitex interlibrary system or from the Minnesota Department of Health or Office of Administrative Hearings.

The Safe Drinking Water Act, Minnesota Statutes, section 144.381 to 144.388.

The National Primary Drinking Water Regulations, Code of Federal Regulations, title 40, parts 141 and 142 as amended through June 29, 1989.

Federal Register, Volume 54, No. 124, pages 27526 to 27541 and 27562 to 27568 as published June 29, 1989.

Recommended Standards for Water Works, Policies for the Review and Approval of Plans and Specifications for Public Water Supplies, prepared by the Water Supply Committee of the Great Lakes-Upper Mississippi River Board of Public Health and Environmental Managers, 1987 edition. Published by Health Research Inc., Health Education Services Division, P.O. Box 7126, Albany, NY 12224.
Member states and province: Illinois, Indiana, Iowa, Michigan, Minnesota, Missouri, New York, Ohio, Ontario, Pennsylvania and Wisconsin.

STATE OF MINNESOTA

MINNESOTA DEPARTMENT OF HEALTH

In the Matter of the Proposed Adoption of the Rules of the Minnesota Department of Health Governing Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970	NOTICE OF INTENT TO ADOPT A RULE WITHOUT A PUBLIC HEARING

(1) Notice is hereby given that the Minnesota Department of Health intends to adopt the above-entitled rule without a public hearing following the procedures set forth in the Administrative Procedures Act for adopting rules without a public hearing in Minnesota Statutes, sections 14.22 to 14.28. The statutory authority to adopt the rule is Minnesota Statutes, section 144.383, paragraph (e).

(2) All persons have 30 days or until 4:30 p.m. on January 9, 1991 in which to submit comment in support of or in opposition to the proposed rule or any part or subpart of the rule. Comment is encouraged.(3) Each comment should identify the portion of the proposed rule addressed, the reason for the comment, and any change proposed.

Any person may make a written request for a public hearing on the rule within the 30-day comment period. (4) If 25 or more persons submit a written request for a public hearing within the 30-day comment period, a public hearing will be held unless a sufficient number withdraw their request in writing. (6) Any person requesting a public hearing should state his or her name and address, and is encouraged to identify the portion of the proposed rule addressed, the reason for the request, and any change proposed. (7) If a public hearing is required, the agency will proceed pursuant to Minnesota Statutes, sections 14.131 to 14.20.

Comments or written requests for a public hearing must be submitted to:

(3)
Richard Clark, Supervisor
Public Water Supply Unit
Environmental Health Division
Minnesota Department of Health
925 Southeast Delaware Street
P.O. Box 59040
Minneapolis, Minnesota 55459-0040
(612) 627-5180

(8) The proposed rule may be modified if the modifications are supported by data and views submitted to the Department and do not result in a substantial change in the proposed rule as noticed.

(11) The proposed rules include provisions relating to U.S. Environmental Protection Agency and state standards for safe drinking water. Specifically,

the proposed standards: 1) revise the adopted coliform bacteria monitoring, reporting and maximum contaminant levels; 2) add performance requirements for public water suppliers who use surface water as the source water; and 3) add standards for surface water treatment facilities. A copy of the proposed rules is attached to the notice as mailed.

(11) A free copy of the rule is available upon request from Richard Clark.

(12) A Statement of Need and Reasonableness that describes the need for and reasonableness of each provision of the proposed rule and identifies the data and information relied upon to support the proposed rule has been prepared and is available from Richard Clark.

(13) Adoption of these rules will not result in additional spending by local public bodies in excess of $100,000 per year for the first two years following adoption under the requirements of Minnesota Statutes, section 14.11.

(15) The proposed rule will not have an impact on agricultural land; therefore, no further information need be provided under Minnesota Sta5tutes, section 14.11.

(14) The Department is subject to Minnesota Statutes, section 14.115 regarding small business considerations in rulemaking. The Department's evaluation of the applicability of the methods contained in Minnesota Statutes, section 14.115, subdivision 2, for reducing the impact of the proposed rules is addressed in the statement of need and reasonableness.

(9) If no hearing is required, upon adoption of the rule, the rule and the required supporting documents will be submitted to the Attorney General for review as to legality and form, including the issues of substantial change; whether the Department has the authority to adopt the rules; and whether the record demonstrates a rational basis for the need for and reasonableness of the proposed rules. Any person may request notification of the date of submission to the Attorney General. Persons who wish to be advised of the submission of this material to the Attorney General, or who wish to receive a copy of the adopted rule, must submit the written request to Richard Clark. If the proposed rule has been modified, the notice will also state that fact and will state that a free copy of the proposed rule, as modified, will be available on request from the Department.

Date:

S. Mary Madonna Ashton

SISTER MARY MADONNA ASHTON

COMMISSIONER OF HEALTH

Department of Health

Proposed Permanent Rules Relating to Public Water Supplies

Rules as Proposed

4720.0200 JUSTIFICATION.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 are adopted pursuant to ~~legislative authority granted in laws of Minnesota 1977, chapter 66, section 3, clause (e)~~ the Safe Drinking Water Act, Minnesota Statutes, sections 144.381 to 144.388, which requires that the commissioner of health adopt for all public water supplies rules which are at least as stringent as the federal regulations dealing with public water supplies adopted by the United States Environmental Protection Agency, in order for the commissioner to be able to assume the primary responsibility for enforcing the federal act.

4720.0300 SCOPE AND COVERAGE.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 prescribe standards for water supply siting and construction, set maximum contaminant levels for turbidity, microbiological constituents, organic and inorganic chemicals, and radioactivity, prescribe a frequency for monitoring the levels of these constituents and sodium and corrosivity, and prescribe the procedures for reporting results, notifying the public and for maintaining records.

The standards and procedures adopted in parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 inclusive shall apply to all public drinking water supplies, pursuant to authority granted by existing statutes and amendments thereto, notwithstanding any other water quality standards or regulations.

A water supply which meets all of the following requirements shall not be a public supply for the purpose of parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970:

A. consists only of distribution and storage facilities and does not have any collection and treatment

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facilities;

B. obtains all of its water from, but is not owned or operated by a public water supply to which ~~such~~ the regulations apply;

C. does not sell water to any person; and

D. is not a carrier which conveys passengers in interstate commerce.

Rules as Proposed (all new material)

4720.0350 RULES AND STANDARDS ADOPTED BY REFERENCE.

The National Primary Drinking Water Regulations in Code of Federal Regulations, title 40, parts 141, and 142.40 to 142.64 as amended through June 29, 1989, are incorporated by reference in parts 4720.0200 to 4720.3970 and are subject to the alterations and amendments contained in parts 4720.0200 to 4720.3970.

4720.0450 DEFINITIONS; SECTION 141.2 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Subpart 1. **Central water treatment defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Central water treatment" means providing treatment at a common location or facility and subsequently delivering it to the consumer of the public water supply.

Subp. 2. **Commissioner of health defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Commissioner of health" means the authority established by Minnesota Statutes, sections 144.381 to 144.388, for enforcement in the state of the National Primary Drinking Water Regulations and parts 4720.0200 to 4720.3970. For purposes of enforcing the National Primary Drinking Water Regulations, title 40, part 141, the term "state" contained in those regulations means the commissioner of health.

Subp. 3. **Composite defined.** In section 141.2 of the

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National Primary Drinking Water Regulations, the following definition is added:

"Composite" means a sampling technique in which two or more samples are combined before an analysis is performed.

Subp. 4. **Distribution system defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Distribution system" means a network of pipes, valves, storage reservoirs, and pumping stations that delivers water to homes, businesses, and industries for drinking and other uses.

Subp. 5. **Entry point samples defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Entry point samples" means water samples collected at a location after any application of treatment but before the water is delivered to any consumer.

Subp. 6. **Environmental Protection Agency methods defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Environmental Protection Agency methods" means methods contained in Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, September 1986. These methods are issued by the Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268. These methods are incorporated by reference and are not subject to frequent change. The methods are available through the Minitex interlibrary loan system.

Subp. 7. **Federal act defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Federal act" means the Safe Drinking Water Act of 1974, Public Law Number 93-523, title 42, United States Code, section 300f to 300j-11.

Subp. 8. **Federal regulations defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following

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definition is added:

"Federal regulations" means regulations dealing with public water supplies and drinking water quality, adopted by the Administrator of the United States Environmental Protection Agency pursuant to the federal act.

Subp. 9. **Groundwater defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Groundwater" means the water in the zone of saturation in which all of the pore spaces of the subsurface material are filled with water. The water that supplies a well is groundwater.

Subp. 10. **Turbidity unit defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Turbidity unit" means an amount of turbidity equivalent to that in a solution composed of 0.000125 percent hydrazine sulfate and 0.00125 percent hexamethylenetetramine in distilled and filtered (100 µ pore size membrane) water, as measured by a nephelometric turbidimeter.

Subp. 11. **Year round resident defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Year round resident" means a person who resides in the area served by the public water supply for more than six months of the year.

4720.0550 MICROBIOLOGICAL CONTAMINANT SAMPLING AND ANALYTICAL REQUIREMENTS; SECTION 141.21 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Section 141.21, paragraph (b), clause (1), of the National Primary Drinking Water Regulations is amended to read:

If a routine sample is total coliform-positive, the public water supplier must collect a set of repeat samples within 24 hours of being notified of the positive result. A supplier must collect no fewer than four repeat samples for each total

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coliform-positive sample found. The commissioner of health may extend the 24-hour limit on a case-by-case basis if the supplier has a logistical problem in collecting the repeat samples within 24 hours and the problem is beyond the supplier's control. In the case of an extension, the commissioner of health shall specify how much time the supplier has to collect the repeat samples.

Rules as Proposed

4720.2300 ADDITIONAL MONITORING REQUIREMENTS.

The commissioner may impose additional monitoring requirements if the results of a sanitary survey indicate that a public health risk may exist. The commissioner may impose a requirement for more frequent sampling if the analytical results of water tests show that a previously measured contaminant is approaching a maximum contaminant level ~~as~~ prescribed in ~~parts 4720.0400 to 4720.0900~~ Code of Federal Regulations, title 40, part 141, as amended through June 29, 1989.

Rules as Proposed (all new material)

4720.3920 GENERAL REQUIREMENTS FOR CONSTRUCTION OF SURFACE WATER TREATMENT FACILITIES.

The source of surface water selected for a public water supply must provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, meets the requirements specified in Code of Federal Regulations, title 40, parts 141.72(b) and 141.73, as amended through June 29, 1989. The design of the treatment processes, equipment, and structures shall depend on an evaluation of the nature and quality of the particular water to be treated. Variations from the design criteria may be approved by the commissioner in cases where experimental, pilot, or full scale studies have demonstrated that acceptable results can be obtained.

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4720.3922 INTAKES.

Intake structures must provide:

A. a velocity of flow 0.25 to 0.50 feet per second through the inlet structure so frazil ice is held to a minimum;

B. for the withdrawal of water from the depth of the best water quality;

C. inspection manholes every 1,000 feet for pipe sizes large enough to permit visual inspection;

D. protection against rupture by dragging anchors, ice, and other activity; and

E. permanent monuments to reference locations.

4720.3925 SHORE WELLS.

Shore well structures must:

A. have motors and electrical controls located above grade and flood level;

B. be accessible for operation and service;

C. be designed to prevent flotation;

D. be equipped with removable or traveling screens before the pump suction well;

E. provide chlorination or other chemical addition facilities for raw water transmission mains;

F. have the intake valved with provisions for backflushing and testing for leaks; and

G. have provisions for controlling surges.

4720.3927 PUMPING STATIONS; DESIGN REQUIREMENTS.

Subpart 1. **General.** Pumping stations must be designed to maintain the sanitary quality of the water being pumped. All raw or finished water pump stations must:

A. provide space to access and service all equipment;

B. have outward opening doors;

C. have a floor elevation at least six inches above the finished grade and at least 24 inches above the regional flood level. Below grade installations shall be permitted only if the terrain at the site is such that a gravity drain system can be provided;

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D. have all floors drained without impairing the quality of water being handled; and

E. provide a suitable outlet for drainage from pump glands without discharging onto the floor.

Subp. 2. **Pumping station suction well.** Suction wells, including installations where the pumps are installed on top of a reservoir, must:

A. be watertight;

B. have bottoms sloped to permit removal of water and entrained solids;

C. be vented by means of a pipe or other device terminating in a screened U-bend at least 24 inches above the floor; and

D. have curbs a minimum of four inches around all access openings, pipes, and other equipment which extend through the top of the suction well. Access openings must have covers which overlap at least two inches.

Subp. 3. **Pumping station pumps.** Pumping stations must:

A. have at least two pumping units except where additional pumping stations which can meet the peak demand are available or where the commissioner determines that ample time will be available between pumping periods for necessary repairs. If only two units are provided, each must be capable of carrying the peak demand. If more than two units are installed, each must have sufficient capacity so that any one pump can be taken out of service with the remaining pump capable of carrying the peak demand.

B. have controls for proper alternation where two or more pumps are installed. Provision must be made to prevent operation of the pump during the backspin cycle. All electrical controls must be located above grade.

C. provide a power supply from at least two independent sources or from a standby, auxiliary power source.

D. provide a prelubrication line with a valved bypass around the automatic control and backflow protection where required, whenever automatic prelubrication of pump bearings is

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necessary and an auxiliary power supply is provided.

Subp. 4. **Pumping station suction lift.** A suction lift shall be allowed only for distances of less than 15 feet and where provision is made for priming the pumps. A suction lift shall not be permitted if used with buried piping carrying finished water.

Subp. 5. **Pumping station priming.** Prime water must not be of lesser sanitary quality than that of the water being pumped. Means must be provided to prevent backflow. When an air-operated ejector is used, the screened intake must draw clean air from a point at least ten feet above the ground or other source of contamination, unless the air is filtered by apparatus approved by the commissioner. Vacuum priming may be used.

4720.3930 WATER CLARIFICATION PROCEDURES.

Subpart 1. **Duplicate systems.** Facilities designed to process surface water must provide duplicate systems for flocculation and sedimentation and be constructed to permit a system to be taken out of service without disrupting operation.

Subp. 2. **Pretreatment.** Water containing high turbidity or having unusual treatment requirements shall be pretreated, usually by sedimentation or detention either with or without the addition of chemicals.

A. Sedimentation basins must have a means for sludge removal.

B. Inlets for incoming water must disperse water across the full width of the line of travel as quickly as possible; short circuiting must be prevented.

C. Means for bypassing sedimentation basins must be provided.

D. Three hours detention is the minimum period required for sedimentation. In individual cases where chemical pretreatment is required because of unusual water quality characteristics, a greater detention time shall be required.

Subp. 3. **Flash or rapid mixing.** Mixing means the rapid

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dispersion of chemicals throughout the water to be treated, usually by vigorous agitation.

A. Basins must be equipped with mechanical mixing devices unless other methods, such as baffling or injection of chemicals at a point of high velocity, are approved by the commissioner after determining that the other requirements of this chapter are met.

B. The detention period for mechanical mixing must be as short as possible depending on the velocity gradient provided by the mixing units.

4720.3932 FLOCCULATION (SLOW MIXING).

Subpart 1. **Basin design.** Inlet and outlet design must prevent short circuiting and destruction of floc. A drain must be provided.

Subp. 2. **Detention.** Minimum flow-through velocity must be not less than 0.5 feet or greater than 1.5 feet per minute with a detention time for floc formation of at least 30 minutes.

Subp. 3. **Equipment.** Agitators must be driven by variable speed drives or other means which vary the peripheral speed of paddles in the range of 0.5 to 3.0 feet per second. Uniform mixing must be provided to prevent settling in the flocculation basin.

Subp. 4. **Piping.** Flocculation and sedimentation basins must be as close together as possible to avoid settling out. The velocity of flocculated water through pipes or conduits to settling basins must be no less than 0.5 feet nor greater than 1.5 feet per second.

Subp. 5. **Baffling; other designs.** Baffling may be used to provide flocculation only after the supplier consults with the commissioner and receives the commissioner's approval. The design must maintain the velocities and flows set forth in this subpart.

4720.3935 SEDIMENTATION.

Subpart 1. **General.** Sedimentation must follow flocculation. The detention time for effective water

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clarification shall depend on basin design and the nature of the raw water, such as turbidity, color, colloidal matter, taste, and odor causing compounds.

Subp. 2. **Detention time.** Facilities with a conventional sedimentation system must provide a minimum of four hours of settling time.

Subp. 3. **Inlet devices.** Inlets must be designed to distribute the water equally and at uniform velocities. A baffle must be constructed across the basin, close to the inlet end. The baffle must project far enough below the water surface to dissipate inlet velocities and provide uniform flow across the basin.

Subp. 4. **Outlet devices.** Outlet devices must maintain velocities suitable for settling in the basin and must minimize short circuiting.

Subp. 5. **Weir overflow rate.** The rate of flow over the outlet weir must not exceed 20,000 gallons a day per foot of weir length. If submerged ports are used as an alternate for overflow weirs, they must not be lower than three feet below the flow line.

Subp. 6. **Drainage.** Basins must be provided with a means for dewatering. Basin bottoms must slope toward the drain.

Subp. 7. **Covers.** Covers or superstructures are required at all facilities. Where covers are used, manholes must be provided, as well as drop light connections, so the flow can be observed at the inlet midpoint and outlet of the basin.

Subp. 8. **Velocity.** The velocity through settling basins must not exceed one foot a minute. The basins must be designed to minimize short circuiting. Baffles must be provided if the commissioner determines the flow through time cannot be met.

Subp. 9. **Overflow.** An overflow weir or pipe must be installed which establishes the maximum water level on top of the filters. The overflow weir must discharge with a free fall at a location where the discharge is visible.

Subp. 10. **Safety.** Guard rails must be installed around openings hazardous to maintenance personnel.

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Subp. 11. **Sludge disposal.** A facility must provide for sludge disposal. Provisions must be made for the operator to observe and sample sludge being withdrawn from the unit.

Subp. 12. **Cross connection control.** Protection must be provided for all potable water lines used to backflush sludge lines and basins or for other purposes if potable water could become contaminated by nonpotable water.

4720.3940 SOLIDS CONTACT UNIT.

Subpart 1. **General.** A unit designed for combined water softening and sedimentation shall be permitted only if the unit is:

A. designed for the maximum uniform flow rate;

B. adjustable to changes in flow which are less than the design rate; and

C. designed for changes in water quality characteristics.

Subp. 2. **Installation supervision.** Supervision by a representative of the manufacturer must be provided whenever mechanical equipment is installed at the facility and, also, at the time of initial operation.

Subp. 3. **Sampling taps.** Sampling taps must be located to permit the collection of water samples from the solids contact unit.

Subp. 4. **Chemical feed.** Chemicals must be applied at points and by means which ensure satisfactory mixing of the chemicals with the water.

Subp. 5. **Mixing devices.** Mixing devices must be constructed to adequately mix raw water with previously formed sludge particles, and to prevent the deposit of solids in the mixing zone.

Subp. 6. **Flocculation.** Flocculation equipment must be adjustable so that coagulation occurs in a separate chamber or baffled zone within the unit and so that there is a flocculation and mixing period of not less than 30 minutes.

Subp. 7. **Sludge concentrators.** The solids contact unit

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must provide either internal or external concentrators which concentrate sludge and minimize wastewater.

Subp. 8. **Sludge removal.** Design of the sludge removal system must provide:

A. sludge pipes not less than three inches in diameter, arranged to facilitate cleaning;

B. an entrance to sludge withdrawal piping to prevent clogging;

C. accessible valves located outside the tank; and

D. a means for an operator to observe or sample sludge being withdrawn from the solids contact unit.

Subp. 9. **Cross connections.** Blow-off outlets and drains must terminate and discharge at places so backflow is prevented. Cross connection control must be included for all potable water lines including those used to backflush sludge lines and flush basins if potable water could become contaminated by nonpotable water.

Subp. 10. **Detention period.** The detention time must be established on the basis of the raw water characteristics and local conditions that affect the operation of the unit. Based on design flow rates, the minimum detention time must be two hours for suspended solids contact clarifiers, and one hour for the suspended solids contact softeners.

Subp. 11. **Suspended slurry concentrate.** Softening units must be designed so continuous slurry concentrates of one percent or more, by weight, are maintained.

Subp. 12. **Weirs or orifices.** Units must be equipped with either overflow weirs or orifices. Weirs must be adjustable, must be at least equivalent in length to the perimeter of the tank, and must be constructed so surface water does not travel over ten feet horizontally to the collection trough.

Subp. 13. **Weir; orifice loading.** Weir loading must not exceed 20 gallons a minute per foot of weir length for units used for softeners, or ten gallons a minute per foot of weir length for units used for clarifiers. Orifices must produce uniform rising rates over the entire area of the tank.

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Subp. 14. **Upflow rates.** The upflow rates in the solid contact unit must not exceed:

A. 1.75 gallons a minute per square foot of area at the slurry separation line if units are used for softeners; and

B. 1.0 gallon a minute per square foot of area at the sludge separation line if units are used for clarifiers.

4720.3942 FILTRATION.

The application of any type of filter and media must be supported by water quality data for the period of use sufficient to characterize any variation in water quality. Filtration systems must meet the requirements in parts 4720.3945 to 4720.3955.

4720.3945 RAPID RATE GRAVITY FILTERS.

Subpart 1. **Pretreatment.** Rapid rate gravity filters must only be used after coagulation, flocculation, and sedimentation.

Subp. 2. **Number.** At least two filter units must be provided. Provisions must be made to meet the maximum day demand at the approved filtration rate if one filter is out of service.

Subp. 3. **Rate of filtration.** The permissible rate of filtration shall be determined after consideration of factors such as raw water quality, the degree of pretreatment provided, the filter media, and water quality control parameters. In all cases the filtration rate must be reviewed and approved by a registered engineer and approved by the commissioner before the preparation of final plans.

Subp. 4. **Structural details and hydraulics.** The filter structure must be designed to:

A. provide vertical walls within the filter;

B. prevent protrusion of the filter walls or other structures into the filter media or the area between the top of the media and the high water line during backwashing;

C. provide cover by superstructure;

D. provide head room to permit normal inspection and operation;

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E. provide a minimum filter depth of 8-1/2 feet;

F. provide a minimum water depth three feet over the surface of the media;

G. provide a trap on the effluent pipe or conduit to prevent backflow of air to the bottom of the filter;

H. prevent drainage from the floor to the filter with a minimum four-inch curb around the filter;

I. prevent flooding by providing overflow if this is not provided in a pretreatment unit;

J. provide a maximum velocity of treated water in the pipe and conduits to the filter of two feet per second;

K. provide cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy or following lime-soda softening;

L. provide wash water drain capacity to carry maximum backwash flow;

M. provide walkways around filters not less than 24 inches wide; and

N. provide safety handrails or walls around the filter areas adjacent to the walkways.

Subp. 5. **Wash water troughs.** Wash water troughs must be designed to provide:

A. a bottom elevation above the maximum level of expanded media during washing;

B. a top elevation not exceeding 30 inches above the filter surface;

C. a two-inch freeboard at the maximum rate of wash;

D. a top or edge which is level;

E. spacing so each trough serves the same number of square feet of filter area; and

F. a maximum horizontal travel of suspended particles not exceeding three feet in reaching the trough.

Subp. 6. **Filter media.** Filter media must meet the standards specified in this subpart.

A. Sand must be:

(1) clean silica sand having a depth no less than

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24 inches and no more than 30 inches;

(2) an effective size from 0.45 millimeter to 0.55 millimeter, depending upon the quality of the raw water; and

(3) have a uniformity coefficient no greater than 1.65 millimeters.

B. Clean crushed anthracite, or sand and anthracite may be used as a filter media if supported by experimental data obtained from the project. Anthracite used as the only media must have an effective size from 0.45 millimeter to 0.8 millimeter and a uniformity coefficient no greater than 1.6 millimeters. Anthracite used to cap sand filters must have an effective size from 0.7 millimeter to 1.2 millimeters and a uniformity coefficient no greater than 1.85 millimeters.

C. Granular activated carbon may be used as a filter material only if approved by the commissioner. A request for approval must:

(1) include a report from a registered engineer detailing raw water quality, the results of pilot plant studies, proposed flow rates, process controls to be provided, proposed operational adjustments, and justification for the project proposals;

(2) specify criteria for the media;

(3) provide for a chlorine residual in the water following filtering and before distribution;

(4) provide for periodic treatment of the filter bed to control possible bacterial and other growths; and

(5) include plans showing any proposed modification of facilities.

D. Other media may be approved by the commissioner, but only on the basis of pilot tests and experience which demonstrate that the requirements of this part will be met.

E. Except as provided in item F, sand and gravel must be provided as supporting media according to subitems (1) and (2).

(1) A three-inch layer of sand must be used as a

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supporting media for the filter sand. The sand must have an effective size from 0.8 millimeter to 2.0 millimeters, and a uniformity coefficient no greater than 1.7 millimeters.

(2) Gravel, when used as the supporting media, must consist of hard, rounded particles and must not include flat or elongated particles. The coarsest gravel shall be no more than 2-1/2 inches in diameter in any direction when the gravel rests directly on the strainer system, and must extend above the top of the perforated laterals or strainer nozzles. No less than four layers of gravel shall be provided according to the following size and depth distribution when used with perforated laterals or strainer nozzles:

(a) 2-1/2 to 1-1/2 inches, five to eight inches deep;

(b) 1-1/2 to 1/4 inches, three to five inches deep;

(c) 1/4 to 1/2 inches; three to five inches deep;

(d) 1/2 to 3/16 inches, two to three inches deep; and

(e) 3/16 to 3/32 inches, two to three inches deep.

F. If the supplier submits subtantiation to the commissioner that proprietary filter bottoms are used, the commissioner may allow elimination of certain layers of supporting media or a reduction in the depth of the layers of supporting media that are required in item E.

Subp. 7. **Filter bottoms and strainer systems.** Departures from the standards in this subpart by using proprietary bottoms may be approved by the commissioner on a case-by-case basis if the effectiveness of the method is demonstrated by the supplier. Porous plate bottoms must not be used where iron or manganese may clog them or with water softened with lime. The design of a manifold-type collection system must:

A. minimize loss of head in the manifold and laterals;

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B. assure even distribution of wash water and an even rate of filtration over the entire area of the filter;

C. provide a ratio of the area of the final openings of the strainer system to the area of the filter of not more than 0.003;

D. provide a total cross-sectional area of the laterals at least twice the total area of the final openings of the strainer system; and

E. provide a cross-sectional area of the manifold at 1-1/2 to two times the total cross-sectional area of the laterals.

Subp. 8. **Surface wash.** Surface wash facilities consisting of either fixed nozzles or a revolving mechanism are required. All devices must be designed for:

A. water pressures of at least 45 pounds per square inch;

B. a volume of flow of 2.0 gallons per minute per square foot of filter area with fixed nozzles and 0.5 gallons per minute per square foot with revolving arms; and

C. a vacuum breaker installed above the high water elevation in the filter or other device approved by the commissioner to prevent back siphonage.

Subp. 9. **Appurtenances.** The following shall be provided for every filter:

A. a sampling tap on the effluent line;

B. a loss-of-head gauge;

C. controls to indicate flow rate;

D. a drain to waste with appropriate measures for backflow prevention;

E. a means of monitoring the effluent from each filter for turbidity on a continuous basis or on a selective basis where one turbidimeter would monitor more than one filter on a rotating cycle. The turbidimeter must have a recorder. Access to the filter interior through wall sleeves must be provided in several locations to allow the installation of sampling lines, pressure sensors, and other devices, at

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different depths in the filter media; and

F. a one to 1-1/2 inch pressure hose and rack at the operating floor for washing the filter walls.

Subp. 10. **Backwash.** Facilities must provide for the washing of filters as follows:

A. by filtered water at a rate no less than 15 gallons per square foot per minute from wash water tanks, a wash water pump from a reservoir, or a high service main, or a combination of these;

B. by wash water pumps in duplicate unless an alternate means of obtaining wash water is available;

C. by no less than 15 minutes wash of one filter at the design rate of wash;

D. by a wash water regulator or valve on the wash water line to obtain the desired rate of filter wash;

E. by a rate-of-flow indicator and totalizer on the main wash water line, located for convenient reading by the operator during the washing process; and

F. by a method which prevents rapid changes in the backwash water flow.

Subp. 11. **Roof drains.** Roof drains must not discharge into the filters and basins or the conduits preceding the filters.

4720.3947 SLOW RATE GRAVITY FILTERS.

Subpart 1. **Demonstration study.** The use of slow rate gravity filters shall require an engineering study to demonstrate the adequacy and suitability of this filtration method for a specific raw water supply. The standards in this part shall be applied to determine the adequacy and suitability of this filtration method.

Subp. 2. **Quality of raw water.** Slow rate gravity filtration must be limited to water with a maximum turbidity of 50 units and maximum color of 30 units. The turbidity must not be attributable to colloidal clay. Raw water quality data must include an examination for algae.

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Subp. 3. **Structural details and hydraulics.** A slow rate gravity filter must be designed to provide:

A. no less than two filter units;

B. a cover or superstructure;

C. headroom to permit normal movement by operating personnel for scraping and sand removal operations;

D. manholes and access ports for handling sand; and

E. filtration to waste and overflow at the maximum filter water levels.

Subp. 4. **Rates of filtration.** The permissible rates of filtration must be based on the quality of the raw water as determined from experimental data. Proposed rates must be submitted to the commissioner for approval. The design rate shall be 45 to 150 gallons a day per square foot of sand area. However, rates of 150 to 230 gallons a day per square foot shall be approved when effectiveness is demonstrated by the supplier to the satisfaction of the commissioner.

Subp. 5. **Under drains.** Each filter unit must be equipped with a main drain and lateral drains under the filter media to collect the filtered water. The under drains must be spaced so the maximum velocity of the water flow in a lateral under drain does not exceed 0.75 feet per second. The maximum spacing of lateral under drains shall not exceed 12 feet.

Subp. 6. **Filtering material.** A minimum depth of 30 inches of filter sand, clean and free of foreign matter, must be placed on graded gravel layers. The effective size of the filter media must be between 0.35 and 0.50 millimeter, and the uniformity coefficient must not exceed 2.5.

Subp. 7. **Filter gravel.** The supporting gravel must conform to the size and depth distribution provided for rapid rate gravity filters.

Subp. 8. **Depth of water on filter beds.** The design must provide a depth of at least three feet of water over the sand. Influent water must be distributed in a manner which does not scour the sand surfaces.

Subp. 9. **Control appurtenances.** Each filter must be

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equipped with:

A. a loss-of-head gauge;

B. an orifice, Venturi meter, or other suitable metering device installed on each filter to enable control of the rate of filtration; and

C. an effluent pipe located at an elevation which maintains the water level in the filter above the top of the sand.

4720.3950 DIATOMACEOUS EARTH FILTRATION.

Subpart 1. **Applicability.** The use of diatomaceous earth filters may be considered for application to surface water with low turbidity and low bacterial contamination. Diatomaceous earth filters must not be used for bacterial removal, color removal, or turbidity removal where either the gross quantity of turbidity exceeds 40 turbidity units or the turbidity exhibits poor filterability characteristics.

Subp. 2. **Pilot plant study.** Installation of a diatomaceous earth filtration system must be preceded by a pilot plant study on the water to be treated.

A. Conditions of the study such as duration, filter rates, head loss accumulation, slurry feed rates, turbidity removal, and bacteria removal, must be approved by the commissioner before the study.

B. The pilot plant study must demonstrate the ability of the system to meet the requirements of Code of Federal Regulations, title 40, part 141.73(c), as amended through June 29, 1989.

Subp. 3. **Treated water storage capacity.** Treated water storage capacity in excess of normal requirements must be provided to allow operation of the filters at a uniform rate during all conditions of system demand at or below the approved filtration rate, and to guarantee continuity of service during adverse raw water conditions without bypassing the system.

Subp. 4. **Number of filters.** There must be at least two filters provided. Where only two filters are provided, they

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must each be capable of meeting the plant's design capacity at the approved filtration rate.

Subp. 5. **Precoat.** A uniform precoat of diatomaceous earth must be applied hydraulically to each septum by introducing a slurry to the tank influent line and employing a filter-to-waste or recirculation system. Diatomaceous earth in the amount of 0.1 pound per square foot of filter area or an amount sufficient to apply a 1/16 inch coating must be used with recirculation. When precoating is accomplished with a filter-to-waste system, 0.15 to 0.2 of a pound per square foot of filter area must be provided.

Subp. 6. **Body feed.** A body feed system must apply additional amounts of diatomaceous earth slurry during the filter run to avoid short filter runs or excessive head loss.

A. The rate of body feed shall depend on raw water quality and characteristics and must be determined in the pilot plant study in subpart 2.

B. The feed systems and slurry lines must be accessible.

C. The body feed slurry must be continuously mixed.

Subp. 7. **Rate of filtration.** The minimum rate of filtration is 1.0 gallon a minute per square foot of filter area with a maximum of 1.5 gallons a minute per square foot. The filtration rate must be mechanically controlled.

