CHAPTER 4717
DEPARTMENT OF HEALTH
ENVIRONMENTAL HEALTH

4717.0100 [Repealed, 19 SR 1419; 19 SR 1637]

PUBLIC SWIMMING POOLS

4717.0150 APPLICABILITY.

Parts 4717.0150 to 4717.3975 establish operation and maintenance, design, installation, and construction standards for public pools and facilities related to them.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.0200 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0250 DEFINITIONS.

Subpart 1. **Scope.** For the purposes of parts 4717.0150 to 4717.3975, the terms defined in this part have the meanings given them.

Subp. 2. **Commissioner.** "Commissioner" means the commissioner of health or the commissioner's authorized representative.

Subp. 3. **Operator.** "Operator" means the individual designated by the owner as responsible to operate and maintain the public pool in compliance with parts 4717.0150 to 4717.3975.

Subp. 4. **Owner.** "Owner" means the person who owns the public pool and is responsible for compliance with parts 4717.0150 to 4717.3975.

Subp. 5. **Person.** "Person" means an individual, firm, partnership, association, limited liability company, corporation, company, government agency, club, or organization of any kind.

Subp. 6. **Pool.** "Pool" means any structure, chamber, or tank containing an artificial body of water for swimming, diving, relaxation, or recreational use including special purpose pools and wading pools.

Subp. 7. **Private residential pool.** "Private residential pool" means a pool connected with a single-family residence or owner-occupied duplex, located on private property under the control of the homeowner, the use of which is limited to family members or the family's invited guests. A private residential pool is not a pool used as part of a business.

Subp. 8. **Public pool.** "Public pool" has the meaning given in Minnesota Statutes, section 144.1222, subdivision 4, paragraph (d).

Subp. 9. **Spa pool.** "Spa pool" means a hot water pool intended for seated recreational use with a water agitation system in addition to the recirculation system. Spa pool is synonymous with the term "whirlpool."

Subp. 10. **Special purpose pool.** "Special purpose pool" means a pool intended to accommodate a use other than normal swimming, diving, or wading. A special purpose pool includes, but is not limited to, spa pools, pools used for water therapy, dedicated plunge pools, flume water slides, and wave pools.

Subp. 11. **Trained operator.** "Trained operator" means an individual who meets the requirements of part 4717.0650, subpart 5.

Subp. 12. **Wading pool.** "Wading pool" means any pool with a maximum depth of 24 inches used or designed to be used exclusively for wading.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637; L 2008 c 328 s 13*

4717.0275 INCORPORATIONS BY REFERENCE.

This part indicates documents, specifications, methods, and standards that are incorporated by reference in parts 4717.0150 to 4717.3975. This material is not subject to frequent change and is available from the source listed, for loan or inspection from the Barr Library of the Minnesota Department of Health, or through the Minitex interlibrary loan system.

A. American Public Health Association, "Standard Methods for the Examination of Water and Wastewater," 18th edition (1992), 1015 Fifteenth Street NW, Washington, D.C., 20005.

B. American Society for Testing Materials (ASTM) Standard F1346-91 (1991) "Standard Performance Specification for Safety Covers and Labeling Requirements for All Covers for Swimming Pools, Spas and Hot Tubs," 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959.

C. NSF International, Standard 50 "Circulation System Components for Swimming Pools, Spas or Hot Tubs," May 1992, 3475 Plymouth Road, P.O. Box 1468, Ann Arbor, MI 48106.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.0300 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0310 PLAN REVIEW FEES.

All plans for swimming pool construction, installation, or alteration submitted to the commissioner of health for review and approval under part 4717.0450 must be accompanied by the fee specified in this part:

A. each pool, except as provided in items B and C, $500;

B. each spa pool, $200; and

C. alterations to an existing pool without changing the size or configuration of the pool, $200.

Statutory Authority: *L 1987 c 403 art 1 s 8 subd 2; MS s 16A.128; 144.05; 144.12; 144.122; 144.123; 145.05; 145A.02; 157.01*

History: *12 SR 1660; 16 SR 2780; 19 SR 1419; 19 SR 1637*

4717.0350 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0375 INSPECTIONS; WATER SAMPLING.

The commissioner is authorized to inspect and sample the water in public pools for compliance with parts 4717.0150 to 4717.3975.

The commissioner has the right of entry at any reasonable hour to ensure compliance with parts 4717.0150 to 4717.3975.

The commissioner may collect and examine water samples for compliance with part 4717.1750 at any reasonable hour.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.0400 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0450 SUBMISSION OF PLANS AND SPECIFICATIONS.

Subpart 1. **Plan submission and review.** No public pool shall be constructed, installed, or materially altered until complete plans and specifications are submitted to the commissioner in duplicate and approved by the commissioner.

A. A separate plan is required for each pool site.

B. Plans shall be reviewed and approved by the commissioner for sanitation and safety.

C. Once a plan is approved by the commissioner, no modification affecting the safety and sanitation features of the public pool shall be made without prior approval of the commissioner.

D. The pool and related facilities must be built in accordance with the approved plan unless prior approval of changes are given in writing by the commissioner.

E. Projects that include design features not specifically addressed in parts 4717.0150 to 4717.3975 must be reviewed in the design development stage. Those design features shall be permitted only where the pool owner demonstrates that safety and water quality can be maintained based on the current technology and information provided to the commissioner at the time of review. The commissioner may require special provisions to assure that safety and water quality are maintained. Special provisions may include continuous supervision.

Subp. 2. **Plan contents.** Plans and specifications for pool construction and any existing pool alteration must contain:

A. the name and address of the facility where the pool is located;

B. the name and address of the pool owner and operator;

C. the name, address, and telephone number of the organization or individual who prepared the plans and specifications;

D. a site plan or floor plan, drawn to scale, showing:

(1) the facility and dimensions of deck areas;

(2) fencing, access, and other security provisions;

(3) toilet and shower areas;

(4) pool equipment location; and

(5) any related facilities;

E. plans for the pool drawn to scale, with top and profile views, that include dimensions and all equipment or appurtenances such as skimmers, gutters, inlets, drains, lights, diving boards, slides, ladders, steps, and handrails;

F. a plan of the recirculation system showing all pipe sizing, fittings, valves, gauges, and equipment connections;

G. a plan for the deck and equipment room that shows all drains, sumps, deck slopes, and air gaps at discharges to the sewer from all deck drains, pool drains, and recirculation system drains;

H. a complete equipment list specifying manufacturer, model number, and size; and

I. the pool volume, surface area, and design recirculation rate.

Subp. 3. **Inspection of completed project.** The owner of the pool or the owner's agent must notify the commissioner and any local jurisdiction which regulates pool use at the time the pool is complete to permit inspection of the pool and related facilities.

A. The pool must not be placed into public use until the commissioner's inspection shows compliance with parts 4717.0150 to 4717.3975.

B. If sustained construction of the pool does not begin within one year of the plan approval date, the approval is no longer valid.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.0500 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0600 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0650 POOL OPERATION AND MAINTENANCE; OPERATOR TRAINING.

Subpart 1. **Pool maintenance.** A public pool, pool equipment, and related facilities and equipment must be maintained in a properly operating condition.

Subp. 2. **Responsibility for operation.** A public pool and the related facilities and equipment must be operated and maintained in working condition by a person who is designated as responsible for compliance with parts 4717.0150 to 4717.3975 and ensures that the pool poses no threat to public health or safety. The owner shall be responsible for the operation of the pool and related facilities and compliance with parts 4717.0150 to 4717.3975. Where another person has operational authority under an agreement with the owner, that person also has responsibility for the operation of the pool and related facilities and for compliance with parts 4717.0150 to 4717.3975.

Subp. 3. **Designation of trained operator.** The owner or operator of the pool must designate a trained operator who is responsible for the direct operation of the pool whenever the pool is open for use.

A. The trained operator must be responsible for the daily operation of the pool and ensure that required testing is done and records are maintained. The trained operator, or a designated alternate trained operator, must be able to respond to emergency, unsafe and unsanitary conditions at any time the pool is open for use.

B. The trained operator must assure that other individuals who assist with chemical monitoring and pool equipment operation are trained for those functions.

Subp. 4. **Operations manual.** An operations manual must be available that provides operational information relating to all pool equipment.

Subp. 5. **Operator training.** The owner or operator must ensure that the designated trained operator is trained to operate the pool in compliance with parts 4717.0150 to 4717.3975.

A. The trained operator must be trained in safe chemical handling and the use of protective equipment in addition to pool operation and sanitation described in items B to F.

B. Until January 1, 1997, any operator is eligible for certification through attendance at and successful completion of a pool operator's training course.

C. After January 1, 1997, the trained operator must be certified as successfully completing a pool operator training course as specified in item E.

D. A certified trained operator must successfully complete a training course as specified in item E at least once every five years after January 1, 1997.

E. Acceptable training courses are:

(1) the National Swimming Pool Foundation Certified Pool Operator course;

(2) the National Spa and Pool Institute Tech I and Tech II courses (both required); or

(3) the National Recreation and Park Association Aquatic Facility Operator course.

F. After January 1, 1997, a copy of the trained operator's training certificate must be posted at the facility whenever the pool is open for use.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.0700 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0750 POOL RECORD.

A record of a public pool's operation and routine maintenance must be kept by the operator. The record must be maintained for six years. The record must include the following for each day the pool is open to use:

A. the operating periods of recirculation pumps and filters and corresponding rate-of-flow meter readings;

B. amounts of chemicals used, except chemicals added through an automated system;

C. disinfectant residuals including both free and total disinfectant residuals;

D. pH readings;

E. the temperature readings of a pool with a heater;

F. any other pool chemistry measurements taken, although not required to be recorded daily, such as alkalinity and cyanuric acid concentrations;

G. maintenance of equipment;

H. any malfunction of equipment; and

I. any accidents or injuries requiring assistance from a lifeguard, attendant, or emergency medical personnel.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.0775 REPORTING.

All pool incidents resulting in death or serious injury that require assistance from emergency medical personnel must be reported to the commissioner by the owner or the owner's agent by the end of the next working day.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.0800 [Repealed, 19 SR 1419; 19 SR 1637]

4717.0900 [Repealed, 19 SR 1419; 19 SR 1637]

POOLS; LIFEGUARDS; AND EQUIPMENT

4717.0950 LIFEGUARD REQUIREMENT.

An individual currently certified in first aid and adult, child, and infant cardiopulmonary resuscitation must be on duty at all times the pool is open to use, unless a sign warning that a lifeguard is not present is posted as specified in part 4717.1050.

The individual must have a Red Cross lifeguard certification or equivalent and be responsible for user supervision, safety, and sanitation at all times the pool is in use.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1000 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1050 NO LIFEGUARD WARNING SIGN.

When a lifeguard is not on duty at a public pool open to use, a warning sign must be placed in plain view.

A. The sign must state in clear, legible letters at least four inches high: "Warning - No lifeguard on duty."

B. The sign must state in clear, legible letters at least one inch high: "Children must not use the pool without an adult in attendance."

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1100 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1200 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1250 EMERGENCY TELEPHONE LOCATION.

A pool with a lifeguard present must have a telephone in or immediately adjacent to the pool area. When a telephone is provided, the emergency number must be posted. When a telephone is not located in the pool enclosure, a sign placed in plain view must indicate the location of the nearest telephone available to a pool user and the emergency number.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1300 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1350 POOL FACILITY CAPACITY.

Subpart 1. **Posting pool facility capacity.** The capacity for the pool, determined according to subpart 2, must be posted in the pool enclosure area.

Subp. 2. **Pool user capacity.** User capacity must be determined as specified in this subpart.

A. One person is permitted for each 15 square feet of pool water surface in areas of the pool with five feet or less in water depth.

B. One person is permitted for each 25 square feet of pool water surface in areas of the pool over five feet in water depth.

C. Three hundred square feet of pool water surface area must be reserved around each diving board, diving platform, or slide. The area in this item must not be included when computing the user capacity in item B. Ten persons must be included in the user capacity for each diving board, diving platform, and slide.

D. Spa pools must be limited to one user for each three linear feet of seating space provided in the spa pool, measured along the front edge of the seats.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1400 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1450 LIFEGUARD STATIONS AND LIFESAVING EQUIPMENT.

Subpart 1. **Lifeguard stations.** At any time a pool with more than 2,250 square feet of water surface is operated primarily for unorganized use, the pool must have an elevated lifeguard platform or chair. In a pool with 4,000 square feet or more of water surface, additional elevated platforms, or chairs must be located to provide a clear, unobstructed view of the pool bottom in the area under surveillance.

Subp. 2. **Lifesaving equipment.** Except for a spa pool or wading pool, not less than one unit of lifesaving equipment as described in subpart 3, must be at every public pool. One unit must be provided for each 2,000 square feet of water surface or fraction thereof.

Subp. 3. **Lifesaving equipment unit.** One unit of lifesaving equipment is:

A. a ring buoy attached to a 3/16 inch manila, or equivalent material, rope that is 1-1/2 times the pool width, but not over 60 feet; and

B. a lifepole or shepherd's crook pole with blunted ends and a minimum fixed length of 12 feet; or

C. where a lifeguard is provided, a rescue tube may be used instead of a ring buoy.

Subp. 4. **Lifesaving equipment; access.** Lifesaving equipment must be mounted in conspicuous places, distributed around the pool deck, at lifeguard chairs or at another readily accessible location. The equipment must be plainly marked "For emergency use only." Equipment must be kept in repair and ready condition. No one may tamper with, use for any purpose other than its intended use, or remove equipment from its established location, except for emergency use.

Subp. 5. **First aid kit; spine board.** Every pool where a lifeguard is present must have a first aid kit filled and ready for use and a spine board with ties. The spine board must be within the pool enclosure. The first aid kit must contain at least:

A. two units of one inch adhesive compress;

B. two units of two-inch bandage compress;

C. two units of three-inch bandage compress;

D. two units of four-inch bandage compress;

E. one unit of (three-inch by three-inch) plain gauze pad;

F. two units of gauze roller bandage;

G. one unit of eye dressing packet;

H. four units of plain absorbent gauze one-half square yard;

I. three units of plain absorbent gauze, (24 inches by 72 inches);

J. four units of triangular bandages, 40 inches;

K. one bandage scissors;

L. one tweezers;

M. rubber gloves; and

N. pocket face mask.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1500 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1550 POOL ACCESS RESTRICTION; FENCING.

Subpart 1. **General.** Access to a public pool must be controlled to effectively prevent the entrance of children.

A. Where fencing is used to control access, it must comply with subparts 2 to 6 except as noted in item B, subitem (2).

B. Access to a public pool within a building or enclosure must be controlled:

(1) by locating the pool in a separate room with self-latching doors that restrict access to the room; or

(2) with fencing or a comparable barrier which is at least four feet high and has self-closing, self-latching doors or gates.

Exception: poolside guest rooms, corridors adjacent to poolside guest rooms, and poolside activity areas may be within the pool enclosure.

Subp. 2. **Fencing.** Fencing must:

A. be at least five feet high;

B. be equipped with self-closing, self-latching gates capable of being locked;

C. not have any opening greater than four inches;

D. not have any opening greater than two inches below the fence; and

E. not be a readily climbable design.

Subp. 3. **Existing four-foot fencing.** Fencing in existence prior to January 4, 1995, that is less than five feet high must:

A. be no less than four feet high;

B. be equipped with self-closing, self-latching gates capable of being locked;

C. not have any opening greater than four inches; and

D. not be a readily climbable design.

Subp. 4. **Wading pools.** Fencing for a wading pool enclosure must be at least 42 inches high for existing installations and 48 inches high for new installations.

Subp. 5. **Chain link fencing.** New chain link fencing must not exceed 1-1/2 inch mesh for fencing less than eight feet high. New chain link fencing eight foot high or higher must have mesh which does not exceed two inches.

Subp. 6. **Latches.** Latches for new installations must be four feet above the ground.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1575 POOL COVERS.

If a pool cover is used, any new cover must comply with ASTM Standard F1346-91.

A. Pool covers must be maintained in a clean and sanitary condition to preclude contamination of the pool water.

B. If the deck area is accessible when the cover is in place, a fully secured safety cover must be used.

C. A pool cover may not be used in lieu of a fence or other access restrictions required by part 4717.1550.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1600 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1650 USER SANITATION AND SAFETY.

Subpart 1. **Posting user safety and sanitation rules.** Placards and pictorial representations, where appropriate, embodying the requirements in this part must be posted in plain view in the pool room or enclosure and in the dressing rooms of all public pools. Lettering must be clear, legible, and at least one-fourth inch high.

Subp. 2. **Communicable disease.** No person with or suspected of having a communicable disease which could be transmitted through use of the pool shall work at or use any public pool.

Subp. 3. **Warning.** A person with any considerable area of exposed subepidermal tissue, open blisters, or cuts must be warned that these may become infected and advised not to use the public pool.

Subp. 4. **Showering.** Any person using a public pool must take a cleansing shower using warm water and soap and thoroughly rinse off all soap before entering the pool enclosure. A user leaving the pool to use the toilet must take a second cleansing shower before returning to the pool enclosure. A person who exercises, applies lotion, or uses a sauna or steam room must shower before using the pool.

Subp. 5. **No spitting.** Spitting, spouting water from the mouth, and blowing the nose in the pool is prohibited.

Subp. 6. **No running.** No running or boisterous or rough play, except supervised water sports, is permitted in the pool, in dressing rooms or shower rooms, on runways, on the diving board, or platforms.

