12/10/90

11/26/90

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.

SF-00006-05 (4/86)

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.