Subp. 8. **Recirculation.** A recirculation or holding pump must be used to maintain differential pressure across the filter when the unit is not in operation to prevent the filter cake from dropping off the filter elements. A minimum recirculation rate of 0.1 gallon a minute per square foot of filter area must be provided.

Subp. 9. **Septum or filter element.** The filter elements must be structurally capable of withstanding maximum pressure and velocity variations during filtration and backwash cycles, and must be spaced so no less than one inch is provided between elements or between any element and a wall.

Subp. 10. **Inlet design.** The filter influent must be

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designed to prevent scour of the diatomaceous earth from the filter element.

Subp. 11. **Backwash.** A satisfactory method to thoroughly remove and dispose of spent filter cake must be provided.

Subp. 12. **Appurtenances.** The following must be provided for every filter:

A. sampling taps for raw and filtered water;

B. a loss of head or differential pressure gauge;

C. rate-of-flow indicator, preferable with totalizer; and

D. a throttling valve to reduce rates below normal during adverse raw water conditions.

Subp. 13. **Monitoring turbidimeter.** A continuous monitoring turbidimeter with recorder is required on the filter effluent for plants treating surface water.

4720.3955 DIRECT FILTRATION PLANTS.

Subpart 1. **Studies.** A full scale direct filtration plant must not be constructed without a pilot study acceptable to the commissioner. An in-plant demonstration study shall be appropriate where conventional treatment plants are converted to direct filtration. Where direct filtration is proposed, the supplier must submit an engineering report to the commissioner. The commissioner must approve the report before the supplier conducts a pilot plant or in-plant demonstration study.

Subp. 2. **Engineering report.** The engineering report must include a historical summary of meteorological conditions and of raw water quality with special reference to fluctuations in quality and possible sources of contamination. The following raw water parameters must be evaluated in the report:

A. color;

B. turbidity;

C. bacterial concentration;

D. microscopic biological organisms;

E. temperature;

F. total solids;

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G. general inorganic chemical characteristics; and

H. additional parameters as required by the reviewing authority.

The report must also include a description of methods and work to be done during a pilot plant study or where appropriate, an in-plant demonstration study.

Subp. 3. **Pilot plant or in-plant demonstration studies.** After approval of the engineering report, a pilot study or, for existing plants where conventional treatment is being converted to direct filtration, an in-plant demonstration study, shall be conducted. The study must be conducted over a sufficient time to treat all expected raw water conditions throughout the year. The pilot plant filter must be of a similar type and operated in the same manner as proposed for full scale operation. The study shall emphasize but not be limited to, the following items:

A. chemical mixing conditions including shear gradients and detention periods;

B. chemical feed rates;

C. use of various coagulants and coagulant aids;

D. flocculation conditions;

E. filtration rates;

F. filter gradation, types of media, and depth of media;

G. filter breakthrough conditions; and

H. a description of the adverse impact of recycling backwash water due to solids, algae, trihalomethane formation and similar problems.

Before initiation of design plans and specifications, the supplier shall submit a final report including the engineer's design recommendations. The study must demonstrate the minimum contact time necessary for optimum filtration for each coagulant proposed.

Subp. 4. **Pretreatment - rapid mix and flocculation.** The final rapid mix and flocculation basin design shall be based on the pilot plant or in-plant demonstration studies augmented with applicable portions of parts 4720.3930, subpart 3, and 4720.3932.

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Subp. 5. **Filtration.** Filters must be rapid rate gravity filters, with dual or mixed media. The final filter design must be based on the pilot plant or in-plant demonstration studies augmented by applicable portions of part 4720.3945, subparts 1 to 7. Pressure filters or single media sand filters must not be used.

A. Surface wash, subsurface wash, or air scour must be provided for the filters according to part 4720.3945, subpart 8.

B. Provisions for filtration to waste must be provided with measures for backflow prevention according to chapter 4715.

Subp. 6. **Siting requirements.** The plant design and land ownership surrounding the plant must allow for the installation of conventional sedimentation basins should the commissioner find that the installation of the direct filtration methods specified in this part do not achieve the water quality standard indicated in Code of Federal Regulations, title 40, part 141.73(a)(1), as amended through June 29, 1989.

4720.3957 CHEMICAL ADDITION.

Subpart 1. **Feed equipment required.** If chemical feed such as chlorination, coagulation, or other processes are necessary for the protection of the water supply, a minimum of two feeders must be provided so a standby unit or combination of units is available to replace the largest unit during shutdowns. Spare parts must be available for all feeders to replace parts subject to wear and damage.

Subp. 2. **Design and capacity.** The design of the facility must ensure that:

A. a separate feed system is provided for each chemical;

B. feeders supply, at all times, the necessary amounts of chemical at an accurate rate, throughout the range of feed. To allow for changes in pumping or application rates, the feeder must be designed to operate between 30 and 70 percent of

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the feeder range on initial start-up. If this is not possible with stock chemical solution, the chemical must be diluted;

C. proportioning of chemical feed to rate of flow is provided;

D. positive displacement-type solution feeders are used to feed liquid chemicals;

E. chemical solutions are prevented from being siphoned into the water supply by assuring discharge at points of positive pressure and by providing anti-siphon devices, or through a suitable air gap or other effective means approved by the commissioner;

F. the service water supply is protected from contamination by chemical solutions either by equipping the supply line with backflow or backsiphonage prevention devices, or by providing an air gap of two pipe diameters, but not less than three inches, between the supply line and top of the solution tank;

G. materials and surfaces in contact with chemicals are resistant to the chemical solution;

H. dry chemical feeders:

(1) measure chemicals volumetrically or gravimetrically;

(2) effectively dissolve the chemical in the solution pot;

(3) provide gravity feed from solution pots, if possible; and

(4) completely enclose chemicals to prevent emission of dust to the operating room; and

I. no direct connection exists between any sewer and a drain or overflow from the feeder or solution chamber or tank.

Subp. 3. **Location of feed equipment.** Chemical feed equipment must be:

A. readily accessible for servicing, repair, and observation of operation;

B. located and have protective curbings to prevent chemicals from equipment failure, spillage, or accidental

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drainage from entering the water in conduits, and treatment or storage basins; and

C. located above grade.

Subp. 4. **Controls.** Feeders must be manually or automatically controlled if the water supply pumps are manually controlled. Where pumps are automatically controlled, the feeders must be automatically controlled. In all cases, automatic control shall be capable of reverting to manual control when necessary.

A. Feeders must be designed and controlled to provide rates proportional to flow.

B. Automatic chemical feed rate control may be used in combination with residual analyzers which have alarms for critical values and recording charts.

Subp. 5. **Weighing scales.** Weighing scales:

A. must be provided to weigh cylinders at all plants using chlorine gas;

B. are required for solution feed unless a comparable means for determining use is approved by the commissioner;

C. are required for volumetric dry chemical feeders; and

D. must be accurate enough to measure increments of 0.5 percent of load.

Subp. 6. **Feed lines.** Feed lines must:

A. be as short as possible in length of run; of durable, corrosion resistant material; easily accessible throughout entire length; protected against freezing; and readily cleanable;

B. slope upward from chemical source to feeder when conveying gases;

C. introduce corrosive chemicals so as to minimize the potential for corrosion;

D. be designed consistent with the scale-forming or solids-depositing properties of the water, chemical, solution, or mixture conveyed;

E. not carry chlorine gas beyond the chlorine feeder

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room; and

F. include an injection nozzle when application is into a pipeline.

Subp. 7. **Service water supply.** Water used for dissolving dry chemicals, diluting liquid chemicals, or operating chemical feeders must be from a safe, approved source with appropriate backflow prevention provided. The commissioner may grant an exception in cases where the finished water quality is not affected by addition of the chemical mixed with untreated water.

4720.3960 CHEMICAL STORAGE.

Subpart 1. **Storage space.** Storage space must provide for:

A. storage of at least 30 days of chemical supply;

B. convenient and efficient handling of chemicals;

C. dry storage conditions; and

D. a minimum of 1-1/2 truckloads storage volume where purchase is by truckload.

Subp. 2. **Containers.** Covered or unopened shipping containers must be provided for storage unless the chemical is transferred into an approved covered storage unit. Solution tanks must have overlapping covers.

Subp. 3. **Capacity.** Solution storage or day tanks supplying feeders directly must have sufficient capacity for one day of operation. When the chemical solution is prepared from a powder or slurry, two solution tanks are required to assure continuity of feed.

Subp. 4. **Storage containers.** Storage must be constructed of or lined with materials compatible with the chemical being handled.

Subp. 5. **Mixing equipment.** Mixing equipment must be provided where necessary to assure a uniform chemical solution strength.

Subp. 6. **Measurements.** Means must be provided to accurately determine the amount of chemical applied either by measurement of the solution level in the tank or by weighing scales. A meter must be provided on the water fill line to a

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fluoride saturator. Liquid chemical storage tanks must have a liquid level indicator.

Subp. 7. **Drainage.** Means to drain tanks must be provided in the storage space, but there must be no direct connection between any drain piping and a sewer. Drain piping must terminate at least two pipe diameters, but not less than three inches, above the overflow rim of a receiving sump, conduit, or waste receptacle.

Subp. 8. **Overflow pipes.** Overflow pipes must be turned downward, be screened, have a free discharge, and be in a conspicuous location.

Subp. 9. **Subsurface storage.** Where subsurface locations for solution or storage tanks are provided, the tanks must be free from sources of possible contamination and located to assure drainage for groundwater, accumulated water, chemical spills, and overflows.

Subp. 10. **Compatibility of chemicals.** Incompatible chemicals must not be stored or handled in common areas.

Subp. 11. **Venting.** Gases from feeders, storage, and equipment exhausts must be conveyed to the outside atmosphere above grade and remote from air intakes. Acid storage tanks must be vented to the outside but not through vents in common with day tanks.

4720.3962 CHEMICAL HANDLING.

Subpart 1. **Measuring equipment.** Equipment must be provided in the handling facility to measure the chemicals used to prepare feed solutions.

Subp. 2. **Piping.** Piping for chemicals must be compatible with the chemical being conveyed.

Subp. 3. **Dust control.** Provision must be made for the transfer of dry chemicals from shipping containers to storage bins or hoppers in a way that minimizes dust. Control must be provided by use of one of the following:

A. vacuum pneumatic equipment or closed conveyor systems;

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B. facilities for emptying shipping containers in special containers; or

C. exhaust fans and dust filters which place the hoppers or bins under negative pressure.

Subp. 4. **Acids.** Acids must be kept in closed, acid-resistant shipping containers or storage units. Transfer from shipping containers to solution or day tanks must be through suitable hose or pipe by means of a transfer pump.

4720.3965 DISINFECTION.

Subpart 1. **Chlorine.** Chlorine must be the principal agent used to disinfect the water supply. Other agents may be approved by the commissioner on a case-by-case basis provided reliable feeding equipment is available and testing procedures for a residual are recognized in the 16th edition of Standard Methods for the Examination of Water and Wastewater (1985). This edition is incorporated by reference, is not subject to frequent change, and is available through the Minitex interlibrary loan system.

Subp. 2. **Equipment.** A gas chlorinator or a positive displacement hypochlorite feeder must be provided by the supplier.

Subp. 3. **Capacity.** The chlorinator capacity must provide that a free chlorine residual of at least two mg/l is attained in the water after a contact time of at least 30 minutes when maximum flow rates coincide with anticipated maximum chlorine demands. The equipment must be designed to operate accurately over the desired feed range.

Subp. 4. **Standby equipment.** Where chlorination is needed to protect the water supply, standby equipment of sufficient capacity must be available to replace the largest unit during shutdowns.

Subp. 5. **Automatic proportioning.** Automatic proportioning chlorinators are required where the rate of flow is not reasonably constant or where the rate of flow of the water is not manually controlled.

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Subp. 6. **Contact time and point of application.** To determine the contact time of the chlorine in water, ammonia, taste-producing substances, temperature, bacterial quality, trihalomethane formation potential and other pertinent factors must be considered. All basins used for disinfection must be designed to minimize short circuiting.

A. At plants treating surface water, provisions must be made for applying chlorine to the raw water, settled water, filtered water, and water entering the distribution system. The contact time required in item B must be provided after filtration.

B. Surface water supplies using free residual chlorination must provide a minimum contact time of two hours. When combined residual chlorination is used for surface water supplies, a minimum of three hours contact time must be provided.

Subp. 7. **Residual testing equipment.** Residual testing equipment must measure residuals to the nearest 0.1 mg/l in the range below 0.5 mg/l and to the nearest 0.2 mg/l between 0.5 mg/l to 2.0 mg/l.

Subp. 8. **Chlorinator piping.** The water supply piping must be designed to prevent contamination of the treated water supply by water sources of impure or unknown quality.

Subp. 9. **Housing.** Chlorine gas feed and storage must be:

A. separated from other operating areas by gas-tight enclosures to prevent injury to personnel and damage to equipment;

B. provided with an inspection window installed in an interior wall or exterior door to permit viewing of the interior of the room and the equipment;

C. provided with doors having emergency or panic hardware and opening outward to the building exterior;

D. heated to prevent freezing and insure proper operation of the equipment;

E. provided with restraints to prevent movement of the chlorine cylinders; and

F. designed so the ejector for mixing chlorine gas

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and water is located in the chlorine room.

Subp. 10. **Ventilation of chlorine rooms.** One complete air change a minute must be provided when the chlorine room is occupied. In addition:

A. the exhaust fan suction must be near the floor with the point of discharge located to avoid contamination of air inlets to other rooms and structures or blockage by snow or other obstructions;

B. air inlets must be located near the ceiling and controlled to prevent adverse temperature variation;

C. the exhaust fan switch must be located at the entrance to the chlorine room with a signal light indicating fan operation when the fan is controlled from more than one point; and

D. vents from feeder and storage units must discharge to the outside atmosphere, above grade as indicated in item A.

Subp. 11. **Ammoniation.** Housing and ventilation for ammoniation must be provided as specified in subparts 9 and 10. Ammonia storage and feed facilities must be separate from chlorine facilities because of the combustion hazard. A plastic bottle of hydrochloric acid must be available and used for leak detection.

4720.3970 VARIANCE PROCEDURES AND CRITERIA FOR SURFACE WATER CONSTRUCTION STANDARDS.

The commissioner of health shall grant a variance to parts 4720.3920 to 4720.3965 according to the procedures and criteria in parts 4717.7000 to 4717.7050, as proposed at 15 State Register 985, October 29, 1990, and as later adopted.

REPEALER. Minnesota Rules, parts 4717.6000 to 4717.6900, 4720.0020, 4720.0100, 4720.0400, 4720.0500, 4720.0600, 4720.0700, 4720.0800, 4720.0900, 4720.1000, 4720.1100, 4720.1200, 4720.1300, 4720.1400, 4720.1500, 4720.1510, 4720.1600, 4720.1700, 4720.1800, 4720.1900, 4720.2000, 4720.2100, 4720.2200, 4720.2400, 4720.2500, 4720.2600,

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4720.3100, 4720.3200, 4720.3300, 4720.3400, 4720.3500, 4720.3510, 4720.3600, 4720.3700, and 4720.3900 are repealed.

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Office of the Revisor of Statutes

Administrative Rules

TITLE: Proposed Permanent Rules Relating to Public Water Supplies

AGENCY: Department of Health

MINNESOTA RULES: Chapter 4720

INCORPORATIONS BY REFERENCE:

Part 4720.0450, subpart 6: Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water (September 1986); Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268

Part 4720.3965, subpart 1: Standard Methods for the Examination of Water and Wastewater (16th edition, 1985)

Available at Minitex interlibrary loan system.

The attached rules are approved for publication in the State Register

Kathleen T. Harrington
Assistant Revisor

DEPARTMENT: Office of the Attorney General **STATE OF MINNESOTA**

OFFICE MEMORANDUM

DATE: January 31, 1991

TO: RICHARD CLARK
Department of Health

FROM: MARTHA J. CASSERLY
Special Assistant
Attorney General

PHONE: 296-6839

SUBJECT: In the Matter of the Adopted Rule Relating to
Public Water Supplies

The above-referenced rule has been approved as to its legality by the Attorney General on January 31, 1991.

Enclosed is your copy of the approved rule. This office has already filed two copies with the Secretary of State, who will forward one copy to the Revisor of Statutes. The fourth is being retained by this division of the Attorney General's Office for its records.

Also enclosed are any petitions, requests, submissions or comments along with any extra copies of documents which you submitted to the Attorney General.

Your next step is to arrange for publication of the Notice of Adoption in the State Register. In a day or two, you should receive from the Revisor's Office three copies of the notice of adoption of your rule. You should submit two copies of the Notice of Adoption to the State Register for publication. A permanent rule without a hearing does not become effective until five days after a notice of adoption is published in the State Register in accordance with Minn. Stat. § 14.27. An emergency rule becomes effective five working days after approval by the Attorney General; however, the agency must publish a notice in the State Register in accordance with Minn. Stat. § 14.34.

If you have any questions in this regard, please contact me.

MJC:sc

cc: Maria Christu
William Brown, Chief Judge
MaryAnn Hruby

Department of Health

Adopted Permanent Rules Relating to Public Water Supplies

Rules as Adopted

4720.0200 JUSTIFICATION.

Parts 4720.0200 to 4720.3970 are adopted pursuant to the Safe Drinking Water Act, Minnesota Statutes, sections 144.381 to 144.388, which requires that the commissioner of health adopt for all public water supplies rules which are at least as stringent as the federal regulations dealing with public water supplies adopted by the United States Environmental Protection Agency, in order for the commissioner to be able to assume the primary responsibility for enforcing the federal act.

4720.0300 SCOPE AND COVERAGE.

Parts 4720.0200 to 4720.3970 prescribe standards for water supply siting and construction, set maximum contaminant levels for turbidity, microbiological constituents, organic and inorganic chemicals, and radioactivity, prescribe a frequency for monitoring the levels of these constituents and sodium and corrosivity, and prescribe the procedures for reporting results, notifying the public and for maintaining records.

The standards and procedures adopted in parts 4720.0200 to 4720.3970 inclusive shall apply to all public drinking water supplies, pursuant to authority granted by existing statutes and amendments thereto, notwithstanding any other water quality standards or regulations.

A water supply which meets all of the following requirements shall not be a public supply for the purpose of parts 4720.0200 to 4720.3970:

A. consists only of distribution and storage facilities and does not have any collection and treatment facilities;

B. obtains all of its water from, but is not owned or operated by a public water supply to which the regulations

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apply;

C. does not sell water to any person; and

D. is not a carrier which conveys passengers in interstate commerce.

4720.0350 RULES AND STANDARDS ADOPTED BY REFERENCE.

The National Primary Drinking Water Regulations in Code of Federal Regulations, title 40, parts 141, and 142.40 to 142.64 as amended through June 29, 1989, are incorporated by reference in parts 4720.0200 to 4720.3970 and are subject to the alterations and amendments contained in parts 4720.0200 to 4720.3970.

4720.0450 DEFINITIONS; SECTION 141.2 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Subpart 1. **Central water treatment defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Central water treatment" means providing treatment at a common location or facility and subsequently delivering it to the consumer of the public water supply.

Subp. 2. **Commissioner of health defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Commissioner of health" means the authority established by Minnesota Statutes, sections 144.381 to 144.388, for enforcement in the state of the National Primary Drinking Water Regulations and parts 4720.0200 to 4720.3970. For purposes of enforcing the National Primary Drinking Water Regulations, title 40, part 141, the term "state" contained in those regulations means the commissioner of health.

Subp. 3. **Composite defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Composite" means a sampling technique in which two or more samples are combined before an analysis is performed.

Subp. 4. **Distribution system defined.** In section 141.2 of

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the National Primary Drinking Water Regulations, the following definition is added:

"Distribution system" means a network of pipes, valves, storage reservoirs, and pumping stations that delivers water to homes, businesses, and industries for drinking and other uses.

Subp. 5. **Entry point samples defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Entry point samples" means water samples collected at a location after any application of treatment but before the water is delivered to any consumer.

Subp. 6. **Environmental Protection Agency methods defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Environmental Protection Agency methods" means methods contained in Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, September 1986. These methods are issued by the Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268. These methods are incorporated by reference and are not subject to frequent change. The methods are available through the Minitex interlibrary loan system.

Subp. 7. **Federal act defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Federal act" means the Safe Drinking Water Act of 1974, Public Law Number 93-523, title 42, United States Code, section 300f to 300j-11.

Subp. 8. **Federal regulations defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Federal regulations" means regulations dealing with public water supplies and drinking water quality, adopted by the Administrator of the United States Environmental Protection Agency pursuant to the federal act.

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Subp. 9. **Groundwater defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Groundwater" means the water in the zone of saturation in which all of the pore spaces of the subsurface material are filled with water. The water that supplies a well is groundwater.

Subp. 10. **Turbidity unit defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Turbidity unit" means an amount of turbidity equivalent to that in a solution composed of 0.000125 percent hydrazine sulfate and 0.00125 percent hexamethylenetetramine in distilled and filtered (100 µ pore size membrane) water, as measured by a nephelometric turbidimeter.

Subp. 11. **Year round resident defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Year round resident" means a person who resides in the area served by the public water supply for more than six months of the year.

4720.0550 MICROBIOLOGICAL CONTAMINANT SAMPLING AND ANALYTICAL REQUIREMENTS; SECTION 141.21 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Section 141.21, paragraph (b), clause (1), of the National Primary Drinking Water Regulations is amended to read:

If a routine sample is total coliform-positive, the public water supplier must collect a set of repeat samples within 24 hours of being notified of the positive result. A supplier must collect no fewer than four repeat samples for each total coliform-positive sample found. The commissioner of health may extend the 24-hour limit on a case-by-case basis if the supplier has a logistical problem in collecting the repeat samples within 24 hours and the problem is beyond the supplier's control. In the case of an extension, the commissioner of health shall

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specify how much time the supplier has to collect the repeat samples.

4720.2300 ADDITIONAL MONITORING REQUIREMENTS.

The commissioner may impose additional monitoring requirements if the results of a sanitary survey indicate that a public health risk may exist. The commissioner may impose a requirement for more frequent sampling if the analytical results of water tests show that a previously measured contaminant is approaching a maximum contaminant level prescribed in Code of Federal Regulations, title 40, part 141, as amended through June 29, 1989.

4720.3920 GENERAL REQUIREMENTS FOR CONSTRUCTION OF SURFACE WATER TREATMENT FACILITIES.

The source of surface water selected for a public water supply must provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, meets the requirements specified in Code of Federal Regulations, title 40, parts 141.72(b) and 141.73, as amended through June 29, 1989. The design of the treatment processes, equipment, and structures shall depend on an evaluation of the nature and quality of the particular water to be treated. Variations from the design criteria may be approved by the commissioner in cases where experimental, pilot, or full scale studies have demonstrated that acceptable results can be obtained.

4720.3922 INTAKES.

Intake structures must provide:

A. a velocity of flow 0.25 to 0.50 feet per second through the inlet structure so frazil ice is held to a minimum;

B. for the withdrawal of water from the depth of the best water quality;

C. inspection manholes every 1,000 feet for pipe sizes large enough to permit visual inspection;

D. protection against rupture by dragging anchors,

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ice, and other activity; and

E. permanent monuments to reference locations.

4720.3925 SHORE WELLS.

Shore well structures must:

A. have motors and electrical controls located above grade and flood level;

B. be accessible for operation and service;

C. be designed to prevent flotation;

D. be equipped with removable or traveling screens before the pump suction well;

E. provide chlorination or other chemical addition facilities for raw water transmission mains;

F. have the intake valved with provisions for backflushing and testing for leaks; and

G. have provisions for controlling surges.

4720.3927 PUMPING STATIONS; DESIGN REQUIREMENTS.

Subpart 1. **General.** Pumping stations must be designed to maintain the sanitary quality of the water being pumped. All raw or finished water pump stations must:

A. provide space to access and service all equipment;

B. have outward opening doors;

C. have a floor elevation at least six inches above the finished grade and at least 24 inches above the regional flood level. Below grade installations shall be permitted only if the terrain at the site is such that a gravity drain system can be provided;

D. have all floors drained without impairing the quality of water being handled; and

E. provide a suitable outlet for drainage from pump glands without discharging onto the floor.

Subp. 2. **Pumping station suction well.** Suction wells, including installations where the pumps are installed on top of a reservoir, must:

A. be watertight;

B. have bottoms sloped to permit removal of water and

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entrained solids;

C. be vented by means of a pipe or other device terminating in a screened U-bend at least 24 inches above the floor; and

D. have curbs a minimum of four inches around all access openings, pipes, and other equipment which extend through the top of the suction well. Access openings must have covers which overlap at least two inches.

Subp. 3. **Pumping station pumps.** Pumping stations must:

A. have at least two pumping units except where additional pumping stations which can meet the peak demand are available or where the commissioner determines that ample time will be available between pumping periods for necessary repairs. If only two units are provided, each must be capable of carrying the peak demand. If more than two units are installed, each must have sufficient capacity so that any one pump can be taken out of service with the remaining pump capable of carrying the peak demand.

B. have controls for proper alternation where two or more pumps are installed. Provision must be made to prevent operation of the pump during the backspin cycle. All electrical controls must be located above grade.

C. provide a power supply from at least two independent sources or from a standby, auxiliary power source.

D. provide a prelubrication line with a valved bypass around the automatic control and backflow protection where required, whenever automatic prelubrication of pump bearings is necessary and an auxiliary power supply is provided.

Subp. 4. **Pumping station suction lift.** A suction lift shall be allowed only for distances of less than 15 feet and where provision is made for priming the pumps. A suction lift shall not be permitted if used with buried piping carrying finished water.

Subp. 5. **Pumping station priming.** Prime water must not be of lesser sanitary quality than that of the water being pumped. Means must be provided to prevent backflow. When an

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air-operated ejector is used, the screened intake must draw clean air from a point at least ten feet above the ground or other source of contamination, unless the air is filtered by apparatus approved by the commissioner. Vacuum priming may be used.

4720.3930 WATER CLARIFICATION PROCEDURES.

Subpart 1. **Duplicate systems.** Facilities designed to process surface water must provide duplicate systems for flocculation and sedimentation and be constructed to permit a system to be taken out of service without disrupting operation.

Subp. 2. **Pretreatment.** Water containing high turbidity or having unusual treatment requirements shall be pretreated, usually by sedimentation or detention either with or without the addition of chemicals.

A. Sedimentation basins must have a means for sludge removal.

B. Inlets for incoming water must disperse water across the full width of the line of travel as quickly as possible; short circuiting must be prevented.

C. Means for bypassing sedimentation basins must be provided.

D. Three hours detention is the minimum period required for sedimentation. In individual cases where chemical pretreatment is required because of unusual water quality characteristics, a greater detention time shall be required.

Subp. 3. **Flash or rapid mixing.** Mixing means the rapid dispersion of chemicals throughout the water to be treated, usually by vigorous agitation.

A. Basins must be equipped with mechanical mixing devices unless other methods, such as baffling or injection of chemicals at a point of high velocity, are approved by the commissioner after determining that the other requirements of this chapter are met.

B. The detention period for mechanical mixing must be as short as possible depending on the velocity gradient provided

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by the mixing units.

4720.3932 FLOCCULATION (SLOW MIXING).

Subpart 1. **Basin design.** Inlet and outlet design must prevent short circuiting and destruction of floc. A drain must be provided.

Subp. 2. **Detention.** Minimum flow-through velocity must be not less than 0.5 feet or greater than 1.5 feet per minute with a detention time for floc formation of at least 30 minutes.

Subp. 3. **Equipment.** Agitators must be driven by variable speed drives or other means which vary the peripheral speed of paddles in the range of 0.5 to 3.0 feet per second. Uniform mixing must be provided to prevent settling in the flocculation basin.

Subp. 4. **Piping.** Flocculation and sedimentation basins must be as close together as possible to avoid settling out. The velocity of flocculated water through pipes or conduits to settling basins must be no less than 0.5 feet nor greater than 1.5 feet per second.

Subp. 5. **Baffling; other designs.** Baffling may be used to provide flocculation only after the supplier consults with the commissioner and receives the commissioner's approval. The design must maintain the velocities and flows set forth in this subpart.

4720.3935 SEDIMENTATION.

Subpart 1. **General.** Sedimentation must follow flocculation. The detention time for effective water clarification shall depend on basin design and the nature of the raw water, such as turbidity, color, colloidal matter, taste, and odor causing compounds.

Subp. 2. **Detention time.** Facilities with a conventional sedimentation system must provide a minimum of four hours of settling time.

Subp. 3. **Inlet devices.** Inlets must be designed to distribute the water equally and at uniform velocities. A baffle must be constructed across the basin, close to the inlet

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end. The baffle must project far enough below the water surface to dissipate inlet velocities and provide uniform flow across the basin.

Subp. 4. **Outlet devices.** Outlet devices must maintain velocities suitable for settling in the basin and must minimize short circuiting.

Subp. 5. **Weir overflow rate.** The rate of flow over the outlet weir must not exceed 20,000 gallons a day per foot of weir length. If submerged ports are used as an alternate for overflow weirs, they must not be lower than three feet below the flow line.

Subp. 6. **Drainage.** Basins must be provided with a means for dewatering. Basin bottoms must slope toward the drain.

Subp. 7. **Covers.** Covers or superstructures are required at all facilities. Where covers are used, manholes must be provided, as well as drop light connections, so the flow can be observed at the inlet midpoint and outlet of the basin.

Subp. 8. **Velocity.** The velocity through settling basins must not exceed one foot a minute. The basins must be designed to minimize short circuiting. Baffles must be provided if the commissioner determines the flow through time cannot be met.

Subp. 9. **Overflow.** An overflow weir or pipe must be installed which establishes the maximum water level on top of the filters. The overflow weir must discharge with a free fall at a location where the discharge is visible.

Subp. 10. **Safety.** Guard rails must be installed around openings hazardous to maintenance personnel.

Subp. 11. **Sludge disposal.** A facility must provide for sludge disposal. Provisions must be made for the operator to observe and sample sludge being withdrawn from the unit.

Subp. 12. **Cross connection control.** Protection must be provided for all potable water lines used to backflush sludge lines and basins or for other purposes if potable water could become contaminated by nonpotable water.

4720.3940 SOLIDS CONTACT UNIT.

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Subpart 1. **General.** A unit designed for combined water softening and sedimentation shall be permitted only if the unit is:

A. designed for the maximum uniform flow rate;

B. adjustable to changes in flow which are less than the design rate; and

C. designed for changes in water quality characteristics.

Subp. 2. **Installation supervision.** Supervision by a representative of the manufacturer must be provided whenever mechanical equipment is installed at the facility and, also, at the time of initial operation.

Subp. 3. **Sampling taps.** Sampling taps must be located to permit the collection of water samples from the solids contact unit.

Subp. 4. **Chemical feed.** Chemicals must be applied at points and by means which ensure satisfactory mixing of the chemicals with the water.

Subp. 5. **Mixing devices.** Mixing devices must be constructed to adequately mix raw water with previously formed sludge particles, and to prevent the deposit of solids in the mixing zone.

Subp. 6. **Flocculation.** Flocculation equipment must be adjustable so that coagulation occurs in a separate chamber or baffled zone within the unit and so that there is a flocculation and mixing period of not less than 30 minutes.

Subp. 7. **Sludge concentrators.** The solids contact unit must provide either internal or external concentrators which concentrate sludge and minimize wastewater.

Subp. 8. **Sludge removal.** Design of the sludge removal system must provide:

A. sludge pipes not less than three inches in diameter, arranged to facilitate cleaning;

B. an entrance to sludge withdrawal piping to prevent clogging;

C. accessible valves located outside the tank; and

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D. a means for an operator to observe or sample sludge being withdrawn from the solids contact unit.

Subp. 9. **Cross connections.** Blow-off outlets and drains must terminate and discharge at places so backflow is prevented. Cross connection control must be included for all potable water lines including those used to backflush sludge lines and flush basins if potable water could become contaminated by nonpotable water.

Subp. 10. **Detention period.** The detention time must be established on the basis of the raw water characteristics and local conditions that affect the operation of the unit. Based on design flow rates, the minimum detention time must be two hours for suspended solids contact clarifiers, and one hour for the suspended solids contact softeners.

Subp. 11. **Suspended slurry concentrate.** Softening units must be designed so continuous slurry concentrates of one percent or more, by weight, are maintained.

Subp. 12. **Weirs or orifices.** Units must be equipped with either overflow weirs or orifices. Weirs must be adjustable, must be at least equivalent in length to the perimeter of the tank, and must be constructed so surface water does not travel over ten feet horizontally to the collection trough.

Subp. 13. **Weir; orifice loading.** Weir loading must not exceed 20 gallons a minute per foot of weir length for units used for softeners, or ten gallons a minute per foot of weir length for units used for clarifiers. Orifices must produce uniform rising rates over the entire area of the tank.

Subp. 14. **Upflow rates.** The upflow rates in the solid contact unit must not exceed:

A. 1.75 gallons a minute per square foot of area at the slurry separation line if units are used for softeners; and

B. 1.0 gallon a minute per square foot of area at the sludge separation line if units are used for clarifiers.

4720.3942 FILTRATION.

The application of any type of filter and media must be

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supported by water quality data for the period of use sufficient to characterize any variation in water quality. Filtration systems must meet the requirements in parts 4720.3945 to 4720.3955.