Subp. 7. **Glassware.** Glassware and similar material with a tendency to shatter on impact is not allowed in the pool enclosure area.

Subp. 8. **Diving.** Diving is not permitted except in areas that comply with part 4717.3750.

Subp. 9. **No pets.** Domestic animals are not permitted in the pool enclosure, showers, or dressing rooms.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1700 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1750 POOL WATER CONDITION.

Subpart 1. **Maximum water temperature.** The water temperature in a pool must not be more than 104 degrees Fahrenheit.

Subp. 2. **Test kits.** Each pool must have the testing equipment specified in this subpart:

A. a DPD (Diethyl-P-Phenylene Diamine) test kit to measure the concentration of disinfectant in water, accurate within 0.1 parts per million;

B. a phenol red pH testing kit accurate to the nearest 0.2 pH unit;

C. a test kit to measure alkalinity using the methyl orange or equivalent method; and

D. where cyanuric acid is used, a test kit to test cyanuric acid concentration.

Subp. 3. **Disinfection residual.** When in use, a pool must be continuously disinfected with a chemical that imparts an easily measured, free available residual.

A. When chlorine is used, a free chlorine residual of at least 0.5 parts per million must be maintained throughout the pool.

B. When bromine is used, a bromine residual of at least 1.0 parts per million must be maintained throughout the pool.

C. The minimum free residual for chlorine must be 1.0 parts per million and 2.0 parts per million for bromine when any of the following conditions exist:

(1) cyanuric acid exceeds 30 parts per million;

(2) the pH exceeds 7.7;

(3) the water temperature exceeds 84 degrees Fahrenheit; or

(4) the pool is a wading pool.

D. The disinfectant concentration in an operating pool must not exceed five parts per million for chlorine and ten parts per million for bromine.

E. If other halogens are used, residuals of equivalent disinfectant strength must be maintained.

F. If the concentration of combined chlorine residual exceeds 0.5 parts per million, the pool must be superchlorinated or treated to reduce the concentration of the combined chlorine residual to not exceed 0.5 parts per million.

G. Where a cyanuric acid compound is used to stabilize chlorine, the concentration of cyanuric acid in the pool must not exceed 100 parts per million.

Subp. 4. **Disinfection of spa pools.** The disinfectant residual in a spa pool must be at least 2.0 parts per million for free chlorine and 4.0 parts per million for bromine throughout the pool when in use.

Subp. 5. **pH.** Water in the pool must be maintained with a pH of not less than 7.2 and not more than 8.0.

Subp. 6. **Alkalinity.** The alkalinity of the water in the pool must be at least 50 parts per million.

Subp. 7. **Water clarity.** Whenever the pool is open for use, the pool water must be clear enough so the bottom drain is easily visible.

Subp. 8. **Use of nontoxic chemicals; chemical container security.** Chemicals used to control water quality must not impart toxic properties to the water. All containers used for chemicals must be kept in a secure location, inaccessible to pool users, and properly labeled and stored according to the manufacturer's instructions.

Subp. 9. **Bacteriological samples.** When bacteriological sampling is done, no sample collected may:

A. exceed 200 bacteria per milliliter as determined by the heterotrophic plate count; or

B. indicate the presence of total coliform organisms in a 100 milliliter sample by any of the following methods:

(1) multiple tube;

(2) membrane filter; or

(3) the Minimal Medium ONPG-MUG test described in Code of Federal Regulations, title 40, part 141.

All samples must be collected, dechlorinated, and examined according to the American Public Health Association's "Standard Methods for the Examination of Water and Wastewater."

Subp. 10. **Bacteriological treatment.** Where sampling indicates that the standards in subpart 9 are exceeded, the pool must be treated to effectively reduce biological concentration to a complying level.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1800 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1850 DEPTH OF POOL WATER.

Subpart 1. **General.** The minimum depth of water in a public pool must be three feet. The maximum depth at the shallow end of the pool must not exceed three feet six inches.

Subp. 2. **Exceptions.** The requirements in subpart 1 do not apply to special purpose pools, wading pools, and pools used for supervised competition.

A. A wading pool must have a maximum depth of no more than 24 inches.

B. A pool with a zero depth area may be approved by the commissioner if:

(1) a lifeguard is present at the zero depth area at all times the pool is in use; and

(2) there is an effective barrier, such as stanchions and ropes to restrict access from the deck of the pool to the area where the water depth is less than three feet, except on the side of zero depth. The barrier must permit easy removal for emergency access or maintenance.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.1900 [Repealed, 19 SR 1419; 19 SR 1637]

4717.1950 POOL CLEANING.

Subpart 1. **Cleaning schedule.** Visible dirt on the bottom of the pool must be removed every 24 hours or more frequently as needed to eliminate buildup. Visible scum or floating matter on the pool surface must be removed no less than every 24 hours by flushing or other effective means.

Subp. 2. **Cleaning system.** A vacuum-cleaning system capable of cleaning the entire pool must be provided, except that it is not required for spa pools with less than 75 square feet of water surface.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2000 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2100 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2150 WATER SUPPLY.

Subpart 1. **Potable supply.** The water supply serving a pool and all plumbing fixtures, including drinking fountains, lavatories, and showers, must meet the requirements of the commissioner for potable water specified in chapters 4720 and 4725.

Subp. 2. **Backflow prevention.** All portions of the water distribution system serving the pool and related facilities must be protected against backflow. Water introduced into the pool, either directly or through the recirculation system, must be supplied through an air gap or protected with a suitable backflow preventer as specified in parts 4715.2000 to 4715.2170.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2200 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2250 SEWER SYSTEM.

The sewer system must adequately serve the pool, bathhouse, dressing rooms, and related facilities and must conform to the standards of the commissioner of health and the Minnesota Pollution Control Agency.

A. There must be no direct physical connection between the sewer system and any drain from the pool or recirculation system.

B. Any pool, gutter drain, or overflow from the recirculation system when discharged to a sewer system, storm drain, or other complying natural drainage course must discharge through a complying air gap or air break to preclude the backup of sewage or waste into the pool or piping system.

C. Valves and pumps used for draining the pool must be sized or designed to prevent the surcharging of the sanitary sewer.

D. Any sanitary sewer serving facilities related to the pool must discharge into the public sewer system.

E. Where a public sewer system is not available, the connection must be made to a treatment system designed, constructed, installed, and operated according to the requirements of the commissioner of health and the Minnesota Pollution Control Agency.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2300 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2350 POOL STRUCTURE.

Subpart 1. **General.** The pool and all appurtenances must be constructed of materials which:

A. are inert, nontoxic, impervious, permanent and enduring;

B. withstand design stress;

C. provide a tight tank with a smooth and easily cleaned surface; and

D. can be finished in a white or light color.

Wood tank construction and vinyl liner pools are prohibited.

Subp. 2. **Finish.** The pool basin finish, including bottom and sides, must:

A. be of white or light colored material;

B. be nontoxic to humans;

C. have a smooth finished surface;

D. be void of cracks; and

E. be bonded to the supporting members, excluding structural expansion joints.

Subp. 3. **Design, detail, and structural stability.** The pool must be designed, installed, operated, and constructed to withstand all anticipated loading for both full and empty conditions.

Subp. 4. **Designer responsibility.** The owner and the architect, engineer, contractor, or other designer is responsible for the structural stability and safety of the pool design.

Subp. 5. **Relief valve.** A hydrostatic relief valve or an underdrain system must be provided where a high water table may affect the stability of the pool.

Subp. 6. **Shape.** The pool's shape must:

A. be such that the circulation of pool water and control of users' safety are not impaired;

B. allow complete, continuous circulation of pool water throughout all parts of the pool; and

C. ensure that user safety is not impaired. Underwater or overhead projections or obstructions that would endanger user safety or interfere with operation are prohibited.

Subp. 7. **Corners.** Corners formed by the intersection of walls and the bottom must be rounded with at least a one-half inch radius.

Subp. 8. **Slope of bottom.** The slope must conform to the provisions in this subpart.

A. The slope of the bottom of any part of the pool with a water depth of less than five feet must not be more than one foot in ten feet and must be uniform.

B. In parts of the pool with a water depth greater than five feet, the slope must not exceed one foot in three feet.

Subp. 9. **Side walls.** The walls of the pool must be either:

A. vertical for water depths of at least six feet; or

B. vertical for a distance of three feet below the water level, below which the wall may be curved to the bottom with a radius not greater than the difference between the depth at that point and three feet, provided that vertical is interpreted to permit slopes not greater than one foot, horizontally, for each five feet of depth of sidewall (11 degrees vertical).

Subp. 10. **Ledges.** A ledge along the pool wall within the pool basin is permitted only if it is a necessary part of the sidewall construction. The ledge must be:

A. at least two feet six inches below the water surface;

B. not over four inches wide; and

C. sloped into the pool with a rounded outside edge.

Subp. 11. **Wading pools.** Wading pools must be physically separated from other pools and have a separate recirculation system.

Subp. 12. **Fountains.** Fountains or similar features require approval by the commissioner and must be located in areas of two feet or less of water depth. They must be designed to preclude climbing.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2400 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2450 MARKINGS AND LINES.

Subpart 1. **Depth markings.** The depth of the water in the pool must be plainly marked in numbers and letters, be in a color contrasting with the background, and specify the water depth and units in feet and inches. Numerals must be at least four inches high. The water depth must be indicated:

A. on the edge of the deck next to the pool;

B. at the maximum and minimum depths;

C. on all sides of the pool;

D. at the points of change of slope between deep and shallow portions; and

E. at intermediate increments of depth, spaced at not more than 25-foot intervals.

Subp. 2. **Depth transition markings.** Where a transition to a steeper bottom slope occurs, the transition must be marked on the bottom and walls of the pool by a stripe of dark contrasting color at least six inches wide.

Subp. 3. **No diving markings.** Pools and sections of pools that do not comply with the depth requirements for diving in part 4717.3750 must have:

A. the words "No Diving" in letters not less than four inches high and of a color contrasting with the background located on the pool deck on all sides of the pool where diving is not permitted and spaced at not more than 25 foot intervals; or

B. the universal no diving symbol at least four inches high accompanied by the words "No Diving" in letters not less than one-half inch high and of a color contrasting with the background located on the pool deck on all sides of the pool where diving is not permitted and spaced at not more than 25 foot intervals. This provision does not apply to spa pools, wading pools, flume or plunge pools.

Subp. 4. **Stair markings.** The leading edge of stair treads must be marked by a stripe of dark, contrasting color between one-half inch and two inches in width.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2500 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2550 RECIRCULATION SYSTEM.

All pools must have a water recirculation system with treatment and filtration equipment consisting of overflow gutters or skimmers, main drains, inlets, pumps, piping, filters, water conditioning, disinfection equipment, and other accessory equipment. The pumps, filter, disinfectant and chemical feeders, and related appurtenances must be kept in operation at all times during the swimming season unless approved by the commissioner.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2560 RECIRCULATION RATE.

Subpart 1. **General recirculation rate.** The water recirculation system must clarify and disinfect the pool volume of water in six hours or less.

Subp. 2. **Wading pools and special purpose pools.** The water recirculation system of a wading pool or a special purpose pool must recirculate a water volume equal to the pool volume in two hours or less.

Subp. 3. **Spa pools.** The recirculation system in a spa pool must recirculate a water volume equal to the pool volume in 30 minutes or less, except that a minimum rate of 35 gallons per minute is required.

Subp. 4. **Dedicated plunge pools.** The recirculation system of a dedicated plunge pool must recirculate a water volume equal to the total volume of the pool in one hour or less.

Subp. 5. **Pools with zero depth area.** The recirculation system of a pool with a zero depth end must recirculate water at the rate specified in this subpart.

A. The area of the pool with a water depth of less than three feet must have a recirculation rate of two hours or less.

B. The remainder of the pool must meet the requirements in subpart 1.

C. A system of bottom inlets must be provided in the shallow end.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2570 RECIRCULATION EQUIPMENT.

Subpart 1. **General.** Equipment which is part of the installation or alteration of a pool recirculation system must comply with Standard 50 "Circulation System Components for Swimming Pools, Spas or Hot Tubs" of the NSF International.

Subp. 2. **Recirculation system strainers.** The recirculation system must include a strainer to prevent debris such as hair and lint from reaching the pump and filters. The strainer must:

A. be corrosion-resistant;

B. have openings not more than one-eighth inch;

C. provide a free flow area at least four times the area of the pump suction line; and

D. be readily accessible for frequent cleaning.

Subp. 3. **Recirculation system piping.** Recirculation system piping must:

A. carry the recirculation quantity of water required in part 4717.2650 at a velocity not exceeding six feet per second for suction piping, eight feet per second for discharge piping, and three feet per second for gravity flow piping;

B. be nontoxic and corrosion-resistant, and able to withstand operating pressures; and

C. be identified by a label, color code, tag, or other distinguishing marking.

Subp. 4. **Rate-of-flow indicator.** A rate-of-flow indicator, reading in gallons per minute, must be installed and located, preferably on the pool return line, so the rate of recirculation and backwash rate are indicated. The indicator must be capable of reading flows measuring at least 1-1/2 times the design flow rate, be accurate within ten percent of the true flow, and be easy to read.

Subp. 5. **Pumps.** Pumps must provide the number of turnovers of pool water specified in part 4717.2560.

If the pump or suction piping is located above the overflow level of the pool, the pump must be self-priming. The pump or pumps must be capable of providing flow to backwash filters.

Under normal conditions, the pump or pumps must supply the recirculation rate of flow specified in part 4717.2560 at a dynamic head of at least 50 feet for pressure filters.

Subp. 6. **Heaters.** Pools equipped with heaters must have a fixed thermometer in the recirculation line to measure the temperature of the water returning to the pool.

Subp. 7. **Valves.** Valves must be provided on the main drain and skimmer lines to permit balancing the recirculation flow.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2580 INLETS AND OUTLETS.

Subpart 1. **Outlets.** All pools must have an outlet at the deepest point to permit the pool to be completely emptied.

A. Outlet openings must be covered by grating not readily removable by users.

B. Outlet openings of the grating on the floor of the pool must be at least four times the area of discharge pipe and provide enough area so the velocity of water passing the grate does not exceed 1-1/2 feet per second.

C. Grate openings must be no more than one-half inch wide.

D. When a single outlet is used, it must be at least 100 square inches in size, or have an antivortex cover.

E. In pools more than 30 feet wide, multiple outlets must be provided. The outlets must be no more than 30 feet apart, and no more than 15 feet from the side walls.

Subp. 2. **Inlets.** Water inlets must be located to produce uniform circulation of water and maintain a uniform disinfectant residual throughout the entire pool without the existence of dead spots.

A. Inlets from the recirculation system must be flush with the pool wall and submerged at least 12 inches below the water level.

B. Over-the-rim fill spouts are not permitted unless located under a diving board or installed in a manner that does not present any hazard.

C. Make up water spouts must terminate at least six inches above the fill rim of the pool or surge tank.

Subp. 3. **Adjustable inlets.** Inlets must be directionally adjustable and located so there is complete, uniform circulation of incoming water throughout the pool, a uniform disinfectant residual is maintained at all times, and there are no dead spots.

A. Each inlet must be adjustable or have an individual gate or similar valve to permit adjustment of water volume to obtain the best circulation.

B. The maximum spacing of inlets must be 20 feet based on the pool perimeter.

C. In a pool with a surface area greater than 1,600 square feet or longer than 60 feet, side inlets must be placed at 15-foot intervals around the entire perimeter.

D. An engineered, manufactured gutter system with integral supply orifices may be used instead of individual directional inlets.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2590 OVERFLOW GUTTERS.

Subpart 1. **General.** Overflow gutters must extend completely around the pool except at steps or recessed ladders.

A. The overflow gutter must also serve as a handhold.

B. The gutter must continuously remove 50 percent or more of the recirculated water and return it to the filter.

C. Pools with overflow gutters must be provided with surge capacity.

D. The gutters, drains, and return piping must be sized to remove overflow water caused by recirculation, displacement, wave action, or other cause produced from maximum pool user load.

E. Drain outlets must not be more than 15 feet apart.

F. The opening into the gutter beneath the coping must not be less than four inches wide. The interior of the gutter must not be less than three inches wide with a depth of at least three inches.

G. Gutters must be designed to prevent the entrance of or entrapment of a user's arms or legs.

H. The overflow edge or lip must be rounded and no thicker than 2-1/2 inches for the top two inches.

I. Overflow outlets must have outlet pipes at least two inches in diameter.

J. Outlet fittings must have a clear opening in the grating at least equal to 1-1/2 times the cross sectional area of the outlet pipe.

K. New overflow gutter system installations must include automatic water level control to provide automatic and continuous skimming during quiescence.

Subp. 2. **Surge systems and surge capacity.** An in-pool surge system may be used only if it is part of an engineered and manufactured gutter system that has surge weirs which provide effective skimming during quiescence.

A. In-pool surge weirs must be self-closing during normal pool use.

B. The total surge capacity of the system must be at least one gallon per square foot of water surface.

C. If some of the surge capacity is within the gutter system, the system must be able to carry 50 percent of the recirculation flow while maintaining the surge capacity.

Subp. 3. **Rollout and deck systems.** Nothing in this part precludes the use of a rollout overflow system or deck level system if proper surge capacity is provided as specified in subpart 2.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2595 SKIMMERS.

Subpart 1. **Skimmers.** Skimmers are permitted in lieu of a gutter if the suction outlets induce enough motion to the pool water to remove floating oil and waste from the entire pool surface, and the edge of the pool deck provides a handhold for swimmers.

A. Skimming devices must be built into the pool wall.

B. At least one skimming device must be provided for each 400 square feet of water surface area or fraction thereof.

C. Where two or more skimmers are used, they must not interfere with each other and must ensure skimming of the entire pool surface.

D. The flow through rate must be no less than 30 gallons per minute.

E. Skimmer piping and other components must be designed for a total capacity of at least 80 percent of the required filter flow of the recirculation system.

F. The skimmer weir must automatically adjust and operate freely with continuous action to variations in water level over a range of at least four inches.

(1) The weir must operate at all flow variations.

(2) The weir must be of a buoyancy and design to permit effective skimming velocity.

G. Provision must be made to prevent airlock in the skimmer suction line.

(1) Where an equalizer pipe is used, it must be sized to meet the capacity requirements of the filter and pump and not be less than two inches in diameter. If equalizer lines are not provided on skimmers, the main drain must be sized based on the total recirculation flow. The equalizer pipe must be located at least one foot below the lowest overflow level of the skimmer. It must be provided with a valve or equivalent device that automatically opens when the water level drops below the lowest weir level.

(2) If any other device, surge tank, or arrangement is used, enough water for pump suction must be assured.

(3) Equalizer pipe is not required on a pool with an automatic water level control and on spa pools with less than a 1,000 gallon capacity.

Subp. 2. **Screen.** Skimmers must have an easily removable and cleanable basket or screen through which all overflow water passes to trap large solids.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2600 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2610 DISINFECTANT AND CHEMICAL FEEDERS.

A pool must have a disinfectant feeder or feeders that meet the requirements in this part.

A. Feeders must be sturdy and withstand wear, corrosion, or attack by disinfectant solutions or vapors.

B. Feeders must not be adversely affected by repeated regular adjustment or other anticipated use.

C. Feeders must be capable of being disassembled for cleaning and maintenance.

D. The design and construction of feeders must preclude stoppage from chemicals intended to be used or foreign materials.

E. Feeders must incorporate failure-proof features so the disinfectant cannot feed directly into the pool, the pool piping system, water supply system, or pool enclosure under any type of failure of the equipment, or during its maintenance.

F. Feeders must be able to supply at least the equivalent of one pound of chlorine in eight hours for each 10,000 gallons of pool capacity.

G. Feeders must have a graduated and clearly marked dose adjustment ranging from full capacity to 25 percent of capacity.

H. Feeders must be capable of continuous delivery within ten percent of the dose at any setting.

I. When the disinfectant is introduced at the suction side of the pump, a device or method to prevent air lock of the pump or recirculation system must be provided.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2620 CHEMICAL HANDLING EQUIPMENT; PROTECTIVE EQUIPMENT.

Equipment and piping used to apply chemicals to the water must be sized, designed, and of material that does not clog and is easily cleaned. Material must be resistant to the action of the chemicals used.

Protective equipment recommended by the chemical manufacturer as necessary for the safe handling of any chemicals used must be provided.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2630 USE OF GAS CHLORINE.

Subpart 1. **General.** The standards in this part apply when compressed gas chlorine is used. The gas chlorine and chlorinating equipment must be in:

A. a separate, mechanically ventilated room; or

B. a secure reach-in enclosure.

Subp. 2. **Rooms.** When a room is used, it must comply with the provisions in this subpart.

A. The room must be above grade.

B. A shatter resistant inspection window must be installed in an interior wall or the door.

C. The room must have a ventilating fan with a capacity to provide one complete air change per minute when the room is occupied.

D. Separate switches for the fan and lights must be located outside the room. Outside switches must be protected from vandalism. A signal light indicating fan operation must be provided at each entrance when the fan can be controlled from more than one point.

E. The ventilating fan must take suction near the floor as far as practical from the door and air inlet, with the point of discharge located so as not to contaminate air inlets to any rooms or structures.

F. Air inlets must be through louvers or other ventilation openings near the ceiling.

G. When present, floor drains must discharge to the outside of the building and must not be connected to other internal or external drainage systems.

Subp. 3. **Reach-in enclosures.** Reach-in enclosures must be:

A. not over two feet in depth;

B. vandal resistant; and

C. naturally ventilated by means of openings in the upper and lower parts of the enclosure.

Subp. 4. **Doors.** The door of a room or enclosure must be labeled "DANGER - GAS CHLORINE" in letters at least four inches high.

Subp. 5. **Seals.** All openings between a chlorine room or enclosure and other enclosed space must be sealed.

Subp. 6. **Venting.** Vents from feeders and storage rooms or enclosures must discharge to the outside atmosphere, above grade.

Subp. 7. **Chlorinating equipment.** Chlorinating equipment must be capable of withstanding wear without developing leaks.

A. All chlorine cylinders must be anchored to prevent falling over.

B. A valve stem wrench must be maintained on the chlorine cylinder so the supply can be shut off quickly in an emergency.

C. The valve protection hood must be kept in place except when the cylinder is connected to the system.

D. The chlorine feeding device must be designed so that during accidents or interruptions of the water supply, leaking chlorine gas is conducted to the out-of-doors.

E. The chlorinator must be a vacuum-operated solution-feed type, capable of delivering chlorine at its maximum rate without releasing chlorine gas to the atmosphere.

F. Pressurized chlorine feedlines must not carry chlorine gas beyond the chlorinating room.

G. Chlorinators must be designed to prevent the backflow of water into the chlorine solution container.

Subp. 8. **Respiratory protection equipment.** Respiratory protection equipment, meeting the requirements of the National Institute for Occupational Safety and Health (NIOSH) or the United States Bureau of Mines for chlorine use must be available where chlorine gas is handled. The respiratory protection equipment must be stored at a convenient location, in a closed cabinet accessible without a key, but not inside any room where chlorine is used or stored.

A. The respirators must use compressed air, have at least a 30-minute capacity, and be compatible with or exactly the same as the respirators used by the fire or emergency rescue department responsible for the pool facility, or be a canister type gas mask with full face mask and replacement canisters provided.

B. A record of use and inspection must be kept to ensure that the respirators will be serviceable when needed.

Subp. 9. **Chlorine leak detection.** A bottle of ammonium hydroxide, 56 percent ammonia solution, or a comparable solution recommended by the chlorine supplier, must be available for chlorine leak detection.

A. Where ton chlorine containers are used, an emergency leak repair kit recommended by the Chlorine Institute, Inc., 2001 "L" Street NW, Washington, D.C. 20036, must be provided.

B. Where an automatic leak detector is provided, it must be equipped with both an audible alarm and a visual warning sign.

Subp. 10. **Trained personnel.** Installation of chlorinator equipment and its operation must be carried on by and under the supervision of personnel trained by the manufacturer or supplier for the installation and operation of such equipment.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2650 USE OF HYPOCHLORITE SOLUTION.

When hypochlorite solution is fed through hypochlorinating equipment:

A. the feed must be continuous under all conditions of pressure in the circulating system and feed without artificial constriction of the pump suction line, whether or not the pump suction line is under vacuum or pressure head;

B. regulation must be provided to ensure constant feed with varying supply or back pressure;

C. positive features must be designed to prevent backflow from the recirculation system to the solution container and reduce to a minimum the entry into the pool of free calcium released from calcium hypochlorite; and

D. for aboveground installations, means must be provided to prevent siphoning of hypochlorite solution when the recirculation pump and hypochlorinator are both turned off.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2700 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2750 USE OF EROSION FEEDERS.

An erosion feeder must:

A. have enough capacity to achieve the disinfectant residual specified in part 4717.1750;

B. be adjustable in output rate; and

C. be capable of continuous operation.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2800 [Repealed, 19 SR 1419; 19 SR 1637]

4717.2850 SAND FILTERS.

Subpart 1. **Applicability.** The requirements in this part apply to vacuum and pressure sand filters.

A. Pressure sand filters must filter at a maximum rate of three gallons per minute per square foot of bed area at the time of maximum head loss with enough area to meet the rate of flow specified in part 4717.2560.

B. The filtration rate for high-rate sand filters and vacuum sand filters must not exceed 20 gallons per minute per square foot of bed area.

Subp. 2. **Filter material.** Filter material must be screened, sharp filter sand sized between 0.4 and 0.55 millimeters with a uniformity coefficient not exceeding 1.75. Anthracite sized between 0.6 and 0.8 millimeters with a uniformity coefficient not exceeding 1.8, may be used instead of sand.

A. The filter material must be at least 20 inches deep for standard pressure sand filters and at least 12 inches deep for high-rate sand filters.

B. The filter material must be supported by at least ten inches of graded filter gravel. The gravel must distribute water uniformly during filtration and backwashing.

C. A reduction in depth or an elimination of gravel is permitted when equivalent performance and service is demonstrated through compliance with NSF International Standard 50.

Subp. 3. **Underdrain system.** The underdrain system must be corrosion-resistant, enduring, and provide even collection and distribution of the flow during filtration and backwashing. Orifices and other openings must maintain constant area.

Subp. 4. **Freeboard.** Freeboard provided between the upper surface of the filter media and the lowest portion of the pipes or drains which serve as overflows during backwashing must be designed to prevent loss of filter material.

Subp. 5. **Filter system.** The filter system must have influent and effluent pressure gauges or a filter-mounted pressure gauge, backwash sight glass on the waste discharge line, and an air-relief valve at or near the high point of the filter. The filter system must have valves and piping that permit:

A. filtering to the pool;

B. individual backwashing of filters to waste at a rate of not less than 15 gallons per minute per square foot of filter area;

C. isolation of individual filters for repair while other units are in service;

D. complete drainage of all parts of the system; and

E. maintenance, operation, and inspection.

Subp. 6. **Filter access.** Each pressure filter tank must have an access opening to permit maintenance.

Subp. 7. **Coagulant feed.** Devices with dosage control features must be provided if coagulants are added ahead of filters.

Subp. 8. **Tank.** On pressure filters, the tank and integral parts must have a pressure safety factor of four based on the maximum shutoff head of the pump. For design purposes, the shutoff head must in no case be considered less than 50 pounds per square inch.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.2900 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3000 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3050 DIATOMACEOUS EARTH FILTERS.

Subpart 1. **Area.** The filter area for a diatomaceous earth filter must meet the design pump capacity as required by this part. Where fabric is used, the filter area is determined by the surfaces created by septum supports with no allowance for areas of impaired filtration such as broad supports, folds, or portions which may bridge.

Subp. 2. **Rate of filtration.** The rate of filtration must not be greater than two gallons per minute per square foot of filter area without continuous body feed and no greater than 2.5 gallons per minute per square foot with continuous body feed.

Subp. 3. **Use of body feeder.** If a body feeder is used, it must be accurate within ten percent and capable of continually feeding within a calibrated range adjustable from two to six parts per million at the capacity of the recirculation pump. The feeding of diatomaceous earth through skimmers is prohibited.

Subp. 4. **Filter and components.** The filter and all component parts must withstand normal continuous use without significant deformation, deterioration, corrosion, or wear which adversely affects filter operation. The filter design, construction, or other provision must preclude introduction of filter aid into the pool during precoating operations.

A. Where dissimilar metals which may set up galvanic electric currents are used in the filters, provision must be made to resist electrolytic corrosion.

B. The filter and surrounding space must permit removal, replacement of any part, and maintenance.

C. The filter must be cleaned by backwashing, air pump assist backwashing, mechanical or manual spray wash, or agitation.

Subp. 5. **Filter tank.** The tank containing the filter elements must be constructed of steel, plastic, or another material resistant to corrosion, with or without coating.

A. Pressure filters must be designed for a minimum working pressure of 50 pounds per square inch with a four-to-one safety factor.

B. Vacuum filters must withstand the pressure developed by the weight of the water contained therein with a safety factor of 1.5.

C. Closed vacuum filters must withstand crushing pressure developed under a vacuum of 25 inches of mercury with a safety factor of 1.5.

D. The septa or elements which support the filter-aid must be corrosion-resistant. The septa must resist rupture under conditions of maximum differential pressure between influent and effluent developed by the circulating pump, and resist stress developed by cleaning.

Subp. 6. **Filter plant.** The filter plant must have pressure, vacuum, or compound gauges to indicate the condition of the filter. In vacuum filters where the circulating pump is two horsepower or higher, an adjustable high vacuum automatic shutoff must be provided to prevent damage to the pump by cavitation.

Subp. 7. **Complete draining of filter.** The filter must provide for complete drainage.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3100 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3150 CARTRIDGE FILTERS.

Surface-type cartridge filters must be sized for a maximum filtration rate of 0.375 gallons per minute per square foot. An effluent pressure gauge and an air relief valve must be provided. A spare set of cartridges must be provided and available at all times.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3200 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3250 STEPS, LADDERS, HANDHOLDS, AND HANDRAILS.

Subpart 1. **Step or ladder location in-pool.** Steps or ladders must be provided at the shallow end of the pool if the vertical distance from the bottom of the pool to the deck or walk is over two feet. Recessed steps or ladders must be provided at the deep end of the pool. If the pool is over 30 feet wide, steps or ladders must be installed on each side.

Subp. 2. **Steps.** Steps leading into the pool must be of nonslip material, have a minimum tread of 12 inches, and have a maximum rise or height of ten inches.

A. Steps must have accent stripes as specified in part 4717.2450, subpart 4.

B. There must be no abrupt drop-off or submerged projections into the pool, unless guarded by handrails.

C. At least one sturdy handrail, reachable from the pool bottom, must be provided for all steps.

D. At least two rails must be provided when the steps are over six feet wide or an additional railing is needed to define the location of the steps.

E. If steps are inserted in the walls or if stepholes are provided, they must be easily cleaned and drain into the pool to prevent the accumulation of dirt. Stepholes must have a minimum tread of five inches and a minimum width of 14 inches.

Subp. 3. **Ladders.** Pool ladders must be corrosion-resistant and equipped with nonslip treads.

A. All ladders must provide a handhold and be rigidly installed.

B. There must be a clearance of not more than five inches nor less than three inches between any ladder and the pool wall.

Subp. 4. **Handrails.** When stepholes or ladders are provided in the pool, handrails must be provided that extend over the coping or edge of the deck.

Subp. 5. **Handholds; coping.** All pools, except wading pools and spa pools, must have a continuous handhold along the pool edge.

A. Handholds must be no more than nine inches above the normal water line.

B. Where bull-nosed coping is used, it must not be over 2-1/2 inches thick for the outer two inches.

C. If brick coping is used, it must be completely rounded on the pool side, overhang the pool wall 1-1/2 inches, and slope away from the pool at least one-half inch over the length of the brick.

Subp. 6. **Diving boards.** Supports, platforms, and steps for diving boards must safely carry the maximum anticipated load.

A. Steps must be corrosion-resistant, cleanable, and constructed of nonslip material.

B. Handrails must be provided for all steps and ladders leading to any diving board more than one meter above the water.

C. Platforms and diving boards over one meter above the water must be protected with guardrails.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3300 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3350 DECKS AND WALKWAYS.

A continuous deck, free from fixed obstruction, at least five feet wide, must extend completely around the pool. The deck must be sloped away from the pool to drain at a grade of one-fourth inch per lineal foot. The deck must have a nonslip, nonabsorbent surface.

A. Deck drains connected to the recirculation system or gutters are prohibited for new installations.

B. Carpeting must not be used within ten feet of the pool unless it is outside the required deck area and separated from the deck by an effective access barrier. In deck areas where carpeting is contiguous to the deck area, water must be conveyed away from the carpeted area.

C. Wood decking is prohibited.

D. A minimum ceiling clearance of seven feet is required above pool edges and pool decks.

(1) Where diving boards are provided, ceiling clearances must comply with part 4717.3750.

(2) Greater heights must be provided as necessary to accommodate the use of slides or to comply with state building code requirements.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3400 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3450 LIGHTING, VENTILATION, AND ELECTRICAL REQUIREMENTS.

Subpart 1. **Lighting.** Lighting must meet the criteria in this part.

A. When underwater lighting is used, not less than 0.5 watts shall be employed per square foot of pool water surface area.

B. Light must be located to provide illumination so all portions of the pool, including the bottom, may be seen without glare.

C. Area lighting must provide at least ten footcandles of illumination at all locations on the pool surface and on any deck within five feet of the pool whenever the pool is in use.

D. A pool used for education, training, or competition must have at least 30 footcandles of illumination on the pool surface and on any deck within five feet of the pool.

E. Security lighting, when provided, must illuminate the entire pool area to make it readily visible.

Subp. 2. **Ventilation.** All indoor pools, dressing rooms, shower rooms, and toilet space must be ventilated by mechanical means.

A. Pool equipment rooms must have natural or mechanical ventilation.

B. For new installations, ventilation must comply with the Minnesota Building Code.

C. Gas chlorine rooms must have mechanical ventilation as specified in part 4717.2630, subpart 2.

Subp. 3. **Electrical.** All electrical installations must conform with the standards of the Board of Electricity effective at the time of installation.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3475 STARTING BLOCKS AND PLATFORMS; SLIDES; OTHER OBJECTS.

Subpart 1. **Starting block or platform use.** Starting blocks or starting platforms located at any pool area with a water depth of less than five feet must be removed when the pool is used for other than supervised competitive swimming or training for competitive swimming. For installations after January 1, 1995, all starting blocks or starting platforms must be positioned at a water depth of five feet or greater.