4720.3945 RAPID RATE GRAVITY FILTERS.

Subpart 1. **Pretreatment.** Rapid rate gravity filters must only be used after coagulation, flocculation, and sedimentation.

Subp. 2. **Number.** At least two filter units must be provided. Provisions must be made to meet the maximum day demand at the approved filtration rate if one filter is out of service.

Subp. 3. **Rate of filtration.** The permissible rate of filtration shall be determined after consideration of factors such as raw water quality, the degree of pretreatment provided, the filter media, and water quality control parameters. In all cases the filtration rate must be reviewed and approved by a registered engineer and approved by the commissioner before the preparation of final plans.

Subp. 4. **Structural details and hydraulics.** The filter structure must be designed to:

A. provide vertical walls within the filter;

B. prevent protrusion of the filter walls or other structures into the filter media or the area between the top of the media and the high water line during backwashing;

C. provide cover by superstructure;

D. provide head room to permit normal inspection and operation;

E. provide a minimum filter depth of 8-1/2 feet;

F. provide a minimum water depth three feet over the surface of the media;

G. provide a trap on the effluent pipe or conduit to prevent backflow of air to the bottom of the filter;

H. prevent drainage from the floor to the filter with a minimum four-inch curb around the filter;

I. prevent flooding by providing overflow if this is

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not provided in a pretreatment unit;

J. provide a maximum velocity of treated water in the pipe and conduits to the filter of two feet per second;

K. provide cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy or following lime-soda softening;

L. provide wash water drain capacity to carry maximum backwash flow;

M. provide walkways around filters not less than 24 inches wide; and

N. provide safety handrails or walls around the filter areas adjacent to the walkways.

Subp. 5. **Wash water troughs.** Wash water troughs must be designed to provide:

A. a bottom elevation above the maximum level of expanded media during washing;

B. a top elevation not exceeding 30 inches above the filter surface;

C. a two-inch freeboard at the maximum rate of wash;

D. a top or edge which is level;

E. spacing so each trough serves the same number of square feet of filter area; and

F. a maximum horizontal travel of suspended particles not exceeding three feet in reaching the trough.

Subp. 6. **Filter media.** Filter media must meet the standards specified in this subpart.

A. Sand must be:

(1) clean silica sand having a depth no less than 24 inches and no more than 30 inches;

(2) an effective size from 0.45 millimeter to 0.55 millimeter, depending upon the quality of the raw water; and

(3) have a uniformity coefficient no greater than 1.65 millimeters.

B. Clean crushed anthracite, or sand and anthracite may be used as a filter media if supported by experimental data

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obtained from the project. Anthracite used as the only media must have an effective size from 0.45 millimeter to 0.8 millimeter and a uniformity coefficient no greater than 1.6 millimeters. Anthracite used to cap sand filters must have an effective size from 0.7 millimeter to 1.2 millimeters and a uniformity coefficient no greater than 1.85 millimeters.

C. Granular activated carbon may be used as a filter material only if approved by the commissioner. A request for approval must:

(1) include a report from a registered engineer detailing raw water quality, the results of pilot plant studies, proposed flow rates, process controls to be provided, proposed operational adjustments, and justification for the project proposals;

(2) specify criteria for the media;

(3) provide for a chlorine residual in the water following filtering and before distribution;

(4) provide for periodic treatment of the filter bed to control possible bacterial and other growths; and

(5) include plans showing any proposed modification of facilities.

D. Other media may be approved by the commissioner, but only on the basis of pilot tests and experience which demonstrate that the requirements of this part will be met.

E. Except as provided in item F, sand and gravel must be provided as supporting media according to subitems (1) and (2).

(1) A three-inch layer of sand must be used as a supporting media for the filter sand. The sand must have an effective size from 0.8 millimeter to 2.0 millimeters, and a uniformity coefficient no greater than 1.7 millimeters.

(2) Gravel, when used as the supporting media, must consist of hard, rounded particles and must not include flat or elongated particles. The coarsest gravel shall be no more than 2-1/2 inches in diameter in any direction when the gravel rests directly on the strainer system, and must extend

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above the top of the perforated laterals or strainer nozzles. No less than four layers of gravel shall be provided according to the following size and depth distribution when used with perforated laterals or strainer nozzles:

(a) 2-1/2 to 1-1/2 inches, five to eight inches deep;

(b) 1-1/2 to 1/4 inches, three to five inches deep;

(c) 1/4 to 1/2 inches; three to five inches deep;

(d) 1/2 to 3/16 inches, two to three inches deep; and

(e) 3/16 to 3/32 inches, two to three inches deep.

F. If the supplier submits subtantiation to the commissioner that proprietary filter bottoms are used, the commissioner may allow elimination of certain layers of supporting media or a reduction in the depth of the layers of supporting media that are required in item E.

Subp. 7. **Filter bottoms and strainer systems.** Departures from the standards in this subpart by using proprietary bottoms may be approved by the commissioner on a case-by-case basis if the effectiveness of the method is demonstrated by the supplier. Porous plate bottoms must not be used where iron or manganese may clog them or with water softened with lime. The design of a manifold-type collection system must:

A. minimize loss of head in the manifold and laterals;

B. assure even distribution of wash water and an even rate of filtration over the entire area of the filter;

C. provide a ratio of the area of the final openings of the strainer system to the area of the filter of not more than 0.003;

D. provide a total cross-sectional area of the laterals at least twice the total area of the final openings of the strainer system; and

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E. provide a cross-sectional area of the manifold at 1-1/2 to two times the total cross-sectional area of the laterals.

Subp. 8. **Surface wash.** Surface wash facilities consisting of either fixed nozzles or a revolving mechanism are required. All devices must be designed for:

A. water pressures of at least 45 pounds per square inch;

B. a volume of flow of 2.0 gallons per minute per square foot of filter area with fixed nozzles and 0.5 gallons per minute per square foot with revolving arms; and

C. a vacuum breaker installed above the high water elevation in the filter or other device approved by the commissioner to prevent back siphonage.

Subp. 9. **Appurtenances.** The following shall be provided for every filter:

A. a sampling tap on the effluent line;

B. a loss-of-head gauge;

C. controls to indicate flow rate;

D. a drain to waste with appropriate measures for backflow prevention;

E. a means of monitoring the effluent from each filter for turbidity on a continuous basis or on a selective basis where one turbidimeter would monitor more than one filter on a rotating cycle. The turbidimeter must have a recorder. Access to the filter interior through wall sleeves must be provided in several locations to allow the installation of sampling lines, pressure sensors, and other devices, at different depths in the filter media; and

F. a one to 1-1/2 inch pressure hose and rack at the operating floor for washing the filter walls.

Subp. 10. **Backwash.** Facilities must provide for the washing of filters as follows:

A. by filtered water at a rate no less than 15 gallons per square foot per minute from wash water tanks, a wash water pump from a reservoir, or a high service main, or a

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combination of these;

B. by wash water pumps in duplicate unless an alternate means of obtaining wash water is available;

C. by no less than 15 minutes wash of one filter at the design rate of wash;

D. by a wash water regulator or valve on the wash water line to obtain the desired rate of filter wash;

E. by a rate-of-flow indicator and totalizer on the main wash water line, located for convenient reading by the operator during the washing process; and

F. by a method which prevents rapid changes in the backwash water flow.

Subp. 11. **Roof drains.** Roof drains must not discharge into the filters and basins or the conduits preceding the filters.

4720.3947 SLOW RATE GRAVITY FILTERS.

Subpart 1. **Demonstration study.** The use of slow rate gravity filters shall require an engineering study to demonstrate the adequacy and suitability of this filtration method for a specific raw water supply. The standards in this part shall be applied to determine the adequacy and suitability of this filtration method.

Subp. 2. **Quality of raw water.** Slow rate gravity filtration must be limited to water with a maximum turbidity of 50 units and maximum color of 30 units. The turbidity must not be attributable to colloidal clay. Raw water quality data must include an examination for algae.

Subp. 3. **Structural details and hydraulics.** A slow rate gravity filter must be designed to provide:

A. no less than two filter units;

B. a cover or superstructure;

C. headroom to permit normal movement by operating personnel for scraping and sand removal operations;

D. manholes and access ports for handling sand; and

E. filtration to waste and overflow at the maximum

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filter water levels.

Subp. 4. **Rates of filtration.** The permissible rates of filtration must be based on the quality of the raw water as determined from experimental data. Proposed rates must be submitted to the commissioner for approval. The design rate shall be 45 to 150 gallons a day per square foot of sand area. However, rates of 150 to 230 gallons a day per square foot shall be approved when effectiveness is demonstrated by the supplier to the satisfaction of the commissioner.

Subp. 5. **Under drains.** Each filter unit must be equipped with a main drain and lateral drains under the filter media to collect the filtered water. The under drains must be spaced so the maximum velocity of the water flow in a lateral under drain does not exceed 0.75 feet per second. The maximum spacing of lateral under drains shall not exceed 12 feet.

Subp. 6. **Filtering material.** A minimum depth of 30 inches of filter sand, clean and free of foreign matter, must be placed on graded gravel layers. The effective size of the filter media must be between 0.35 and 0.50 millimeter, and the uniformity coefficient must not exceed 2.5.

Subp. 7. **Filter gravel.** The supporting gravel must conform to the size and depth distribution provided for rapid rate gravity filters.

Subp. 8. **Depth of water on filter beds.** The design must provide a depth of at least three feet of water over the sand. Influent water must be distributed in a manner which does not scour the sand surfaces.

Subp. 9. **Control appurtenances.** Each filter must be equipped with:

A. a loss-of-head gauge;

B. an orifice, Venturi meter, or other suitable metering device installed on each filter to enable control of the rate of filtration; and

C. an effluent pipe located at an elevation which maintains the water level in the filter above the top of the sand.

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4720.3950 DIATOMACEOUS EARTH FILTRATION.

Subpart 1. **Applicability.** The use of diatomaceous earth filters may be considered for application to surface water with low turbidity and low bacterial contamination. Diatomaceous earth filters must not be used for bacterial removal, color removal, or turbidity removal where either the gross quantity of turbidity exceeds 40 turbidity units or the turbidity exhibits poor filterability characteristics.

Subp. 2. **Pilot plant study.** Installation of a diatomaceous earth filtration system must be preceded by a pilot plant study on the water to be treated.

A. Conditions of the study such as duration, filter rates, head loss accumulation, slurry feed rates, turbidity removal, and bacteria removal, must be approved by the commissioner before the study.

B. The pilot plant study must demonstrate the ability of the system to meet the requirements of Code of Federal Regulations, title 40, part 141.73(c), as amended through June 29, 1989.

Subp. 3. **Treated water storage capacity.** Treated water storage capacity in excess of normal requirements must be provided to allow operation of the filters at a uniform rate during all conditions of system demand at or below the approved filtration rate, and to guarantee continuity of service during adverse raw water conditions without bypassing the system.

Subp. 4. **Number of filters.** There must be at least two filters provided. Where only two filters are provided, they must each be capable of meeting the plant's design capacity at the approved filtration rate.

Subp. 5. **Precoat.** A uniform precoat of diatomaceous earth must be applied hydraulically to each septum by introducing a slurry to the tank influent line and employing a filter-to-waste or recirculation system. Diatomaceous earth in the amount of 0.1 pound per square foot of filter area or an amount sufficient to apply a 1/16 inch coating must be used with recirculation.

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When precoating is accomplished with a filter-to-waste system, 0.15 to 0.2 of a pound per square foot of filter area must be provided.

Subp. 6. **Body feed.** A body feed system must apply additional amounts of diatomaceous earth slurry during the filter run to avoid short filter runs or excessive head loss.

A. The rate of body feed shall depend on raw water quality and characteristics and must be determined in the pilot plant study in subpart 2.

B. The feed systems and slurry lines must be accessible.

C. The body feed slurry must be continuously mixed.

Subp. 7. **Rate of filtration.** The minimum rate of filtration is 1.0 gallon a minute per square foot of filter area with a maximum of 1.5 gallons a minute per square foot. The filtration rate must be mechanically controlled.

Subp. 8. **Recirculation.** A recirculation or holding pump must be used to maintain differential pressure across the filter when the unit is not in operation to prevent the filter cake from dropping off the filter elements. A minimum recirculation rate of 0.1 gallon a minute per square foot of filter area must be provided.

Subp. 9. **Septum or filter element.** The filter elements must be structurally capable of withstanding maximum pressure and velocity variations during filtration and backwash cycles, and must be spaced so no less than one inch is provided between elements or between any element and a wall.

Subp. 10. **Inlet design.** The filter influent must be designed to prevent scour of the diatomaceous earth from the filter element.

Subp. 11. **Backwash.** A satisfactory method to thoroughly remove and dispose of spent filter cake must be provided.

Subp. 12. **Appurtenances.** The following must be provided for every filter:

A. sampling taps for raw and filtered water;

B. a loss of head or differential pressure gauge;

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C. rate-of-flow indicator, preferable with totalizer; and

D. a throttling valve to reduce rates below normal during adverse raw water conditions.

Subp. 13. **Monitoring turbidimeter.** A continuous monitoring turbidimeter with recorder is required on the filter effluent for plants treating surface water.

4720.3955 DIRECT FILTRATION PLANTS.

Subpart 1. **Studies.** A full scale direct filtration plant must not be constructed without a pilot study acceptable to the commissioner. An in-plant demonstration study shall be appropriate where conventional treatment plants are converted to direct filtration. Where direct filtration is proposed, the supplier must submit an engineering report to the commissioner. The commissioner must approve the report before the supplier conducts a pilot plant or in-plant demonstration study.

Subp. 2. **Engineering report.** The engineering report must include a historical summary of meteorological conditions and of raw water quality with special reference to fluctuations in quality and possible sources of contamination. The following raw water parameters must be evaluated in the report:

A. color;

B. turbidity;

C. bacterial concentration;

D. microscopic biological organisms;

E. temperature;

F. total solids;

G. general inorganic chemical characteristics; and

H. additional parameters as required by the reviewing authority.

The report must also include a description of methods and work to be done during a pilot plant study or where appropriate, an in-plant demonstration study.

Subp. 3. **Pilot plant or in-plant demonstration studies.** After approval of the engineering report, a pilot study or, for

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existing plants where conventional treatment is being converted to direct filtration, an in-plant demonstration study, shall be conducted. The study must be conducted over a sufficient time to treat all expected raw water conditions throughout the year. The pilot plant filter must be of a similar type and operated in the same manner as proposed for full scale operation. The study shall emphasize but not be limited to, the following items:

A. chemical mixing conditions including shear gradients and detention periods;

B. chemical feed rates;

C. use of various coagulants and coagulant aids;

D. flocculation conditions;

E. filtration rates;

F. filter gradation, types of media, and depth of media;

G. filter breakthrough conditions; and

H. a description of the adverse impact of recycling backwash water due to solids, algae, trihalomethane formation and similar problems.

Before initiation of design plans and specifications, the supplier shall submit a final report including the engineer's design recommendations. The study must demonstrate the minimum contact time necessary for optimum filtration for each coagulant proposed.

Subp. 4. **Pretreatment - rapid mix and flocculation.** The final rapid mix and flocculation basin design shall be based on the pilot plant or in-plant demonstration studies augmented with applicable portions of parts 4720.3930, subpart 3, and 4720.3932.

Subp. 5. **Filtration.** Filters must be rapid rate gravity filters, with dual or mixed media. The final filter design must be based on the pilot plant or in-plant demonstration studies augmented by applicable portions of part 4720.3945, subparts 1 to 7. Pressure filters or single media sand filters must not be used.

A. Surface wash, subsurface wash, or air scour must be provided for the filters according to part 4720.3945, subpart

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8.

B. Provisions for filtration to waste must be provided with measures for backflow prevention according to chapter 4715.

Subp. 6. **Siting requirements.** The plant design and land ownership surrounding the plant must allow for the installation of conventional sedimentation basins should the commissioner find that the installation of the direct filtration methods specified in this part do not achieve the water quality standard indicated in Code of Federal Regulations, title 40, part 141.73(a)(1), as amended through June 29, 1989.

4720.3957 CHEMICAL ADDITION.

Subpart 1. **Feed equipment required.** If chemical feed such as chlorination, coagulation, or other processes are necessary for the protection of the water supply, a minimum of two feeders must be provided so a standby unit or combination of units is available to replace the largest unit during shutdowns. Spare parts must be available for all feeders to replace parts subject to wear and damage.

Subp. 2. **Design and capacity.** The design of the facility must ensure that:

A. a separate feed system is provided for each chemical;

B. feeders supply, at all times, the necessary amounts of chemical at an accurate rate, throughout the range of feed. To allow for changes in pumping or application rates, the feeder must be designed to operate between 30 and 70 percent of the feeder range on initial start-up. If this is not possible with stock chemical solution, the chemical must be diluted;

C. proportioning of chemical feed to rate of flow is provided;

D. positive displacement-type solution feeders are used to feed liquid chemicals;

E. chemical solutions are prevented from being siphoned into the water supply by assuring discharge at points

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of positive pressure and by providing anti-siphon devices, or through a suitable air gap or other effective means approved by the commissioner;

F. the service water supply is protected from contamination by chemical solutions either by equipping the supply line with backflow or backsiphonage prevention devices, or by providing an air gap of two pipe diameters, but not less than three inches, between the supply line and top of the solution tank;

G. materials and surfaces in contact with chemicals are resistant to the chemical solution;

H. dry chemical feeders:

(1) measure chemicals volumetrically or gravimetrically;

(2) effectively dissolve the chemical in the solution pot;

(3) provide gravity feed from solution pots, if possible; and

(4) completely enclose chemicals to prevent emission of dust to the operating room; and

I. no direct connection exists between any sewer and a drain or overflow from the feeder or solution chamber or tank.

Subp. 3. **Location of feed equipment.** Chemical feed equipment must be:

A. readily accessible for servicing, repair, and observation of operation;

B. located and have protective curbings to prevent chemicals from equipment failure, spillage, or accidental drainage from entering the water in conduits, and treatment or storage basins; and

C. located above grade.

Subp. 4. **Controls.** Feeders must be manually or automatically controlled if the water supply pumps are manually controlled. Where pumps are automatically controlled, the feeders must be automatically controlled. In all cases, automatic control shall be capable of reverting to manual

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control when necessary.

A. Feeders must be designed and controlled to provide rates proportional to flow.

B. Automatic chemical feed rate control may be used in combination with residual analyzers which have alarms for critical values and recording charts.

Subp. 5. **Weighing scales.** Weighing scales:

A. must be provided to weigh cylinders at all plants using chlorine gas;

B. are required for solution feed unless a comparable means for determining use is approved by the commissioner;

C. are required for volumetric dry chemical feeders; and

D. must be accurate enough to measure increments of 0.5 percent of load.

Subp. 6. **Feed lines.** Feed lines must:

A. be as short as possible in length of run; of durable, corrosion resistant material; easily accessible throughout entire length; protected against freezing; and readily cleanable;

B. slope upward from chemical source to feeder when conveying gases;

C. introduce corrosive chemicals so as to minimize the potential for corrosion;

D. be designed consistent with the scale-forming or solids-depositing properties of the water, chemical, solution, or mixture conveyed;

E. not carry chlorine gas under pressure beyond the chlorine feeder room; and

F. include an injection nozzle when application is into a pipeline.

Subp. 7. **Service water supply.** Water used for dissolving dry chemicals, diluting liquid chemicals, or operating chemical feeders must be from a safe, approved source with appropriate backflow prevention provided. The commissioner may grant an exception in cases where the finished water quality is not

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affected by addition of the chemical mixed with untreated water.

4720.3960 CHEMICAL STORAGE.

Subpart 1. **Storage space.** Storage space must provide for:

A. storage of at least 30 days of chemical supply;

B. convenient and efficient handling of chemicals;

C. dry storage conditions; and

D. a minimum of 1-1/2 truckloads storage volume where purchase is by truckload.

Subp. 2. **Containers.** Covered or unopened shipping containers must be provided for storage unless the chemical is transferred into an approved covered storage unit. Solution tanks must have overlapping covers.

Subp. 3. **Capacity.** Solution storage or day tanks supplying feeders directly must have sufficient capacity for one day of operation. When the chemical solution is prepared from a powder or slurry, two solution tanks are required to assure continuity of feed.

Subp. 4. **Storage containers.** Storage must be constructed of or lined with materials compatible with the chemical being handled.

Subp. 5. **Mixing equipment.** Mixing equipment must be provided where necessary to assure a uniform chemical solution strength.

Subp. 6. **Measurements.** Means must be provided to accurately determine the amount of chemical applied either by measurement of the solution level in the tank or by weighing scales. A meter must be provided on the water fill line to a fluoride saturator. Liquid chemical storage tanks must have a liquid level indicator.

Subp. 7. **Drainage.** Means to drain tanks must be provided in the storage space, but there must be no direct connection between any drain piping and a sewer. Drain piping must terminate at least two pipe diameters, but not less than three inches, above the overflow rim of a receiving sump, conduit, or waste receptacle.

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Subp. 8. **Overflow pipes.** Overflow pipes must be turned downward, be screened, have a free discharge, and be in a conspicuous location.

Subp. 9. **Subsurface storage.** Where subsurface locations for solution or storage tanks are provided, the tanks must be free from sources of possible contamination and located to assure drainage for groundwater, accumulated water, chemical spills, and overflows.

Subp. 10. **Compatibility of chemicals.** Incompatible chemicals must not be stored or handled in common areas.

Subp. 11. **Venting.** Gases from feeders, storage, and equipment exhausts must be conveyed to the outside atmosphere above grade and remote from air intakes. Acid storage tanks must be vented to the outside but not through vents in common with day tanks.

4720.3962 CHEMICAL HANDLING.

Subpart 1. **Measuring equipment.** Equipment must be provided in the handling facility to measure the chemicals used to prepare feed solutions.

Subp. 2. **Piping.** Piping for chemicals must be compatible with the chemical being conveyed.

Subp. 3. **Dust control.** Provision must be made for the transfer of dry chemicals from shipping containers to storage bins or hoppers in a way that minimizes dust. Control must be provided by use of one of the following:

A. vacuum pneumatic equipment or closed conveyor systems;

B. facilities for emptying shipping containers in special containers; or

C. exhaust fans and dust filters which place the hoppers or bins under negative pressure.

Subp. 4. **Acids.** Acids must be kept in closed, acid-resistant shipping containers or storage units. Transfer from shipping containers to solution or day tanks must be through suitable hose or pipe by means of a transfer pump.

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4720.3965 DISINFECTION.

Subpart 1. **Chlorine.** Chlorine must be the principal agent used to disinfect the water supply. Other agents may be approved by the commissioner on a case-by-case basis provided reliable feeding equipment is available and testing procedures for a residual are recognized in the 16th edition of Standard Methods for the Examination of Water and Wastewater (1985). This edition is incorporated by reference, is not subject to frequent change, and is available through the Minitex interlibrary loan system.

Subp. 2. **Equipment.** A gas chlorinator or a positive displacement hypochlorite feeder must be provided by the supplier.

Subp. 3. **Capacity.** The chlorinator capacity must provide that a free chlorine residual of at least two mg/l is attained in the water after a contact time of at least 30 minutes when maximum flow rates coincide with anticipated maximum chlorine demands. The equipment must be designed to operate accurately over the desired feed range.

Subp. 4. **Standby equipment.** Where chlorination is needed to protect the water supply, standby equipment of sufficient capacity must be available to replace the largest unit during shutdowns.

Subp. 5. **Automatic proportioning.** Automatic proportioning chlorinators are required where the rate of flow is not reasonably constant or where the rate of flow of the water is not manually controlled.

Subp. 6. **Contact time and point of application.** To determine the contact time of the chlorine in water, ammonia, taste-producing substances, temperature, bacterial quality, trihalomethane formation potential and other pertinent factors must be considered. All basins used for disinfection must be designed to minimize short circuiting.

A. At plants treating surface water, provisions must be made for applying chlorine to the raw water, settled water,

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filtered water, and water entering the distribution system. The contact time required in item B must be provided after filtration.

B. Surface water supplies using free residual chlorination must provide a minimum contact time of two hours. When combined residual chlorination is used for surface water supplies, a minimum of three hours contact time must be provided.

Subp. 7. **Residual testing equipment.** Residual testing equipment must measure residuals to the nearest 0.1 mg/l in the range below 0.5 mg/l and to the nearest 0.2 mg/l between 0.5 mg/l to 2.0 mg/l.

Subp. 8. **Chlorinator piping.** The water supply piping must be designed to prevent contamination of the treated water supply by water sources of impure or unknown quality.

Subp. 9. **Housing.** Chlorine gas feed and storage must be:

A. separated from other operating areas by gas-tight enclosures to prevent injury to personnel and damage to equipment;

B. provided with an inspection window installed in an interior wall or exterior door to permit viewing of the interior of the room and the equipment;

C. provided with doors having emergency or panic hardware and opening outward to the building exterior;

D. heated to prevent freezing and insure proper operation of the equipment;

E. provided with restraints to prevent movement of the chlorine cylinders; and

F. designed so the ejector for mixing chlorine gas and water is located in the chlorine room <u>where chlorine gas under pressure is used</u>.

Subp. 10. **Ventilation of chlorine rooms.** One complete air change a minute must be provided when the chlorine room is occupied. In addition:

A. the exhaust fan suction must be near the floor with the point of discharge located to avoid contamination of air inlets to other rooms and structures or blockage by snow or

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other obstructions;

B. air inlets must be located near the ceiling and controlled to prevent adverse temperature variation;

C. the exhaust fan switch must be located at the entrance to the chlorine room with a signal light indicating fan operation when the fan is controlled from more than one point; and

D. vents from feeder and storage units must discharge to the outside atmosphere, above grade as indicated in item A.

Subp. 11. **Ammoniation.** Housing and ventilation for ammoniation must be provided as specified in subparts 9 and 10. Ammonia storage and feed facilities must be separate from chlorine facilities because of the combustion hazard. A plastic bottle of hydrochloric acid must be available and used for leak detection.

4720.3970 VARIANCE PROCEDURES AND CRITERIA FOR SURFACE WATER CONSTRUCTION STANDARDS.

The commissioner of health shall grant a variance to parts 4720.3920 to 4720.3965 according to the procedures and criteria in parts 4717.7000 to 4717.7050~~, as proposed at 15 State Register 985, October 29, 1990, and as later adopted~~.

REPEALER. Minnesota Rules, parts 4717.6000 to 4717.6900, 4720.0020, 4720.0100, 4720.0400, 4720.0500, 4720.0600, 4720.0700, 4720.0800, 4720.0900, 4720.1000, 4720.1100, 4720.1200, 4720.1300, 4720.1400, 4720.1500, 4720.1510, 4720.1600, 4720.1700, 4720.1800, 4720.1900, 4720.2000, 4720.2100, 4720.2200, 4720.2400, 4720.2500, 4720.2600, 4720.3100, 4720.3200, 4720.3300, 4720.3400, 4720.3500, 4720.3510, 4720.3600, 4720.3700, and 4720.3900 are repealed.

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APPROVED AS TO FORM AND LEGALITY

January 31 1991

HUBERT H. HUMPHREY, III
ATTORNEY GENERAL

BY M J Cassedy

SPECIAL ASSISTANT ATTORNEY GENERAL

STATE OF MINNESOTA
DEPARTMENT OF STATE
FILED

JAN 31 1991

Joan Anderson Growe

Secretary of State

3:45 P.M.

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MJC

RULE REVIEW CHECKLIST

File No. 1783
DATE RECEIVED 1-17-91
REVIEW DATE 1-28-91
DUE DATE 1-31-91
(DIS)APPROVED 1-31-91 mjc
WITHDRAWN

Docket No. 05 0009 1210
ADOPTED W/O HEARING
EMERGENCY RULE
TO REVISOR ON 1/25/91
REVISOR (DIS)APPROVED
FILED W/SEC. OF STATE 1-31-91
RETURNED TO AGENCY

✓ Rule as adopted (4 copies)

✓ Notice to Solicit Outside Information/Opinion (if applicable)
January 22, 1990 Date published in State Register
~~January 22, 1990~~ Comments

Petition for Adoption of a Rule

Board's ~~Authorizing~~ Resolution
Date adopted

✓ Proposed Rule
✓ Revisor's Certificate

✓ Notice of Intent to Adopt Rule
144.383 (c) Statutory Authority
NA Small Business Statement
Expenditure of public money statement
not dated Signature

✓ Statement of Need and Reasonableness (if applicable)
NA Small Business Statement
Fees - § 16A.128

✓ Affidavit of Mailing Notice of Intent to Adopt Rule
December 7, 1990 Dated (30)/25 days before adoption
✓ Notice attached indicates it is attached
Copy of rule or summary attached

✓ Publication in State Register
~~December 10, 1990~~ Date (30)/25 days before adoption

✓ 180-day deadline from:
✓ Effective date of law requiring rule (14.12) (both rules) not mandatory amendments don't apply
✓ end of comment period (§ 14.26) (rules without hearing)
effective date of statutory authority (§ 14.29) (emergency rules)

Resolution Adopting
~~Date adopted~~

✓ Findings of Fact, Conclusions & Order Adopting
January 15, 1991 Date

✓ Written Requests, Submissions or Comments

✓ Declaration of Attorney
Maria Smith Name of SAAG representing agency

Notice of Submission to Attorney General (if applicable)

Affidavit [illegible]

Department of Health

Proposed Permanent Rules Relating to Public Water Supplies

Rules as Proposed

4720.0200 JUSTIFICATION.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 are adopted pursuant to ~~legislative authority granted in laws of Minnesota 1977, chapter 66, section 3, clause (e)~~ the Safe Drinking Water Act, Minnesota Statutes, sections 144.381 to 144.388, which requires that the commissioner of health adopt for all public water supplies rules which are at least as stringent as the federal regulations dealing with public water supplies adopted by the United States Environmental Protection Agency, in order for the commissioner to be able to assume the primary responsibility for enforcing the federal act.

4720.0300 SCOPE AND COVERAGE.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 prescribe standards for water supply siting and construction, set maximum contaminant levels for turbidity, microbiological constituents, organic and inorganic chemicals, and radioactivity, prescribe a frequency for monitoring the levels of these constituents and sodium and corrosivity, and prescribe the procedures for reporting results, notifying the public and for maintaining records.

The standards and procedures adopted in parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 inclusive shall apply to all public drinking water supplies, pursuant to authority granted by existing statutes and amendments thereto, notwithstanding any other water quality standards or regulations.

A water supply which meets all of the following requirements shall not be a public supply for the purpose of parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970:

A. consists only of distribution and storage facilities and does not have any collection and treatment

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facilities;

B. obtains all of its water from, but is not owned or operated by a public water supply to which ~~such~~ the regulations apply;

C. does not sell water to any person; and

D. is not a carrier which conveys passengers in interstate commerce.

Rules as Proposed (all new material)

4720.0350 RULES AND STANDARDS ADOPTED BY REFERENCE.

The National Primary Drinking Water Regulations in Code of Federal Regulations, title 40, parts 141, and 142.40 to 142.64 as amended through June 29, 1989, are incorporated by reference in parts 4720.0200 to 4720.3970 and are subject to the alterations and amendments contained in parts 4720.0200 to 4720.3970.

4720.0450 DEFINITIONS; SECTION 141.2 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Subpart 1. **Central water treatment defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Central water treatment" means providing treatment at a common location or facility and subsequently delivering it to the consumer of the public water supply.

Subp. 2. **Commissioner of health defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Commissioner of health" means the authority established by Minnesota Statutes, sections 144.381 to 144.388, for enforcement in the state of the National Primary Drinking Water Regulations and parts 4720.0200 to 4720.3970. For purposes of enforcing the National Primary Drinking Water Regulations, title 40, part 141, the term "state" contained in those regulations means the commissioner of health.

Subp. 3. **Composite defined.** In section 141.2 of the

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National Primary Drinking Water Regulations, the following definition is added:

"Composite" means a sampling technique in which two or more samples are combined before an analysis is performed.

Subp. 4. **Distribution system defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Distribution system" means a network of pipes, valves, storage reservoirs, and pumping stations that delivers water to homes, businesses, and industries for drinking and other uses.

Subp. 5. **Entry point samples defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Entry point samples" means water samples collected at a location after any application of treatment but before the water is delivered to any consumer.

Subp. 6. **Environmental Protection Agency methods defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Environmental Protection Agency methods" means methods contained in Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, September 1986. These methods are issued by the Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268. These methods are incorporated by reference and are not subject to frequent change. The methods are available through the Minitex interlibrary loan system.

Subp. 7. **Federal act defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Federal act" means the Safe Drinking Water Act of 1974, Public Law Number 93-523, title 42, United States Code, section 300f to 300j-11.

Subp. 8. **Federal regulations defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following

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definition is added:

"Federal regulations" means regulations dealing with public water supplies and drinking water quality, adopted by the Administrator of the United States Environmental Protection Agency pursuant to the federal act.