Subp. 2. **Play equipment.** All play equipment at a pool must be specifically designed for pool use and installed in accordance with the safe use parameters specified by the manufacturer and the requirements of the commissioner. All slides used at a pool must meet the requirements specified in part 4717.3870.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3500 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3550 DRESSING ROOMS.

When dressing rooms are provided for both sexes, they must be separated by a tight partition and be designated for men or women.

A. The entrances must be screened to break line of sight.

B. Floors and wet paths between showers and the pool must have a smooth, nonslip surface, impervious to moisture, and sloped to a drain.

C. The junctions between walls and floors must be coved or provided with a sealed, easily cleaned joint.

D. Walls and partitions must be of smooth, impervious material, free from cracks or open joints.

E. Lockers must be set either on solid masonry bases four inches high or on legs with the bottom of the locker at least ten inches above the floor. Lockers must be vented.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3600 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3650 TOILETS, LAVATORIES, SHOWERS, AND DRESSING ROOMS.

Subpart 1. **General.** Toilets, showers, and dressing rooms must be conveniently available to pool patrons.

A. Toilets, showers, and dressing rooms may be in a nearby toiletroom, locker room, or, if conveniently available, within the living units of an apartment building, hotel, or similar occupancy.

B. Toilet, shower, lavatory, and locker and other ancillary facilities must be maintained in a sanitary condition to preclude the possibility of spreading pathogens to the pool.

C. When toilet facilities are accessible to pool patrons in the pool area, each toilet facility must include showers which permit nude showering within each toilet facility.

D. At least one shower must be provided which is conveniently located to permit a shower before entering any pool when sauna or exercise facilities are provided.

Subp. 2. **Ratios.** Toilet, handwashing, and shower facilities must be provided according to the following schedule.

	First 300 males	First 300 females	Additional males over 300	Additional females over 300
Water closets	1/100	1/50	1/200	1/100
Urinals	1/100	--	1/200	--
Lavatories	1/100	1/100	1/200	1/200
Showers	1/50	1/50	1/50	1/50

Subp. 3. **Additional fixtures.** Additional sanitation fixtures must be provided for pool facilities with extensive deck areas or facilities that provide other functions in accordance with the sanitation fixture requirements in the state building code.

Subp. 4. **Shower temperature.** Showers must be supplied with water at a temperature of at least 90 degrees Fahrenheit at a rate of at least 2.0 gallons per minute. Thermostatic, tempering, or mixing valves must be installed if necessary to prevent water temperatures in excess of 130 degrees.

Subp. 5. **Layout.** Pool users leaving the dressing room must pass the showers last in route to the pool.

Subp. 6. **Floor finish.** The floor finish between the toilet and shower areas and the pool must be nonslip and nonabsorbent.

Subp. 7. **Wading pool exception.** On-site showers are not required for freestanding wading pools if a free chlorine residual of at least two parts per million is maintained in the pool and the owner of the pool requests that on-site showers not be required.

Subp. 8. **Lighting.** Lighting for toilet, shower, and locker facilities must provide at least ten footcandles illumination measured at floor level.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3675 DRINKING FOUNTAINS.

Drinking fountains must be provided in the pool area for pools over 1,600 square feet.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3700 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3750 STANDARDS FOR POOLS WITH DIVING.

The dimensions of the pool and appurtenances in a diving area must meet the standards in this part.

A. There must be a completely unobstructed clear distance of 16 feet above the diving board measured from the center of the front end of the board. This area must extend at least eight feet behind, eight feet to each side, and 16 feet ahead of the measuring point.

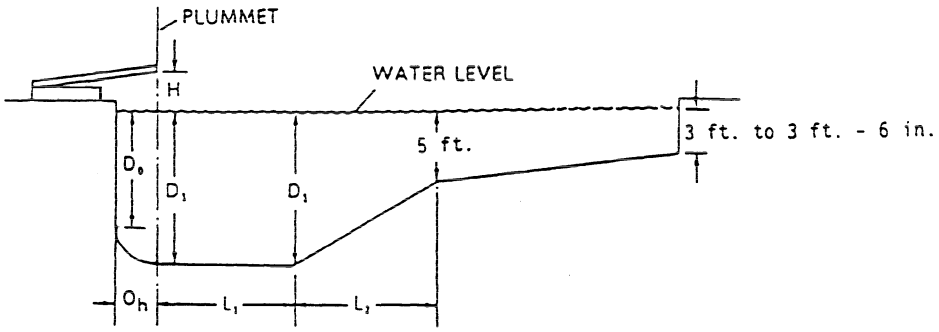
B. Pools used for competitive diving must provide pool depths compatible with the level of competition anticipated.

C. Diving is not permitted, except in areas which conform to the minimum dimensions specified in this part.

D. The dimensions of the diving area in all pools must conform to the minimum dimensions specified in this part.

			Lengths		
Height of Diving Board	Water Depths		Minimum Overhang	Length of Diving Well	Run-out
H	D_o	D_1	O_h	L_1	L_2
Deck Level or no board	6 ft.	8.5 ft.	3 ft.	12 ft.	10.5 ft.
1 m	6 ft.	10 ft.	5 ft.	12 ft.	15 ft.
3 m	6 ft.	12 ft.	5 ft.	13 ft.	21 ft.

			Clearances	
Height of Diving Board	Water Depths		Adjacent Board's Center-to-Center	Center of Board to Sidewall
H	D_o	D_1		
Deck Level or no board	6 ft.	8.5 ft.	10 ft.	10 ft.
1 m	6 ft.	10 ft.	10 ft.	10 ft.
3 m	6 ft.	12 ft.	10 ft.	12 ft.



Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3800 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3850 SPA POOLS.

Subpart 1. **Applicability.** Spa pools must comply with parts 4717.0150 to 4717.3975, except as modified in this part.

Subp. 2. **Recirculation rate.** The recirculation system must recirculate a water volume equal to the pool volume in 30 minutes or less, except that a minimum rate of 35 gallons per minute is required.

Subp. 3. **Inlets.** The recirculation system must have at least two remote inlets to the pool.

Subp. 4. **Main drain.** The main drain must consist of:

A. a grate-covered bottom opening at least 100 square inches in size; or

B. a bottom opening with an antivortex cover.

Subp. 5. **Agitation system.** The agitation system must have a separate pump. If sidewall suction fittings are used, at least two inlets, remotely located, must be provided.

Subp. 6. **Timer.** The agitation system must be controlled by a timer with the control switch accessible to pool users but at least five feet from the pool. The maximum time setting must be 15 minutes.

Subp. 7. **Access.** Access to a spa pool must be provided according to this subpart.

A. Access to the pool must be provided by an unobstructed deck, at the pool elevation, which extends at least five feet from the pool around the entire perimeter.

B. Where a deck cannot be provided as specified in item A, a five-foot wide deck at the pool elevation must extend along at least 25 percent of the pool perimeter. The remaining perimeter must be one foot or less to a wall, partition, or other effective barrier to restrict access. The deck must provide complete and unobstructed access to the steps in the pool.

C. Where access is provided by sitting on the edge of a raised pool and swinging the legs into the pool:

(1) the deck requirement in item A or B must be met;

(2) the pool must be no less than 18 inches nor more than 20 inches above the deck;

(3) steps with equal risers and 12-inch minimum treads must be provided outside the pool which line up with the steps inside the pool; and

(4) the pool edge must not exceed 12 inches in width.

Subp. 8. **Steps.** The requirements for steps in this subpart apply to spa pools.

A. Steps for access to an elevated spa pool must have a handrail and a finished surface that meets the requirements for decks in part 4717.3350.

B. Steps within manufactured spa pools may vary from the dimensions in part 4717.3250, subpart 2, if the commissioner determines that the design is safe.

Subp. 9. **Disinfectant.** The disinfection residual must be maintained in accordance with part 4717.1750, subpart 4.

Subp. 10. **Signs.** In addition to the signs required in parts 4717.1050, 4717.1250, 4717.1350, and 4717.1650 signs with the warnings in items A to C must be posted and plainly visible in the spa pool area.

A. Pregnant women, small children, or persons with heart disease, diabetes, high blood pressure, or low blood pressure should not enter the spa except under advice of a physician.

B. Avoid use while under the influence of alcohol or drugs.

C. Exposure may result in nausea, dizziness, or fainting. Observe a reasonable time limit.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3870 POOL SLIDES.

Subpart 1. **General.** All slides used at a pool must be specifically designed and intended for use with a pool, and for use as a slide.

Subp. 2. **Standard pool slide.** Standard pool slides must meet the Consumer Product Safety Commission Standard "Safety Standard for Swimming Pool Slides," Code of Federal Regulations, title 16, part 1207, as amended through December 18, 1978.

Subp. 3. **Slides in wading pools.** Slides for use by children in wading pools must be designated by the manufacturer for use in 24 inches or less of water, and installed accordingly.

Subp. 4. **Drop slides.** A slide other than a standard pool slide that discharges to a pool with a drop of more than two inches to the water surface must meet the requirements in this subpart.

A. At least one attendant must be continuously present observing the slide and controlling its use.

B. Slide entry areas must be designed so the rider is able to properly enter and position before sliding down the chute. This area must be a platform or flat portion of the chute with assist bars.

C. Handrails must be present on both sides of the ladder or steps. Platforms and landings must have 42-inch high guardrails, with at least one intermediate-height rail.

D. A landing area must be provided that extends five feet on either side of the center line of the slide and from the back wall to 20 feet in front of the slide terminus.

(1) The landing area must not infringe on the required landing area for any other slide or diving equipment.

(2) The landing area must be separated from the rest of the pool.

(3) A slide mounted in a separate diving area may be allowed to use the separate diving area if access to the diving well is restricted to patrons using the slide and diving equipment.

E. Each slide must have a separate dedicated ladder or stair to exit the pool.

F. The terminus of the slide chute must extend beyond the pool wall and be so oriented that the landing area in front of the slide does not interfere with the landing area of another slide or other pool equipment.

G. The maximum angle of the slide runway at the exit must be between zero degrees and 11 degrees, measured downward from horizontal.

H. The area from the slide terminus outward to six feet in front of the slide terminus must have a depth as specified in this item.

(1) The slide must provide for the entrance of the rider into the water in this six-foot area.

(2) If the depth of the terminus area is five feet or less, the bottom of this area must have a maximum slope of one inch in 12 inches and the slide must be located at least five feet from any change to steeper slope of the pool bottom.

(3) If the slide exit is 12 inches or less above the water, the water depth from the slide terminus to six feet in front of the terminus must be in the four to five feet range.

(4) If the slide exit is more than 12 inches above the water, the water depth from the slide terminus to six feet in front of the terminus must be at least eight feet.

I. The maximum drop height at the terminus of the slide must not exceed 42 inches.

J. If water is pumped from a pool to the slide, the pump intake must be enclosed or constructed to prevent injury or entrapment of pool users. Intake velocity must not exceed 1-1/2 feet per second.

K. Slides must be located and constructed to allow easy supervision. When a slide is not supervised, or not open for use, it must be secured to prevent access.

L. The slide must have posted a set of rules that include the requirements in subitems (1) to (6).

(1) One rider at a time. Wait until the landing area is clear before entering the slide.

(2) Slide in a sitting position or on the back only.

(3) Do not attempt to stop on the slide.

(4) Leave plunge area immediately.

(5) WARNING: Water depth is ..... feet.

(6) Nonswimmers not permitted. (If landing area water depth is over five feet.)

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3875 FLUME WATER SLIDES.

Subpart 1. **Applicability.** A flume water slide facility must comply with parts 4717.0150 to 4717.3975, except as modified in this part.

Subp. 2. **Attendant required.** When the flume is in use, at least one attendant must be continuously present, observing the flume and controlling its use.

Subp. 3. **Discharge pool.** A flume must discharge to a dedicated plunge pool or dedicated area of a pool with a separate ladder or stairs.

A. The pool's operating water depth at the end of the flume must be no less than three feet and no more than three feet six inches.

B. The depth specified in item A must be maintained in front of the flume's discharge point for a distance of at least ten feet.

C. Steps with handrails or a ladder must be provided at the exit from the pool.

Subp. 4. **Flume exit design.** The exit end of the flume must be perpendicular to the plunge pool wall for a distance of at least ten feet.

A. The flume must terminate no more than six inches below the pool operating water surface level and no more than two inches above the pool operating water surface level.

B. The side of the exit end of the flume must be at least four feet from the side of the pool wall.

C. The distance between the sides of any adjacent flume exit must be at least six feet.

D. The distance between a flume exit end and the opposite side of the pool must be at least 20 feet.

Subp. 5. **Water reservoirs.** Water pumped to the top of a flume must be pumped from a reservoir connected to the pool.

A. The reservoir must be inaccessible to patrons.

B. The reservoir must be secured to prevent unauthorized access.

C. Intakes must enable cleaning and be designed to prevent entrapment of patrons.

D. Where any entrance to a pump reservoir presents an underwater obstruction, patron access to that area must be prevented.

E. Water inlet velocity to the reservoir must not exceed 1-1/2 feet per second.

Subp. 6. **Pump valves.** Each flume pump discharge pipe must have a check valve. The volume of water in the pool during use and shutdown of any flume pump must permit proper operation of the recirculation system.

Subp. 7. **Dedicated plunge pools.** The recirculation system for a dedicated plunge pool must recirculate the water in accordance with part 4717.2560, subpart 4.

Subp. 8. **Walkway, stairs, and platform surfaces.** Walkways from the pool deck to the top of the flume or tower, the tower stairs, and platforms must have finished surfaces which meet the requirements for decks in part 4717.3350.

Subp. 9. **Fencing.** Fencing complying with part 4717.1550 or other enclosure must encompass the pool deck, walkways, and flume access.

Subp. 10. **Flume plan content; certification.** Flume design plans must include:

A. flume construction and layout details;

B. flume support structure details;

C. tower structure, stair, and platform details; and

D. all related construction details.

Flume support and tower structure plans must be certified by a registered engineer or approved by a local building official for structural integrity.

Subp. 11. **Signs.** A legible sign with the warnings in this subpart must be located at the entrance to each flume slide.

A. Do not use this slide while under the influence of alcohol or drugs.

B. Follow the instructions of the flume attendant.

C. No running, standing, kneeling, rotating, tumbling, or stopping in the flume.

D. Only one person at a time.

E. Keep your hands inside the flume.

F. No diving from the flume.

G. Leave the flume pool promptly after entering.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3900 [Repealed, 19 SR 1419; 19 SR 1637]

4717.3950 WAVE POOLS.

Subpart 1. **Applicability.** Wave pools must comply with parts 4717.0150 to 4717.3975, except as modified in this part.

Subp. 2. **Lifeguard required.** When the wave pool is in use:

A. the minimum number of lifeguards who must be continuously present must be one for every 2,000 square feet of pool surface water where the pool depth is greater than two feet; and

B. where the design, configuration, or operation requires additional lifeguards to provide complete observation of the entire pool they must be provided in addition to those required in item A.

Subp. 3. **Water depth.** Water depth may reduce to zero at the shallow end of the pool to allow for dissipation of the waves.

Subp. 4. **Access barriers.** In addition to the fencing required in part 4717.1550, a safety barrier of stanchions and ropes or a similar barrier at least 42 inches high must be located to prevent pool patrons from entering the pool at any location other than at the zero water depth end. The barrier must have at least one intermediate height rope.

Subp. 5. **Emergency shut off.** An emergency shut off for wave generation must be provided at every lifeguard chair or station.

Subp. 6. **Wave strength.** The wave generating equipment must not be capable of producing waves that could cause pool users to have contact with the pool bottom in a manner which may cause injury.

Subp. 7. **Overflow gutters.** Overflow gutters may be omitted along the side of a pool with the wave generating equipment.

A. If overflow gutters are not provided on the pool side where the wave generating equipment is located, effective skimming devices are required and must be designed and maintained to function continuously during all periods when waves are not generated.

B. Overflow gutters are required on the sides of the pool where the wave generating equipment is not installed.

C. A gutter is required along the zero depth end of the pool.

Subp. 8. **Decks.** Deck areas accessible to pool users may be omitted along the side of the pool with the wave generating equipment.

Subp. 9. **Recirculation system.** The recirculation system must operate at a rate equivalent to recirculating the total volume of water in the pool in four hours or less. A system of bottom inlets must be provided in the shallow end.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3970 POOL CLOSURE.

When any of the conditions in items A to E are found, a public pool must be immediately closed to use when so ordered by the commissioner. The owner of the pool or the owner's agent must place a sign at the entrance to the pool indicating that the pool is closed. The pool must remain closed until the condition is corrected and approval to reopen is granted by the commissioner. A pool must be closed when:

A. the units of lifesaving equipment specified in part 4717.1450 are not provided;

B. the water clarity standard specified in part 4717.1750, subpart 7, is not met;

C. the disinfection residual specified in part 4717.1750 subpart 3, is not met;

D. the pool has been constructed or physically altered without approval of plans as required by part 4717.0450; or

E. there is any condition that endangers the health or safety of the public.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

4717.3975 VARIANCE.

The commissioner shall grant a variance to parts 4717.0100 to 4717.3950 only according to the procedures and criteria specified in parts 4717.7000 to 4717.7050.

Statutory Authority: *MS s 144.05; 144.12; 144.123; 145A.02; 157.01*

History: *19 SR 1419; 19 SR 1637*

ON-LAND DISPOSAL FACILITIES FOR SEWAGE AND OTHER WASTES FROM MARINE TOILETS EQUIPPED WITH RETENTION DEVICES

4717.4000 PUMP.

A self-priming pump, suitable for pumping raw sewage or other wastes, and easily serviceable in the event of clogging shall be provided for the on-land disposition of sewage or other wastes from watercraft or other marine conveyance equipped with a marine toilet and retention device. Head characteristics and capacity shall be based on installation needs for the site; however, as a minimum the pump shall be capable of lifting sewage or other wastes 12 feet. The pump may be either fixed in position or portable mounted.

Statutory Authority: *MS s 144.12*

4717.4100 SUCTION HOSE.

The suction hose shall be pliable, noncollapsible, nonkinking, and a minimum of 15 feet in length. It shall have a smooth interior. A quick-connect drip-proof connector shall be fitted to the end of the hose that is attached to the boat piping outlet. Such connector should be capable of a friction fit in the inside diameter of a 1-1/2-inch Schedule 40 pipe.

Statutory Authority: *MS s 144.12*

4717.4200 DISCHARGE HOSE.

Flexible hose, compatible with the pump characteristics, shall be used. The discharge hose and suction hose of part 4717.4100 shall be labeled and color-coded brown. All permanent piping shall conform to the Minnesota State Plumbing Code, parts 4715.0100 to 4715.6000.

Statutory Authority: *MS s 144.12*

4717.4300 SEWAGE OR OTHER WASTE DISPOSAL REQUIREMENTS.

When connection to a public sanitary sewer is available, the disposal piping shall be designed to discharge thereto.

When a public sewer is not available, a private sewage disposal system installed in compliance with applicable state standards shall be provided unless adequate private treatment and disposal systems are already available. The sewage disposal system may be either a septic tank-soil absorption system or a holding tank.

Statutory Authority: *MS s 144.12*

4717.4400 WATER SUPPLY REQUIREMENTS.

The on-land disposal facility shall be served by a water supply piping system to permit flushing of the facilities serviced. If a potable water supply is the source of flushing, the distribution piping shall be protected from back-siphonage and back-pressure, labeled, and color-coded brown from the back-siphonage, back-pressure device to the end of the hose. A separate hose shall be provided for filling the drinking water system of the watercraft or other marine conveyance. That hose shall be labeled and color-coded blue.

Statutory Authority: *MS s 144.12*

4717.4500 PLAN APPROVAL.

Subpart 1. **Plans submitted.** Two sets of plans and specifications for the proposed construction of new, or modification of existing on-land disposal facilities for the receipt of sewage or other wastes from watercraft or other marine conveyances equipped with marine toilets and retention devices shall be submitted to the Minnesota Department of Health. The proposed modification or construction of the on land disposal facilities shall not commence until the plans and specifications are approved, in writing, by the Department of Health. If the disposal system is designed to discharge an effluent to the waters of the state, or involves a sewer extension from a municipal sewer system, plan approval and a permit shall also be obtained from the Minnesota Pollution Control Agency.

Subp. 2. **Content of plans.** At a minimum, plans and specifications shall cover in detail the materials to be used, the pump characteristics, and the water supply system. Where applicable, the connection to the public sewer or the private disposal system, the size and construction details of the septic or holding tank, results of soil percolation tests and soil borings and the construction details of the soil absorption system shall be included. Location of all wells within 100 feet of the absorption system, the surface water high water level and the general topography of the area shall be shown on the plans.

Subp. 3. **Plan approval.** Plans and specifications will not be reviewed for approval until they are submitted in sufficient detail to permit proper evaluation for compliance with Minnesota Statutes, sections 86B.325; 86B.401, subdivision 1, paragraph (c); and 86B.535; and these and all other applicable rules. The plan approval required by this section shall be in addition to any other permit, approval, or license required by federal, state, or local law.

Statutory Authority: *MS s 144.12*

4717.4600 [Repealed, 14 SR 1874]

4717.4700 [Repealed, 14 SR 1874]

4717.4800 [Repealed, 14 SR 1874]

4717.4900 [Repealed, 14 SR 1874]

4717.5000 [Repealed, 14 SR 1874]

4717.5100 [Repealed, 14 SR 1874]

4717.5200 [Repealed, 14 SR 1874]

4717.5300 [Repealed, 14 SR 1874]

4717.6000 [Repealed, 15 SR 1842]

4717.6100 [Repealed, 15 SR 1842]

4717.6200 [Repealed, 15 SR 1842]

4717.6300 [Repealed, 15 SR 1842]

4717.6400 [Repealed, 15 SR 1842]

4717.6500 [Repealed, 15 SR 1842]

4717.6600 [Repealed, 15 SR 1842]

4717.6700 [Repealed, 15 SR 1842]

4717.6800 [Repealed, 15 SR 1842]

4717.6900 [Repealed, 15 SR 1842]

VARIANCES

4717.7000 VARIANCE REQUEST.

Subpart 1. **Request.** A party may ask the commissioner of health to grant a variance from the following rules:

A. clean indoor air, parts 4620.0100 to 4620.1500;

B. formaldehyde in housing, part 4620.1800;

C. asbestos abatement, part 4620.3710, item A, and, where space limitations prevent compliance with the specified requirements or where compliance with the specified requirements would create a greater hazard, parts 4620.3566, 4620.3567, 4620.3568, subparts 1 to 4, 4620.3569, 4620.3571, subparts 1 and 2, and 4620.3575, subpart 3;

D. lodging establishments, parts 4625.0400 to 4625.0600; 4625.0900; 4625.1200 to 4625.1600; 4625.2000, except the last sentence; and 4625.2200;

E. manufactured home parks and recreational camping areas, parts 4630.0400; 4630.0600, subparts 2 to 4; and 4630.0900 to 4630.1700;

F. children's camps, parts 4630.2300 to 4630.4700;

G. roller towels, part 4635.0200;

H. enclosed sports arenas, parts 4620.3900 to 4620.4800, except part 4620.4300;

I. [Repealed, L 2007 c 140 art 13 s 3]

J. public swimming pools, parts 4717.0100 to 4717.3900;

K. general requirements for construction of surface water and groundwater under the direct influence of surface water treatment facilities, parts 4720.3920 to 4720.3965;

L. water haulers, parts 4720.4000 to 4720.4600;

M. wellhead protection, parts 4720.5200 to 4720.5570;

N. wells and borings, parts 4725.0100 to 4725.7450;

O. explorers and exploratory borings, parts 4727.0100 to 4727.1300;

P. explorers and exploratory borings, parts 4727.0100 to 4727.1300;

Q. ionizing radiation, parts 4732.0100 to 4732.1130, except parts 4732.0200 and 4732.0210; and

R. lead poisoning prevention, parts 4761.2000 to 4761.2700, except parts 4761.2000, 4761.2100, 4761.2200, 4761.2220, and 4761.2510.

Subp. 2. **Procedures for requesting a variance.** The procedures in this subpart apply to a request for a variance of the rules specified in subpart 1. Additional procedures may be specified in the rules listed in subpart 1 which also must be complied with. The party requesting the variance must submit the variance request in writing to the commissioner of health along with any applicable fee. A request must contain:

A. the specific language in the rule or rules 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 the commissioner determines necessary to properly evaluate the request for the variance.

Subp. 3. **Applicant for a variance.** The applicant for a variance must be the party to whom the rule specified in subpart 1 applies.

Statutory Authority: *MS s 14.05; 14.388; 31.101; 31.11; 103I.101; 103I.221; 103I.301; 103I.621; 144.05; 144.08; 144.12; 144.123; 144.383; 144.9508; 145A.02; 157.01; 157.011; 157.04; 157.08; 157.09; 157.13; 326.70 to 326.81*

History: *15 SR 1597; 17 SR 2773; 19 SR 1419; 19 SR 1637; 20 SR 2765; 22 SR 314; 22 SR 668; 23 SR 519; 23 SR 1591; 26 SR 31; 28 SR 147; 29 SR 531; L 2007 c 140 art 13 s 3; 33 SR 1771*

4717.7010 CRITERIA FOR DECISION; CONDITIONS.

Subpart 1. **Criteria for granting a variance.** The commissioner may grant a variance if:

A. the variance was requested in a manner prescribed by part 4717.7000;

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 those prescribed in the 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.

Subp. 2. **Conditions for variance.** In granting a variance the commissioner may attach conditions the commissioner determines are needed to protect public health, safety, or the environment.

Subp. 3. **Future effect.** A variance shall have only future effect.

Statutory Authority: *MS s 14.05*

History: *15 SR 1597*

4717.7020 NOTIFICATION OF DECISION.

The commissioner of health shall notify the party in writing of the commissioner's decision to grant or deny the variance. If a variance is granted, the notification must specify the period of time for which the variance will be effective and the alternative measures or

conditions, if any, the applicant must meet. If a variance is denied, the commissioner of health shall specify the reasons for the denial.

Statutory Authority: *MS s 14.05*

History: *15 SR 1597*

4717.7030 EFFECT OF ALTERNATIVE MEASURES OR CONDITIONS.

Alternative measures or conditions attached to a variance have the force and effect of the applicable rule. If the party violates the alternative measures or conditions attached to the variance, the party is subject to the enforcement actions and penalties provided in the applicable law or rule. The party to whom a variance has been issued must notify the commissioner of health in writing within 30 days of any material change in the conditions upon which the variance was granted.

Statutory Authority: *MS s 14.05*

History: *15 SR 1597*

4717.7040 RENEWAL OF VARIANCE.

A request for the renewal of a variance must be submitted to the commissioner of health in writing 30 days before its expiration date. Renewal requests must contain the information specified in part 4717.7000, subpart 2. The commissioner shall renew a variance if the party continues to satisfy the criteria contained in part 4717.7010 and demonstrates compliance with the alternative measures or conditions imposed at the time the original variance was approved. This provision does not apply if there has been any material change in the conditions upon which the variance was granted.

Statutory Authority: *MS s 14.05*

History: *15 SR 1597*

4717.7050 DENIAL, REVOCATION, OR REFUSAL TO RENEW; APPEALS.

Subpart 1. **Action.** The commissioner shall deny, revoke, or refuse to renew a variance if the commissioner determines that the criteria in part 4717.7010 are not met.

Subp. 2. **Appeal procedure.** A party may appeal the denial, revocation, or refusal to renew a variance by requesting, in writing, a contested case hearing under the Administrative Procedure Act, Minnesota Statutes, chapter 14, within 30 days of receipt of the notice to deny, revoke, or refuse to renew the variance.

Statutory Authority: *MS s 14.05*

History: *15 SR 1597*

4717.7100 [Repealed, 33 SR 1792]

4717.7150 Subpart 1. [Repealed, 33 SR 1792]

Subp. 2. [Repealed, 33 SR 1792]

Subp. 3. [Repealed, 33 SR 1792]

Subp. 4. [Repealed, 33 SR 1792]

Subp. 5. [Repealed, 19 SR 1191]

Subp. 6. [Repealed, 33 SR 1792]

Subp. 7. [Repealed, 33 SR 1792]

Subp. 8. [Repealed, 33 SR 1792]

Subp. 9. [Repealed, 33 SR 1792]

Subp. 10. [Repealed, 33 SR 1792]

Subp. 11. [Repealed, 33 SR 1792]

4717.7200 [Repealed, 33 SR 1792]

4717.7300 [Repealed, 33 SR 1792]

4717.7400 [Repealed, 33 SR 1792]

HEALTH RISK LIMITS

4717.7500 TABLE OF HEALTH RISK LIMITS.

Subpart 1. **Generally.** This part contains the table of the health risk limits. For each substance or chemical listed in a subpart, the information required by part 4717.7400 shall be specified in the manner required by this subpart.

CAS RN	RfD* (milligrams per kilogram per day)	Slope factor* (the inverse of milligrams per kilogram per day)	Health Risk Limit (micro-grams per liter)
Subp. 2. **Acenaphthene.** Acenaphthene:			
83-32-9	0.06	--	400
Subp. 3. [Repealed, 35 SR 1395]			
Subp. 3a. [Repealed, 35 SR 1395]			
Subp. 4. **Aldicarb.** Aldicarb:			
116-06-3	0.0002	--	1
Subp. 4a. **Allyl chloride (3 chloropropene).** Allyl chloride (3 chloropropene):			
107-05-1	0.05 (C)	--	30
Subp. 5. **Anthracene.** Anthracene:			
120-12-7	0.3	--	2,000
Subp. 6. **Antimony.** Antimony:			
7440-36-0	0.0004	--	6
Subp. 6a. [Repealed, 35 SR 1395]			
Subp. 7. **Barium.** Barium:			
7440-39-3	0.07	--	2,000
Subp. 8. [Repealed, 35 SR 1395]			
Subp. 9. **Benzoic acid.** Benzoic acid:			
65-85-0	4	--	30,000
Subp. 10. **Beryllium.** Beryllium:			
7440-41-7	--	4.3	0.08
Subp. 11. **1,1-Biphenyl (Diphenyl).** 1,1-Biphenyl (Diphenyl):			
92-52-4	0.05	--	300
Subp. 12. **Bis(chloroethyl)ether (BCEE).** Bis(chloroethyl)ether (BCEE):			
111-44-4	--	1.1	0.3

Subp. 13. **Bis(chloromethyl)ether (BCME).** Bis(chloromethyl)ether (BCME):

542-88-1	--	220	0.002

Subp. 14. [Repealed, 35 SR 1395]

Subp. 15. **Bromodichloromethane.** Bromodichloromethane:

75-27-4	--	0.062	6

Subp. 16. **Bromoform.** Bromoform:

75-25-2	--	0.0079	40

Subp. 17. **Bromomethane (Methyl bromide).** Bromomethane (Methyl bromide):

74-83-9	0.0014	--	10

Subp. 18. **n-Butanol.** n-Butanol:

71-36-3	0.1	--	700

Subp. 19. **Butyl benzyl phthalate.** Butyl benzyl phthalate:

85-68-7	0.2 (C)	--	100

Subp. 20. **Butylphthalyl butylglycolate (BPBG).** Butylphthalyl butylglycolate (BPBG):

85-70-1	1	--	7,000

Subp. 21. **Cadmium.** Cadmium:

7440-43-9	0.0005	--	4

Subp. 22. **Carbon disulfide.** Carbon disulfide:

75-15-0	0.1	--	700

Subp. 23. **Carbon tetrachloride.** Carbon tetrachloride:

56-23-5	--	0.13	3

Subp. 23a. **Chloramben.** Chloramben:

133-90-4	0.015	--	100

Subp. 24. **Chlorobenzene.** Chlorobenzene:

108-90-7	0.02	--	100

Subp. 25. [Repealed, 35 SR 1395]

Subp. 26. **2-Chlorophenol.** 2-Chlorophenol:

95-57-8	0.005	--	30

Subp. 26a. **Chlorothalonil.** Chlorothalonil:

1897-45-6	--	0.011	30

Subp. 26b. **Chromium III.** Chromium III:

16065-83-1	1	--	20,000

Subp. 27. **Chromium VI.** Chromium VI:

18540-29-9	0.005	--	100

Subp. 28. **Cumene (Isopropyl benzene).** Cumene (Isopropyl benzene):

98-82-8	0.04	--	300

Subp. 29. **Cyanide, free.** Cyanide, free:

57-12-5	0.02	--	100

Subp. 30. **Dibromochloromethane.** Dibromochloromethane:

124-48-1	0.02 (C)	--	10

Subp. 31. **1,2-Dibromoethane (Ethylene dibromide, EDB).** 1,2-Dibromoethane (Ethylene dibromide, EDB):

106-93-4	--	85	0.004

Subp. 32. **Dibutyl phthalate.** Dibutyl phthalate:

84-74-2	0.1	--	700

Subp. 33. **Dicamba.** Dicamba:

1918-00-9	0.03	--	200

Subp. 34. **1,2-Dichlorobenzene.** 1,2-Dichlorobenzene:

95-50-1	0.09	--	600

Subp. 34a. **1,4-Dichlorobenzene (para).** 1,4-Dichlorobenzene (para):

106-46-7	--	0.024	10

Subp. 35. **3,3'-Dichlorobenzidine.** 3,3'-Dichlorobenzidine:

91-94-1	--	0.45	0.8

Subp. 36. [Repealed, 35 SR 1395]

Subp. 37. **p,p'-Dichlorodiphenyl dichloroethane (DDD).** p,p'-Dichlorodiphenyl dichloroethane (DDD):

72-54-8	--	0.24	1

Subp. 38. **p,p'-Dichlorodiphenyldichloroethylene (DDE).** p,p'-Dichlorodiphenyldichloroethylene (DDE):

72-55-9	--	0.34	1

Subp. 39. **p,p'-Dichlorodiphenyltrichloroethane (DDT).** p,p'-Dichlorodiphenyl-trichloroethane (DDT):

50-29-3	--	0.34	1

Subp. 39a. [Repealed, 35 SR 1395]

Subp. 40. **1,2-Dichloroethane.** 1,2-Dichloroethane:

107-06-2	--	0.091	4

Subp. 40a. [Repealed, 35 SR 1395]

Subp. 41. [Repealed, 35 SR 1395]

Subp. 42. **1,2-Dichloroethylene, trans-.** 1,2-Dichloroethylene, trans-:

156-60-5	0.02	--	100

Subp. 43. [Repealed, 35 SR 1395]

Subp. 44. **2,4-Dichlorophenol.** 2,4-Dichlorophenol:

120-83-2	0.003	--	20

Subp. 45. **2,4-Dichlorophenoxyacetic acid (2,4-D).** 2,4-Dichlorophenoxyacetic acid (2,4-D):