Subp. 9. **Groundwater defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Groundwater" means the water in the zone of saturation in which all of the pore spaces of the subsurface material are filled with water. The water that supplies a well is groundwater.

Subp. 10. **Turbidity unit defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Turbidity unit" means an amount of turbidity equivalent to that in a solution composed of 0.000125 percent hydrazine sulfate and 0.00125 percent hexamethylenetetramine in distilled and filtered (100 µ pore size membrane) water, as measured by a nephelometric turbidimeter.

Subp. 11. **Year round resident defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Year round resident" means a person who resides in the area served by the public water supply for more than six months of the year.

4720.0550 MICROBIOLOGICAL CONTAMINANT SAMPLING AND ANALYTICAL REQUIREMENTS; SECTION 141.21 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Section 141.21, paragraph (b), clause (1), of the National Primary Drinking Water Regulations is amended to read:

If a routine sample is total coliform-positive, the public water supplier must collect a set of repeat samples within 24 hours of being notified of the positive result. A supplier must collect no fewer than four repeat samples for each total

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coliform-positive sample found. The commissioner of health may extend the 24-hour limit on a case-by-case basis if the supplier has a logistical problem in collecting the repeat samples within 24 hours and the problem is beyond the supplier's control. In the case of an extension, the commissioner of health shall specify how much time the supplier has to collect the repeat samples.

Rules as Proposed

4720.2300 ADDITIONAL MONITORING REQUIREMENTS.

The commissioner may impose additional monitoring requirements if the results of a sanitary survey indicate that a public health risk may exist. The commissioner may impose a requirement for more frequent sampling if the analytical results of water tests show that a previously measured contaminant is approaching a maximum contaminant level ~~as~~ prescribed in ~~parts 4720.0400 to 4720.0900~~ Code of Federal Regulations, title 40, part 141, as amended through June 29, 1989.

Rules as Proposed (all new material)

4720.3920 GENERAL REQUIREMENTS FOR CONSTRUCTION OF SURFACE WATER TREATMENT FACILITIES.

The source of surface water selected for a public water supply must provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, meets the requirements specified in Code of Federal Regulations, title 40, parts 141.72(b) and 141.73, as amended through June 29, 1989. The design of the treatment processes, equipment, and structures shall depend on an evaluation of the nature and quality of the particular water to be treated. Variations from the design criteria may be approved by the commissioner in cases where experimental, pilot, or full scale studies have demonstrated that acceptable results can be obtained.

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4720.3922 INTAKES.

Intake structures must provide:

A. a velocity of flow 0.25 to 0.50 feet per second through the inlet structure so frazil ice is held to a minimum;

B. for the withdrawal of water from the depth of the best water quality;

C. inspection manholes every 1,000 feet for pipe sizes large enough to permit visual inspection;

D. protection against rupture by dragging anchors, ice, and other activity; and

E. permanent monuments to reference locations.

4720.3925 SHORE WELLS.

Shore well structures must:

A. have motors and electrical controls located above grade and flood level;

B. be accessible for operation and service;

C. be designed to prevent flotation;

D. be equipped with removable or traveling screens before the pump suction well;

E. provide chlorination or other chemical addition facilities for raw water transmission mains;

F. have the intake valved with provisions for backflushing and testing for leaks; and

G. have provisions for controlling surges.

4720.3927 PUMPING STATIONS; DESIGN REQUIREMENTS.

Subpart 1. **General.** Pumping stations must be designed to maintain the sanitary quality of the water being pumped. All raw or finished water pump stations must:

A. provide space to access and service all equipment;

B. have outward opening doors;

C. have a floor elevation at least six inches above the finished grade and at least 24 inches above the regional flood level. Below grade installations shall be permitted only if the terrain at the site is such that a gravity drain system can be provided;

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D. have all floors drained without impairing the quality of water being handled; and

E. provide a suitable outlet for drainage from pump glands without discharging onto the floor.

Subp. 2. **Pumping station suction well.** Suction wells, including installations where the pumps are installed on top of a reservoir, must:

A. be watertight;

B. have bottoms sloped to permit removal of water and entrained solids;

C. be vented by means of a pipe or other device terminating in a screened U-bend at least 24 inches above the floor; and

D. have curbs a minimum of four inches around all access openings, pipes, and other equipment which extend through the top of the suction well. Access openings must have covers which overlap at least two inches.

Subp. 3. **Pumping station pumps.** Pumping stations must:

A. have at least two pumping units except where additional pumping stations which can meet the peak demand are available or where the commissioner determines that ample time will be available between pumping periods for necessary repairs. If only two units are provided, each must be capable of carrying the peak demand. If more than two units are installed, each must have sufficient capacity so that any one pump can be taken out of service with the remaining pump capable of carrying the peak demand.

B. have controls for proper alternation where two or more pumps are installed. Provision must be made to prevent operation of the pump during the backspin cycle. All electrical controls must be located above grade.

C. provide a power supply from at least two independent sources or from a standby, auxiliary power source.

D. provide a prelubrication line with a valved bypass around the automatic control and backflow protection where required, whenever automatic prelubrication of pump bearings is

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necessary and an auxiliary power supply is provided.

Subp. 4. **Pumping station suction lift.** A suction lift shall be allowed only for distances of less than 15 feet and where provision is made for priming the pumps. A suction lift shall not be permitted if used with buried piping carrying finished water.

Subp. 5. **Pumping station priming.** Prime water must not be of lesser sanitary quality than that of the water being pumped. Means must be provided to prevent backflow. When an air-operated ejector is used, the screened intake must draw clean air from a point at least ten feet above the ground or other source of contamination, unless the air is filtered by apparatus approved by the commissioner. Vacuum priming may be used.

4720.3930 WATER CLARIFICATION PROCEDURES.

Subpart 1. **Duplicate systems.** Facilities designed to process surface water must provide duplicate systems for flocculation and sedimentation and be constructed to permit a system to be taken out of service without disrupting operation.

Subp. 2. **Pretreatment.** Water containing high turbidity or having unusual treatment requirements shall be pretreated, usually by sedimentation or detention either with or without the addition of chemicals.

A. Sedimentation basins must have a means for sludge removal.

B. Inlets for incoming water must disperse water across the full width of the line of travel as quickly as possible; short circuiting must be prevented.

C. Means for bypassing sedimentation basins must be provided.

D. Three hours detention is the minimum period required for sedimentation. In individual cases where chemical pretreatment is required because of unusual water quality characteristics, a greater detention time shall be required.

Subp. 3. **Flash or rapid mixing.** Mixing means the rapid

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dispersion of chemicals throughout the water to be treated, usually by vigorous agitation.

A. Basins must be equipped with mechanical mixing devices unless other methods, such as baffling or injection of chemicals at a point of high velocity, are approved by the commissioner after determining that the other requirements of this chapter are met.

B. The detention period for mechanical mixing must be as short as possible depending on the velocity gradient provided by the mixing units.

4720.3932 FLOCCULATION (SLOW MIXING).

Subpart 1. **Basin design.** Inlet and outlet design must prevent short circuiting and destruction of floc. A drain must be provided.

Subp. 2. **Detention.** Minimum flow-through velocity must be not less than 0.5 feet or greater than 1.5 feet per minute with a detention time for floc formation of at least 30 minutes.

Subp. 3. **Equipment.** Agitators must be driven by variable speed drives or other means which vary the peripheral speed of paddles in the range of 0.5 to 3.0 feet per second. Uniform mixing must be provided to prevent settling in the flocculation basin.

Subp. 4. **Piping.** Flocculation and sedimentation basins must be as close together as possible to avoid settling out. The velocity of flocculated water through pipes or conduits to settling basins must be no less than 0.5 feet nor greater than 1.5 feet per second.

Subp. 5. **Baffling; other designs.** Baffling may be used to provide flocculation only after the supplier consults with the commissioner and receives the commissioner's approval. The design must maintain the velocities and flows set forth in this subpart.

4720.3935 SEDIMENTATION.

Subpart 1. **General.** Sedimentation must follow flocculation. The detention time for effective water

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clarification shall depend on basin design and the nature of the raw water, such as turbidity, color, colloidal matter, taste, and odor causing compounds.

Subp. 2. **Detention time.** Facilities with a conventional sedimentation system must provide a minimum of four hours of settling time.

Subp. 3. **Inlet devices.** Inlets must be designed to distribute the water equally and at uniform velocities. A baffle must be constructed across the basin, close to the inlet end. The baffle must project far enough below the water surface to dissipate inlet velocities and provide uniform flow across the basin.

Subp. 4. **Outlet devices.** Outlet devices must maintain velocities suitable for settling in the basin and must minimize short circuiting.

Subp. 5. **Weir overflow rate.** The rate of flow over the outlet weir must not exceed 20,000 gallons a day per foot of weir length. If submerged ports are used as an alternate for overflow weirs, they must not be lower than three feet below the flow line.

Subp. 6. **Drainage.** Basins must be provided with a means for dewatering. Basin bottoms must slope toward the drain.

Subp. 7. **Covers.** Covers or superstructures are required at all facilities. Where covers are used, manholes must be provided, as well as drop light connections, so the flow can be observed at the inlet midpoint and outlet of the basin.

Subp. 8. **Velocity.** The velocity through settling basins must not exceed one foot a minute. The basins must be designed to minimize short circuiting. Baffles must be provided if the commissioner determines the flow through time cannot be met.

Subp. 9. **Overflow.** An overflow weir or pipe must be installed which establishes the maximum water level on top of the filters. The overflow weir must discharge with a free fall at a location where the discharge is visible.

Subp. 10. **Safety.** Guard rails must be installed around openings hazardous to maintenance personnel.

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Subp. 11. **Sludge disposal.** A facility must provide for sludge disposal. Provisions must be made for the operator to observe and sample sludge being withdrawn from the unit.

Subp. 12. **Cross connection control.** Protection must be provided for all potable water lines used to backflush sludge lines and basins or for other purposes if potable water could become contaminated by nonpotable water.

4720.3940 SOLIDS CONTACT UNIT.

Subpart 1. **General.** A unit designed for combined water softening and sedimentation shall be permitted only if the unit is:

A. designed for the maximum uniform flow rate;

B. adjustable to changes in flow which are less than the design rate; and

C. designed for changes in water quality characteristics.

Subp. 2. **Installation supervision.** Supervision by a representative of the manufacturer must be provided whenever mechanical equipment is installed at the facility and, also, at the time of initial operation.

Subp. 3. **Sampling taps.** Sampling taps must be located to permit the collection of water samples from the solids contact unit.

Subp. 4. **Chemical feed.** Chemicals must be applied at points and by means which ensure satisfactory mixing of the chemicals with the water.

Subp. 5. **Mixing devices.** Mixing devices must be constructed to adequately mix raw water with previously formed sludge particles, and to prevent the deposit of solids in the mixing zone.

Subp. 6. **Flocculation.** Flocculation equipment must be adjustable so that coagulation occurs in a separate chamber or baffled zone within the unit and so that there is a flocculation and mixing period of not less than 30 minutes.

Subp. 7. **Sludge concentrators.** The solids contact unit

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must provide either internal or external concentrators which concentrate sludge and minimize wastewater.

Subp. 8. **Sludge removal.** Design of the sludge removal system must provide:

A. sludge pipes not less than three inches in diameter, arranged to facilitate cleaning;

B. an entrance to sludge withdrawal piping to prevent clogging;

C. accessible valves located outside the tank; and

D. a means for an operator to observe or sample sludge being withdrawn from the solids contact unit.

Subp. 9. **Cross connections.** Blow-off outlets and drains must terminate and discharge at places so backflow is prevented. Cross connection control must be included for all potable water lines including those used to backflush sludge lines and flush basins if potable water could become contaminated by nonpotable water.

Subp. 10. **Detention period.** The detention time must be established on the basis of the raw water characteristics and local conditions that affect the operation of the unit. Based on design flow rates, the minimum detention time must be two hours for suspended solids contact clarifiers, and one hour for the suspended solids contact softeners.

Subp. 11. **Suspended slurry concentrate.** Softening units must be designed so continuous slurry concentrates of one percent or more, by weight, are maintained.

Subp. 12. **Weirs or orifices.** Units must be equipped with either overflow weirs or orifices. Weirs must be adjustable, must be at least equivalent in length to the perimeter of the tank, and must be constructed so surface water does not travel over ten feet horizontally to the collection trough.

Subp. 13. **Weir; orifice loading.** Weir loading must not exceed 20 gallons a minute per foot of weir length for units used for softeners, or ten gallons a minute per foot of weir length for units used for clarifiers. Orifices must produce uniform rising rates over the entire area of the tank.

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Subp. 14. **Upflow rates.** The upflow rates in the solid contact unit must not exceed:

A. 1.75 gallons a minute per square foot of area at the slurry separation line if units are used for softeners; and

B. 1.0 gallon a minute per square foot of area at the sludge separation line if units are used for clarifiers.

4720.3942 FILTRATION.

The application of any type of filter and media must be supported by water quality data for the period of use sufficient to characterize any variation in water quality. Filtration systems must meet the requirements in parts 4720.3945 to 4720.3955.

4720.3945 RAPID RATE GRAVITY FILTERS.

Subpart 1. **Pretreatment.** Rapid rate gravity filters must only be used after coagulation, flocculation, and sedimentation.

Subp. 2. **Number.** At least two filter units must be provided. Provisions must be made to meet the maximum day demand at the approved filtration rate if one filter is out of service.

Subp. 3. **Rate of filtration.** The permissible rate of filtration shall be determined after consideration of factors such as raw water quality, the degree of pretreatment provided, the filter media, and water quality control parameters. In all cases the filtration rate must be reviewed and approved by a registered engineer and approved by the commissioner before the preparation of final plans.

Subp. 4. **Structural details and hydraulics.** The filter structure must be designed to:

A. provide vertical walls within the filter;

B. prevent protrusion of the filter walls or other structures into the filter media or the area between the top of the media and the high water line during backwashing;

C. provide cover by superstructure;

D. provide head room to permit normal inspection and operation;

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E. provide a minimum filter depth of 8-1/2 feet;

F. provide a minimum water depth three feet over the surface of the media;

G. provide a trap on the effluent pipe or conduit to prevent backflow of air to the bottom of the filter;

H. prevent drainage from the floor to the filter with a minimum four-inch curb around the filter;

I. prevent flooding by providing overflow if this is not provided in a pretreatment unit;

J. provide a maximum velocity of treated water in the pipe and conduits to the filter of two feet per second;

K. provide cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy or following lime-soda softening;

L. provide wash water drain capacity to carry maximum backwash flow;

M. provide walkways around filters not less than 24 inches wide; and

N. provide safety handrails or walls around the filter areas adjacent to the walkways.

Subp. 5. **Wash water troughs.** Wash water troughs must be designed to provide:

A. a bottom elevation above the maximum level of expanded media during washing;

B. a top elevation not exceeding 30 inches above the filter surface;

C. a two-inch freeboard at the maximum rate of wash;

D. a top or edge which is level;

E. spacing so each trough serves the same number of square feet of filter area; and

F. a maximum horizontal travel of suspended particles not exceeding three feet in reaching the trough.

Subp. 6. **Filter media.** Filter media must meet the standards specified in this subpart.

A. Sand must be:

(1) clean silica sand having a depth no less than

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24 inches and no more than 30 inches;

(2) an effective size from 0.45 millimeter to 0.55 millimeter, depending upon the quality of the raw water; and

(3) have a uniformity coefficient no greater than 1.65 millimeters.

B. Clean crushed anthracite, or sand and anthracite may be used as a filter media if supported by experimental data obtained from the project. Anthracite used as the only media must have an effective size from 0.45 millimeter to 0.8 millimeter and a uniformity coefficient no greater than 1.6 millimeters. Anthracite used to cap sand filters must have an effective size from 0.7 millimeter to 1.2 millimeters and a uniformity coefficient no greater than 1.85 millimeters.

C. Granular activated carbon may be used as a filter material only if approved by the commissioner. A request for approval must:

(1) include a report from a registered engineer detailing raw water quality, the results of pilot plant studies, proposed flow rates, process controls to be provided, proposed operational adjustments, and justification for the project proposals;

(2) specify criteria for the media;

(3) provide for a chlorine residual in the water following filtering and before distribution;

(4) provide for periodic treatment of the filter bed to control possible bacterial and other growths; and

(5) include plans showing any proposed modification of facilities.

D. Other media may be approved by the commissioner, but only on the basis of pilot tests and experience which demonstrate that the requirements of this part will be met.

E. Except as provided in item F, sand and gravel must be provided as supporting media according to subitems (1) and (2).

(1) A three-inch layer of sand must be used as a

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supporting media for the filter sand. The sand must have an effective size from 0.8 millimeter to 2.0 millimeters, and a uniformity coefficient no greater than 1.7 millimeters.

(2) Gravel, when used as the supporting media, must consist of hard, rounded particles and must not include flat or elongated particles. The coarsest gravel shall be no more than 2-1/2 inches in diameter in any direction when the gravel rests directly on the strainer system, and must extend above the top of the perforated laterals or strainer nozzles. No less than four layers of gravel shall be provided according to the following size and depth distribution when used with perforated laterals or strainer nozzles:

(a) 2-1/2 to 1-1/2 inches, five to eight inches deep;

(b) 1-1/2 to 1/4 inches, three to five inches deep;

(c) 1/4 to 1/2 inches; three to five inches deep;

(d) 1/2 to 3/16 inches, two to three inches deep; and

(e) 3/16 to 3/32 inches, two to three inches deep.

F. If the supplier submits subtantiation to the commissioner that proprietary filter bottoms are used, the commissioner may allow elimination of certain layers of supporting media or a reduction in the depth of the layers of supporting media that are required in item E.

Subp. 7. **Filter bottoms and strainer systems.** Departures from the standards in this subpart by using proprietary bottoms may be approved by the commissioner on a case-by-case basis if the effectiveness of the method is demonstrated by the supplier. Porous plate bottoms must not be used where iron or manganese may clog them or with water softened with lime. The design of a manifold-type collection system must:

A. minimize loss of head in the manifold and laterals;

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B. assure even distribution of wash water and an even rate of filtration over the entire area of the filter;

C. provide a ratio of the area of the final openings of the strainer system to the area of the filter of not more than 0.003;

D. provide a total cross-sectional area of the laterals at least twice the total area of the final openings of the strainer system; and

E. provide a cross-sectional area of the manifold at 1-1/2 to two times the total cross-sectional area of the laterals.

Subp. 8. **Surface wash.** Surface wash facilities consisting of either fixed nozzles or a revolving mechanism are required. All devices must be designed for:

A. water pressures of at least 45 pounds per square inch;

B. a volume of flow of 2.0 gallons per minute per square foot of filter area with fixed nozzles and 0.5 gallons per minute per square foot with revolving arms; and

C. a vacuum breaker installed above the high water elevation in the filter or other device approved by the commissioner to prevent back siphonage.

Subp. 9. **Appurtenances.** The following shall be provided for every filter:

A. a sampling tap on the effluent line;

B. a loss-of-head gauge;

C. controls to indicate flow rate;

D. a drain to waste with appropriate measures for backflow prevention;

E. a means of monitoring the effluent from each filter for turbidity on a continuous basis or on a selective basis where one turbidimeter would monitor more than one filter on a rotating cycle. The turbidimeter must have a recorder. Access to the filter interior through wall sleeves must be provided in several locations to allow the installation of sampling lines, pressure sensors, and other devices, at

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different depths in the filter media; and

F. a one to 1-1/2 inch pressure hose and rack at the operating floor for washing the filter walls.

Subp. 10. **Backwash.** Facilities must provide for the washing of filters as follows:

A. by filtered water at a rate no less than 15 gallons per square foot per minute from wash water tanks, a wash water pump from a reservoir, or a high service main, or a combination of these;

B. by wash water pumps in duplicate unless an alternate means of obtaining wash water is available;

C. by no less than 15 minutes wash of one filter at the design rate of wash;

D. by a wash water regulator or valve on the wash water line to obtain the desired rate of filter wash;

E. by a rate-of-flow indicator and totalizer on the main wash water line, located for convenient reading by the operator during the washing process; and

F. by a method which prevents rapid changes in the backwash water flow.

Subp. 11. **Roof drains.** Roof drains must not discharge into the filters and basins or the conduits preceding the filters.

4720.3947 SLOW RATE GRAVITY FILTERS.

Subpart 1. **Demonstration study.** The use of slow rate gravity filters shall require an engineering study to demonstrate the adequacy and suitability of this filtration method for a specific raw water supply. The standards in this part shall be applied to determine the adequacy and suitability of this filtration method.

Subp. 2. **Quality of raw water.** Slow rate gravity filtration must be limited to water with a maximum turbidity of 50 units and maximum color of 30 units. The turbidity must not be attributable to colloidal clay. Raw water quality data must include an examination for algae.

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Subp. 3. **Structural details and hydraulics.** A slow rate gravity filter must be designed to provide:

A. no less than two filter units;

B. a cover or superstructure;

C. headroom to permit normal movement by operating personnel for scraping and sand removal operations;

D. manholes and access ports for handling sand; and

E. filtration to waste and overflow at the maximum filter water levels.

Subp. 4. **Rates of filtration.** The permissible rates of filtration must be based on the quality of the raw water as determined from experimental data. Proposed rates must be submitted to the commissioner for approval. The design rate shall be 45 to 150 gallons a day per square foot of sand area. However, rates of 150 to 230 gallons a day per square foot shall be approved when effectiveness is demonstrated by the supplier to the satisfaction of the commissioner.

Subp. 5. **Under drains.** Each filter unit must be equipped with a main drain and lateral drains under the filter media to collect the filtered water. The under drains must be spaced so the maximum velocity of the water flow in a lateral under drain does not exceed 0.75 feet per second. The maximum spacing of lateral under drains shall not exceed 12 feet.

Subp. 6. **Filtering material.** A minimum depth of 30 inches of filter sand, clean and free of foreign matter, must be placed on graded gravel layers. The effective size of the filter media must be between 0.35 and 0.50 millimeter, and the uniformity coefficient must not exceed 2.5.

Subp. 7. **Filter gravel.** The supporting gravel must conform to the size and depth distribution provided for rapid rate gravity filters.

Subp. 8. **Depth of water on filter beds.** The design must provide a depth of at least three feet of water over the sand. Influent water must be distributed in a manner which does not scour the sand surfaces.

Subp. 9. **Control appurtenances.** Each filter must be

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equipped with:

A. a loss-of-head gauge;

B. an orifice, Venturi meter, or other suitable metering device installed on each filter to enable control of the rate of filtration; and

C. an effluent pipe located at an elevation which maintains the water level in the filter above the top of the sand.

4720.3950 DIATOMACEOUS EARTH FILTRATION.

Subpart 1. **Applicability.** The use of diatomaceous earth filters may be considered for application to surface water with low turbidity and low bacterial contamination. Diatomaceous earth filters must not be used for bacterial removal, color removal, or turbidity removal where either the gross quantity of turbidity exceeds 40 turbidity units or the turbidity exhibits poor filterability characteristics.

Subp. 2. **Pilot plant study.** Installation of a diatomaceous earth filtration system must be preceded by a pilot plant study on the water to be treated.

A. Conditions of the study such as duration, filter rates, head loss accumulation, slurry feed rates, turbidity removal, and bacteria removal, must be approved by the commissioner before the study.

B. The pilot plant study must demonstrate the ability of the system to meet the requirements of Code of Federal Regulations, title 40, part 141.73(c), as amended through June 29, 1989.

Subp. 3. **Treated water storage capacity.** Treated water storage capacity in excess of normal requirements must be provided to allow operation of the filters at a uniform rate during all conditions of system demand at or below the approved filtration rate, and to guarantee continuity of service during adverse raw water conditions without bypassing the system.

Subp. 4. **Number of filters.** There must be at least two filters provided. Where only two filters are provided, they

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must each be capable of meeting the plant's design capacity at the approved filtration rate.

Subp. 5. **Precoat.** A uniform precoat of diatomaceous earth must be applied hydraulically to each septum by introducing a slurry to the tank influent line and employing a filter-to-waste or recirculation system. Diatomaceous earth in the amount of 0.1 pound per square foot of filter area or an amount sufficient to apply a 1/16 inch coating must be used with recirculation. When precoating is accomplished with a filter-to-waste system, 0.15 to 0.2 of a pound per square foot of filter area must be provided.

Subp. 6. **Body feed.** A body feed system must apply additional amounts of diatomaceous earth slurry during the filter run to avoid short filter runs or excessive head loss.

A. The rate of body feed shall depend on raw water quality and characteristics and must be determined in the pilot plant study in subpart 2.

B. The feed systems and slurry lines must be accessible.

C. The body feed slurry must be continuously mixed.

Subp. 7. **Rate of filtration.** The minimum rate of filtration is 1.0 gallon a minute per square foot of filter area with a maximum of 1.5 gallons a minute per square foot. The filtration rate must be mechanically controlled.

Subp. 8. **Recirculation.** A recirculation or holding pump must be used to maintain differential pressure across the filter when the unit is not in operation to prevent the filter cake from dropping off the filter elements. A minimum recirculation rate of 0.1 gallon a minute per square foot of filter area must be provided.

Subp. 9. **Septum or filter element.** The filter elements must be structurally capable of withstanding maximum pressure and velocity variations during filtration and backwash cycles, and must be spaced so no less than one inch is provided between elements or between any element and a wall.

Subp. 10. **Inlet design.** The filter influent must be

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designed to prevent scour of the diatomaceous earth from the filter element.

Subp. 11. **Backwash.** A satisfactory method to thoroughly remove and dispose of spent filter cake must be provided.

Subp. 12. **Appurtenances.** The following must be provided for every filter:

A. sampling taps for raw and filtered water;

B. a loss of head or differential pressure gauge;

C. rate-of-flow indicator, preferable with totalizer; and

D. a throttling valve to reduce rates below normal during adverse raw water conditions.

Subp. 13. **Monitoring turbidimeter.** A continuous monitoring turbidimeter with recorder is required on the filter effluent for plants treating surface water.

4720.3955 DIRECT FILTRATION PLANTS.

Subpart 1. **Studies.** A full scale direct filtration plant must not be constructed without a pilot study acceptable to the commissioner. An in-plant demonstration study shall be appropriate where conventional treatment plants are converted to direct filtration. Where direct filtration is proposed, the supplier must submit an engineering report to the commissioner. The commissioner must approve the report before the supplier conducts a pilot plant or in-plant demonstration study.

Subp. 2. **Engineering report.** The engineering report must include a historical summary of meteorological conditions and of raw water quality with special reference to fluctuations in quality and possible sources of contamination. The following raw water parameters must be evaluated in the report:

A. color;

B. turbidity;

C. bacterial concentration;

D. microscopic biological organisms;

E. temperature;

F. total solids;

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G. general inorganic chemical characteristics; and

H. additional parameters as required by the reviewing authority.

The report must also include a description of methods and work to be done during a pilot plant study or where appropriate, an in-plant demonstration study.

Subp. 3. **Pilot plant or in-plant demonstration studies.** After approval of the engineering report, a pilot study or, for existing plants where conventional treatment is being converted to direct filtration, an in-plant demonstration study, shall be conducted. The study must be conducted over a sufficient time to treat all expected raw water conditions throughout the year. The pilot plant filter must be of a similar type and operated in the same manner as proposed for full scale operation. The study shall emphasize but not be limited to, the following items:

A. chemical mixing conditions including shear gradients and detention periods;

B. chemical feed rates;

C. use of various coagulants and coagulant aids;

D. flocculation conditions;

E. filtration rates;

F. filter gradation, types of media, and depth of media;

G. filter breakthrough conditions; and

H. a description of the adverse impact of recycling backwash water due to solids, algae, trihalomethane formation and similar problems.

Before initiation of design plans and specifications, the supplier shall submit a final report including the engineer's design recommendations. The study must demonstrate the minimum contact time necessary for optimum filtration for each coagulant proposed.

Subp. 4. **Pretreatment - rapid mix and flocculation.** The final rapid mix and flocculation basin design shall be based on the pilot plant or in-plant demonstration studies augmented with applicable portions of parts 4720.3930, subpart 3, and 4720.3932.

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Subp. 5. **Filtration.** Filters must be rapid rate gravity filters, with dual or mixed media. The final filter design must be based on the pilot plant or in-plant demonstration studies augmented by applicable portions of part 4720.3945, subparts 1 to 7. Pressure filters or single media sand filters must not be used.

A. Surface wash, subsurface wash, or air scour must be provided for the filters according to part 4720.3945, subpart 8.

B. Provisions for filtration to waste must be provided with measures for backflow prevention according to chapter 4715.

Subp. 6. **Siting requirements.** The plant design and land ownership surrounding the plant must allow for the installation of conventional sedimentation basins should the commissioner find that the installation of the direct filtration methods specified in this part do not achieve the water quality standard indicated in Code of Federal Regulations, title 40, part 141.73(a)(1), as amended through June 29, 1989.

4720.3957 CHEMICAL ADDITION.

Subpart 1. **Feed equipment required.** If chemical feed such as chlorination, coagulation, or other processes are necessary for the protection of the water supply, a minimum of two feeders must be provided so a standby unit or combination of units is available to replace the largest unit during shutdowns. Spare parts must be available for all feeders to replace parts subject to wear and damage.

Subp. 2. **Design and capacity.** The design of the facility must ensure that:

A. a separate feed system is provided for each chemical;

B. feeders supply, at all times, the necessary amounts of chemical at an accurate rate, throughout the range of feed. To allow for changes in pumping or application rates, the feeder must be designed to operate between 30 and 70 percent of

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the feeder range on initial start-up. If this is not possible with stock chemical solution, the chemical must be diluted;

C. proportioning of chemical feed to rate of flow is provided;

D. positive displacement-type solution feeders are used to feed liquid chemicals;

E. chemical solutions are prevented from being siphoned into the water supply by assuring discharge at points of positive pressure and by providing anti-siphon devices, or through a suitable air gap or other effective means approved by the commissioner;

F. the service water supply is protected from contamination by chemical solutions either by equipping the supply line with backflow or backsiphonage prevention devices, or by providing an air gap of two pipe diameters, but not less than three inches, between the supply line and top of the solution tank;

G. materials and surfaces in contact with chemicals are resistant to the chemical solution;

H. dry chemical feeders:

(1) measure chemicals volumetrically or gravimetrically;

(2) effectively dissolve the chemical in the solution pot;

(3) provide gravity feed from solution pots, if possible; and

(4) completely enclose chemicals to prevent emission of dust to the operating room; and

I. no direct connection exists between any sewer and a drain or overflow from the feeder or solution chamber or tank.

Subp. 3. **Location of feed equipment.** Chemical feed equipment must be:

A. readily accessible for servicing, repair, and observation of operation;

B. located and have protective curbings to prevent chemicals from equipment failure, spillage, or accidental

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drainage from entering the water in conduits, and treatment or storage basins; and

C. located above grade.

Subp. 4. **Controls.** Feeders must be manually or automatically controlled if the water supply pumps are manually controlled. Where pumps are automatically controlled, the feeders must be automatically controlled. In all cases, automatic control shall be capable of reverting to manual control when necessary.

A. Feeders must be designed and controlled to provide rates proportional to flow.

B. Automatic chemical feed rate control may be used in combination with residual analyzers which have alarms for critical values and recording charts.

Subp. 5. **Weighing scales.** Weighing scales:

A. must be provided to weigh cylinders at all plants using chlorine gas;

B. are required for solution feed unless a comparable means for determining use is approved by the commissioner;

C. are required for volumetric dry chemical feeders; and

D. must be accurate enough to measure increments of 0.5 percent of load.

Subp. 6. **Feed lines.** Feed lines must:

A. be as short as possible in length of run; of durable, corrosion resistant material; easily accessible throughout entire length; protected against freezing; and readily cleanable;

B. slope upward from chemical source to feeder when conveying gases;

C. introduce corrosive chemicals so as to minimize the potential for corrosion;

D. be designed consistent with the scale-forming or solids-depositing properties of the water, chemical, solution, or mixture conveyed;

E. not carry chlorine gas beyond the chlorine feeder

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room; and

F. include an injection nozzle when application is into a pipeline.

Subp. 7. **Service water supply.** Water used for dissolving dry chemicals, diluting liquid chemicals, or operating chemical feeders must be from a safe, approved source with appropriate backflow prevention provided. The commissioner may grant an exception in cases where the finished water quality is not affected by addition of the chemical mixed with untreated water.

4720.3960 CHEMICAL STORAGE.

Subpart 1. **Storage space.** Storage space must provide for:

A. storage of at least 30 days of chemical supply;

B. convenient and efficient handling of chemicals;

C. dry storage conditions; and

D. a minimum of 1-1/2 truckloads storage volume where purchase is by truckload.

Subp. 2. **Containers.** Covered or unopened shipping containers must be provided for storage unless the chemical is transferred into an approved covered storage unit. Solution tanks must have overlapping covers.

Subp. 3. **Capacity.** Solution storage or day tanks supplying feeders directly must have sufficient capacity for one day of operation. When the chemical solution is prepared from a powder or slurry, two solution tanks are required to assure continuity of feed.