94-75-7	0.01	--	70

Subp. 45a. **1,2-Dichloropropane.** 1,2-Dichloropropane:

78-87-5	--	0.068	5

Subp. 45b. **1,3-Dichloropropene.** 1,3-Dichloropropene:

542-75-6	--	0.18	2

Subp. 46. [Repealed, 35 SR 1395]

Subp. 47. **Diethyl phthalate.** Diethyl phthalate:

84-66-2	0.8	--	6,000

Subp. 48. **2,4-Dimethylphenol.** 2,4-Dimethylphenol:

105-67-9	0.02	--	100

Subp. 48a. **Dimethylphthalate.** Dimethylphthalate:

131-11-3	10	--	70,000

Subp. 49. **2,4-Dinitrophenol.** 2,4-Dinitrophenol:

51-28-5	0.002	--	10

Subp. 49a. **Disulfoton.** Disulfoton:

298-04-4	0.00004	--	0.3

Subp. 50. [Repealed, 35 SR 1395]

Subp. 51. **S-Ethyl dipropylthiocarbamate (EPTC).** S-Ethyl dipropylthiocarbamate (EPTC):

759-94-4	0.025	--	200

Subp. 52. [Repealed, 35 SR 1395]

Subp. 52a. [Repealed, 35 SR 1395]

Subp. 53. **Fluoranthene.** Fluoranthene:

206-44-0	0.04	--	300

Subp. 54. **Fluorene (9H-Fluorene).** Fluorene (9H-Fluorene):

86-73-7	0.04	--	300

Subp. 54a. **Formaldehyde.** Formaldehyde:

50-00-0	0.2	--	1,000

Subp. 55. **Heptachlor.** Heptachlor:

76-44-8	--	4.5	0.08

Subp. 56. **Heptachlor epoxide.** Heptachlor epoxide:

1024-57-3	--	9.1	0.04

Subp. 57. **Hexachlorobenzene.** Hexachlorobenzene:

118-74-1	--	1.6	0.2

Subp. 58. **Hexachlorobutadiene.** Hexachlorobutadiene:

87-68-3	0.002 (C)	--	1

Subp. 58a. **Hexane (n-hexane).** Hexane (n-hexane):

110-54-3	0.06	--	400

Subp. 59. **Isophorone.** Isophorone:

78-59-1	0.2 (C)	--	100

Subp. 60. **Linuron.** Linuron:

330-55-2	0.002 (C)	--	1

Subp. 61. **Manganese.** Manganese:

7439-96-5	0.005	--	100

Subp. 61a. **Methanol.** Methanol:

67-56-1	0.5	--	3,000

Subp. 62. **2-Methyl-4-chlorophenoxyacetic acid (MCPA).** 2-Methyl-4-chlorophenoxyacetic acid (MCPA):

94-74-6	0.0005	--	3

Subp. 62a. **Methyl ethyl ketone (MEK, 2-butanone).** Methyl ethyl ketone (MEK, 2-butanone):

78-93-3	0.6	--	4,000

Subp. 62b. **Methyl isobutyl ketone (MIBK).** Methyl isobutyl ketone (MIBK):

108-10-1	0.05	--	300

Subp. 63. **2-Methylphenol (o-cresol).** 2-Methylphenol (o-cresol):

95-48-7	0.05 (C)	--	30

Subp. 64. **3-Methylphenol (m-cresol).** 3-Methylphenol (m-cresol):

108-39-4	0.05 (C)	--	30

Subp. 64a. **4-Methylphenol (p-cresol).** 4-Methylphenol (p-cresol):

106-44-5	0.005 (C)	--	3

Subp. 65. [Repealed, 35 SR 1395]

Subp. 66. **Metribuzin.** Metribuzin:

21087-64-9	0.025	--	200

Subp. 66a. **Naphthalene.** Naphthalene:

91-20-3	0.04	--	300

Subp. 67. **Nickel, soluble salts.** Nickel, soluble salts:

7440-02-0	0.02	--	100

Subp. 68. [Repealed, 35 SR 1395]

Subp. 69. **N-Nitrosodiphenylamine.** N-Nitrosodiphenylamine:

86-30-6	--	0.0049	70

Subp. 70. [Repealed, 35 SR 1395]

Subp. 70a. MR 2008 [Expired]

Subp. 70b. MR 2008 [Expired]

Subp. 71. **Phenol.** Phenol:

108-95-2	0.6	--	4,000

Subp. 72. **Picloram.** Picloram:

1918-02-1	0.07	--	500

Subp. 72a. **Polychlorinated biphenyls (PCBs).** Polychlorinated biphenyls (PCBs):

1336-36-3	--	7.7	.04

Subp. 73. **Prometon.** Prometon:

1610-18-0	0.015	--	100

Subp. 74. **Propachlor.** Propachlor:

1918-16-7	0.013	--	90

Subp. 75. **Pyrene.** Pyrene:

129-00-0	0.03	--	200

Subp. 76. **Selenium.** Selenium:

7782-49-2	0.005	--	30

Subp. 77. **Silver.** Silver:

7440-22-4	0.005	--	30

Subp. 77a. [Repealed, 35 SR 1395]

Subp. 78. **1,1,1,2-Tetrachloroethane.** 1,1,1,2-Tetrachloroethane:

630-20-6	0.03 (C)	--	70

Subp. 78a. **1,1,2,2-Tetrachloroethane.** 1,1,2,2-Tetrachloroethane:

79-34-5	--	0.2 (C)	2

Subp. 78b. [Repealed, 35 SR 1395]

Subp. 78c. **Thallium salts.** Thallium salts:

7440-28-0	0.00008	--	0.6

Subp. 78d. **Tin.** Tin:

7440-31-5	0.6	--	4,000

Subp. 79. [Repealed, 35 SR 1395]

Subp. 80. **Toxaphene.** Toxaphene:

8001-35-2	--	1.1	0.3

Subp. 80a. [Repealed, 35 SR 1395]

Subp. 81. **1,1,2-Trichloroethane.** 1,1,2-Trichloroethane:

79-00-5	0.004 (C)	--	3

Subp. 81a. [Repealed, 35 SR 1395]

Subp. 82. **Trichlorofluoromethane.** Trichlorofluoromethane:

75-69-4	0.3	--	2,000

Subp. 83. **2,4,6-Trichlorophenol.** 2,4,6-Trichlorophenol:

88-06-2	--	0.011	30

Subp. 84. **2,4,5-Trichlorophenoxyacetic acid (2,4,5-T).** 2,4,5-Trichlorophenoxyacetic acid (2,4,5-T):

93-76-5	0.01	--	70

Subp. 85. [Repealed, 35 SR 1395]

Subp. 86. **1,2,3-Trichloropropane.** 1,2,3-Trichloropropane:

96-18-4	0.006	--	40

Subp. 87. **1,1,2-Trichloro-1,2,2-trifluoroethane.** 1,1,2-Trichloro-1,2,2-trifluoroethane:

76-13-1	30	--	200,000

Subp. 88. **1,3,5-Trinitrobenzene.** 1,3,5-Trinitrobenzene:

99-35-4	0.00005	--	0.3

Subp. 88a. **Vanadium.** Vanadium:

7440-62-2	0.007	--	50

Subp. 88b. [Repealed, 35 SR 1395]

Subp. 89. [Repealed, 35 SR 1395]

Subp. 89a. **Zinc.** Zinc:

7440-66-6	0.3	--	2,000

Subp. 90. **Reference doses and slope factors.** For purposes of this part:

* Substances or chemicals that have an RfD or slope factor annotated with a (C) are classified by the United States Environmental Protection Agency as possible human carcinogens.

Statutory Authority: *MS s 103H.201; L 2007 c 37*

History: *18 SR 1340; 19 SR 1191; 32 SR 373; 35 SR 1395*

4717.7600 [Repealed, 33 SR 1792]

4717.7650 [Repealed, 33 SR 1792]

4717.7700 [Repealed, 33 SR 1792]

4717.7750 [Repealed, 33 SR 1792]

4717.7800 [Repealed, 33 SR 1792]

4717.7810 HEALTH RISK LIMITS; PURPOSE AND SCOPE.

Subpart 1. **Purpose.** The purpose of parts 4717.7810 to 4717.7900 is to establish health risk limits (HRLs) for substances found to degrade Minnesota groundwater.

Subp. 2. **Scope.**

A. As provided by Minnesota Statutes, sections 103H.005, subdivision 3, and 103H.201, subdivision 1, HRLs are derived as human health-based groundwater standards based on cancer or noncancer effects from consumption and federal maximum contaminant levels incorporated by reference as required by Laws 2007, chapter 147, article 17, section 2.

B. Health risk limits are for use by public agencies and private entities in Minnesota in determining whether groundwater, impacted by human activity, is subject to regulatory or advisory actions based on human health concerns. HRLs specify a minimum level of quality for water used for human consumption, such as ingestion of water, and do not imply that allowing degradation of water supplies to HRL levels is acceptable.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7820 DEFINITIONS.

Subpart 1. **Scope.** For the purposes of parts 4717.7810 to 4717.7900, the terms in this part have the meanings given them.

Subp. 2. **$AF_{lifetime}$ or lifetime adjustment factor.** "$AF_{lifetime}$" or "lifetime adjustment factor" is a numerical multiplier used to modify the adult-based cancer slope factor for lifetime exposure based on chemical-specific data.

Subp. 3. **ADAFs or age-dependent adjustment factors.** "ADAFs" or "age-dependent adjustment factors" are the default modifiers to the cancer slope factor that account for the increased susceptibility to cancer from early life exposures to linear carcinogens in the absence of chemical-specific data. For the default derivation of cancer HRLs, the following ADAFs and corresponding age groups are utilized:

$ADAF_{<2}$=10, for birth until two years of age; $ADAF_{2\ to\ <16}$=3, for two up to 16 years of age; and $ADAF_{16+}$=1, for 16 years of age and older.

Subp. 4. **Additional lifetime cancer risk.** "Additional lifetime cancer risk" means the probability that daily exposure to a carcinogen over a lifetime may induce cancer. The Department of Health uses an additional cancer risk of $1x10^{-5}$ (1 in 100,000) to derive cancer HRLs.

Subp. 5. **Carcinogen.** "Carcinogen" means a chemical:

A. classified as a human carcinogen or a probable human carcinogen according to the "EPA Classification System for Categorizing Weight of Evidence for Carcinogenicity from Human and Animal Studies," the Risk Assessment Guidelines of 1986, United States Environmental Protection Agency, Office of Health and Environmental Assessment (August 1987), which is incorporated by reference;

B. classified as "carcinogenic to humans" or "likely to be carcinogenic to humans" according to the Final Guidelines for Carcinogenic Risk Assessment, United States Environmental Protection Agency, Office of Research and Development (March 2005), which are incorporated by reference. The guidelines are not subject to frequent change. The final guidelines are available at: http://cfpub.epa.gov/ncea/cfm/recordisplay.cfm?deid=116283 or through the public library using the Minitex interlibrary loan system; or

C. classified as a substance known to be a human carcinogen or reasonably anticipated to be a human carcinogen in the Report on Carcinogens, United States Department of Health and Human Services, Public Health Service, National Toxicology Program. This report is incorporated by reference and is subject to frequent change. The report is available at: http://ntp.niehs.nih.gov/go/roc.

Subp. 6. **Chemical.** "Chemical" includes a single chemical or a defined mixture of two or more chemicals.

Subp. 7. **Chemical abstracts service registry number or CAS number.** The "chemical abstracts service registry number" or "CAS number" means the number assigned to a chemical by the Chemical Abstracts Service, a division of the American Chemical Society, 2540 Olentangy River Road, Box 3012, Columbus, OH 43210-0012. CAS numbers function as unique identifiers for chemicals in part 4717.7860. The Chemical Abstracts Service maintains a database of all CAS numbers at http://www.cas.org.

Subp. 8. **Developmental health endpoint or developmental.** "Developmental health endpoint" or "developmental" means an adverse effect on the developing organism that may result from parental exposure prior to conception, maternal exposure during prenatal development, or direct exposure postnatally until the time of sexual maturation. Developmental toxicity may be detected at any point in the lifespan of the organism. The major manifestations of developmental toxicity include:

A. death of the developing organism;

B. structural abnormality;

C. altered growth; and

D. functional deficiency.

Subp. 9. **Duration.** "Duration" means the length of the exposure period under consideration.

A. For the default derivation of noncancer health risk limits, the following durations are utilized:

(1) acute - a period of 24 hours or less;

(2) short-term - a period of more than 24 hours, up to 30 days;

(3) subchronic - a period of more than 30 days, up to approximately ten percent of the life span in humans; or

(4) chronic - a period of more than approximately ten percent of the life span in humans.

B. For the default derivation of cancer health risk limits, the durations corresponding to the three age groups associated with the age-dependent adjustments (ADAFs) specified in subpart 3, are utilized:

(1) two-year duration for the birth to two-year age group;

(2) 14-year duration for the two- to 16-year age group; and

(3) 54-year duration for the 16 and older age group.

C. For the chemical-specific derivation of a noncancer or cancer health risk limit, the duration is based on chemical-specific information regarding the relevant length of exposure.

Subp. 10. **Endocrine or (E).** "Endocrine" or "(E)" means a change in circulating hormone levels or interactions with hormone receptors, regardless of the organ or organ system affected. Endpoints with or without the (E) designation are deemed equivalent, for example, thyroid (E)=thyroid, and shall be included in the same health risk index equation in part 4717.7880.

Subp. 11. **Health risk index.** "Health risk index" is a sum of the quotients calculated by identifying all chemicals that share a common health endpoint and dividing the measured or statistically derived concentration of each chemical by its HRL. The multiple chemical health risk index is compared to the multiple chemical health risk limit, defined in subpart 19 as one, to identify exceedances. Equations to calculate multiple chemical health risk indices are found in parts 4717.7880 and 4717.7890.

Subp. 12. **Health risk index endpoint or health endpoint.** "Health risk index endpoint" or "health endpoint" means the general description of toxic effects used to group chemicals for the purpose of calculating a health risk index. Health risk index endpoints or health endpoints for each chemical are listed in part 4717.7860.

Subp. 13. **Health risk limit or HRL.** "Health risk limit" or "HRL" has the meaning given in Minnesota Statutes, section 103H.005, subdivision 3. An HRL is expressed as µg/L.

Subp. 14. **Intake rate or IR.** "Intake rate" or "IR" means the rate of ingestion of water, or the amount of water, on a per body weight basis, ingested per day, expressed as liters per kilogram body weight per day or L/kg-day. The time-weighted average of the 95th percentile intake rate for the derivation of cancer and noncancer HRLs is calculated for the relevant duration specified in subpart 9.

Subp. 15. **Maximum contaminant level or MCL.** "Maximum contaminant level" or "MCL" means the maximum permissible level of a contaminant in water that is delivered to any user of a public water system under the Federal Drinking Water Program according to Code of Federal Regulations, title 40, section 141.2.

Subp. 16. **Maximum contaminant level-based health risk limit or MCL-based HRL.** "Maximum contaminant level-based health risk limit" or "MCL-based HRL" means an MCL that is adopted as an HRL as authorized by Laws 2007, chapter 147, article 17, section 2.

Subp. 17. **µg/L.** "µg/L" means micrograms of chemical per liter of water.

Subp. 18. **mg/kg-day.** "mg/kg-day" means milligrams of chemical per kilogram of body weight per day.

Subp. 19. **Multiple chemical health risk limit or multiple chemical HRL.** The "multiple chemical health risk limit" or "multiple chemical HRL" is equal to one. Equations to determine whether the multiple chemical health risk limit has been exceeded are in parts 4717.7880 and 4717.7890.

Subp. 20. **Nonlinear carcinogen.** "Nonlinear carcinogen" means a chemical agent for which, particularly at low doses, the associated cancer risk does not rise in direct proportion to the extent of exposure, and for which a threshold level of exposure exists below which there is no cancer risk. The HRL for a nonlinear carcinogen is based on a reference dose that is lower than the threshold for cancer risk.

Subp. 21. **Reference dose or RfD.** "Reference dose" or "RfD" means an estimate of a dose for a given duration to the human population, including susceptible subgroups such as infants, that is likely to be without an appreciable risk of adverse effects during a lifetime. It is derived from a suitable dose level at which there are few or no statistically or biologically significant increases in the frequency or severity of an adverse effect between

the dosed population and its associated control group. The RfD includes one or more divisors, applied to the suitable dose level, accounting for: (i) uncertainty in extrapolating from mammalian laboratory animal data to humans; (ii) variation in toxicological sensitivity among individuals in the human population; (iii) uncertainty in extrapolating from effects observed in a short-term study to effects of long-term exposure; (iv) uncertainty in using a study in which health effects were found at all doses tested; and (v) uncertainty associated with deficiencies in the available data. An HRL is not derived if the product of the divisors exceeds 3,000. The RfD is expressed as mg/kg-day.

Subp. 22. **Relative source contribution or RSC.** "Relative source contribution" or "RSC" means the fraction of total exposure to a substance or chemical that is allocated to drinking water. The default RSC is 0.2 for highly volatile chemicals. For other chemicals, the default RSC is 0.5 for acute and short-term HRLs and 0.2 for subchronic or chronic HRLs.

Subp. 23. **Slope factor or SF.** "Slope factor" or "SF" means an upper-bound estimate of risk per increment of dose that can be used to estimate cancer risk probabilities for different exposure levels. A cancer slope factor is expressed as cancer incidence per mg/kg-day. Minnesota Statutes, section 103H.201, subdivision 1, paragraph (d), requires the Department of Health, when deriving cancer HRLs, to use cancer slope factors published by the United States Environmental Protection Agency.

Subp. 24. **Toxic effects.** "Toxic effects" means an observable or measurable adverse biological event, or the organ, tissue, or system in which the effect is manifested. The designation of endpoints does not exclude other possible observable and measurable biological events. For the purpose of grouping chemicals and creating a health risk index when multiple chemicals are present, toxic effects may be ascribed to more general health risk index endpoints or health endpoints. Health endpoints are listed in part 4717.7860.

Subp. 25. **Volatility.** "Volatility" means having a tendency to evaporate. Using Henry's Law constants, chemicals are characterized as nonvolatile or low, moderate, or high volatility as follows:

A. nonvolatile - Henry's Law constant $<3x10^{-7}$ atm-m^3/mol

B. low - Henry's Law constant $>3x10^{-7}$ to $1x10^{-5}$ atm-m^3/mol

C. moderate - Henry's Law constant $>1x10^{-5}$ to $1x10^{-3}$ atm-m^3/mol

D. high - Henry's Law constant $>1x10^{-3}$ atm-m^3/mol

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7830 FOR TOXIC EFFECTS OTHER THAN CANCER.

Subpart 1. **Scope.** This part establishes the method for determining a health risk limit for a toxic effect other than cancer.

Subp. 2. **Equation for toxic effects other than cancer or MCL-based HRLs.** The equation for deriving a health risk limit for a toxic effect other than cancer or a maximum contaminant level-based health risk limit is:

$$nHRL_{duration} = \frac{RfD_{duration} \times RSC \times 1{,}000}{IR_{duration}}$$

Where:

A. $nHRL_{duration}$ is the noncancer health risk limit for a given duration as defined in part 4717.7820, subparts 9, item A, and 13, expressed as µg/L. The HRLs derived for each chemical are listed in part 4717.7860.

B. $RfD_{duration}$ is the reference dose for a given duration as defined in part 4717.7820, subparts 9, item A, and 21, expressed as mg/kg-day. The RfDs utilized for each chemical are listed in part 4717.7860.

C. RSC is the relative source contribution factor as defined in part 4717.7820, subpart 22. The RSCs utilized for each chemical are listed in part 4717.7860.

D. 1,000 is a factor used to convert milligrams (mg) to micrograms (µg). There are 1,000 micrograms per milligram.

E. $IR_{duration}$ is the intake rate for a given duration as defined in part 4717.7820, subparts 9, item A, and 14. The IRs utilized for each chemical are listed in part 4717.7860.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7840 FOR CANCER.

Subpart 1. **Scope.** This part establishes the methods for determining a health risk limit for cancer.

Subp. 2. **Equation for cancer for chemicals other than chemicals for which a lifetime adjustment factor has been derived or nonlinear carcinogens.** The equation for deriving the health risk limit for cancer for chemicals other than chemicals identified in subpart 3, or nonlinear carcinogens is:

$$cHRL = \frac{(1x10^{-5}) \times 1{,}000}{[(SFxADAF_{<2}xIR_{<2}xD_{<2})+(SFxADAF_{2\ to\ <16}xIR_{2\ to\ <16}xD_{2\ to\ <16})+(SFxADAF_{16+}xIR_{16+}xD_{16+})]/70\ years}$$

Where:

A. cHRL is the cancer health risk limit expressed as µg/L.

B. $(1x10^{-5})$ is the additional cancer risk level.

C. Units 1,000 are as described in part 4717.7830, subpart 2.

D. SF or slope factor is expressed in units of cancer incidence per mg/kg-day. The SFs utilized for each chemical are listed in part 4717.7860.

E. ADAF is the age-dependent adjustment factor as defined in part 4717.7820, subpart 3. The ADAFs utilized for each chemical are listed in part 4717.7860.

F. $IR_{duration}$ is the intake rate for a given duration as defined in part 4717.7820, subpart 14. The IRs utilized for each chemical are listed in part 4717.7860.

G. D is the duration corresponding to the three age groups birth up to two years of age (two-year duration), two up to 16 years of age (14-year duration), and 16 up to 70 years of age (54-year duration) as defined in part 4717.7820, subpart 9, item B.

H. 70 years is the standard lifetime duration utilized by the United States Environmental Protection Agency in the characterization of lifetime cancer risk.

Subp. 3. **Equation for cancer for chemicals for which a lifetime adjustment factor has been derived.** The Department of Health may depart from the default equation presented in subpart 2 when an adjustment factor is based on chemical-specific information. The equation for deriving the health risk limit for cancer for these chemicals is:

$$cHRL = \frac{(1x10^{-5}) \times 1{,}000}{[SFxAF_{lifetime} \times IR_{lifetime}]}$$

Where:

A. Units or values for cHRL, ($1x10^{-5}$), 1,000, and SF are as described in part 4717.7840, subpart 2.

B. $AF_{lifetime}$ is the lifetime adjustment factor utilized to adjust the adult exposure-based SF for lifetime exposure based on chemical-specific data. The $AF_{lifetime}$ utilized is described in part 4717.7860.

C. $IR_{lifetime}$ is the 95th percentile water intake rate representative of a lifetime period.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7850 USE OF MAXIMUM CONTAMINANT LEVELS.

Subpart 1. **Scope.** This part establishes the methods for determining a health risk limit based on a maximum contaminant level.

Subp. 2. **Water level standards.** As authorized by Laws 2007, chapter 147, article 17, section 2, the maximum contaminant levels for the following chemicals are adopted by reference as health risk limits:

A. Atrazine;

B. Dichloromethane;

C. Di(2-ethylhexyl) phthalate;

D. Nitrate (as N);

E. Pentachlorophenol;

F. Simazine;

G. 1,1,2,2-Tetrachloroethylene;

H. 1,1,2-Trichloroethylene; and

I. 2(2,4,5-Trichlorophenoxy)propionic acid.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7860 HEALTH RISK LIMITS TABLE.

Subpart 1. **Generally.** This table lists the health risk limits derived from methods specified in parts 4717.7830, 4717.7840, and 4717.7850. For each chemical, this table specifies: the chemical name; the CAS number; the year the HRL was established; the volatility classification; any noncancer HRL; any cancer HRL; the RfD and RSC used in the derivation of any noncancer HRL; the slope factor and any ADAF or $AF_{lifetime}$ used in the derivation of any cancer HRL; the intake rate used in the derivation of any noncancer or cancer HRL; and the health endpoints.

Subp. 2. **Explanation of table in this part.**

A. "-" symbol means not relevant.

B. "NA" means not applicable.

C. "ND" means not derived due to absence or paucity of toxicity information.

D. "None" means not applicable for inclusion in the health risk index.

E. The following explanations in subitems (1) to (3) apply where noted:

(1) The acute HRL value is less than the calculated HRL. To be protective of acute exposures, the HRL is set equal to the acute HRL value.

(2) The short-term HRL value is less than the calculated HRL. To be protective of short-term exposures, the HRL is set equal to the short-term HRL value.

(3) The subchronic HRL value is less than the calculated HRL. To be protective of subchronic exposures, the HRL is set equal to the subchronic HRL value.

Subp. 3. **Acetochlor.**

CAS number: 34256-82-1

Year Established: 2008

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	40	40	40 (2)	9	NA
RfD (mg/kg-day)	0.021	0.021	(2)	0.002	--
RSC	0.5	0.5	(2)	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	0.289	0.289	(2)	0.043	--
Endpoints	developmental	developmental	developmental	hepatic (liver) system, male reproductive system, nervous system, renal (kidney) system, respiratory system	--

Subp. 3a. **Acetochlor ESA.**

CAS number: 187022-11-3

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	600	600	300	NA
RfD (mg/kg-day)	--	0.37	0.23	0.075	--
RSC	--	0.5	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	0.077	0.043	--
Endpoints	--	thyroid (E)	thyroid (E)	thyroid (E)	--

Subp. 3b. **Acetochlor OXA.**

CAS number: 184992-44-4

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	200	200	100	NA
RfD (mg/kg-day)	--	0.12	0.077	0.026	--
RSC	--	0.5	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	0.077	0.043	--
Endpoints	--	thyroid (E)	thyroid (E)	thyroid (E)	--

Subp. 3c. **Acetone.**

CAS number: 67-64-1

Year Proposed: 2010

Volatility: Moderate

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	9,000	8,000	4,000	NA
RfD (mg/kg-day)	--	5.0	3.0	0.90	--
RSC	--	0.5	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	0.077	0.043	--
Endpoints	--	renal (kidney) system	renal (kidney) system, hematological (blood) system	renal (kidney) system, hematological (blood) system	--

Subp. 4. **Alachlor.**

CAS number: 15972-60-8

Year Established: 2008

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	200	30	5	NA
RfD (mg/kg-day)	--	0.1	0.01	0.001	--
RSC	--	0.5	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	0.077	0.043	--
Endpoints	--	renal (kidney) system	hepatic (liver) system, hematological (blood) system	hepatic (liver) system, hematological (blood) system	--

Subp. 5. **Atrazine.**

CAS number: 1912-24-9

Year Established: 2008

Volatility: Nonvolatile

MCL-based HRL: 3 µg/L

Subp. 6. **Benzene.**

CAS number: 71-43-2

Year Established: 2008

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	10	10	3	3 (3)	2
RfD (mg/kg-day)	0.015	0.014	0.0013	(3)	--
RSC	0.2	0.2	0.2	(3)	--

SF (per mg/kg-day)	--	--	--	--	0.055
ADAF	--	--	--	--	10 ($ADAF_{<2}$) 3 ($ADAF_{2 \text{ to } <16}$) 1 ($ADAF_{16+}$)
Intake Rate (L/kg-day)	0.289	0.289	0.077	(3)	0.137 ($_{<2}$) 0.047 ($_{2 \text{ to } <16}$) 0.039 ($_{16+}$)
Endpoints	develop-mental	hemato-logical (blood) system, immune system	hemato-logical (blood) system, immune system	hemato-logical (blood) system, immune system	cancer

Subp. 7. **Chloroform.**

CAS number: 67-66-3

Year Established: 2008

Volatility: High

	Acute	**Short-term**	**Subchronic**	**Chronic**	**Cancer**
HRL (µg/L)	ND	30	30 (2)	30 (2)	NA
RfD (mg/kg-day)	--	0.05	(2)	(2)	--
RSC	--	0.2	(2)	(2)	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	(2)	(2)	--
Endpoints	--	developmental, hepatic (liver) system, immune system	developmental, hepatic (liver) system, immune system, male reproductive system	developmental, hepatic (liver) system, immune system, male reproductive system	--

Subp. 8. **Cyanazine.**

CAS number: 21725-46-2

Year Established: 2008

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	2	2	2	1	NA
RfD (mg/kg-day)	0.001	0.001	0.00063	0.00026	--
RSC	0.5	0.5	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	0.289	0.289	0.077	0.043	--
Endpoints	developmental	developmental	hepatic (liver) system, renal (kidney) system	None	--

Subp. 8a. **Dichlorodifluoromethane.**

CAS number: 75-71-8

Year Proposed: 2010

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	ND	700	NA
RfD (mg/kg-day)	--	--	--	0.15	--
RSC	--	--	--	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	--	--	0.043	--
Endpoints	--	--	--	None	--

Subp. 8b. **1,1-Dichloroethylene.**

CAS number: 75-35-4

Year Proposed: 2010

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	200	200	NA
RfD (mg/kg-day)	--	--	0.090	0.046	--
RSC	--	--	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	--	0.077	0.043	--
Endpoints	--	--	hepatic (liver) system	hepatic (liver) system	--

Subp. 9. **cis 1,2-Dichloroethylene.**

CAS number: 156-59-2

Year Established: 2008

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	70	70 (2)	50	NA
RfD (mg/kg-day)	--	0.097	(2)	0.011	--
RSC	--	0.2	(2)	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	(2)	0.043	--
Endpoints	--	hematological (blood) system	hematological (blood) system	hematological (blood) system	--

Subp. 10. **Dichloromethane.**

CAS number: 75-09-2

Year Established: 2008

Volatility: High

MCL-based HRL: 5 µg/L

Subp. 11. **Dieldrin.**

CAS number: 60-57-1

Year Established: 2008

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	0.2	0.2	0.2 (2)	0.2	0.006
RfD (mg/kg-day)	0.0001	0.0001	(2)	0.00005	--
RSC	0.5	0.5	(2)	0.2	--
SF (per mg/kg-day)	--	--	--	--	16
$AF_{lifetime}$	--	--	--	--	2.5
Intake Rate (L/kg-day)	0.289	0.289	(2)	0.043	0.043
Endpoints	developmental	developmental, immune system, nervous system	developmental, immune system, nervous system	hepatic (liver) system, nervous system	cancer

Subp. 12. **Di-(2-ethylhexyl) phthalate.**

CAS number: 117-81-7

Year Established: 2008

Volatility: Moderate

MCL-based HRL: 6 µg/L

Subp. 12a. **Ethylbenzene.**

CAS number: 100-41-4

Year Proposed: 2010

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	50	50 (2)	50 (2)	NA
RfD (mg/kg-day)	--	0.075	(2)	(2)	--
RSC	--	0.2	(2)	(2)	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	(2)	(2)	--
Endpoints	--	hepatic (liver) system, renal (kidney) system	hepatic (liver) system, renal (kidney) system	hepatic (liver) system, renal (kidney) system	--

Subp. 12b. **Ethylene glycol.**

CAS number: 107-21-1

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	4,000	4,000	2,000	2,000	NA
RfD (mg/kg-day)	0.76	0.76	0.72	0.50	--
RSC	0.2	0.2	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	0.043	0.043	0.077	0.043	--
Endpoints	developmental	developmental	renal (kidney) system, developmental	renal (kidney) system, developmental	--

Subp. 12c. **Metolachlor and S-Metolachlor.**

CAS number: 51218-45-2; 87392-12-9

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	400	400	300	300 (3)	NA
RfD (mg/kg-day)	0.24	0.24	0.097	(3)	--
RSC	0.5	0.5	0.2	(3)	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	0.289	0.289	0.077	(3)	--
Endpoints	developmental	developmental	none	none	--

Subp. 12d. **Metolachlor ESA.**

CAS number: 171118-09-5

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	4,000	800	NA
RfD (mg/kg-day)	--	--	1.7	0.17	--
RSC	--	--	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	--	0.077	0.043	--
Endpoints	--	--	hepatic (liver) system	hepatic (liver) system	--

Subp. 12e. **Metolachlor OXA.**

CAS number: 152019-73-3

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	3,000	3,000 (2)	800	NA
RfD (mg/kg-day)	--	1.7	(2)	0.17	--
RSC	--	0.5	(2)	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	(2)	0.043	--
Endpoints	--	none	none	none	--

Subp. 13. **Nitrate (as N).**

CAS number: 14797-55-8

Year Established: 2008

Volatility: Nonvolatile

MCL-based HRL: 10,000 µg/L

Subp. 14. **Pentachlorophenol.**

CAS number: 87-86-5

Year Established: 2008

Volatility: Nonvolatile

MCL-based HRL: 1 µg/L

Subp. 14a. **Perfluorobutane sulfonate (PFBS).**

CAS number: 375-73-5

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	9	7	NA
RfD (mg/kg-day)	--	--	0.0042	0.0014	--
RSC	--	--	0.5	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	--	0.245	0.043	--
Endpoints	--	--	hepatic (liver) system, hematological (blood) system, renal (kidney) system	hepatic (liver) system, hematological (blood) system, renal (kidney) system	--

Subp. 14b. **Perfluorobutyrate (PFBA).**

CAS number: 375-22-4

Year Proposed: 2010

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	7	7 (2)	7 (2)	NA
RfD (mg/kg-day)	--	0.0038	(2)	(2)	--
RSC	--	0.5	(2)	(2)	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	(2)	(2)	--
Endpoints	--	hepatic (liver) system; thyroid (E)	hepatic (liver) system; thyroid (E)	hepatic (liver) system; thyroid (E)	--

Subp. 15. **Perfluorooctane sulfonate (PFOS) and salts.**

CAS number: 1763-23-1; 29081-56-9; 2795-39-3; 70225-14-8; and 29457-72-5

Year Established: 2008

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	ND	0.3	NA
RfD (mg/kg-day)	--	--	--	0.00008	--
RSC	--	--	--	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	--	--	0.049	--
Endpoints	--	--	--	developmental, hepatic (liver) system, thyroid (E)	--

Subp. 16. **Perfluorooctanoic acid (PFOA) and salts.**

CAS number: 335-67-1; 3825-26-1; 2395-00-8; 335-93-3; and 335-95-5

Year Established: 2008

Volatility: Nonvolatile

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	ND	0.3	NA
RfD (mg/kg-day)	--	--	--	0.000077	--
RSC	--	--	--	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	--	--	0.053	--
Endpoints	--	--	--	developmental, hepatic (liver) system, immune system	--

Subp. 17. **Simazine.**

CAS number: 122-34-9

Year Established: 2008

Volatility: Nonvolatile

MCL-based HRL: 4 µg/L

Subp. 18. **1,1,2,2-Tetrachloroethylene.**

CAS number: 127-18-4

Year Established: 2008

Volatility: High

MCL-based HRL: 5 µg/L

Subp. 18a. **Toluene.**

CAS number: 108-88-3

Year Proposed: 2010

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	200	200 (2)	200 (2)	NA
RfD (mg/kg-day)	--	0.22	(2)	(2)	--
RSC	--	0.2	(2)	(2)	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	0.289	(2)	(2)	--
Endpoints	--	immune system, nervous system	immune system, nervous system	immune system, nervous system	--