Subp. 4. **Storage containers.** Storage must be constructed of or lined with materials compatible with the chemical being handled.

Subp. 5. **Mixing equipment.** Mixing equipment must be provided where necessary to assure a uniform chemical solution strength.

Subp. 6. **Measurements.** Means must be provided to accurately determine the amount of chemical applied either by measurement of the solution level in the tank or by weighing scales. A meter must be provided on the water fill line to a

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fluoride saturator. Liquid chemical storage tanks must have a liquid level indicator.

Subp. 7. **Drainage.** Means to drain tanks must be provided in the storage space, but there must be no direct connection between any drain piping and a sewer. Drain piping must terminate at least two pipe diameters, but not less than three inches, above the overflow rim of a receiving sump, conduit, or waste receptacle.

Subp. 8. **Overflow pipes.** Overflow pipes must be turned downward, be screened, have a free discharge, and be in a conspicuous location.

Subp. 9. **Subsurface storage.** Where subsurface locations for solution or storage tanks are provided, the tanks must be free from sources of possible contamination and located to assure drainage for groundwater, accumulated water, chemical spills, and overflows.

Subp. 10. **Compatibility of chemicals.** Incompatible chemicals must not be stored or handled in common areas.

Subp. 11. **Venting.** Gases from feeders, storage, and equipment exhausts must be conveyed to the outside atmosphere above grade and remote from air intakes. Acid storage tanks must be vented to the outside but not through vents in common with day tanks.

4720.3962 CHEMICAL HANDLING.

Subpart 1. **Measuring equipment.** Equipment must be provided in the handling facility to measure the chemicals used to prepare feed solutions.

Subp. 2. **Piping.** Piping for chemicals must be compatible with the chemical being conveyed.

Subp. 3. **Dust control.** Provision must be made for the transfer of dry chemicals from shipping containers to storage bins or hoppers in a way that minimizes dust. Control must be provided by use of one of the following:

A. vacuum pneumatic equipment or closed conveyor systems;

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B. facilities for emptying shipping containers in special containers; or

C. exhaust fans and dust filters which place the hoppers or bins under negative pressure.

Subp. 4. **Acids.** Acids must be kept in closed, acid-resistant shipping containers or storage units. Transfer from shipping containers to solution or day tanks must be through suitable hose or pipe by means of a transfer pump.

4720.3965 DISINFECTION.

Subpart 1. **Chlorine.** Chlorine must be the principal agent used to disinfect the water supply. Other agents may be approved by the commissioner on a case-by-case basis provided reliable feeding equipment is available and testing procedures for a residual are recognized in the 16th edition of Standard Methods for the Examination of Water and Wastewater (1985). This edition is incorporated by reference, is not subject to frequent change, and is available through the Minitex interlibrary loan system.

Subp. 2. **Equipment.** A gas chlorinator or a positive displacement hypochlorite feeder must be provided by the supplier.

Subp. 3. **Capacity.** The chlorinator capacity must provide that a free chlorine residual of at least two mg/l is attained in the water after a contact time of at least 30 minutes when maximum flow rates coincide with anticipated maximum chlorine demands. The equipment must be designed to operate accurately over the desired feed range.

Subp. 4. **Standby equipment.** Where chlorination is needed to protect the water supply, standby equipment of sufficient capacity must be available to replace the largest unit during shutdowns.

Subp. 5. **Automatic proportioning.** Automatic proportioning chlorinators are required where the rate of flow is not reasonably constant or where the rate of flow of the water is not manually controlled.

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Subp. 6. **Contact time and point of application.** To determine the contact time of the chlorine in water, ammonia, taste-producing substances, temperature, bacterial quality, trihalomethane formation potential and other pertinent factors must be considered. All basins used for disinfection must be designed to minimize short circuiting.

A. At plants treating surface water, provisions must be made for applying chlorine to the raw water, settled water, filtered water, and water entering the distribution system. The contact time required in item B must be provided after filtration.

B. Surface water supplies using free residual chlorination must provide a minimum contact time of two hours. When combined residual chlorination is used for surface water supplies, a minimum of three hours contact time must be provided.

Subp. 7. **Residual testing equipment.** Residual testing equipment must measure residuals to the nearest 0.1 mg/l in the range below 0.5 mg/l and to the nearest 0.2 mg/l between 0.5 mg/l to 2.0 mg/l.

Subp. 8. **Chlorinator piping.** The water supply piping must be designed to prevent contamination of the treated water supply by water sources of impure or unknown quality.

Subp. 9. **Housing.** Chlorine gas feed and storage must be:

A. separated from other operating areas by gas-tight enclosures to prevent injury to personnel and damage to equipment;

B. provided with an inspection window installed in an interior wall or exterior door to permit viewing of the interior of the room and the equipment;

C. provided with doors having emergency or panic hardware and opening outward to the building exterior;

D. heated to prevent freezing and insure proper operation of the equipment;

E. provided with restraints to prevent movement of the chlorine cylinders; and

F. designed so the ejector for mixing chlorine gas

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and water is located in the chlorine room.

Subp. 10. **Ventilation of chlorine rooms.** One complete air change a minute must be provided when the chlorine room is occupied. In addition:

A. the exhaust fan suction must be near the floor with the point of discharge located to avoid contamination of air inlets to other rooms and structures or blockage by snow or other obstructions;

B. air inlets must be located near the ceiling and controlled to prevent adverse temperature variation;

C. the exhaust fan switch must be located at the entrance to the chlorine room with a signal light indicating fan operation when the fan is controlled from more than one point; and

D. vents from feeder and storage units must discharge to the outside atmosphere, above grade as indicated in item A.

Subp. 11. **Ammoniation.** Housing and ventilation for ammoniation must be provided as specified in subparts 9 and 10. Ammonia storage and feed facilities must be separate from chlorine facilities because of the combustion hazard. A plastic bottle of hydrochloric acid must be available and used for leak detection.

4720.3970 VARIANCE PROCEDURES AND CRITERIA FOR SURFACE WATER CONSTRUCTION STANDARDS.

The commissioner of health shall grant a variance to parts 4720.3920 to 4720.3965 according to the procedures and criteria in parts 4717.7000 to 4717.7050, as proposed at 15 State Register 985, October 29, 1990, and as later adopted.

REPEALER. Minnesota Rules, parts 4717.6000 to 4717.6900, 4720.0020, 4720.0100, 4720.0400, 4720.0500, 4720.0600, 4720.0700, 4720.0800, 4720.0900, 4720.1000, 4720.1100, 4720.1200, 4720.1300, 4720.1400, 4720.1500, 4720.1510, 4720.1600, 4720.1700, 4720.1800, 4720.1900, 4720.2000, 4720.2100, 4720.2200, 4720.2400, 4720.2500, 4720.2600,

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by Revisor _____

4720.3100, 4720.3200, 4720.3300, 4720.3400, 4720.3500, 4720.3510, 4720.3600, 4720.3700, and 4720.3900 are repealed.

Approved
by Revisor _____

Office of the Revisor of Statutes

Administrative Rules

TITLE: Proposed Permanent Rules Relating to Public Water Supplies

AGENCY: Department of Health

MINNESOTA RULES: Chapter 4720

INCORPORATIONS BY REFERENCE:

Part 4720.0450, subpart 6: Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water (September 1986); Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268

Part 4720.3965, subpart 1: Standard Methods for the Examination of Water and Wastewater (16th edition, 1985)

Available at Minitex interlibrary loan system.

The attached rules are approved for publication in the State Register

Kathleen T. Harrington
Assistant Revisor

Stat Authority 144.383 (c) The commission has the following powers:

To promulgate rules, pursuant to Chapter 14 but no less stringent than federal regulation, which may include the granting of variances and exemptions

end of comment period is listed as January 9, 1991

Official Notices

Pursuant to the provisions of Minnesota Statutes §14.10, an agency, in preparing proposed rules, may seek information or opinion from sources outside the agency. Notices of intent to solicit outside opinion must be published in the *State Register* and all interested persons afforded the opportunity to submit data or views on the subject, either orally or in writing.

The *State Register* also publishes other official notices of state agencies, notices of meetings, and matters of public interest.

Minnesota Health Care Access Commission

Notice of Meeting of the Health Care Access Commission

The Meeting of the Health Care Access Commission will be held on Thursday, February 1, 1990 from 1:00 to 4:00 p.m. in the State Office Building, Room 500 South.

Department of Health

Division of Environmental Health

Notice of Solicitation of Outside Information or Opinions Regarding Proposed Rules Governing Various Subjects

NOTICE IS HEREBY GIVEN that the Minnesota Department of Health is seeking information or opinions from sources outside the department in preparing to propose the adoption of new rules and revision of existing rules governing the subjects listed below. The adoption of the rules is authorized by the statutory provisions listed. The Department of Health requests information and opinions on the subject matter of the rules. Interested persons or groups may submit data or views on the subject matter of concern in writing or orally. Written statements should be addressed to the contact person listed at the Minnesota Department of Health, Division of Environmental Health, 717 Delaware Street Southeast, P.O. Box 59040, Minneapolis, Minnesota, 55459-0040. Oral statements will be received during regular business hours over the telephone at the number listed for the particular subject matter and in person at the above address.

All statements of information and opinions will be accepted until the rules are formally proposed for adoption. Any written material received by the Department of Health will become part of the rulemaking record to be submitted to the Office of the Attorney General or the Office of Administrative Hearings in the event that a rule is adopted.

Subject Matter of Rule	Statutory Authority	Contact Person
• Variance Procedures for Environmental Health Rules (New rule)	*Minnesota Statutes*, section 144.05	Jane A. Nelson 612/623-5749
• Lead abatement (Permanent rule)	*Laws 1989*, Chap. 282 Art. 2, sec. 20	Douglas Benson 612/623-5653
• Health Supervision Services in Lodging Establishments	*Minnesota Statutes*, section 157.031, subd. 5	C.B. Schneider 612/623-5337
• Fines for Uncorrected Deficiencies in Food, Beverage and Lodging Establishments; and Manufactured Home Parks and Recreational Camping Areas	*Minnesota Statutes*, section 157.081	C.B. Schneider 612/623-5337
• License Fees, Sewer and Water Standards for Manufactured Home Parks and Recreational Camping Areas	*Minnesota Statutes*, sections 327.14-327.28	C.B. Schneider 612/623-5337
• Children's Camps	*Minnesota Statutes*, section 144.74	C.B. Schneider 612/623-5337

KEY: PROPOSED RULES SECTION — Underlining indicates additions to existing rule language. ~~Strike outs~~ indicate deletions from existing rule language. If a proposed rule is totally new, it is designated "all new material." ADOPTED RULES SECTION — Underlining indicates additions to proposed rule language. ~~Strike outs~~ indicate deletions from proposed rule language.

• Infectious Waste Generators	*Minnesota Statutes*, section 116.81	Darrell Anderson 612/623-5333
• Health Risk Limits for Groundwater	*Laws 1989*, Chap. 326 Art. 1, sec. 8	David Gray 612/623-5352
• Asbestos (Revision)	*Minnesota Statutes*, sections 326.70-326.82	Wm. Fetzner 612/623-5380
• Public Water Supplies	*Minnesota Statutes*, section 144.383	Richard Clark 612/623-5227
• Wells and Borings at grade wells, casings bore holes, construction	*Minnesota Statutes*, chapter 1031	Ronald Thompson 612/623-5264

Raymond W. Thron, Ph.D., P.E., Director
Division of Environmental Health

Department of Labor and Industry

Workers' Compensation Division

Notice of Solicitation of Outside Information or Opinions in the Matter of the Proposed Amendment of Rules of the Minnesota Department of Labor and Industry Governing Charges for Copies of Medical Records

NOTICE IS HEREBY GIVEN that the Minnesota Department of Labor and Industry, Workers' Compensation Division is seeking information or opinions from sources outside the agency in preparing to propose the amendment of rules governing charges for copies of medical records in workers' compensation cases. The adoption of the rules is authorized by *Minnesota Statutes* § 176.135, subd. 7 (Supp. 1989) and § 176.83 (1988).

The Minnesota Department of Labor and Industry, Workers' Compensation Division, requests information and opinions concerning the subject matter of these rules. Interested or affected persons or groups may submit data or views on the subject matter of concern in writing or orally. Written statements should be addressed to:

Gloria Gebhard
Rehabilitation and Medical Affairs
Department of Labor and Industry
1st Floor, 443 Lafayette Road
St. Paul, Minnesota 55155-4304

Any written material received by the Minnesota Department of Labor and Industry, Workers' Compensation Division, shall become part of the rulemaking record to be submitted to the Attorney General or Administrative Law Judge in the event that the rule is adopted.

Dated: 12 January 1990

Ken Peterson, Commissioner
Department of Labor and Industry

Metropolitan Council

Public Hearing on the Revision of Plan Amendment Guidelines

The Metropolitan and Community Development Committee of the Metropolitan Council will hold a public hearing on the proposed revision of the guidelines it uses for review of plans and plan amendments of local units of government submitted to it pursuant to the Metropolitan Land Planning Act. The hearing will be held on Thursday, February 15, 1990 at 2:00 p.m. in the Council Chambers, Mears Park Centre, 230 E. Fifth St., St. Paul.

All interested persons are encouraged to attend the hearing and offer comments. People may register in advance to speak by calling the Community Outreach Division at 291-6500. Copies of the revised guidelines are available for public inspection at designated libraries throughout the region. For information on the location of these libraries or a free copy of the document, call 291-8140.

DEPARTMENT : Health

STATE OF MINNESOTA

Office Memorandum

DATE : November 27, 1990

TO : Legislative Commission to Review Administrataive Rules
Room 55 State Office Building
100 Constitution Avenue, St. Paul, Minnesota

FROM : Jane A. Nelson, Rules Coordinator
Environmental Health Division
Minnesota Department of Health

PHONE : 627-5038

SUBJECT : Submission of Statement of Need and Reasonableness pursuant to Minnesota Statutes, sections 14.131 and 14.23

In accordance with the above matter, the Minnesota Department of Health is submitting to you the Statement of Need and Reasonableness on proposed permanent rules relating to public water supplies, Minnesota Rules, parts 4720.0200 to 4720.3970. These rules are scheduled for publication in the State Register December 10, 1990.

SF-00006-05 (4/86)

STATE OF MINNESOTA

Office Memorandum

DEPARTMENT : Health

DATE : January 15, 1991

TO : Patricia Nolte, Legal Assistant
Office of the Attorney General
Capitol Office Building

FROM : Jane A. Nelson, Rules Coordinator
Environmental Health Division Jane Nelson

PHONE : 627-5038

SUBJECT : Review of a Rule Adopted Without a Public Hearing. Proposed Permanent Rules of the Minnesota Department of Health Relating to Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970

Enclosed are the documents required to be submitted under Minnesota Rules, part 2010.0300, for your review of a rule adopted without a public hearing.

Official documents in this submittal include:

A. A copy or photocopy of the notice of solicitation of outside information or opinions as published in the State Register.

B. A copy of the proposed rule with a certificate of approval as to form by the Revisor of Statutes attached.

C. The notice of intent to adopt a rule without a public hearing as mailed.

D. The Statement of Need and Reasonableness in support of the proposed rule complying with part 2010.0700.

E. Notice of mailing the Statement of Need and Reasonableness to the Legislative Commission to Review Administrative Rules.

F. The affidavit of mailing the notice of intent to adopt a rule without a public hearing. The affidavit states that the mailing list maintained by the Department pursuant to Minnesota Statutes, section 14.14 and 14.22 is accurate, complete, and current and that the notice of intent to adopt the rule was mailed to all persons and groups whose names appear on the list.

G. A copy or photo copy of the notice of intent to adopt the rule without a public hearing as published in the State Register.

H. Four copies of the rule as adopted.

I. The Findings of Fact, Conclusions, and Order Adopting the Rule.

J. All written requests, submissions, or comment on the rule received by the Department except requests solely for copies of the rule or for the Statement of Need and Reasonableness.

K. The Declaration of Counsel of the Attorney General-Health.

L. No requests to be notified of submittal of the rule to the Attorney General-Administration were received.

If you have any questions on this submittal, please call me at 627-5038.

STATE OF MINNESOTA

MINNESOTA DEPARTMENT OF HEALTH

In the Matter of the Proposed
Adoption of Rules of the
Minnesota Department of Health
Governing Public Water
Supplies, Minnesota Rules,
parts 4720.0200 to 4720.3970

CERTIFICATE

I hereby certify that the list of persons, associations, and other interested groups who have requested, pursuant to Minnesota Statutes, section 14.14, subdivision 1a, that their names be placed on file with, and maintained by, the Minnesota Department of Health for the purpose of receiving notice of rule hearings, is accurate and complete as of

9:04 a.m., this 3rd day of December, 1990.

Christine R. Barton

~~Dee Woodard~~

STATE OF MINNESOTA

MINNESOTA DEPARTMENT OF HEALTH

In the Matter of the Proposed Adoption of the Rules of the Minnesota Department of Health Governing Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970

AFFIDAVIT OF MAILING NOTICE OF INTENT TO ADOPT A RULE WITHOUT A PUBLIC HEARING

Elizabeth J. Meyer, being sworn, says:

That on the 7 day of December, 1990, in the City of Minneapolis, County of Hennepin, State of Minnesota, I mailed the attached Notice of Intent to Adopt a Rule Without a Public Hearing by depositing in the State of Minnesota Central Mail System for United States mailing, a copy thereof, with postage prepaid, to all persons and associations on the attached Department list.

Elizabeth J. Meyer
(name)
Clerk Typist One
(title)
Environmental Health
(division)

Subscribed and sworn to before me this 7th day of December, 1990.

Mary N. Quam

MARY N. QUAM
NOTARY PUBLIC — MINNESOTA
HENNEPIN COUNTY
My commission expires 10-18-96

The Notice and Rule were also copied and distributed to all members of the Minnesota House and Senate (201members).

Michael J. Ahern
Moss & Barnett
4800 Norwest Center
Minneapolis, MN 55402-4119

Donna M. Anderson
Dakota County
Public Health Dept.
33 E. Wentworth Ave. #345
W. St. Paul, MN 55118

Herbert Anderson
418 Eighth St. S.
Virginia, MN 55792

Anoka Co. Env. Services
c/o Robert Hutchison
Courthouse - Fourth Floor
Anoka, MN 55303

Walter A. Baldus
Woodvale Management
Services, Inc.
P.O. Box 1047
Austin, MN 55912

Mary Ann Blade
808 S.E. Third St.
Little Falls, MN 56345

Lester Block
School of Public Health
Box 197 Mayo
University of Minnesota
Minneapolis, MN 55455

William Bond
MN State Pharmaceutical
Association
2221 University Ave. S.E.
Suite 326
Minneapolis, MN 55414

Broeker, Geer, Fletcher &
LaFond
8500 Normandale Lake Blvd.
Suite 1510
Minneapolis, MN 55437

Mark J. Brunner
MN Manufactured Housing
Association
555 Park Street, Ste. 400
St. Paul, MN 55103

Tim Burkett
CIP
1845 Stinson Blvd. N.E.
Minneapolis, MN 55418

William Carter, III
Executive Director
POST Board
1600 University Ave.
Suite 200
St. Paul, MN 55431

Jane Cavanaugh, QA Coord.
Share Health Plan
3600 W. 80th Street
Bloomington, MN 55431

Becky A. Comstock
Dorsey & Whitney
2200 First Bank Place E.
Minneapolis, MN 55402

Bill Conley
114 Mackubin St.
St. Paul, MN 55102

Mary Davies, Director
Dakota Mental Health Center
744 - 19th Avenue N.
So. St. Paul, MN 55075

Judith S. Douglas
The Phoenix Residence, Inc.
135 Colorado St. E.
St. Paul, MN 55107

John E. Drawz
1500 Northland Plaza Bldg.
3800 West 80th Street
Minneapolis, MN 55431-4409

Michael J. Duffy, Director
Community Health Serv. Bd.
325 Lake Ave. S., Ste. 604
Duluth, MN 55802

Ewald Consulting Group
26 East Exchange
St. Paul, MN 55101

Bob Fitzgerald, D.C.
133 W. Lake Street
Minneapolis, MN 55408

Iris C. Freeman
MN Alliance for Health
Care Consumers
5609 Lyndale Ave. S.
Minneapolis, MN 55419

Patti Cullen Garvey
Care Providers of MN
2850 Metro Drive, Ste. 200
Minneapolis, MN 55425

Steven D. Gatlin
Division of Public Works
City of Roseville
2660 Civic Center Drive
Roseville, MN 55113

Goodhue & Wabasha Counties
Public Health Service
419 Bush Street
Red Wing, MN 55066

Jerry Gross
Community Living, Inc.
Box 130
Victoria, MN 55386

Bob Hamper
Dept. of Human Services
444 Lafayette Road
St. Paul, MN 55155

Robert A. Harder
MN Dental Association
2236 Marshall Ave.
St. Paul, MN 55104

Lois Hacker, Prog. Spclst.
Anoka Co. Community Health
and Social Services
Courthouse - Fourth Floor
Anoka, MN 55303

Heartland Homes, Inc.
Box 214
Park Rapids, MN 56470

Thomas L. Heenan
4141 Douglas Drive
Crystal, MN 55422

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ARC of Olmsted County
903 West Center St.
Rochester, MN 55904

Edward R. Henrich
Bergerson-Caswell
5115 Industrial Street
Maple Plain, MN 55359

Charles B. Hoffman
Director, Env. Affairs
Pickands Mather & Co.
Suite 811
200 W. Superior St.
Duluth, MN 55802

Hope Residence, Inc.
Box 63
Waterville, MN 56096

James Jack
Dept. of Recreation, Parks
and Leisure Services
Mankato State University
Mankato, MN 56002

Gaynold Jensen, R.D.
8400 Pennsylvania Rd. #327
Minneapolis, MN 55438

Sharon Kannenberg
Home and Community Options
252 W. Wabasha Street
Winona, MN 55987

Bob Kent
Lakeland Drilling
Rt. 1, Box 67-C
Wrenshall, MN 55797

David Ray Kiely
c/o ARRM
26 E. Exchange Street
St. Paul, MN 55101

Karen Knepper
N. Memorial Medical Ctr.
3300 North Oakdale
Robbinsdale, MN 55422

Ione Koep
125 N. Union
P.O. Box 764
Fergus Falls, MN 56537

Jim Koesling
Capitol Supply Co.
600 Lafayette Road
St. Paul, MN 55101

Julie Krause
119 Third Street
Long Prairie, MN 56347

Cynthia Kroeger
Executive Director
QSS, Inc.
P.O. Box 838
Faribault, MN 55021

Vicki Kunerth
3426 - 39th Ave. So.
Minneapolis, MN 55406

Sue Kvendra
Metropolitan Sr. Federation
1885 University Ave.
Suite 190
St. Paul, MN 55104

Byron Laher
404 S. Eighth Street
Minneapolis, MN 55404

Wayne Larson
Mount Olivet Rolling Acres
7200 Rolling Acres Road
Excelsior, MN 55331

Virgil H. Lee, R.Ph.
St. Mary's Hospital
Pharmacy
1216 Second St. S.W.
Rochester, MN 55902

Ernest K. Lehmann &
Associates, Inc.
Attn: Land Dept.
Suite 790-Kickernick Bldg.
430 First Ave. N.
Minneapolis, MN 55401-1713

Kathleen LeMay
400 W. Marie Avenue
W. St. Paul, MN 55118

Karen Lenander
Northern States Power Co.
A.S. King Plant
210 N. Tenth Avenue
Bayport, MN 55003

Shirley K. Loucks
Assisi Residences, Inc.
Box 454
Blue Earth, MN 56013

Georgianne Lowney
540 E. First St.
Waconia, MN 55387

David Lurie
Minneapolis Health Dept.
250 South Fourth St.
Minneapolis, MN 55415

Mary Luth
Washington County
Public Health
14900 N. 61st St.
P.O. Box 6
Stillwater, MN 55082

Ann Lutterman, R.N.
Director of Nrsg. Services
1554 Midway Parkway
St. Paul, MN 55108

Mantyla Well Drilling, Inc.
P.O. Box 797
1392 St. Croix Tr. N.
Lakeland, MN 55043

Mary Martin & Assocs.
1551 Livingston Ave.
Suite 102
West St. Paul, MN 55118

Scott Mayer
MN Chiropractic Association
1700 W. Highway 36 #130
St. Paul, MN 55113

MBW Company
801 Center Street
New Ulm, MN 56073

Phillip Newberg, Exec. Dir.
MN Bd. of Nrsg. Home Admin.
2700 University Ave. W.
Ste. 104
St. Paul, MN 55114-1082

Larry Mosow
5620 Wycliffe Road
Edina, MN 55436

National Association
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480 Concordia Avenue
St. Paul, MN 55103

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Wadena County Health Dept.
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Wadena, MN 56482

Toni Nelson
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Cloquet, MN 55720

Richard W. O'Dea
92 Wildwood Beach Rd.
Mathomedi, MN 55115

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St. Paul, MN 55103

Pine River Group Home, Inc.
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Lino Lakes, MN 55014

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Lakeland, MN 55043

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Chatfield, MN 55923

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Shoreview, MN 55126

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Minneapolis College of Art
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Minneapolis, MN 55404

Deborah Sonem
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Sauk Rapids, MN 56379

South Center Manor
508 Park Island
Center City, MN 55012

Dominic J. Sposeto
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Minneapolis, MN 55408

St. Louis Co. Health Dept.
Public Health Nrsg. Admin.
1001 East First Street
Duluth, MN 55805

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Willmar, MN 56201

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Region 5 Development Cmsn.
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Staples, MN 56479

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Minneapolis Health Dept.
250 So. Fourth Street
Minneapolis, MN 55415

Torgerson Well Co., Inc.
6855 Dogwood St.
Rockford, MN 55373

Gail Trenholm
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Minnetonka, MN 55345

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Edina, MN 55424

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Mankato, MN 56001

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Colleen Wieck
State Planning Agency
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St. Paul, MN 55155

Sue Zuidema
Hennepin Co. Community
Health Department
525 Portland Ave., Level 3
Minneapolis, MN 55415

Randy S. Sellers
1935 Wilson Ave., #102
St. Paul, MN 55119

Joel Johnson
14920 Paul Ave., North
Marine on St.Croix, MN
55047-9751

STATE OF MINNESOTA

MINNESOTA DEPARTMENT OF HEALTH

In the Matter of the Proposed Adoption of the Rules of the Minnesota Department of Health Governing Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970

NOTICE OF INTENT TO ADOPT A RULE WITHOUT A PUBLIC HEARING

Notice is hereby given that the Minnesota Department of Health intends to adopt the above-entitled rule without a public hearing following the procedures set forth in the Administrative Procedures Act for adopting rules without a public hearing in Minnesota Statutes, sections 14.22 to 14.28. The statutory authority to adopt the rule is Minnesota Statutes, section 144.383, paragraph (e).

All persons have 30 days or until 4:30 p.m. on January 9, 1991 in which to submit comment in support of or in opposition to the proposed rule or any part or subpart of the rule. Comment is encouraged. Each comment should identify the portion of the proposed rule addressed, the reason for the comment, and any change proposed.

Any person may make a written request for a public hearing on the rule within the 30-day comment period. If 25 or more persons submit a written request for a public hearing within the 30-day comment period, a public hearing will be held unless a sufficient number withdraw their request in writing. Any person requesting a public hearing should state his or her name and address, and is encouraged to identify the portion of the proposed rule addressed, the reason for the request, and any change proposed. If a public hearing is required, the agency will proceed pursuant to Minnesota Statutes, sections 14.131 to 14.20.

Comments or written requests for a public hearing must be submitted to:

Richard Clark, Supervisor
Public Water Supply Unit
Environmental Health Division
Minnesota Department of Health
925 Southeast Delaware Street
P.O. Box 59040
Minneapolis, Minnesota 55459-0040
(612) 627-5180

The proposed rule may be modified if the modifications are supported by data and views submitted to the Department and do not result in a substantial change in the proposed rule as noticed.

The proposed rules include provisions relating to U.S. Environmental Protection Agency and state standards for safe drinking water. Specifically,

the proposed standards: 1) revise the adopted coliform bacteria monitoring, reporting and maximum contaminant levels; 2) add performance requirements for public water suppliers who use surface water as the source water; and 3) add standards for surface water treatment facilities. A copy of the proposed rules is attached to the notice as mailed.

A free copy of the rule is available upon request from Richard Clark.

A Statement of Need and Reasonableness that describes the need for and reasonableness of each provision of the proposed rule and identifies the data and information relied upon to support the proposed rule has been prepared and is available from Richard Clark.

Adoption of these rules will not result in additional spending by local public bodies in excess of $100,000 per year for the first two years following adoption under the requirements of Minnesota Statutes, section 14.11.

The proposed rule will not have an impact on agricultural land; therefore, no further information need be provided under Minnesota Sta5tutes, section 14.11.

The Department is subject to Minnesota Statutes, section 14.115 regarding small business considerations in rulemaking. The Department's evaluation of the applicability of the methods contained in Minnesota Statutes, section 14.115, subdivision 2, for reducing the impact of the proposed rules is addressed in the statement of need and reasonableness.

If no hearing is required, upon adoption of the rule, the rule and the required supporting documents will be submitted to the Attorney General for review as to legality and form, including the issues of substantial change; whether the Department has the authority to adopt the rules; and whether the record demonstrates a rational basis for the need for and reasonableness of the proposed rules. Any person may request notification of the date of submission to the Attorney General. Persons who wish to be advised of the submission of this material to the Attorney General, or who wish to receive a copy of the adopted rule, must submit the written request to Richard Clark. If the proposed rule has been modified, the notice will also state that fact and will state that a free copy of the proposed rule, as modified, will be available on request from the Department.

Date:

S. Mary Madonna Ashton

SISTER MARY MADONNA ASHTON

COMMISSIONER OF HEALTH

Department of Health

Proposed Permanent Rules Relating to Public Water Supplies

Rules as Proposed

4720.0200 JUSTIFICATION.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 are adopted pursuant to ~~legislative authority granted in laws of Minnesota 1977, chapter 66, section 3, clause (e)~~ the Safe Drinking Water Act, Minnesota Statutes, sections 144.381 to 144.388, which requires that the commissioner of health adopt for all public water supplies rules which are at least as stringent as the federal regulations dealing with public water supplies adopted by the United States Environmental Protection Agency, in order for the commissioner to be able to assume the primary responsibility for enforcing the federal act.

4720.0300 SCOPE AND COVERAGE.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 prescribe standards for water supply siting and construction, set maximum contaminant levels for turbidity, microbiological constituents, organic and inorganic chemicals, and radioactivity, prescribe a frequency for monitoring the levels of these constituents and sodium and corrosivity, and prescribe the procedures for reporting results, notifying the public and for maintaining records.

The standards and procedures adopted in parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 inclusive shall apply to all public drinking water supplies, pursuant to authority granted by existing statutes and amendments thereto, notwithstanding any other water quality standards or regulations.

A water supply which meets all of the following requirements shall not be a public supply for the purpose of parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970:

A. consists only of distribution and storage facilities and does not have any collection and treatment

Approved by Revisor KTH

facilities;

B. obtains all of its water from, but is not owned or operated by a public water supply to which ~~such~~ the regulations apply;

C. does not sell water to any person; and

D. is not a carrier which conveys passengers in interstate commerce.

Rules as Proposed (all new material)

4720.0350 RULES AND STANDARDS ADOPTED BY REFERENCE.

The National Primary Drinking Water Regulations in Code of Federal Regulations, title 40, parts 141, and 142.40 to 142.64 as amended through June 29, 1989, are incorporated by reference in parts 4720.0200 to 4720.3970 and are subject to the alterations and amendments contained in parts 4720.0200 to 4720.3970.

4720.0450 DEFINITIONS; SECTION 141.2 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Subpart 1. **Central water treatment defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Central water treatment" means providing treatment at a common location or facility and subsequently delivering it to the consumer of the public water supply.

Subp. 2. **Commissioner of health defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Commissioner of health" means the authority established by Minnesota Statutes, sections 144.381 to 144.388, for enforcement in the state of the National Primary Drinking Water Regulations and parts 4720.0200 to 4720.3970. For purposes of enforcing the National Primary Drinking Water Regulations, title 40, part 141, the term "state" contained in those regulations means the commissioner of health.

Subp. 3. **Composite defined.** In section 141.2 of the

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National Primary Drinking Water Regulations, the following definition is added:

"Composite" means a sampling technique in which two or more samples are combined before an analysis is performed.

Subp. 4. **Distribution system defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Distribution system" means a network of pipes, valves, storage reservoirs, and pumping stations that delivers water to homes, businesses, and industries for drinking and other uses.

Subp. 5. **Entry point samples defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Entry point samples" means water samples collected at a location after any application of treatment but before the water is delivered to any consumer.

Subp. 6. **Environmental Protection Agency methods defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Environmental Protection Agency methods" means methods contained in Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, September 1986. These methods are issued by the Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268. These methods are incorporated by reference and are not subject to frequent change. The methods are available through the Minitex interlibrary loan system.

Subp. 7. **Federal act defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Federal act" means the Safe Drinking Water Act of 1974, Public Law Number 93-523, title 42, United States Code, section 300f to 300j-11.

Subp. 8. **Federal regulations defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following

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definition is added:

"Federal regulations" means regulations dealing with public water supplies and drinking water quality, adopted by the Administrator of the United States Environmental Protection Agency pursuant to the federal act.

Subp. 9. **Groundwater defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Groundwater" means the water in the zone of saturation in which all of the pore spaces of the subsurface material are filled with water. The water that supplies a well is groundwater.

Subp. 10. **Turbidity unit defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Turbidity unit" means an amount of turbidity equivalent to that in a solution composed of 0.000125 percent hydrazine sulfate and 0.00125 percent hexamethylenetetramine in distilled and filtered (100 μ pore size membrane) water, as measured by a nephelometric turbidimeter.

Subp. 11. **Year round resident defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Year round resident" means a person who resides in the area served by the public water supply for more than six months of the year.

4720.0550 MICROBIOLOGICAL CONTAMINANT SAMPLING AND ANALYTICAL REQUIREMENTS; SECTION 141.21 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Section 141.21, paragraph (b), clause (1), of the National Primary Drinking Water Regulations is amended to read:

If a routine sample is total coliform-positive, the public water supplier must collect a set of repeat samples within 24 hours of being notified of the positive result. A supplier must collect no fewer than four repeat samples for each total

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coliform-positive sample found. The commissioner of health may extend the 24-hour limit on a case-by-case basis if the supplier has a logistical problem in collecting the repeat samples within 24 hours and the problem is beyond the supplier's control. In the case of an extension, the commissioner of health shall specify how much time the supplier has to collect the repeat samples.

Rules as Proposed

4720.2300 ADDITIONAL MONITORING REQUIREMENTS.

The commissioner may impose additional monitoring requirements if the results of a sanitary survey indicate that a public health risk may exist. The commissioner may impose a requirement for more frequent sampling if the analytical results of water tests show that a previously measured contaminant is approaching a maximum contaminant level ~~as~~ prescribed in ~~parts 4720.0400 to 4720.0900~~ Code of Federal Regulations, title 40, part 141, as amended through June 29, 1989.

Rules as Proposed (all new material)

4720.3920 GENERAL REQUIREMENTS FOR CONSTRUCTION OF SURFACE WATER TREATMENT FACILITIES.

The source of surface water selected for a public water supply must provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, meets the requirements specified in Code of Federal Regulations, title 40, parts 141.72(b) and 141.73, as amended through June 29, 1989. The design of the treatment processes, equipment, and structures shall depend on an evaluation of the nature and quality of the particular water to be treated. Variations from the design criteria may be approved by the commissioner in cases where experimental, pilot, or full scale studies have demonstrated that acceptable results can be obtained.

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4720.3922 INTAKES.

Intake structures must provide:

A. a velocity of flow 0.25 to 0.50 feet per second through the inlet structure so frazil ice is held to a minimum;

B. for the withdrawal of water from the depth of the best water quality;

C. inspection manholes every 1,000 feet for pipe sizes large enough to permit visual inspection;

D. protection against rupture by dragging anchors, ice, and other activity; and

E. permanent monuments to reference locations.

4720.3925 SHORE WELLS.

Shore well structures must:

A. have motors and electrical controls located above grade and flood level;

B. be accessible for operation and service;

C. be designed to prevent flotation;

D. be equipped with removable or traveling screens before the pump suction well;

E. provide chlorination or other chemical addition facilities for raw water transmission mains;

F. have the intake valved with provisions for backflushing and testing for leaks; and

G. have provisions for controlling surges.

4720.3927 PUMPING STATIONS; DESIGN REQUIREMENTS.

Subpart 1. **General.** Pumping stations must be designed to maintain the sanitary quality of the water being pumped. All raw or finished water pump stations must:

A. provide space to access and service all equipment;

B. have outward opening doors;

C. have a floor elevation at least six inches above the finished grade and at least 24 inches above the regional flood level. Below grade installations shall be permitted only if the terrain at the site is such that a gravity drain system can be provided;

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D. have all floors drained without impairing the quality of water being handled; and

E. provide a suitable outlet for drainage from pump glands without discharging onto the floor.

Subp. 2. **Pumping station suction well.** Suction wells, including installations where the pumps are installed on top of a reservoir, must:

A. be watertight;

B. have bottoms sloped to permit removal of water and entrained solids;

C. be vented by means of a pipe or other device terminating in a screened U-bend at least 24 inches above the floor; and

D. have curbs a minimum of four inches around all access openings, pipes, and other equipment which extend through the top of the suction well. Access openings must have covers which overlap at least two inches.

Subp. 3. **Pumping station pumps.** Pumping stations must:

A. have at least two pumping units except where additional pumping stations which can meet the peak demand are available or where the commissioner determines that ample time will be available between pumping periods for necessary repairs. If only two units are provided, each must be capable of carrying the peak demand. If more than two units are installed, each must have sufficient capacity so that any one pump can be taken out of service with the remaining pump capable of carrying the peak demand.

B. have controls for proper alternation where two or more pumps are installed. Provision must be made to prevent operation of the pump during the backspin cycle. All electrical controls must be located above grade.

C. provide a power supply from at least two independent sources or from a standby, auxiliary power source.

D. provide a prelubrication line with a valved bypass around the automatic control and backflow protection where required, whenever automatic prelubrication of pump bearings is

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necessary and an auxiliary power supply is provided.

Subp. 4. **Pumping station suction lift.** A suction lift shall be allowed only for distances of less than 15 feet and where provision is made for priming the pumps. A suction lift shall not be permitted if used with buried piping carrying finished water.

Subp. 5. **Pumping station priming.** Prime water must not be of lesser sanitary quality than that of the water being pumped. Means must be provided to prevent backflow. When an air-operated ejector is used, the screened intake must draw clean air from a point at least ten feet above the ground or other source of contamination, unless the air is filtered by apparatus approved by the commissioner. Vacuum priming may be used.

4720.3930 WATER CLARIFICATION PROCEDURES.

Subpart 1. **Duplicate systems.** Facilities designed to process surface water must provide duplicate systems for flocculation and sedimentation and be constructed to permit a system to be taken out of service without disrupting operation.

Subp. 2. **Pretreatment.** Water containing high turbidity or having unusual treatment requirements shall be pretreated, usually by sedimentation or detention either with or without the addition of chemicals.

A. Sedimentation basins must have a means for sludge removal.

B. Inlets for incoming water must disperse water across the full width of the line of travel as quickly as possible; short circuiting must be prevented.

C. Means for bypassing sedimentation basins must be provided.

D. Three hours detention is the minimum period required for sedimentation. In individual cases where chemical pretreatment is required because of unusual water quality characteristics, a greater detention time shall be required.

Subp. 3. **Flash or rapid mixing.** Mixing means the rapid

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dispersion of chemicals throughout the water to be treated, usually by vigorous agitation.

A. Basins must be equipped with mechanical mixing devices unless other methods, such as baffling or injection of chemicals at a point of high velocity, are approved by the commissioner after determining that the other requirements of this chapter are met.

B. The detention period for mechanical mixing must be as short as possible depending on the velocity gradient provided by the mixing units.

4720.3932 FLOCCULATION (SLOW MIXING).

Subpart 1. **Basin design.** Inlet and outlet design must prevent short circuiting and destruction of floc. A drain must be provided.

Subp. 2. **Detention.** Minimum flow-through velocity must be not less than 0.5 feet or greater than 1.5 feet per minute with a detention time for floc formation of at least 30 minutes.

Subp. 3. **Equipment.** Agitators must be driven by variable speed drives or other means which vary the peripheral speed of paddles in the range of 0.5 to 3.0 feet per second. Uniform mixing must be provided to prevent settling in the flocculation basin.

Subp. 4. **Piping.** Flocculation and sedimentation basins must be as close together as possible to avoid settling out. The velocity of flocculated water through pipes or conduits to settling basins must be no less than 0.5 feet nor greater than 1.5 feet per second.

Subp. 5. **Baffling; other designs.** Baffling may be used to provide flocculation only after the supplier consults with the commissioner and receives the commissioner's approval. The design must maintain the velocities and flows set forth in this subpart.

4720.3935 SEDIMENTATION.

Subpart 1. **General.** Sedimentation must follow flocculation. The detention time for effective water

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clarification shall depend on basin design and the nature of the raw water, such as turbidity, color, colloidal matter, taste, and odor causing compounds.

Subp. 2. **Detention time.** Facilities with a conventional sedimentation system must provide a minimum of four hours of settling time.

Subp. 3. **Inlet devices.** Inlets must be designed to distribute the water equally and at uniform velocities. A baffle must be constructed across the basin, close to the inlet end. The baffle must project far enough below the water surface to dissipate inlet velocities and provide uniform flow across the basin.

Subp. 4. **Outlet devices.** Outlet devices must maintain velocities suitable for settling in the basin and must minimize short circuiting.

Subp. 5. **Weir overflow rate.** The rate of flow over the outlet weir must not exceed 20,000 gallons a day per foot of weir length. If submerged ports are used as an alternate for overflow weirs, they must not be lower than three feet below the flow line.

Subp. 6. **Drainage.** Basins must be provided with a means for dewatering. Basin bottoms must slope toward the drain.

Subp. 7. **Covers.** Covers or superstructures are required at all facilities. Where covers are used, manholes must be provided, as well as drop light connections, so the flow can be observed at the inlet midpoint and outlet of the basin.

Subp. 8. **Velocity.** The velocity through settling basins must not exceed one foot a minute. The basins must be designed to minimize short circuiting. Baffles must be provided if the commissioner determines the flow through time cannot be met.

Subp. 9. **Overflow.** An overflow weir or pipe must be installed which establishes the maximum water level on top of the filters. The overflow weir must discharge with a free fall at a location where the discharge is visible.

Subp. 10. **Safety.** Guard rails must be installed around openings hazardous to maintenance personnel.

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Subp. 11. **Sludge disposal.** A facility must provide for sludge disposal. Provisions must be made for the operator to observe and sample sludge being withdrawn from the unit.

Subp. 12. **Cross connection control.** Protection must be provided for all potable water lines used to backflush sludge lines and basins or for other purposes if potable water could become contaminated by nonpotable water.

4720.3940 SOLIDS CONTACT UNIT.

Subpart 1. **General.** A unit designed for combined water softening and sedimentation shall be permitted only if the unit is:

A. designed for the maximum uniform flow rate;

B. adjustable to changes in flow which are less than the design rate; and

C. designed for changes in water quality characteristics.

Subp. 2. **Installation supervision.** Supervision by a representative of the manufacturer must be provided whenever mechanical equipment is installed at the facility and, also, at the time of initial operation.

Subp. 3. **Sampling taps.** Sampling taps must be located to permit the collection of water samples from the solids contact unit.

Subp. 4. **Chemical feed.** Chemicals must be applied at points and by means which ensure satisfactory mixing of the chemicals with the water.

Subp. 5. **Mixing devices.** Mixing devices must be constructed to adequately mix raw water with previously formed sludge particles, and to prevent the deposit of solids in the mixing zone.

Subp. 6. **Flocculation.** Flocculation equipment must be adjustable so that coagulation occurs in a separate chamber or baffled zone within the unit and so that there is a flocculation and mixing period of not less than 30 minutes.

Subp. 7. **Sludge concentrators.** The solids contact unit

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must provide either internal or external concentrators which concentrate sludge and minimize wastewater.

Subp. 8. **Sludge removal.** Design of the sludge removal system must provide:

A. sludge pipes not less than three inches in diameter, arranged to facilitate cleaning;

B. an entrance to sludge withdrawal piping to prevent clogging;

C. accessible valves located outside the tank; and

D. a means for an operator to observe or sample sludge being withdrawn from the solids contact unit.

Subp. 9. **Cross connections.** Blow-off outlets and drains must terminate and discharge at places so backflow is prevented. Cross connection control must be included for all potable water lines including those used to backflush sludge lines and flush basins if potable water could become contaminated by nonpotable water.

Subp. 10. **Detention period.** The detention time must be established on the basis of the raw water characteristics and local conditions that affect the operation of the unit. Based on design flow rates, the minimum detention time must be two hours for suspended solids contact clarifiers, and one hour for the suspended solids contact softeners.

Subp. 11. **Suspended slurry concentrate.** Softening units must be designed so continuous slurry concentrates of one percent or more, by weight, are maintained.

Subp. 12. **Weirs or orifices.** Units must be equipped with either overflow weirs or orifices. Weirs must be adjustable, must be at least equivalent in length to the perimeter of the tank, and must be constructed so surface water does not travel over ten feet horizontally to the collection trough.

Subp. 13. **Weir; orifice loading.** Weir loading must not exceed 20 gallons a minute per foot of weir length for units used for softeners, or ten gallons a minute per foot of weir length for units used for clarifiers. Orifices must produce uniform rising rates over the entire area of the tank.

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Subp. 14. **Upflow rates.** The upflow rates in the solid contact unit must not exceed:

A. 1.75 gallons a minute per square foot of area at the slurry separation line if units are used for softeners; and

B. 1.0 gallon a minute per square foot of area at the sludge separation line if units are used for clarifiers.

4720.3942 FILTRATION.

The application of any type of filter and media must be supported by water quality data for the period of use sufficient to characterize any variation in water quality. Filtration systems must meet the requirements in parts 4720.3945 to 4720.3955.

4720.3945 RAPID RATE GRAVITY FILTERS.

Subpart 1. **Pretreatment.** Rapid rate gravity filters must only be used after coagulation, flocculation, and sedimentation.

Subp. 2. **Number.** At least two filter units must be provided. Provisions must be made to meet the maximum day demand at the approved filtration rate if one filter is out of service.

Subp. 3. **Rate of filtration.** The permissible rate of filtration shall be determined after consideration of factors such as raw water quality, the degree of pretreatment provided, the filter media, and water quality control parameters. In all cases the filtration rate must be reviewed and approved by a registered engineer and approved by the commissioner before the preparation of final plans.

Subp. 4. **Structural details and hydraulics.** The filter structure must be designed to:

A. provide vertical walls within the filter;

B. prevent protrusion of the filter walls or other structures into the filter media or the area between the top of the media and the high water line during backwashing;

C. provide cover by superstructure;

D. provide head room to permit normal inspection and operation;

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E. provide a minimum filter depth of 8-1/2 feet;

F. provide a minimum water depth three feet over the surface of the media;

G. provide a trap on the effluent pipe or conduit to prevent backflow of air to the bottom of the filter;

H. prevent drainage from the floor to the filter with a minimum four-inch curb around the filter;

I. prevent flooding by providing overflow if this is not provided in a pretreatment unit;

J. provide a maximum velocity of treated water in the pipe and conduits to the filter of two feet per second;

K. provide cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy or following lime-soda softening;

L. provide wash water drain capacity to carry maximum backwash flow;

M. provide walkways around filters not less than 24 inches wide; and

N. provide safety handrails or walls around the filter areas adjacent to the walkways.

Subp. 5. **Wash water troughs.** Wash water troughs must be designed to provide:

A. a bottom elevation above the maximum level of expanded media during washing;

B. a top elevation not exceeding 30 inches above the filter surface;

C. a two-inch freeboard at the maximum rate of wash;

D. a top or edge which is level;

E. spacing so each trough serves the same number of square feet of filter area; and

F. a maximum horizontal travel of suspended particles not exceeding three feet in reaching the trough.

Subp. 6. **Filter media.** Filter media must meet the standards specified in this subpart.

A. Sand must be:

(1) clean silica sand having a depth no less than

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24 inches and no more than 30 inches;

(2) an effective size from 0.45 millimeter to 0.55 millimeter, depending upon the quality of the raw water; and

(3) have a uniformity coefficient no greater than 1.65 millimeters.

B. Clean crushed anthracite, or sand and anthracite may be used as a filter media if supported by experimental data obtained from the project. Anthracite used as the only media must have an effective size from 0.45 millimeter to 0.8 millimeter and a uniformity coefficient no greater than 1.6 millimeters. Anthracite used to cap sand filters must have an effective size from 0.7 millimeter to 1.2 millimeters and a uniformity coefficient no greater than 1.85 millimeters.

C. Granular activated carbon may be used as a filter material only if approved by the commissioner. A request for approval must:

(1) include a report from a registered engineer detailing raw water quality, the results of pilot plant studies, proposed flow rates, process controls to be provided, proposed operational adjustments, and justification for the project proposals;

(2) specify criteria for the media;

(3) provide for a chlorine residual in the water following filtering and before distribution;

(4) provide for periodic treatment of the filter bed to control possible bacterial and other growths; and

(5) include plans showing any proposed modification of facilities.

D. Other media may be approved by the commissioner, but only on the basis of pilot tests and experience which demonstrate that the requirements of this part will be met.

E. Except as provided in item F, sand and gravel must be provided as supporting media according to subitems (1) and (2).

(1) A three-inch layer of sand must be used as a

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supporting media for the filter sand. The sand must have an effective size from 0.8 millimeter to 2.0 millimeters, and a uniformity coefficient no greater than 1.7 millimeters.

(2) Gravel, when used as the supporting media, must consist of hard, rounded particles and must not include flat or elongated particles. The coarsest gravel shall be no more than 2-1/2 inches in diameter in any direction when the gravel rests directly on the strainer system, and must extend above the top of the perforated laterals or strainer nozzles. No less than four layers of gravel shall be provided according to the following size and depth distribution when used with perforated laterals or strainer nozzles:

(a) 2-1/2 to 1-1/2 inches, five to eight inches deep;

(b) 1-1/2 to 1/4 inches, three to five inches deep;

(c) 1/4 to 1/2 inches; three to five inches deep;

(d) 1/2 to 3/16 inches, two to three inches deep; and

(e) 3/16 to 3/32 inches, two to three inches deep.

F. If the supplier submits subtantiation to the commissioner that proprietary filter bottoms are used, the commissioner may allow elimination of certain layers of supporting media or a reduction in the depth of the layers of supporting media that are required in item E.

Subp. 7. **Filter bottoms and strainer systems.** Departures from the standards in this subpart by using proprietary bottoms may be approved by the commissioner on a case-by-case basis if the effectiveness of the method is demonstrated by the supplier. Porous plate bottoms must not be used where iron or manganese may clog them or with water softened with lime. The design of a manifold-type collection system must:

A. minimize loss of head in the manifold and laterals;

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B. assure even distribution of wash water and an even rate of filtration over the entire area of the filter;

C. provide a ratio of the area of the final openings of the strainer system to the area of the filter of not more than 0.003;

D. provide a total cross-sectional area of the laterals at least twice the total area of the final openings of the strainer system; and

E. provide a cross-sectional area of the manifold at 1-1/2 to two times the total cross-sectional area of the laterals.

Subp. 8. **Surface wash.** Surface wash facilities consisting of either fixed nozzles or a revolving mechanism are required. All devices must be designed for:

A. water pressures of at least 45 pounds per square inch;

B. a volume of flow of 2.0 gallons per minute per square foot of filter area with fixed nozzles and 0.5 gallons per minute per square foot with revolving arms; and

C. a vacuum breaker installed above the high water elevation in the filter or other device approved by the commissioner to prevent back siphonage.

Subp. 9. **Appurtenances.** The following shall be provided for every filter:

A. a sampling tap on the effluent line;

B. a loss-of-head gauge;

C. controls to indicate flow rate;

D. a drain to waste with appropriate measures for backflow prevention;

E. a means of monitoring the effluent from each filter for turbidity on a continuous basis or on a selective basis where one turbidimeter would monitor more than one filter on a rotating cycle. The turbidimeter must have a recorder. Access to the filter interior through wall sleeves must be provided in several locations to allow the installation of sampling lines, pressure sensors, and other devices, at

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different depths in the filter media; and

F. a one to 1-1/2 inch pressure hose and rack at the operating floor for washing the filter walls.

Subp. 10. **Backwash.** Facilities must provide for the washing of filters as follows:

A. by filtered water at a rate no less than 15 gallons per square foot per minute from wash water tanks, a wash water pump from a reservoir, or a high service main, or a combination of these;

B. by wash water pumps in duplicate unless an alternate means of obtaining wash water is available;

C. by no less than 15 minutes wash of one filter at the design rate of wash;

D. by a wash water regulator or valve on the wash water line to obtain the desired rate of filter wash;

E. by a rate-of-flow indicator and totalizer on the main wash water line, located for convenient reading by the operator during the washing process; and

F. by a method which prevents rapid changes in the backwash water flow.

Subp. 11. **Roof drains.** Roof drains must not discharge into the filters and basins or the conduits preceding the filters.

4720.3947 SLOW RATE GRAVITY FILTERS.

Subpart 1. **Demonstration study.** The use of slow rate gravity filters shall require an engineering study to demonstrate the adequacy and suitability of this filtration method for a specific raw water supply. The standards in this part shall be applied to determine the adequacy and suitability of this filtration method.

Subp. 2. **Quality of raw water.** Slow rate gravity filtration must be limited to water with a maximum turbidity of 50 units and maximum color of 30 units. The turbidity must not be attributable to colloidal clay. Raw water quality data must include an examination for algae.

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Subp. 3. **Structural details and hydraulics.** A slow rate gravity filter must be designed to provide:

A. no less than two filter units;

B. a cover or superstructure;

C. headroom to permit normal movement by operating personnel for scraping and sand removal operations;

D. manholes and access ports for handling sand; and

E. filtration to waste and overflow at the maximum filter water levels.

Subp. 4. **Rates of filtration.** The permissible rates of filtration must be based on the quality of the raw water as determined from experimental data. Proposed rates must be submitted to the commissioner for approval. The design rate shall be 45 to 150 gallons a day per square foot of sand area. However, rates of 150 to 230 gallons a day per square foot shall be approved when effectiveness is demonstrated by the supplier to the satisfaction of the commissioner.

Subp. 5. **Under drains.** Each filter unit must be equipped with a main drain and lateral drains under the filter media to collect the filtered water. The under drains must be spaced so the maximum velocity of the water flow in a lateral under drain does not exceed 0.75 feet per second. The maximum spacing of lateral under drains shall not exceed 12 feet.

Subp. 6. **Filtering material.** A minimum depth of 30 inches of filter sand, clean and free of foreign matter, must be placed on graded gravel layers. The effective size of the filter media must be between 0.35 and 0.50 millimeter, and the uniformity coefficient must not exceed 2.5.

Subp. 7. **Filter gravel.** The supporting gravel must conform to the size and depth distribution provided for rapid rate gravity filters.

Subp. 8. **Depth of water on filter beds.** The design must provide a depth of at least three feet of water over the sand. Influent water must be distributed in a manner which does not scour the sand surfaces.

Subp. 9. **Control appurtenances.** Each filter must be

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equipped with:

A. a loss-of-head gauge;

B. an orifice, Venturi meter, or other suitable metering device installed on each filter to enable control of the rate of filtration; and

C. an effluent pipe located at an elevation which maintains the water level in the filter above the top of the sand.

4720.3950 DIATOMACEOUS EARTH FILTRATION.

Subpart 1. **Applicability.** The use of diatomaceous earth filters may be considered for application to surface water with low turbidity and low bacterial contamination. Diatomaceous earth filters must not be used for bacterial removal, color removal, or turbidity removal where either the gross quantity of turbidity exceeds 40 turbidity units or the turbidity exhibits poor filterability characteristics.

Subp. 2. **Pilot plant study.** Installation of a diatomaceous earth filtration system must be preceded by a pilot plant study on the water to be treated.

A. Conditions of the study such as duration, filter rates, head loss accumulation, slurry feed rates, turbidity removal, and bacteria removal, must be approved by the commissioner before the study.

B. The pilot plant study must demonstrate the ability of the system to meet the requirements of Code of Federal Regulations, title 40, part 141.73(c), as amended through June 29, 1989.

Subp. 3. **Treated water storage capacity.** Treated water storage capacity in excess of normal requirements must be provided to allow operation of the filters at a uniform rate during all conditions of system demand at or below the approved filtration rate, and to guarantee continuity of service during adverse raw water conditions without bypassing the system.

Subp. 4. **Number of filters.** There must be at least two filters provided. Where only two filters are provided, they

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must each be capable of meeting the plant's design capacity at the approved filtration rate.

Subp. 5. **Precoat.** A uniform precoat of diatomaceous earth must be applied hydraulically to each septum by introducing a slurry to the tank influent line and employing a filter-to-waste or recirculation system. Diatomaceous earth in the amount of 0.1 pound per square foot of filter area or an amount sufficient to apply a 1/16 inch coating must be used with recirculation. When precoating is accomplished with a filter-to-waste system, 0.15 to 0.2 of a pound per square foot of filter area must be provided.

Subp. 6. **Body feed.** A body feed system must apply additional amounts of diatomaceous earth slurry during the filter run to avoid short filter runs or excessive head loss.

A. The rate of body feed shall depend on raw water quality and characteristics and must be determined in the pilot plant study in subpart 2.

B. The feed systems and slurry lines must be accessible.

C. The body feed slurry must be continuously mixed.

Subp. 7. **Rate of filtration.** The minimum rate of filtration is 1.0 gallon a minute per square foot of filter area with a maximum of 1.5 gallons a minute per square foot. The filtration rate must be mechanically controlled.

Subp. 8. **Recirculation.** A recirculation or holding pump must be used to maintain differential pressure across the filter when the unit is not in operation to prevent the filter cake from dropping off the filter elements. A minimum recirculation rate of 0.1 gallon a minute per square foot of filter area must be provided.

Subp. 9. **Septum or filter element.** The filter elements must be structurally capable of withstanding maximum pressure and velocity variations during filtration and backwash cycles, and must be spaced so no less than one inch is provided between elements or between any element and a wall.

Subp. 10. **Inlet design.** The filter influent must be

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designed to prevent scour of the diatomaceous earth from the filter element.

Subp. 11. **Backwash.** A satisfactory method to thoroughly remove and dispose of spent filter cake must be provided.

Subp. 12. **Appurtenances.** The following must be provided for every filter:

A. sampling taps for raw and filtered water;

B. a loss of head or differential pressure gauge;

C. rate-of-flow indicator, preferable with totalizer; and

D. a throttling valve to reduce rates below normal during adverse raw water conditions.

Subp. 13. **Monitoring turbidimeter.** A continuous monitoring turbidimeter with recorder is required on the filter effluent for plants treating surface water.

4720.3955 DIRECT FILTRATION PLANTS.

Subpart 1. **Studies.** A full scale direct filtration plant must not be constructed without a pilot study acceptable to the commissioner. An in-plant demonstration study shall be appropriate where conventional treatment plants are converted to direct filtration. Where direct filtration is proposed, the supplier must submit an engineering report to the commissioner. The commissioner must approve the report before the supplier conducts a pilot plant or in-plant demonstration study.

Subp. 2. **Engineering report.** The engineering report must include a historical summary of meteorological conditions and of raw water quality with special reference to fluctuations in quality and possible sources of contamination. The following raw water parameters must be evaluated in the report:

A. color;

B. turbidity;

C. bacterial concentration;

D. microscopic biological organisms;

E. temperature;

F. total solids;

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G. general inorganic chemical characteristics; and

H. additional parameters as required by the reviewing authority.

The report must also include a description of methods and work to be done during a pilot plant study or where appropriate, an in-plant demonstration study.

Subp. 3. **Pilot plant or in-plant demonstration studies.** After approval of the engineering report, a pilot study or, for existing plants where conventional treatment is being converted to direct filtration, an in-plant demonstration study, shall be conducted. The study must be conducted over a sufficient time to treat all expected raw water conditions throughout the year. The pilot plant filter must be of a similar type and operated in the same manner as proposed for full scale operation. The study shall emphasize but not be limited to, the following items:

A. chemical mixing conditions including shear gradients and detention periods;

B. chemical feed rates;

C. use of various coagulants and coagulant aids;

D. flocculation conditions;

E. filtration rates;

F. filter gradation, types of media, and depth of media;

G. filter breakthrough conditions; and

H. a description of the adverse impact of recycling backwash water due to solids, algae, trihalomethane formation and similar problems.

Before initiation of design plans and specifications, the supplier shall submit a final report including the engineer's design recommendations. The study must demonstrate the minimum contact time necessary for optimum filtration for each coagulant proposed.

Subp. 4. **Pretreatment - rapid mix and flocculation.** The final rapid mix and flocculation basin design shall be based on the pilot plant or in-plant demonstration studies augmented with applicable portions of parts 4720.3930, subpart 3, and 4720.3932.

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Subp. 5. **Filtration.** Filters must be rapid rate gravity filters, with dual or mixed media. The final filter design must be based on the pilot plant or in-plant demonstration studies augmented by applicable portions of part 4720.3945, subparts 1 to 7. Pressure filters or single media sand filters must not be used.

A. Surface wash, subsurface wash, or air scour must be provided for the filters according to part 4720.3945, subpart 8.

B. Provisions for filtration to waste must be provided with measures for backflow prevention according to chapter 4715.

Subp. 6. **Siting requirements.** The plant design and land ownership surrounding the plant must allow for the installation of conventional sedimentation basins should the commissioner find that the installation of the direct filtration methods specified in this part do not achieve the water quality standard indicated in Code of Federal Regulations, title 40, part 141.73(a)(1), as amended through June 29, 1989.

4720.3957 CHEMICAL ADDITION.

Subpart 1. **Feed equipment required.** If chemical feed such as chlorination, coagulation, or other processes are necessary for the protection of the water supply, a minimum of two feeders must be provided so a standby unit or combination of units is available to replace the largest unit during shutdowns. Spare parts must be available for all feeders to replace parts subject to wear and damage.

Subp. 2. **Design and capacity.** The design of the facility must ensure that:

A. a separate feed system is provided for each chemical;

B. feeders supply, at all times, the necessary amounts of chemical at an accurate rate, throughout the range of feed. To allow for changes in pumping or application rates, the feeder must be designed to operate between 30 and 70 percent of

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the feeder range on initial start-up. If this is not possible with stock chemical solution, the chemical must be diluted;

C. proportioning of chemical feed to rate of flow is provided;

D. positive displacement-type solution feeders are used to feed liquid chemicals;

E. chemical solutions are prevented from being siphoned into the water supply by assuring discharge at points of positive pressure and by providing anti-siphon devices, or through a suitable air gap or other effective means approved by the commissioner;

F. the service water supply is protected from contamination by chemical solutions either by equipping the supply line with backflow or backsiphonage prevention devices, or by providing an air gap of two pipe diameters, but not less than three inches, between the supply line and top of the solution tank;

G. materials and surfaces in contact with chemicals are resistant to the chemical solution;

H. dry chemical feeders:

(1) measure chemicals volumetrically or gravimetrically;

(2) effectively dissolve the chemical in the solution pot;

(3) provide gravity feed from solution pots, if possible; and

(4) completely enclose chemicals to prevent emission of dust to the operating room; and

I. no direct connection exists between any sewer and a drain or overflow from the feeder or solution chamber or tank.

Subp. 3. **Location of feed equipment.** Chemical feed equipment must be:

A. readily accessible for servicing, repair, and observation of operation;

B. located and have protective curbings to prevent chemicals from equipment failure, spillage, or accidental

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drainage from entering the water in conduits, and treatment or storage basins; and

C. located above grade.

Subp. 4. **Controls.** Feeders must be manually or automatically controlled if the water supply pumps are manually controlled. Where pumps are automatically controlled, the feeders must be automatically controlled. In all cases, automatic control shall be capable of reverting to manual control when necessary.

A. Feeders must be designed and controlled to provide rates proportional to flow.

B. Automatic chemical feed rate control may be used in combination with residual analyzers which have alarms for critical values and recording charts.

Subp. 5. **Weighing scales.** Weighing scales:

A. must be provided to weigh cylinders at all plants using chlorine gas;

B. are required for solution feed unless a comparable means for determining use is approved by the commissioner;

C. are required for volumetric dry chemical feeders; and

D. must be accurate enough to measure increments of 0.5 percent of load.

Subp. 6. **Feed lines.** Feed lines must:

A. be as short as possible in length of run; of durable, corrosion resistant material; easily accessible throughout entire length; protected against freezing; and readily cleanable;

B. slope upward from chemical source to feeder when conveying gases;

C. introduce corrosive chemicals so as to minimize the potential for corrosion;

D. be designed consistent with the scale-forming or solids-depositing properties of the water, chemical, solution, or mixture conveyed;

E. not carry chlorine gas beyond the chlorine feeder

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room; and

F. include an injection nozzle when application is into a pipeline.

Subp. 7. **Service water supply.** Water used for dissolving dry chemicals, diluting liquid chemicals, or operating chemical feeders must be from a safe, approved source with appropriate backflow prevention provided. The commissioner may grant an exception in cases where the finished water quality is not affected by addition of the chemical mixed with untreated water.

4720.3960 CHEMICAL STORAGE.

Subpart 1. **Storage space.** Storage space must provide for:

A. storage of at least 30 days of chemical supply;

B. convenient and efficient handling of chemicals;

C. dry storage conditions; and

D. a minimum of 1-1/2 truckloads storage volume where purchase is by truckload.

Subp. 2. **Containers.** Covered or unopened shipping containers must be provided for storage unless the chemical is transferred into an approved covered storage unit. Solution tanks must have overlapping covers.

Subp. 3. **Capacity.** Solution storage or day tanks supplying feeders directly must have sufficient capacity for one day of operation. When the chemical solution is prepared from a powder or slurry, two solution tanks are required to assure continuity of feed.

Subp. 4. **Storage containers.** Storage must be constructed of or lined with materials compatible with the chemical being handled.

Subp. 5. **Mixing equipment.** Mixing equipment must be provided where necessary to assure a uniform chemical solution strength.

Subp. 6. **Measurements.** Means must be provided to accurately determine the amount of chemical applied either by measurement of the solution level in the tank or by weighing scales. A meter must be provided on the water fill line to a

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fluoride saturator. Liquid chemical storage tanks must have a liquid level indicator.

Subp. 7. **Drainage.** Means to drain tanks must be provided in the storage space, but there must be no direct connection between any drain piping and a sewer. Drain piping must terminate at least two pipe diameters, but not less than three inches, above the overflow rim of a receiving sump, conduit, or waste receptacle.

Subp. 8. **Overflow pipes.** Overflow pipes must be turned downward, be screened, have a free discharge, and be in a conspicuous location.

Subp. 9. **Subsurface storage.** Where subsurface locations for solution or storage tanks are provided, the tanks must be free from sources of possible contamination and located to assure drainage for groundwater, accumulated water, chemical spills, and overflows.

Subp. 10. **Compatibility of chemicals.** Incompatible chemicals must not be stored or handled in common areas.

Subp. 11. **Venting.** Gases from feeders, storage, and equipment exhausts must be conveyed to the outside atmosphere above grade and remote from air intakes. Acid storage tanks must be vented to the outside but not through vents in common with day tanks.

4720.3962 CHEMICAL HANDLING.

Subpart 1. **Measuring equipment.** Equipment must be provided in the handling facility to measure the chemicals used to prepare feed solutions.

Subp. 2. **Piping.** Piping for chemicals must be compatible with the chemical being conveyed.

Subp. 3. **Dust control.** Provision must be made for the transfer of dry chemicals from shipping containers to storage bins or hoppers in a way that minimizes dust. Control must be provided by use of one of the following:

A. vacuum pneumatic equipment or closed conveyor systems;

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B. facilities for emptying shipping containers in special containers; or

C. exhaust fans and dust filters which place the hoppers or bins under negative pressure.

Subp. 4. **Acids.** Acids must be kept in closed, acid-resistant shipping containers or storage units. Transfer from shipping containers to solution or day tanks must be through suitable hose or pipe by means of a transfer pump.

4720.3965 DISINFECTION.

Subpart 1. **Chlorine.** Chlorine must be the principal agent used to disinfect the water supply. Other agents may be approved by the commissioner on a case-by-case basis provided reliable feeding equipment is available and testing procedures for a residual are recognized in the 16th edition of Standard Methods for the Examination of Water and Wastewater (1985). This edition is incorporated by reference, is not subject to frequent change, and is available through the Minitex interlibrary loan system.

Subp. 2. **Equipment.** A gas chlorinator or a positive displacement hypochlorite feeder must be provided by the supplier.

Subp. 3. **Capacity.** The chlorinator capacity must provide that a free chlorine residual of at least two mg/l is attained in the water after a contact time of at least 30 minutes when maximum flow rates coincide with anticipated maximum chlorine demands. The equipment must be designed to operate accurately over the desired feed range.

Subp. 4. **Standby equipment.** Where chlorination is needed to protect the water supply, standby equipment of sufficient capacity must be available to replace the largest unit during shutdowns.

Subp. 5. **Automatic proportioning.** Automatic proportioning chlorinators are required where the rate of flow is not reasonably constant or where the rate of flow of the water is not manually controlled.

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Subp. 6. **Contact time and point of application.** To determine the contact time of the chlorine in water, ammonia, taste-producing substances, temperature, bacterial quality, trihalomethane formation potential and other pertinent factors must be considered. All basins used for disinfection must be designed to minimize short circuiting.

A. At plants treating surface water, provisions must be made for applying chlorine to the raw water, settled water, filtered water, and water entering the distribution system. The contact time required in item B must be provided after filtration.

B. Surface water supplies using free residual chlorination must provide a minimum contact time of two hours. When combined residual chlorination is used for surface water supplies, a minimum of three hours contact time must be provided.

Subp. 7. **Residual testing equipment.** Residual testing equipment must measure residuals to the nearest 0.1 mg/l in the range below 0.5 mg/l and to the nearest 0.2 mg/l between 0.5 mg/l to 2.0 mg/l.

Subp. 8. **Chlorinator piping.** The water supply piping must be designed to prevent contamination of the treated water supply by water sources of impure or unknown quality.

Subp. 9. **Housing.** Chlorine gas feed and storage must be:

A. separated from other operating areas by gas-tight enclosures to prevent injury to personnel and damage to equipment;

B. provided with an inspection window installed in an interior wall or exterior door to permit viewing of the interior of the room and the equipment;

C. provided with doors having emergency or panic hardware and opening outward to the building exterior;

D. heated to prevent freezing and insure proper operation of the equipment;

E. provided with restraints to prevent movement of the chlorine cylinders; and

F. designed so the ejector for mixing chlorine gas

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and water is located in the chlorine room.

Subp. 10. **Ventilation of chlorine rooms.** One complete air change a minute must be provided when the chlorine room is occupied. In addition:

A. the exhaust fan suction must be near the floor with the point of discharge located to avoid contamination of air inlets to other rooms and structures or blockage by snow or other obstructions;

B. air inlets must be located near the ceiling and controlled to prevent adverse temperature variation;

C. the exhaust fan switch must be located at the entrance to the chlorine room with a signal light indicating fan operation when the fan is controlled from more than one point; and

D. vents from feeder and storage units must discharge to the outside atmosphere, above grade as indicated in item A.

Subp. 11. **Ammoniation.** Housing and ventilation for ammoniation must be provided as specified in subparts 9 and 10. Ammonia storage and feed facilities must be separate from chlorine facilities because of the combustion hazard. A plastic bottle of hydrochloric acid must be available and used for leak detection.

4720.3970 VARIANCE PROCEDURES AND CRITERIA FOR SURFACE WATER CONSTRUCTION STANDARDS.

The commissioner of health shall grant a variance to parts 4720.3920 to 4720.3965 according to the procedures and criteria in parts 4717.7000 to 4717.7050, as proposed at 15 State Register 985, October 29, 1990, and as later adopted.

REPEALER. Minnesota Rules, parts 4717.6000 to 4717.6900, 4720.0020, 4720.0100, 4720.0400, 4720.0500, 4720.0600, 4720.0700, 4720.0800, 4720.0900, 4720.1000, 4720.1100, 4720.1200, 4720.1300, 4720.1400, 4720.1500, 4720.1510, 4720.1600, 4720.1700, 4720.1800, 4720.1900, 4720.2000, 4720.2100, 4720.2200, 4720.2400, 4720.2500, 4720.2600,

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4720.3100, 4720.3200, 4720.3300, 4720.3400, 4720.3500, 4720.3510, 4720.3600, 4720.3700, and 4720.3900 are repealed.

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Office of the Revisor of Statutes

Administrative Rules

TITLE: Proposed Permanent Rules Relating to Public Water Supplies

AGENCY: Department of Health

MINNESOTA RULES: Chapter 4720

INCORPORATIONS BY REFERENCE:

Part 4720.0450, subpart 6: Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water (September 1986); Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268

Part 4720.3965, subpart 1: Standard Methods for the Examination of Water and Wastewater (16th edition, 1985)

Available at Minitex interlibrary loan system.

The attached rules are approved for publication in the State Register

Kathleen T. Harrington
Assistant Revisor

DEC 12 1990

The Minnesota
State Register

Department of Administration—Print Communications Division



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Proposed Rules

Pursuant to Minn. Stat. §§ 14.22, an agency may propose to adopt, amend, suspend or repeal rules without first holding a public hearing, as long as the agency determines that the rules will be noncontroversial in nature. The agency must first publish a notice of intent to adopt rules without a public hearing, together with the proposed rules, in the *State Register*. The notice must advise the public:

1. that they have 30 days in which to submit comment on the proposed rules;
2. that no public hearing will be held unless 25 or more persons make a written request for a hearing within the 30-day comment period;
3. of the manner in which persons shall request a hearing on the proposed rules; and
4. that the rule may be modified if the modifications are supported by the data and views submitted.

If, during the 30-day comment period, 25 or more persons submit to the agency a written request for a hearing of the proposed rules, the agency must proceed under the provisions of §§ 14.14-14.20, which state that if an agency decides to hold a public hearing, it must publish a notice of intent in the *State Register*.

Pursuant to Minn. Stat. §§ 14.29 and 14.30, agencies may propose emergency rules under certain circumstances. Proposed emergency rules are published in the *State Register* and, for at least 25 days thereafter, interested persons may submit data and views in writing to the proposing agency.

Department of Health

Proposed Permanent Rules Relating to Public Water Supplies

Notice of Intent to Adopt a Rule Without a Public Hearing

NOTICE IS HEREBY GIVEN that the Minnesota Department of Health intends to adopt the above-entitled rule without a public hearing following the procedures set forth in the Administrative Procedures Act for adopting rules without a public hearing in *Minnesota Statutes*, sections 14.22 to 14.28. The statutory authority to adopt the rule is *Minnesota Statutes*, section 144.383, paragraph (e).

All persons have 30 days or until 4:30 p.m. on January 9, 1991 in which to submit comment in support of or in opposition to the proposed rule or any part or subpart of the rule. Comment is encouraged. Each comment should identify the portion of the proposed rule addressed, the reason for the comment, and any change proposed.

Any person may make a written request for a public hearing on the rule within the 30-day comment period. If 25 or more persons submit a written request for a public hearing within the 30-day comment period, a public hearing will be held unless a sufficient number withdraw their request in writing. Any person requesting a public hearing should state his or her name and address, and is encouraged to identify the portion of the proposed rule addressed, the reason for the request, and any change proposed. If a public hearing is required, the agency will proceed pursuant to *Minnesota Statutes*, sections 14.131 to 14.20.

Comments or written requests for a public hearing must be submitted to:

Richard Clark, Supervisor
Public Water Supply Unit
Environmental Health Division
Minnesota Department of Health
925 Southeast Delaware Street
P.O. Box 59040
Minneapolis, Minnesota 55459-0040
(612) 627-5180

The proposed rule may be modified if the modifications are supported by data and views submitted to the Department and do not result in a substantial change in the proposed rule as noticed.

The proposed rules include provisions relating to U.S. Environmental Protection Agency and state standards for safe drinking water. Specifically, the proposed standards: 1) revise the adopted coliform bacteria monitoring, reporting and maximum contaminant levels; 2) add performance requirements for public water suppliers who use surface water as the source water; and 3) add standards for surface water treatment facilities. A copy of the proposed rules is attached to the notice as mailed.

A free copy of the rule is available upon request from Richard Clark.

A STATEMENT OF NEED AND REASONABLENESS that describes the need for and reasonableness of each provision of the proposed rule and identifies the data and information relied upon to support the proposed rule has been prepared and is available from Richard Clark.

Adoption of these rules will not result in additional spending by local public bodies in excess of $100,000 per year for the first two years following adoption under the requirements of *Minnesota Statutes*, section 14.11.

The proposed rule will not have an impact on agricultural land; therefore, no further information need be provided under *Minnesota Statutes*, section 14.11.

The Department is subject to *Minnesota Statutes*, section 14.115 regarding small business considerations in rulemaking. The Department's evaluation of the applicability of the methods contained in *Minnesota Statutes*, section 14.115, subdivision 2, for reducing the impact of the proposed rules is addressed in the statement of need and reasonableness.

If no hearing is required, upon adoption of the rule, the rule and the required supporting documents will be submitted to the Attorney General for review as to legality and form, including the issues of substantial change; whether the Department has the authority to adopt the rules; and whether the record demonstrates a rational basis for the need for and reasonableness of the proposed rules. Any person may request notification of the date of submission to the Attorney General. Persons who wish to be advised of the submission of this material to the Attorney General, or who wish to receive a copy of the adopted rule, must submit the written request to Richard Clark. If the proposed rule has been modified, the notice will also state that fact and will state that a free copy of the proposed rule, as modified, will be available on request from the Department.

Sister Mary Madonna Ashton
Commissioner of Health

Rules as Proposed

4720.0200 JUSTIFICATION.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 are adopted pursuant to ~~legislative authority granted in *Laws of Minnesota 1977,* chapter 66, section 3, clause (e)~~ the Safe Drinking Water Act, *Minnesota Statutes*, sections 144.381 to 144.388, which requires that the commissioner of health adopt for all public water supplies rules which are at least as stringent as the federal regulations dealing with public water supplies adopted by the United States Environmental Protection Agency, in order for the commissioner to be able to assume the primary responsibility for enforcing the federal act.

4720.0300 SCOPE AND COVERAGE.

Parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 prescribe standards for water supply siting and construction, set maximum contaminant levels for turbidity, microbiological constituents, organic and inorganic chemicals, and radioactivity, prescribe a frequency for monitoring the levels of these constituents and sodium and corrosivity, and prescribe the procedures for reporting results, notifying the public and for maintaining records.

KEY: PROPOSED RULES SECTION — Underlining indicates additions to existing rule language. ~~Strike outs~~ indicate deletions from existing rule language. If a proposed rule is totally new, it is designated "all new material." **ADOPTED RULES SECTION** — Underlining indicates additions to proposed rule language. ~~Strike outs~~ indicate deletions from proposed rule language.

The standards and procedures adopted in parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970 inclusive shall apply to all public drinking water supplies, pursuant to authority granted by existing statutes and amendments thereto, notwithstanding any other water quality standards or regulations.

A water supply which meets all of the following requirements shall not be a public supply for the purpose of parts ~~4720.0100~~ 4720.0200 to ~~4720.3900~~ 4720.3970:

A. consists only of distribution and storage facilities and does not have any collection and treatment facilities;

B. obtains all of its water from, but is not owned or operated by a public water supply to which ~~such~~ the regulations apply;

C. does not sell water to any person; and

D. is not a carrier which conveys passengers in interstate commerce.

Rules as Proposed (all new material)

4720.0350 RULES AND STANDARDS ADOPTED BY REFERENCE.

The National Primary Drinking Water Regulations in Code of Federal Regulations, title 40, parts 141, and 142.40 to 142.64 as amended through June 29, 1989, are incorporated by reference in parts 4720.0200 to 4720.3970 and are subject to the alterations and amendments contained in parts 4720.0200 to 4720.3970.

4720.0450 DEFINITIONS; SECTION 141.2 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Subpart 1. **Central water treatment defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Central water treatment" means providing treatment at a common location or facility and subsequently delivering it to the consumer of the public water supply.

Subp. 2. **Commissioner of health defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Commissioner of health" means the authority established by *Minnesota Statutes*, sections 144.381 to 144.388, for enforcement in the state of the National Primary Drinking Water Regulations and parts 4720.0200 to 4720.3970. For purposes of enforcing the National Primary Drinking Water Regulations, title 40, part 141, the term "state" contained in those regulations means the commissioner of health.

Subp. 3. **Composite defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Composite" means a sampling technique in which two or more samples are combined before an analysis is performed.

Subp. 4. **Distribution system defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Distribution system" means a network of pipes, valves, storage reservoirs, and pumping stations that delivers water to homes, businesses, and industries for drinking and other uses.

Subp. 5. **Entry point samples defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Entry point samples" means water samples collected at a location after any application of treatment but before the water is delivered to any consumer.

Subp. 6. **Environmental Protection Agency methods defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Environmental Protection Agency methods" means methods contained in Methods for the Determination of Organic Compounds in Finished Drinking Water and Raw Source Water, September 1986. These methods are issued by the Environmental Monitoring and Support Laboratory (EMSL) of the United States Environmental Protection Agency, Cincinnati, Ohio 45268. These methods are incorporated by reference and are not subject to frequent change. The methods are available through the Minitex interlibrary loan system.

Subp. 7. **Federal act defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Federal act" means the Safe Drinking Water Act of 1974, Public Law Number 93-523, title 42, United States Code, section 300f to 300j-11.

Subp. 8. **Federal regulations defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Federal regulations" means regulations dealing with public water supplies and drinking water quality, adopted by the Administrator of the United States Environmental Protection Agency pursuant to the federal act.

Subp. 9. **Groundwater defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Groundwater" means the water in the zone of saturation in which all of the pore spaces of the subsurface material are filled with water. The water that supplies a well is groundwater.

Subp. 10. **Turbidity unit defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Turbidity unit" means an amount of turbidity equivalent to that in a solution composed of 0.000125 percent hydrazine sulfate and 0.00125 percent hexamethylenetetramine in distilled and filtered (100 μ pore size membrane) water, as measured by a nephelometric turbidimeter.

Subp. 11. **Year round resident defined.** In section 141.2 of the National Primary Drinking Water Regulations, the following definition is added:

"Year round resident" means a person who resides in the area served by the public water supply for more than six months of the year.

4720.0550 MICROBIOLOGICAL CONTAMINANT SAMPLING AND ANALYTICAL REQUIREMENTS; SECTION 141.21 OF THE NATIONAL PRIMARY DRINKING WATER REGULATIONS.

Section 141.21, paragraph (b), clause (1), of the National Primary Drinking Water Regulations is amended to read:

If a routine sample is total coliform-positive, the public water supplier must collect a set of repeat samples within 24 hours of being notified of the positive result. A supplier must collect no fewer than four repeat samples for each total coliform-positive sample found. The commissioner of health may extend the 24-hour limit on a case-by-case basis if the supplier has a logistical problem in collecting the repeat samples within 24 hours and the problem is beyond the supplier's control. In the case of an extension, the commissioner of health shall specify how much time the supplier has to collect the repeat samples.

Rules as Proposed

4720.2300 ADDITIONAL MONITORING REQUIREMENTS.

The commissioner may impose additional monitoring requirements if the results of a sanitary survey indicate that a public health risk may exist. The commissioner may impose a requirement for more frequent sampling if the analytical results of water tests show that a previously measured contaminant is approaching a maximum contaminant level ~~as~~ prescribed in ~~parts 4720.0400 to 4720.0900~~ Code of Federal Regulations, title 40, part 141, as amended through June 29, 1989.

Rules as Proposed (all new material)

4720.3920 GENERAL REQUIREMENTS FOR CONSTRUCTION OF SURFACE WATER TREATMENT FACILITIES.

The source of surface water selected for a public water supply must provide the highest quality water reasonably available which, with appropriate treatment and adequate safeguards, meets the requirements specified in Code of Federal Regulations, title 40, parts 141.72(b) and 141.73, as amended through June 29, 1989. The design of the treatment processes, equipment, and structures shall depend on an evaluation of the nature and quality of the particular water to be treated. Variations from the design criteria may be approved by the commissioner in cases where experimental, pilot, or full scale studies have demonstrated that acceptable results can be obtained.

4720.3922 INTAKES.

Intake structures must provide:

A. a velocity of flow 0.25 to 0.50 feet per second through the inlet structure so frazil ice is held to a minimum;

B. for the withdrawal of water from the depth of the best water quality;

C. inspection manholes every 1,000 feet for pipe sizes large enough to permit visual inspection;

D. protection against rupture by dragging anchors, ice, and other activity; and

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E. permanent monuments to reference locations.

4720.3925 SHORE WELLS.

Shore well structures must:

A. have motors and electrical controls located above grade and flood level;

B. be accessible for operation and service;

C. be designed to prevent flotation;

D. be equipped with removable or traveling screens before the pump suction well;

E. provide chlorination or other chemical addition facilities for raw water transmission mains;

F. have the intake valved with provisions for backflushing and testing for leaks; and

G. have provisions for controlling surges.

4720.3927 PUMPING STATIONS; DESIGN REQUIREMENTS.

Subpart 1. **General.** Pumping stations must be designed to maintain the sanitary quality of the water being pumped. All raw or finished water pump stations must:

A. provide space to access and service all equipment;

B. have outward opening doors;

C. have a floor elevation at least six inches above the finished grade and at least 24 inches above the regional flood level. Below grade installations shall be permitted only if the terrain at the site is such that a gravity drain system can be provided;

D. have all floors drained without impairing the quality of water being handled; and

E. provide a suitable outlet for drainage from pump glands without discharging onto the floor.

Subp. 2. **Pumping station suction well.** Suction wells, including installations where the pumps are installed on top of a reservoir, must:

A. be watertight;

B. have bottoms sloped to permit removal of water and entrained solids;

C. be vented by means of a pipe or other device terminating in a screened U-bend at least 24 inches above the floor; and

D. have curbs a minimum of four inches around all access openings, pipes, and other equipment which extend through the top of the suction well. Access openings must have covers which overlap at least two inches.

Subp. 3. **Pumping station pumps.** Pumping stations must:

A. have at least two pumping units except where additional pumping stations which can meet the peak demand are available or where the commissioner determines that ample time will be available between pumping periods for necessary repairs. If only two units are provided, each must be capable of carrying the peak demand. If more than two units are installed, each must have sufficient capacity so that any one pump can be taken out of service with the remaining pump capable of carrying the peak demand.

B. have controls for proper alternation where two or more pumps are installed. Provision must be made to prevent operation of the pump during the backspin cycle. All electrical controls must be located above grade.

C. provide a power supply from at least two independent sources or from a standby, auxiliary power source.

D. provide a prelubrication line with a valved bypass around the automatic control and backflow protection where required, whenever automatic prelubrication of pump bearings is necessary and an auxiliary power supply is provided.

Subp. 4. **Pumping station suction lift.** A suction lift shall be allowed only for distances of less than 15 feet and where provision is made for priming the pumps. A suction lift shall not be permitted if used with buried piping carrying finished water.

Subp. 5. **Pumping station priming.** Prime water must not be of lesser sanitary quality than that of the water being pumped. Means must be provided to prevent backflow. When an air-operated ejector is used, the screened intake must draw clean air from a point at least ten feet above the ground or other source of contamination, unless the air is filtered by apparatus approved by the commissioner. Vacuum priming may be used.

4720.3930 WATER CLARIFICATION PROCEDURES.

Subpart 1. **Duplicate systems.** Facilities designed to process surface water must provide duplicate systems for flocculation and sedimentation and be constructed to permit a system to be taken out of service without disrupting operation.

Subp. 2. **Pretreatment.** Water containing high turbidity or having unusual treatment requirements shall be pretreated, usually by

sedimentation or detention either with or without the addition of chemicals.

A. Sedimentation basins must have a means for sludge removal.

B. Inlets for incoming water must disperse water across the full width of the line of travel as quickly as possible; short circuiting must be prevented.

C. Means for bypassing sedimentation basins must be provided.

D. Three hours detention is the minimum period required for sedimentation. In individual cases where chemical pretreatment is required because of unusual water quality characteristics, a greater detention time shall be required.

Subp. 3. **Flash or rapid mixing.** Mixing means the rapid dispersion of chemicals throughout the water to be treated, usually by vigorous agitation.

A. Basins must be equipped with mechanical mixing devices unless other methods, such as baffling or injection of chemicals at a point of high velocity, are approved by the commissioner after determining that the other requirements of this chapter are met.

B. The detention period for mechanical mixing must be as short as possible depending on the velocity gradient provided by the mixing units.

4720.3932 FLOCCULATION (SLOW MIXING).

Subpart 1. **Basin design.** Inlet and outlet design must prevent short circuiting and destruction of floc. A drain must be provided.

Subp. 2. **Detention.** Minimum flow-through velocity must be not less than 0.5 feet or greater than 1.5 feet per minute with a detention time for floc formation of at least 30 minutes.

Subp. 3. **Equipment.** Agitators must be driven by variable speed drives or other means which vary the peripheral speed of paddles in the range of 0.5 to 3.0 feet per second. Uniform mixing must be provided to prevent settling in the flocculation basin.

Subp. 4. **Piping.** Flocculation and sedimentation basins must be as close together as possible to avoid settling out. The velocity of flocculated water through pipes or conduits to settling basins must be no less than 0.5 feet nor greater than 1.5 feet per second.

Subp. 5. **Baffling; other designs.** Baffling may be used to provide flocculation only after the supplier consults with the commissioner and receives the commissioner's approval. The design must maintain the velocities and flows set forth in this subpart.

4720.3935 SEDIMENTATION.

Subpart 1. **General.** Sedimentation must follow flocculation. The detention time for effective water clarification shall depend on basin design and the nature of the raw water, such as turbidity, color, colloidal matter, taste, and odor causing compounds.

Subp. 2. **Detention time.** Facilities with a conventional sedimentation system must provide a minimum of four hours of settling time.

Subp. 3. **Inlet devices.** Inlets must be designed to distribute the water equally and at uniform velocities. A baffle must be constructed across the basin, close to the inlet end. The baffle must project far enough below the water surface to dissipate inlet velocities and provide uniform flow across the basin.

Subp. 4. **Outlet devices.** Outlet devices must maintain velocities suitable for settling in the basin and must minimize short circuiting.

Subp. 5. **Weir overflow rate.** The rate of flow over the outlet weir must not exceed 20,000 gallons a day per foot of weir length. If submerged ports are used as an alternate for overflow weirs, they must not be lower than three feet below the flow line.

Subp. 6. **Drainage.** Basins must be provided with a means for dewatering. Basin bottoms must slope toward the drain.

Subp. 7. **Covers.** Covers or superstructures are required at all facilities. Where covers are used, manholes must be provided, as well as drop light connections, so the flow can be observed at the inlet midpoint and outlet of the basin.

Subp. 8. **Velocity.** The velocity through settling basins must not exceed one foot a minute. The basins must be designed to minimize short circuiting. Baffles must be provided if the commissioner determines the flow through time cannot be met.

Subp. 9. **Overflow.** An overflow weir or pipe must be installed which establishes the maximum water level on top of the filters. The overflow weir must discharge with a free fall at a location where the discharge is visible.

Subp. 10. **Safety.** Guard rails must be installed around openings hazardous to maintenance personnel.

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Subp. 11. **Sludge disposal.** A facility must provide for sludge disposal. Provisions must be made for the operator to observe and sample sludge being withdrawn from the unit.

Subp. 12. **Cross connection control.** Protection must be provided for all potable water lines used to backflush sludge lines and basins or for other purposes if potable water could become contaminated by nonpotable water.

4720.3940 SOLIDS CONTACT UNIT.

Subpart 1. **General.** A unit designed for combined water softening and sedimentation shall be permitted only if the unit is:

A. designed for the maximum uniform flow rate;

B. adjustable to changes in flow which are less than the design rate; and

C. designed for changes in water quality characteristics.

Subp. 2. **Installation supervision.** Supervision by a representative of the manufacturer must be provided whenever mechanical equipment is installed at the facility and, also, at the time of initial operation.

Subp. 3. **Sampling taps.** Sampling taps must be located to permit the collection of water samples from the solids contact unit.

Subp. 4. **Chemical feed.** Chemicals must be applied at points and by means which ensure satisfactory mixing of the chemicals with the water.

Subp. 5. **Mixing devices.** Mixing devices must be constructed to adequately mix raw water with previously formed sludge particles, and to prevent the deposit of solids in the mixing zone.

Subp. 6. **Flocculation.** Flocculation equipment must be adjustable so that coagulation occurs in a separate chamber or baffled zone within the unit and so that there is a flocculation and mixing period of not less than 30 minutes.

Subp. 7. **Sludge concentrators.** The solids contact unit must provide either internal or external concentrators which concentrate sludge and minimize wastewater.

Subp. 8. **Sludge removal.** Design of the sludge removal system must provide:

A. sludge pipes not less than three inches in diameter, arranged to facilitate cleaning;

B. an entrance to sludge withdrawal piping to prevent clogging;

C. accessible valves located outside the tank; and

D. a means for an operator to observe or sample sludge being withdrawn from the solids contact unit.

Subp. 9. **Cross connections.** Blow-off outlets and drains must terminate and discharge at places so backflow is prevented. Cross connection control must be included for all potable water lines including those used to backflush sludge lines and flush basins if potable water could become contaminated by nonpotable water.

Subp. 10. **Detention period.** The detention time must be established on the basis of the raw water characteristics and local conditions that affect the operation of the unit. Based on design flow rates, the minimum detention time must be two hours for suspended solids contact clarifiers, and one hour for the suspended solids contact softeners.

Subp. 11. **Suspended slurry concentrate.** Softening units must be designed so continuous slurry concentrates of one percent or more, by weight, are maintained.

Subp. 12. **Weirs or orifices.** Units must be equipped with either overflow weirs or orifices. Weirs must be adjustable, must be at least equivalent in length to the perimeter of the tank, and must be constructed so surface water does not travel over ten feet horizontally to the collection trough.

Subp. 13. **Weir; orifice loading.** Weir loading must not exceed 20 gallons a minute per foot of weir length for units used for softeners, or ten gallons a minute per foot of weir length for units used for clarifiers. Orifices must produce uniform rising rates over the entire area of the tank.

Subp. 14. **Upflow rates.** The upflow rates in the solid contact unit must not exceed:

A. 1.75 gallons a minute per square foot of area at the slurry separation line if units are used for softeners; and

B. 1.0 gallon a minute per square foot of area at the sludge separation line if units are used for clarifiers.

4720.3942 FILTRATION.

The application of any type of filter and media must be supported by water quality data for the period of use sufficient to characterize any variation in water quality. Filtration systems must meet the requirements in parts 4720.3945 to 4720.3955.

4720.3945 RAPID RATE GRAVITY FILTERS.

Subpart 1. **Pretreatment.** Rapid rate gravity filters must only be used after coagulation, flocculation, and sedimentation.

Subp. 2. **Number.** At least two filter units must be provided. Provisions must be made to meet the maximum day demand at the approved filtration rate if one filter is out of service.

Subp. 3. **Rate of filtration.** The permissible rate of filtration shall be determined after consideration of factors such as raw water quality, the degree of pretreatment provided, the filter media, and water quality control parameters. In all cases the filtration rate must be reviewed and approved by a registered engineer and approved by the commissioner before the preparation of final plans.

Subp. 4. **Structural details and hydraulics.** The filter structure must be designed to:

A. provide vertical walls within the filter;

B. prevent protrusion of the filter walls or other structures into the filter media or the area between the top of the media and the high water line during backwashing;

C. provide cover by superstructure;

D. provide head room to permit normal inspection and operation;

E. provide a minimum filter depth of 8-1/2 feet;

F. provide a minimum water depth three feet over the surface of the media;

G. provide a trap on the effluent pipe or conduit to prevent backflow of air to the bottom of the filter;

H. prevent drainage from the floor to the filter with a minimum four-inch curb around the filter;

I. prevent flooding by providing overflow if this is not provided in a pretreatment unit;

J. provide a maximum velocity of treated water in the pipe and conduits to the filter of two feet per second;

K. provide cleanouts and straight alignment for influent pipes or conduits where solids loading is heavy or following lime-soda softening;

L. provide wash water drain capacity to carry maximum backwash flow;

M. provide walkways around filters not less than 24 inches wide; and

N. provide safety handrails or walls around the filter areas adjacent to the walkways.

Subp. 5. **Wash water troughs.** Wash water troughs must be designed to provide:

A. a bottom elevation above the maximum level of expanded media during washing;

B. a top elevation not exceeding 30 inches above the filter surface;

C. a two-inch freeboard at the maximum rate of wash;

D. a top or edge which is level;

E. spacing so each trough serves the same number of square feet of filter area; and

F. a maximum horizontal travel of suspended particles not exceeding three feet in reaching the trough.

Subp. 6. **Filter media.** Filter media must meet the standards specified in this subpart.

A. Sand must be:

(1) clean silica sand having a depth no less than 24 inches and no more than 30 inches;

(2) an effective size from 0.45 millimeter to 0.55 millimeter, depending upon the quality of the raw water; and

(3) have a uniformity coefficient no greater than 1.65 millimeters.

B. Clean crushed anthracite, or sand and anthracite may be used as a filter media if supported by experimental data obtained from the project. Anthracite used as the only media must have an effective size from 0.45 millimeter to 0.8 millimeter and a uniformity coefficient no greater than 1.6 millimeters. Anthracite used to cap sand filters must have an effective size from 0.7 millimeter to 1.2 millimeters and a uniformity coefficient no greater than 1.85 millimeters.

C. Granular activated carbon may be used as a filter material only if approved by the commissioner. A request for approval must:

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(1) include a report from a registered engineer detailing raw water quality, the results of pilot plant studies, proposed flow rates, process controls to be provided, proposed operational adjustments, and justification for the project proposals;

(2) specify criteria for the media;

(3) provide for a chlorine residual in the water following filtering and before distribution;

(4) provide for periodic treatment of the filter bed to control possible bacterial and other growths; and

(5) include plans showing any proposed modification of facilities.

D. Other media may be approved by the commissioner, but only on the basis of pilot tests and experience which demonstrate that the requirements of this part will be met.

E. Except as provided in item F, sand and gravel must be provided as supporting media according to subitems (1) and (2).

(1) A three-inch layer of sand must be used as a supporting media for the filter sand. The sand must have an effective size from 0.8 millimeter to 2.0 millimeters, and a uniformity coefficient no greater than 1.7 millimeters.

(2) Gravel, when used as the supporting media, must consist of hard, rounded particles and must not include flat or elongated particles. The coarsest gravel shall be no more than 2-1/2 inches in diameter in any direction when the gravel rests directly on the strainer system, and must extend above the top of the perforated laterals or strainer nozzles. No less than four layers of gravel shall be provided according to the following size and depth distribution when used with perforated laterals or strainer nozzles:

(a) 2-1/2 to 1-1/2 inches, five to eight inches deep;

(b) 1-1/2 to 1/4 inches, three to five inches deep;

(c) 1/4 to 1/2 inches; three to five inches deep;

(d) 1/2 to 3/16 inches, two to three inches deep; and

(e) 3/16 to 3/32 inches, two to three inches deep.

F. If the supplier submits subtantiation to the commissioner that proprietary filter bottoms are used, the commissioner may allow elimination of certain layers of supporting media or a reduction in the depth of the layers of supporting media that are required in item E.

Subp. 7. **Filter bottoms and strainer systems.** Departures from the standards in this subpart by using proprietary bottoms may be approved by the commissioner on a case-by-case basis if the effectiveness of the method is demonstrated by the supplier. Porous plate bottoms must not be used where iron or manganese may clog them or with water softened with lime. The design of a manifold-type collection system must:

A. minimize loss of head in the manifold and laterals;

B. assure even distribution of wash water and an even rate of filtration over the entire area of the filter;

C. provide a ratio of the area of the final openings of the strainer system to the area of the filter of not more than 0.003;

D. provide a total cross-sectional area of the laterals at least twice the total area of the final openings of the strainer system; and

E. provide a cross-sectional area of the manifold at 1-1/2 to two times the total cross-sectional area of the laterals.

Subp. 8. **Surface wash.** Surface wash facilities consisting of either fixed nozzles or a revolving mechanism are required. All devices must be designed for:

A. water pressures of at least 45 pounds per square inch;

B. a volume of flow of 2.0 gallons per minute per square foot of filter area with fixed nozzles and 0.5 gallons per minute per square foot with revolving arms; and

C. a vacuum breaker installed above the high water elevation in the filter or other device approved by the commissioner to prevent back siphonage.

Subp. 9. **Appurtenances.** The following shall be provided for every filter:

A. a sampling tap on the effluent line;

B. a loss-of-head gauge;

C. controls to indicate flow rate;

D. a drain to waste with appropriate measures for backflow prevention;

E. a means of monitoring the effluent from each filter for turbidity on a continuous basis or on a selective basis where one turbidimeter would monitor more than one filter on a rotating cycle. The turbidimeter must have a recorder. Access to the filter interior

through wall sleeves must be provided in several locations to allow the installation of sampling lines, pressure sensors, and other devices, at different depths in the filter media; and

F. a one to 1-1/2 inch pressure hose and rack at the operating floor for washing the filter walls.

Subp. 10. **Backwash.** Facilities must provide for the washing of filters as follows:

A. by filtered water at a rate no less than 15 gallons per square foot per minute from wash water tanks, a wash water pump from a reservoir, or a high service main, or a combination of these;

B. by wash water pumps in duplicate unless an alternate means of obtaining wash water is available;

C. by no less than 15 minutes wash of one filter at the design rate of wash;

D. by a wash water regulator or valve on the wash water line to obtain the desired rate of filter wash;

E. by a rate-of-flow indicator and totalizer on the main wash water line, located for convenient reading by the operator during the washing process; and

F. by a method which prevents rapid changes in the backwash water flow.

Subp. 11. **Roof drains.** Roof drains must not discharge into the filters and basins or the conduits preceding the filters.

4720.3947 SLOW RATE GRAVITY FILTERS.

Subpart 1. **Demonstration study.** The use of slow rate gravity filters shall require an engineering study to demonstrate the adequacy and suitability of this filtration method for a specific raw water supply. The standards in this part shall be applied to determine the adequacy and suitability of this filtration method.

Subp. 2. **Quality of raw water.** Slow rate gravity filtration must be limited to water with a maximum turbidity of 50 units and maximum color of 30 units. The turbidity must not be attributable to colloidal clay. Raw water quality data must include an examination for algae.

Subp. 3. **Structural details and hydraulics.** A slow rate gravity filter must be designed to provide:

A. no less than two filter units;

B. a cover or superstructure;

C. headroom to permit normal movement by operating personnel for scraping and sand removal operations;

D. manholes and access ports for handling sand; and

E. filtration to waste and overflow at the maximum filter water levels.

Subp. 4. **Rates of filtration.** The permissible rates of filtration must be based on the quality of the raw water as determined from experimental data. Proposed rates must be submitted to the commissioner for approval. The design rate shall be 45 to 150 gallons a day per square foot of sand area. However, rates of 150 to 230 gallons a day per square foot shall be approved when effectiveness is demonstrated by the supplier to the satisfaction of the commissioner.

Subp. 5. **Under drains.** Each filter unit must be equipped with a main drain and lateral drains under the filter media to collect the filtered water. The under drains must be spaced so the maximum velocity of the water flow in a lateral under drain does not exceed 0.75 feet per second. The maximum spacing of lateral under drains shall not exceed 12 feet.

Subp. 6. **Filtering material.** A minimum depth of 30 inches of filter sand, clean and free of foreign matter, must be placed on graded gravel layers. The effective size of the filter media must be between 0.35 and 0.50 millimeter, and the uniformity coefficient must not exceed 2.5.

Subp. 7. **Filter gravel.** The supporting gravel must conform to the size and depth distribution provided for rapid rate gravity filters.

Subp. 8. **Depth of water on filter beds.** The design must provide a depth of at least three feet of water over the sand. Influent water must be distributed in a manner which does not scour the sand surfaces.

Subp. 9. **Control appurtenances.** Each filter must be equipped with:

A. a loss-of-head gauge;

B. an orifice, Venturi meter, or other suitable metering device installed on each filter to enable control of the rate of filtration;

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and

C. an effluent pipe located at an elevation which maintains the water level in the filter above the top of the sand.

4720.3950 DIATOMACEOUS EARTH FILTRATION.

Subpart 1. **Applicability.** The use of diatomaceous earth filters may be considered for application to surface water with low turbidity and low bacterial contamination. Diatomaceous earth filters must not be used for bacterial removal, color removal, or turbidity removal where either the gross quantity of turbidity exceeds 40 turbidity units or the turbidity exhibits poor filterability characteristics.

Subp. 2. **Pilot plant study.** Installation of a diatomaceous earth filtration system must be preceded by a pilot plant study on the water to be treated.

A. Conditions of the study such as duration, filter rates, head loss accumulation, slurry feed rates, turbidity removal, and bacteria removal, must be approved by the commissioner before the study.

B. The pilot plant study must demonstrate the ability of the system to meet the requirements of Code of Federal Regulations, title 40, part 141.73(c), as amended through June 29, 1989.

Subp. 3. **Treated water storage capacity.** Treated water storage capacity in excess of normal requirements must be provided to allow operation of the filters at a uniform rate during all conditions of system demand at or below the approved filtration rate, and to guarantee continuity of service during adverse raw water conditions without bypassing the system.

Subp. 4. **Number of filters.** There must be at least two filters provided. Where only two filters are provided, they must each be capable of meeting the plant's design capacity at the approved filtration rate.

Subp. 5. **Precoat.** A uniform precoat of diatomaceous earth must be applied hydraulically to each septum by introducing a slurry to the tank influent line and employing a filter-to-waste or recirculation system. Diatomaceous earth in the amount of 0.1 pound per square foot of filter area or an amount sufficient to apply a 1/16 inch coating must be used with recirculation. When precoating is accomplished with a filter-to-waste system, 0.15 to 0.2 of a pound per square foot of filter area must be provided.

Subp. 6. **Body feed.** A body feed system must apply additional amounts of diatomaceous earth slurry during the filter run to avoid short filter runs or excessive head loss.

A. The rate of body feed shall depend on raw water quality and characteristics and must be determined in the pilot plant study in subpart 2.

B. The feed systems and slurry lines must be accessible.

C. The body feed slurry must be continuously mixed.

Subp. 7. **Rate of filtration.** The minimum rate of filtration is 1.0 gallon a minute per square foot of filter area with a maximum of 1.5 gallons a minute per square foot. The filtration rate must be mechanically controlled.

Subp. 8. **Recirculation.** A recirculation or holding pump must be used to maintain differential pressure across the filter when the unit is not in operation to prevent the filter cake from dropping off the filter elements. A minimum recirculation rate of 0.1 gallon a minute per square foot of filter area must be provided.

Subp. 9. **Septum or filter element.** The filter elements must be structurally capable of withstanding maximum pressure and velocity variations during filtration and backwash cycles, and must be spaced so no less than one inch is provided between elements or between any element and a wall.

Subp. 10. **Inlet design.** The filter influent must be designed to prevent scour of the diatomaceous earth from the filter element.

Subp. 11. **Backwash.** A satisfactory method to thoroughly remove and dispose of spent filter cake must be provided.

Subp. 12. **Appurtenances.** The following must be provided for every filter:

A. sampling taps for raw and filtered water;

B. a loss of head or differential pressure gauge;

C. rate-of-flow indicator, preferable with totalizer; and

D. a throttling valve to reduce rates below normal during adverse raw water conditions.

Subp. 13. **Monitoring turbidimeter.** A continuous monitoring turbidimeter with recorder is required on the filter effluent for plants treating surface water.

4720.3955 DIRECT FILTRATION PLANTS.

Subpart 1. **Studies.** A full scale direct filtration plant must not be constructed without a pilot study acceptable to the commissioner. An in-plant demonstration study shall be appropriate where conventional treatment plants are converted to direct filtration. Where direct filtration is proposed, the supplier must submit an engineering report to the commissioner. The commissioner must approve the report before the supplier conducts a pilot plant or in-plant demonstration study.

Subp. 2. **Engineering report.** The engineering report must include a historical summary of meteorological conditions and of raw water quality with special reference to fluctuations in quality and possible sources of contamination. The following raw water parameters must be evaluated in the report:

A. color;

B. turbidity;

C. bacterial concentration;

D. microscopic biological organisms;

E. temperature;

F. total solids;

G. general inorganic chemical characteristics; and

H. additional parameters as required by the reviewing authority.

The report must also include a description of methods and work to be done during a pilot plant study or where appropriate, an in-plant demonstration study.

Subp. 3. **Pilot plant or in-plant demonstration studies.** After approval of the engineering report, a pilot study or, for existing plants where conventional treatment is being converted to direct filtration, an in-plant demonstration study, shall be conducted. The study must be conducted over a sufficient time to treat all expected raw water conditions throughout the year. The pilot plant filter must be of a similar type and operated in the same manner as proposed for full scale operation. The study shall emphasize but not be limited to, the following items:

A. chemical mixing conditions including shear gradients and detention periods;

B. chemical feed rates;

C. use of various coagulants and coagulant aids;

D. flocculation conditions;

E. filtration rates;

F. filter gradation, types of media, and depth of media;

G. filter breakthrough conditions; and

H. a description of the adverse impact of recycling backwash water due to solids, algae, trihalomethane formation and similar problems.

Before initiation of design plans and specifications, the supplier shall submit a final report including the engineer's design recommendations. The study must demonstrate the minimum contact time necessary for optimum filtration for each coagulant proposed.

Subp. 4. **Pretreatment—rapid mix and flocculation.** The final rapid mix and flocculation basin design shall be based on the pilot plant or in-plant demonstration studies augmented with applicable portions of parts 4720.3930, subpart 3, and 4720.3932.

Subp. 5. **Filtration.** Filters must be rapid rate gravity filters, with dual or mixed media. The final filter design must be based on the pilot plant or in-plant demonstration studies augmented by applicable portions of part 4720.3945, subparts 1 to 7. Pressure filters or single media sand filters must not be used.

A. Surface wash, subsurface wash, or air scour must be provided for the filters according to part 4720.3945, subpart 8.

B. Provisions for filtration to waste must be provided with measures for backflow prevention according to chapter 4715.

Subp. 6. **Siting requirements.** The plant design and land ownership surrounding the plant must allow for the installation of conventional sedimentation basins should the commissioner find that the installation of the direct filtration methods specified in this part do not achieve the water quality standard indicated in Code of Federal Regulations, title 40, part 141.73(a)(1), as amended through June 29, 1989.

4720.3957 CHEMICAL ADDITION.

Subpart 1. **Feed equipment required.** If chemical feed such as chlorination, coagulation, or other processes are necessary for the

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protection of the water supply, a minimum of two feeders must be provided so a standby unit or combination of units is available to replace the largest unit during shutdowns. Spare parts must be available for all feeders to replace parts subject to wear and damage.

Subp. 2. **Design and capacity.** The design of the facility must ensure that:

A. a separate feed system is provided for each chemical;

B. feeders supply, at all times, the necessary amounts of chemical at an accurate rate, throughout the range of feed. To allow for changes in pumping or application rates, the feeder must be designed to operate between 30 and 70 percent of the feeder range on initial start-up. If this is not possible with stock chemical solution, the chemical must be diluted;

C. proportioning of chemical feed to rate of flow is provided;

D. positive displacement-type solution feeders are used to feed liquid chemicals;

E. chemical solutions are prevented from being siphoned into the water supply by assuring discharge at points of positive pressure and by providing anti-siphon devices, or through a suitable air gap or other effective means approved by the commissioner;

F. the service water supply is protected from contamination by chemical solutions either by equipping the supply line with backflow or backsiphonage prevention devices, or by providing an air gap of two pipe diameters, but not less than three inches, between the supply line and top of the solution tank;

G. materials and surfaces in contact with chemicals are resistant to the chemical solution;

H. dry chemical feeders:

(1) measure chemicals volumetrically or gravimetrically;

(2) effectively dissolve the chemical in the solution pot;

(3) provide gravity feed from solution pots, if possible; and

(4) completely enclose chemicals to prevent emission of dust to the operating room; and

I. no direct connection exists between any sewer and a drain or overflow from the feeder or solution chamber or tank.

Subp. 3. **Location of feed equipment.** Chemical feed equipment must be:

A. readily accessible for servicing, repair, and observation of operation;

B. located and have protective curbings to prevent chemicals from equipment failure, spillage, or accidental drainage from entering the water in conduits, and treatment or storage basins; and

C. located above grade.

Subp. 4. **Controls.** Feeders must be manually or automatically controlled if the water supply pumps are manually controlled. Where pumps are automatically controlled, the feeders must be automatically controlled. In all cases, automatic control shall be capable of reverting to manual control when necessary.

A. Feeders must be designed and controlled to provide rates proportional to flow.

B. Automatic chemical feed rate control may be used in combination with residual analyzers which have alarms for critical values and recording charts.

Subp. 5. **Weighing scales.** Weighing scales:

A. must be provided to weigh cylinders at all plants using chlorine gas;

B. are required for solution feed unless a comparable means for determining use is approved by the commissioner;

C. are required for volumetric dry chemical feeders; and

D. must be accurate enough to measure increments of 0.5 percent of load.

Subp. 6. **Feed lines.** Feed lines must:

A. be as short as possible in length of run; of durable, corrosion resistant material; easily accessible throughout entire length; protected against freezing; and readily cleanable;

B. slope upward from chemical source to feeder when conveying gases;

C. introduce corrosive chemicals so as to minimize the potential for corrosion;

D. be designed consistent with the scale-forming or solids-depositing properties of the water, chemical, solution, or mixture conveyed;

E. not carry chlorine gas beyond the chlorine feeder room; and

F. include an injection nozzle when application is into a pipeline.

Subp. 7. **Service water supply.** Water used for dissolving dry chemicals, diluting liquid chemicals, or operating chemical feeders must be from a safe, approved source with appropriate backflow prevention provided. The commissioner may grant an exception in cases where the finished water quality is not affected by addition of the chemical mixed with untreated water.

4720.3960 CHEMICAL STORAGE.

Subpart 1. **Storage space.** Storage space must provide for:

A. storage of at least 30 days of chemical supply;

B. convenient and efficient handling of chemicals;

C. dry storage conditions; and

D. a minimum of 1-1/2 truckloads storage volume where purchase is by truckload.

Subp. 2. **Containers.** Covered or unopened shipping containers must be provided for storage unless the chemical is transferred into an approved covered storage unit. Solution tanks must have overlapping covers.

Subp. 3. **Capacity.** Solution storage or day tanks supplying feeders directly must have sufficient capacity for one day of operation. When the chemical solution is prepared from a powder or slurry, two solution tanks are required to assure continuity of feed.

Subp. 4. **Storage containers.** Storage must be constructed of or lined with materials compatible with the chemical being handled.

Subp. 5. **Mixing equipment.** Mixing equipment must be provided where necessary to assure a uniform chemical solution strength.

Subp. 6. **Measurements.** Means must be provided to accurately determine the amount of chemical applied either by measurement of the solution level in the tank or by weighing scales. A meter must be provided on the water fill line to a fluoride saturator. Liquid chemical storage tanks must have a liquid level indicator.

Subp. 7. **Drainage.** Means to drain tanks must be provided in the storage space, but there must be no direct connection between any drain piping and a sewer. Drain piping must terminate at least two pipe diameters, but not less than three inches, above the overflow rim of a receiving sump, conduit, or waste receptacle.

Subp. 8. **Overflow pipes.** Overflow pipes must be turned downward, be screened, have a free discharge, and be in a conspicuous location.

Subp. 9. **Subsurface storage.** Where subsurface locations for solution or storage tanks are provided, the tanks must be free from sources of possible contamination and located to assure drainage for groundwater, accumulated water, chemical spills, and overflows.

Subp. 10. **Compatibility of chemicals.** Incompatible chemicals must not be stored or handled in common areas.

Subp. 11. **Venting.** Gases from feeders, storage, and equipment exhausts must be conveyed to the outside atmosphere above grade and remote from air intakes. Acid storage tanks must be vented to the outside but not through vents in common with day tanks.

4720.3962 CHEMICAL HANDLING.

Subpart 1. **Measuring equipment.** Equipment must be provided in the handling facility to measure the chemicals used to prepare feed solutions.

Subp. 2. **Piping.** Piping for chemicals must be compatible with the chemical being conveyed.

Subp. 3. **Dust control.** Provision must be made for the transfer of dry chemicals from shipping containers to storage bins or hoppers in a way that minimizes dust. Control must be provided by use of one of the following:

A. vacuum pneumatic equipment or closed conveyor systems;

B. facilities for emptying shipping containers in special containers; or

C. exhaust fans and dust filters which place the hoppers or bins under negative pressure.

Subp. 4. **Acids.** Acids must be kept in closed, acid-resistant shipping containers or storage units. Transfer from shipping containers to solution or day tanks must be through suitable hose or pipe by means of a transfer pump.

4720.3965 DISINFECTION.

Subpart 1. **Chlorine.** Chlorine must be the principal agent used to disinfect the water supply. Other agents may be approved by the commissioner on a case-by-case basis provided reliable feeding equipment is available and testing procedures for a residual are

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recognized in the 16th edition of Standard Methods for the Examination of Water and Wastewater (1985). This edition is incorporated by reference, is not subject to frequent change, and is available through the Minitex interlibrary loan system.

Subp. 2. **Equipment.** A gas chlorinator or a positive displacement hypochlorite feeder must be provided by the supplier.

Subp. 3. **Capacity.** The chlorinator capacity must provide that a free chlorine residual of at least two mg/l is attained in the water after a contact time of at least 30 minutes when maximum flow rates coincide with anticipated maximum chlorine demands. The equipment must be designed to operate accurately over the desired feed range.

Subp. 4. **Standby equipment.** Where chlorination is needed to protect the water supply, standby equipment of sufficient capacity must be available to replace the largest unit during shutdowns.

Subp. 5. **Automatic proportioning.** Automatic proportioning chlorinators are required where the rate of flow is not reasonably constant or where the rate of flow of the water is not manually controlled.

Subp. 6. **Contact time and point of application.** To determine the contact time of the chlorine in water, ammonia, taste-producing substances, temperature, bacterial quality, trihalomethane formation potential and other pertinent factors must be considered. All basins used for disinfection must be designed to minimize short circuiting.

A. At plants treating surface water, provisions must be made for applying chlorine to the raw water, settled water, filtered water, and water entering the distribution system. The contact time required in item B must be provided after filtration.

B. Surface water supplies using free residual chlorination must provide a minimum contact time of two hours. When combined residual chlorination is used for surface water supplies, a minimum of three hours contact time must be provided.

Subp. 7. **Residual testing equipment.** Residual testing equipment must measure residuals to the nearest 0.1 mg/l in the range below 0.5 mg/l and to the nearest 0.2 mg/l between 0.5 mg/l to 2.0 mg/l.

Subp. 8. **Chlorinator piping.** The water supply piping must be designed to prevent contamination of the treated water supply by water sources of impure or unknown quality.

Subp. 9. **Housing.** Chlorine gas feed and storage must be:

A. separated from other operating areas by gas-tight enclosures to prevent injury to personnel and damage to equipment;

B. provided with an inspection window installed in an interior wall or exterior door to permit viewing of the interior of the room and the equipment;

C. provided with doors having emergency or panic hardware and opening outward to the building exterior;

D. heated to prevent freezing and insure proper operation of the equipment;

E. provided with restraints to prevent movement of the chlorine cylinders; and

F. designed so the ejector for mixing chlorine gas and water is located in the chlorine room.

Subp. 10. **Ventilation of chlorine rooms.** One complete air change a minute must be provided when the chlorine room is occupied. In addition:

A. the exhaust fan suction must be near the floor with the point of discharge located to avoid contamination of air inlets to other rooms and structures or blockage by snow or other obstructions;

B. air inlets must be located near the ceiling and controlled to prevent adverse temperature variation;

C. the exhaust fan switch must be located at the entrance to the chlorine room with a signal light indicating fan operation when the fan is controlled from more than one point; and

D. vents from feeder and storage units must discharge to the outside atmosphere, above grade as indicated in item A.

Subp. 11. **Ammoniation.** Housing and ventilation for ammoniation must be provided as specified in subparts 9 and 10. Ammonia storage and feed facilities must be separate from chlorine facilities because of the combustion hazard. A plastic bottle of hydrochloric acid must be available and used for leak detection.

4720.3970 VARIANCE PROCEDURES AND CRITERIA FOR SURFACE WATER CONSTRUCTION STANDARDS.

The commissioner of health shall grant a variance to parts 4720.3920 to 4720.3965 according to the procedures and criteria in parts 4717.7000 to 4717.7050, as proposed at 15 State Register 985, October 29, 1990, and as later adopted.

REPEALER. *Minnesota Rules*, parts 4717.6000 to 4717.6900, 4720.0020, 4720.0100, 4720.0400, 4720.0500, 4720.0600, 4720.0700, 4720.0800, 4720.0900, 4720.1000, 4720.1100, 4720.1200, 4720.1300, 4720.1400, 4720.1500, 4720.1510, 4720.1600, 4720.1700, 4720.1800, 4720.1900, 4720.2000, 4720.2100, 4720.2200, 4720.2400, 4720.2500, 4720.2600, 4720.3100, 4720.3200, 4720.3300, 4720.3400, 4720.3500, 4720.3510, 4720.3600, 4720.3700, and 4720.3900 are repealed.

STATE OF MINNESOTA

MINNESOTA DEPARTMENT OF HEALTH

In the Matter of Proposed Permanent Rules of the Minnesota Department of Health Relating to Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970	Findings of Fact, Conclusions, and Order Adopting A Rule Without a Public Hearing

(1) Notice of the Commissioner's intent to adopt the above-entitled rule was published in the State Register on December 10, 1990, and was sent by United States mail to all persons on the list maintained by the Department pursuant to Minnesota Statutes, sections 14.14, subdivision 1a and 14.22, on December 7, 1990. (2) The Statement of Need and Reasonableness was prepared before the notice of intent to adopt a rule without a public hearing was mailed to all persons on the Department mailing list and published in the State Register and was available to the public. In accordance with Minnesota Statutes, sections 14.131 and 14.23, the Statement of Need and Reasonableness was submitted to the Legislative Commission to Review Administrative Rules on November 27, 1990.

(4) All persons were given the opportunity to submit comment on the rule for 30 days after notice of proposed rulemaking. (5) One request for a public hearing on the rules was received by the Department which was not withdrawn, therefore, the department did not receive 25 requests for a public hearing. (7) No requests for notice of submission to the Attorney General were received by the Department. (7) The department received two written comments on this matter, copies of which are attached and which are addressed in the Findings below.

Based on the comments and evidence in the record before the Department, I find the following:

FINDINGS

1. Based on the comment and evidence in the record before the Department, including the Statement of Need and Reasonableness which is incorporated herein, and the proposed rule as modified in Findings 3 and 4, the Commissioner finds that the above matter is needed and reasonable. (8)

2. Commentor Adam J. Kramer, superintendent, Water Plant Operations for the City of Minneapolis water works, commented that his understanding, after a phone conversation with Richard Clark of the Department, is that the proposed rules are not

retroactive and do not apply to existing operating facilities. The department notes that proposed parts 4720.3920 to 4720.3970, which are general requirements for construction of surface water treatment facilities, are applicable to new facilities constructed after the effective date of the proposed rules and apply to any changes in or remodeling of existing facilities which are necessary to comply with the performance standards in parts 4720.0200 to 4720.2300.

As to the use of different parameters for compliance with the performance standards specified in the proposed rules, the department agrees with commentor Kramer. Part 4720.3920 provides for consideration of variations from design criteria in cases where experimental, pilot, or full scale studies have demonstrated that acceptable results can be obtained. As specified in part 4720.3970, variations will be considered and approved in accordance with the procedures and criteria in parts 4717.7000 to 4717.7050. The adopted procedures and criteria were published in the State Register on January 14, 1991 and will be effective January 22, 1991.

3. Dan Boyce, General Manager of the Water and Light Department of the City of East Grand Forks, recommends changes to parts 4720.3957, subpart 6, Item E and 4720.3965, subpart 9, Item F to address the difference between pressurized and vacuum chlorination systems. The department agrees that it is not necessary, in the case of vacuum systems, to restrict the feed line to the chlorine feeder room. For systems under pressure, the points of addition must be in the room because if there is a leak or line burst a hazard is created. Chlorine gas may continue to spew out of the system. However, with vacuum gas chlorination systems, which are the predominant system in the industry, when there is a break in the feeder system, there is also a subsequent break in the vacuum which feeds the gas, thus there is no hazard of discharge presented. Restriction of vacuum system lines to the chlorine room is thus not necessary. In response to Mr. Boyce's comment, the Department thus makes the following modifications to the proposed rule:

4720.3957, subpart 6, Item E. **Feed lines.** Feed lines must:

E. not carry chlorine gas under pressure beyond the chlorine feeder room; and

4720.3965, subpart 9, Item F. **Housing.** Chlorine gas feed and storage must be:

F. designed so the ejector for mixing chlorine gas and water is located in the chlorine room where chlorine gas under pressure is used.

4. The department proposes the following additional technical clean up amendments at this time so the adopted public water supply rules are current and there is consistent cross reference to and within the newly adopted variance rule, parts 4717.7000 to 4717.7050. Reference to proposed rules in part 4720.3970 is now

deleted because the variance rules are no longer proposed but actually adopted. Part 4720.3970 is thus modified to read:

4720.3970 VARIANCE PROCEDURES AND CRITERIA FOR SURFACE WATER CONSTRUCTION STANDARDS.

The commisisioner of health shall grant a variance to parts 4720.3920 to 4720.3965 according to the procedures and criteria in parts 4717.7000 to 4717.7050~~, as proposed at 15 State Register 985, October 29, 1990, and as later adopted~~.

CONCLUSIONS

1. The above-captioned rule, as modified, is needed and reasonable. (8)

2. All modifications to the rule are not substantial changes.

3. Any duplication in these rules of language contained in Minnesota Statutes is crucial to the ability of the persons affected by the rules to comprehend their meaning and effect.

4. The Department has complied with all applicable provisions of law and rule in the promulgation of these rules.

5. If any finding or part of a finding, above, is properly characterized as a conclusion, it is adopted as a conclusion.

NOW, THEREFORE, IT IS ORDERED (8) that the rule identified as proposed Rules of the Minnesota Department of Health Relating to Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970 (as modified) are adopted this 15th day of January, 1991, pursuant to authority vested in me by Minnesota Statutes, section 144.383, paragraph (e).

(9)

Daniel J. McInerney, Jr.
ACTING COMMISSIONER OF HEALTH

CITY OF PLYMOUTH



December 20, 1990

Mr. Richard Clark
Supervisor
Public Water Supply Unit
Environmental Health Division
Minnesota Department of Health
925 Southeast Delaware Street
P.O. Box 59040
Minneapolis, MN 55459-0040

Dear Mr. Clark

Please accept this letter as my request for your holding a public hearing on your proposed rules dealing with the administration of the Safe Drinking Water Act (SDWA) as published in the State Register on December 10.

I would also appreciate receiving from you a copy of the proposed rules in order that they may be reviewed by our staff.

Yours truly,

James G. Willis
City Manager

JW:kec
cc: Fred Moore, Public Works Director
Mr. Joel Jamnik, League of Minnesota Cities - St. Paul

WATER & LIGHT DEPARTMENT

CITY OF EAST GRAND FORKS, MINNESOTA 56721
303 4th Street N.W. • P.O. Box 322 • Telephone (218) 773-1163

Commissioners
DAVE W. HANGSLEBEN
MARILYNN M. OGDEN
EDWARD B. SCHUE
ROBERT C. BEAUCHAMP

Secretary - Acting Superintendent
JERRY J. KELLER



January 2,1991

Richard Clark, Supervisor
Public Water Supply Unit
Environmental Health Division
Minnesota Department of Health
925 Southeast Delaware Street
P.O. Box 59040
Minneapolis, Minnesota 55459-0040

RE: Proposed Rules Governing Public Water Supplies, Minnesota Rules parts 4720.0200 to 4720.3970

Dear Mr. Clark:

I have the following comments concerning the proposed rules:

Page 24, Section 4720.3957 CHEMICAL ADDITION, Subp.6, Feed lines, Paragraph E.

I believe that the restriction of not allowing a feed line to carry chlorine gas beyond the chlorine feeder room is unnecessarily restrictive when applied to a vacuum feed chlorination system. I believe that considerable operational experience exists to indicate that vacuum chlorine lines pose little to no risk of chlorine release when designed and installed to equipment manufacturer's specifications.

I do believe the restriction is appropriate for pressure chlorine lines.

Page 30, Section 4720.3965 DISINFECTION, Subp.9, Housing, Paragraph E.

I believe that the requirement that the ejector for mixing chlorine gas and water be located in the chlorine room is appropriate only for pressure chlorine systems. I believe considerable operational experience exists to indicate that locating the ejector at the point of application is safer for vacuum gas feed systems. This avoids the problems associated with solution line leaks resulting in the release of chlorine fumes. It also minimizes potential problems of water line leaks or freeze-ups in the chlorine feed room.

Thank you for considering these comments regarding chlorination system design requirements.

Sincerely,

Dan Boyce

Dan Boyce
General Manager

Minneapolis Water Works
Fridley Softening Plant
4300 Marshall Street N.E.
Minneapolis, Minnesota 55421
612/788-3907

minneapolis
city of lakes

January 9, 1991

Mr. Richard Clark, Supervisor
Public Water Supply Unit
Environmental Health Division
Minnesota Department of Health
925 Southeast Delaware Street
P.O. Box 59040
Minneapolis, Minnesota 55459-0040

Dear Mr. Clark:

RE: Minnesota Rules, parts 4720.0200 to 4720.3970

This letter is a follow-up to our telephone conversation on Friday, January 4, 1991. You stated the rules are not retroactive and do not apply to existing operating facilities. You also stated that the rules provide for parameters different than the rules, if the utility can show that satisfactory results can be obtained with the desired parameters. I assume this would apply to any upgrades or new facilities that are planned. Large systems, such as Minneapolis, that have multiple treatment schemes need flexibility in parameters to meet the desired end result.

If your recollection of the conversation is in conflict with my statements or you disagree with my interpretation please notify me. Thank you!

Sincerely,

Adam J. Kramer
Superintendent, Water Plant Operations
Minneapolis Water Works

AJK:vao

STATE OF MINNESOTA

MINNESOTA DEPARTMENT OF HEALTH

In the Matter of Proposed Permanent Rules of the Minnesota Department of Health Relating to Public Water Supplies, Minnesota Rules, parts 4720.0200 to 4720.3970

DECLARATION OF COUNSEL

I, Maria C. Christu, Special Assistant Attorney General, do hereby declare that I have examined the above-captioned rules, and the supporting rulemaking record, and that, based on my examination, the Administrative Procedures Act and Minnesota Rules, chapter 2010 have been followed. Any exceptions are listed below. For Attorney General billing purposes, the four-digit docket client code is 52 0015 · 1210

Maria C. Christu

Special Assistant Attorney General

Dated: 1/17/91