Subp. 19. **1,1,1-Trichloroethane.**

CAS number: 71-55-6

Year Established: 2008

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	20,000	9,000	NA
RfD (mg/kg-day)	--	--	7	2	--

RSC	--	--	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--
Intake Rate (L/kg-day)	--	--	0.077	0.043	--
Endpoints	--	--	hepatic (liver) system, male reproductive system	hepatic (liver) system, male reproductive system	--

Subp. 20. **1,1,2-Trichloroethylene (TCE).**

CAS number: 79-01-6

Year Established: 2008

Volatility: High

MCL-based HRL: 5 µg/L

Subp. 21. **2(2,4,5-Trichlorophenoxy)propionic acid (2,4,5-TP or Silvex).**

CAS number: 93-72-1

Year Established: 2008

Volatility: Nonvolatile

MCL-based HRL: 50 µg/L

Subp. 22. **1,3,5-Trimethylbenzene.**

CAS number: 108-67-8

Year Established: 2008

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	100	100 (2)	100 (2)	NA
RfD (mg/kg-day)	ND	0.14	(2)	(2)	--
RSC	--	0.2	(2)	(2)	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--

Intake Rate (L/kg-day)	--	0.289	(2)	(2)	--
Endpoints	--	hepatic (liver) system	hepatic (liver) system; renal (kidney) system	hepatic (liver) system; renal (kidney) system	--

Subp. 23. **Vinyl Chloride.**

CAS number: 75-01-4

Year Established: 2008

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	ND	ND	80	10	0.2
RfD (mg/kg-day)	--	--	0.03	0.003	--
RSC	--	--	0.2	0.2	--
SF (per mg/kg-day)	--	--	--	--	1.4
$AF_{lifetime}$	--	--	--	--	1
Intake Rate (L/kg-day)	--	--	0.077	0.043	0.043
Endpoints	--	--	hepatic (liver) system	hepatic (liver) system	cancer

Subp. 23a. **Xylenes.**

CAS number: 1330-20-7

Year Proposed: 2010

Volatility: High

	Acute	Short-term	Subchronic	Chronic	Cancer
HRL (µg/L)	800	300	300 (2)	300 (2)	NA
RfD (mg/kg-day)	1.2	0.5	(2)	(2)	--
RSC	0.2	0.2	(2)	(2)	--
SF (per mg/kg-day)	--	--	--	--	--
ADAF or $AF_{lifetime}$	--	--	--	--	--

Intake Rate (L/kg-day)	0.289	0.289	(2)	(2)	--
Endpoints	nervous system	nervous system	renal (kidney) system, nervous system	renal (kidney) system, nervous system	--

Subp. 24. **Transition.** The health risk limits established for the specific chemicals in this part supersede the health risk limits for those chemicals in part 4717.7500. For chemicals not included in this part, the health risk limits established in part 4717.7500 remain in place.

Statutory Authority: *MS s 103H.201; 144.0751*

History: *33 SR 1792; 35 SR 1395*

4717.7870 EVALUATING CONCURRENT EXPOSURES TO MULTIPLE CHEMICALS.

Risk from multiple chemicals detected in groundwater must be evaluated as specified in part 4717.7880 for effects other than cancer and in part 4717.7890 for cancer. If a chemical causes both cancer and effects other than cancer, the risk contributed by that chemical must be included in both evaluations. When the multiple chemical health risk index is greater than one, the multiple chemical health risk limit has been exceeded.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7880 MULTIPLE CHEMICAL HEALTH RISK LIMITS: NONCANCER.

Subpart 1. **Scope.** To evaluate the risk of effects other than cancer from multiple chemicals detected in groundwater, a health risk index for each health endpoint must be calculated for each duration period using the procedure specified in this part.

Subp. 2. **Grouping of chemicals.** Chemicals must be grouped according to health endpoints, other than cancer, specified in part 4717.7860, and according to duration except that:

A. chemicals for which no health endpoint is specified will not be grouped; and

B. a chemical will be included in the group for each health endpoint listed for that chemical.

Subp. 3. **Equation.** Using the following equation, a noncancer health risk index must be determined for each group of two or more chemicals that have a common health endpoint and common duration period.

$$\text{Noncancer health risk index}_{duration}=C_1/nHRL_{1duration}+C_2/nHRL_{2duration}+...+C_N/nHRL_{Nduration}$$

Where:

A. C_N represents the concentration expressed as µg/L of the first through Nth chemical. In the case of a chemical that has been detected but cannot be quantified, C_N is determined by standard statistical procedures.

B. $nHRL_{Nduration}$ represents the duration specific acute, short-term, subchronic, or chronic noncancer health risk limit expressed as µg/L for the first through Nth chemical, as specified in part 4717.7860.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7890 MULTIPLE CHEMICAL HEALTH RISK LIMITS: CANCER.

Subpart 1. **Scope.** To evaluate the risk of cancer from multiple chemicals detected in groundwater, a cancer health risk index must be calculated using the procedure specified in this part.

Subp. 2. **Equation.** To evaluate the risk of cancer from multiple chemicals detected in groundwater, a cancer index must be calculated using the following equation:

$$\text{Cancer health risk index} = C_1/cHRL_1 + C_2/cHRL_2 + ... + C_N/cHRL_N$$

Where:

A. C_N represents the concentration expressed as µg/L of the first through Nth chemical. In the case of a chemical that is detected but cannot be quantified, C_N is determined by acceptable statistical procedures.

B. $cHRL_N$ represents the cancer health risk limit for the first through Nth chemical, as specified in part 4717.7860.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

4717.7900 CHEMICAL BREAKDOWN PRODUCTS.

When testing indicates that chemical breakdown products (degradates) are present in groundwater, it is necessary to consider those breakdown products in a risk assessment. When no health risk limit or other health-based water value exists for a chemical breakdown product, due to absence or paucity of toxicity information on the chemical breakdown product, the health risk limit specified for the parent chemical in part 4717.7860 is the health risk limit for the chemical breakdown product. When a parent and one or more of its breakdown products are present, or when multiple breakdown products are present even in the absence of the parent, it is necessary to conduct a risk assessment for multiple chemicals, according to the procedures in parts 4717.7880 and 4717.7890.

Statutory Authority: *MS s 103H.201*

History: *33 SR 1792*

HEALTH RISK VALUES

4717.8000 PURPOSE AND SCOPE.

Subpart 1. **Purpose.** The purpose of parts 4717.8000 to 4717.8600 is to establish health risk values (HRVs) and multimedia health risk values (MHRVs) for chemicals or defined mixtures of chemicals emitted to the ambient air.

Subp. 2. **Scope.** The HRVs and MHRVs established in parts 4717.8000 to 4717.8600 are intended for use by public agencies or private entities in Minnesota as one set of criteria in evaluating risks to human health by chemical emissions to the ambient air. The chemicals and defined mixtures of chemicals included in parts 4717.8000 to 4717.8600 do not include every toxic chemical emitted to air.

The HRVs and MHRVs were not developed for evaluation of workplace exposures. The Occupational Safety and Health Administration, United States Department of Labor, is responsible for regulating workplace exposures.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229*

4717.8050 DEFINITIONS.

Subpart 1. **Scope.** For the purposes of parts 4717.8000 to 4717.8600, the terms in this part have the meanings given them.

Subp. 2. **Acute health risk value or acute HRV.** "Acute health risk value" or "acute HRV" means the concentration of a chemical or defined mixture of chemicals in ambient

air, at or below which the chemical or defined mixture of chemicals is unlikely to cause an adverse health effect to the general public when exposure occurs over a prescribed time. For implementation purposes, acute HRVs are compared to one-hour averaged concentrations of chemicals or defined mixtures of chemicals in air. An acute HRV is expressed in units of micrograms of the chemical or defined mixture of chemicals per cubic meter of air ($\mu g/m^3$).

Subp. 3. **Additional lifetime risk.** "Additional lifetime risk" means the probability that daily exposure to a carcinogen over a lifetime may induce cancer. The Minnesota Department of Health uses an additional lifetime risk of 1E-5 (1 in 100,000) to set carcinogen exposure guidelines.

Subp. 4. **Benchmark concentration or BMC.** "Benchmark concentration" or "BMC" means the statistical lower limit on the concentration of the chemical or defined mixture of chemicals that produces a predetermined change in response rate of an adverse effect (called a benchmark response or BMR) compared to background. The change in response rate over background of the BMR is usually in the range of five to ten percent. The benchmark concentration may be used instead of the NOAEL for noncancer endpoints and is expressed in units of milligrams of chemical or defined mixture of chemicals per cubic meter of air (mg/m^3).

Subp. 5. **Benchmark dose or BMD.** "Benchmark dose" or "BMD" means the the statistical lower limit on the dose of the chemical or defined mixture of chemicals that produces a predetermined change in response rate of an adverse effect (called a benchmark response or BMR) compared to background. The change in response rate over background of the BMR is usually in the range of five to ten percent. The benchmark dose may be used instead of the NOAEL for noncancer endpoints and is expressed in units of milligrams of chemical or defined mixture of chemicals per kilogram of body weight per day (mg/kg-day).

Subp. 6. **Carcinogen.** "Carcinogen" means a chemical or defined mixture of chemicals:

A. listed as a human carcinogen or a probable human carcinogen according to "EPA Classification System for Categorizing Weight of Evidence for Carcinogenicity from Human and Animal Studies," The Risk Assessment Guidelines of 1986, United States Environmental Protection Agency, Office of Health and Environmental Assessment (August 1987). The classification system is incorporated by reference, is available through the Minitex interlibrary loan system, and is not subject to frequent change;

B. listed as "carcinogenic to humans" or "likely to be carcinogenic to humans" according to Proposed Guidelines for Carcinogen Risk Assessment, United States Environmental Protection Agency, Office of Research and Development (July 1999). The guidelines are incorporated by reference, are available through the Minitex interlibrary loan system, and are not subject to frequent change; or

C. listed as a substance known to be a human carcinogen or reasonably anticipated to be a human carcinogen in the Report on Carcinogens, United States Department of Health and Human Services, Public Health Service, National Toxicology Program. The report is incorporated by reference and is subject to frequent change. The report is available on the Internet at http://ntp-server.niehs.nih.gov/newhomeroc/aboutroc.html.

Subp. 7. **Chemical abstracts service registry number or CAS RN.** "Chemical abstracts service registry number" or "CAS RN" means the number assigned to a chemical by the Chemical Abstracts Service, a division of the American Chemical Society, 2540 Olentangy River Road, Box 3012, Columbus, Ohio 43210. The chemical abstracts service registry numbers are published in Chemical Abstracts Service Registry Handbook - Number Section, American Chemical Society (1965). The handbook is incorporated by reference, is available through the Minitex interlibrary loan system, and is subject to annual change.

Subp. 8. **Chronic health risk value or chronic HRV.** "Chronic health risk value" or "chronic HRV" means the concentration of a chemical or defined mixture of chemicals in ambient air, at or below which the chemical or defined mixture of chemicals is unlikely to cause an adverse health effect to the general public when exposure occurs daily throughout

a person's lifetime. For implementation purposes, chronic HRVs are compared to an annual average concentration of a chemical or defined mixture of chemicals in air. A chronic HRV is expressed in units of micrograms of the chemical or defined mixture of chemicals per cubic meter of air ($\mu g/m^3$).

Subp. 9. **Cumulative health risk value or cumulative HRV.** "Cumulative health risk value" or "cumulative HRV" is a HRV calculated by summing the hazard quotients of chemicals sharing a common endpoint. A hazard quotient for a particular chemical is calculated by dividing the measured or modeled ambient air concentrations for a chemical by the HRV for that chemical. The equation used to calculate a cumulative HRV or hazard index for noncarcinogenic effects of chemicals is found in part 4717.8600. The equation used to calculate a cumulative HRV or cancer index for carcinogens is found in part 4717.8550.

Subp. 10. **Cumulative multimedia health risk value or cumulative MHRV.** "Cumulative multimedia health risk value" or "cumulative MHRV" is a MHRV calculated by summing the hazard quotients of chemicals sharing a common endpoint. A hazard quotient for a particular chemical is calculated by dividing the measured or modeled ambient air concentrations for a chemical by the MHRV for that chemical. The equation used to calculate a cumulative MHRV or hazard index for noncarcinogenic effects of chemicals is found in part 4717.8600. The equation used to calculate a cumulative MHRV or cancer index for carcinogens is found in part 4717.8550.

Subp. 11. **Defined mixture of chemicals.** "Defined mixture of chemicals" means a mixture of chemical compounds where the toxicity of that mixture of chemical compounds is quantified as a group, rather than individually, in an analytical procedure. Defined mixtures of chemicals include, but are not limited to, coke oven emissions, diesel particulate, and nickel refinery dust.

Subp. 12. **Endpoint of concern or endpoint.** "Endpoint of concern" or "endpoint" means an observable and measurable adverse biological event used as a scientifically defensible index of an effect of a low dose chemical exposure. The designation of an endpoint of concern does not exclude other possible observable and measurable biological events.

Subp. 13. **Extrarespiratory effect.** "Extrarespiratory effect" means a toxic effect produced at a site other than the respiratory system following inhalation of a chemical.

Subp. 14. **Extrarespiratory regional dose deposition or RDD_{ER}.** "Extrarespiratory regional dose deposition" or "RDD_{ER}" is the estimated amount of inhaled chemical or defined mixture of chemicals that is transported to nonrespiratory tract tissues after absorption of the chemical has occurred. The default normalizing factor for extrarespiratory effects is body weight. Until clearance and distribution parameters can be incorporated, it is assumed that 100 percent of a deposited dose to the entire respiratory system is available for uptake by the systemic circulation.

Subp. 15. **Extrarespiratory regional dose deposition ratio or $RDDR_{ER}$.** "Extrarespiratory regional dose deposition ratio" or "$RDDR_{ER}$" means the ratio of the extrarespiratory regional dose deposition calculated for an experimental animal to the calculated extrarespiratory regional dose deposition in a human.

Subp. 16. **$(H_{b/g})_A$.** "$(H_{b/g})_A$" means the blood to gas (air) partition coefficient of a chemical in an experimental animal.

Subp. 17. **$(H_{b/g})_H$.** "$(H_{b/g})_H$" means the blood to gas (air) partition coefficient of a chemical in a human.

Subp. 18. **Health effects assessment summary tables or HEAST.** "Health effects assessment summary tables" or "HEAST" means the health effects assessment summary tables prepared by the United States Environmental Protection Agency, Office of Research and Development (1991). The tables are incorporated by reference, are available through the Minitex interlibrary loan system, and are subject to quarter-annual changes.

Subp. 19. **Health risk value or HRV.** "Health risk value" or "HRV" means the concentration of a chemical or defined mixture of chemicals in ambient air, at or below which

the chemical or defined mixture of chemicals is unlikely to cause an adverse health effect to the general public. The HRV is expressed in units of micrograms of the chemical or defined mixture of chemicals per cubic meter of air ($\mu g/m^3$).

Subp. 20. **Human equivalent concentration or HEC.** "Human equivalent concentration" or "HEC" means the concentration of inhalation exposure for humans of an agent that is believed to induce the same magnitude of a toxic effect as associated with the experimental animal species exposure concentration. HEC derivation may incorporate toxicokinetic information on the particular agent, if available, or use a default procedure, such as assuming that daily oral doses experienced for a lifetime are proportional to body weight raised to the 0.75 power.

Subp. 21. **Integrated risk information system or IRIS.** "Integrated risk information system" or "IRIS" means the United States Environmental Protection Agency's electronic database for toxicologic information on chemicals. The IRIS is updated monthly and is available on the Internet at the Web site of the United States Environmental Protection Agency (www.epa.gov/iris/). The database is incorporated by reference and is subject to frequent change.

Subp. 22. **Lowest observed adverse effect level or LOAEL.** "Lowest observed adverse effect level" or "LOAEL" means the lowest exposure dose or concentration of a chemical or defined mixture of chemicals at which adverse effects have been observed in test animals or human test subjects and where the adverse effects are statistically different from background or a control group. The LOAEL is expressed in units of either milligrams of a chemical or defined mixture of chemicals per cubic meter of air (mg/m^3) for inhalation exposures or units of milligrams of a chemical or defined mixture of chemicals per kilogram of body weight per day (mg/kg-day) for multimedia exposures.

Subp. 23. **Lowest observed adverse effect level adjusted or $LOAEL_{[ADJ]}$.** "Lowest observed adverse effect level adjusted" or "$LOAEL_{[ADJ]}$" means the lowest observed adverse effect level for a chemical or defined mixture of chemicals adjusted to a specific period of time. For the chronic HRVs, the concentration in the scientific study is adjusted to a 24-hour per day, seven-day per week exposure period. For acute HRVs, the adjustment may include either a time adjustment to a one-hour exposure period or an adjustment for concentration as indicated in part 4717.8500, subparts 3, 4, and 5.

Subp. 24. **$\mu g/m^3$.** "$\mu g/m^3$" means micrograms per cubic meter.

Subp. 25. **mg/m^3.** "mg/m^3" means milligrams per cubic meter.

Subp. 26. **Modifying factor.** "Modifying factor" means a factor used in the derivation of a reference dose or reference concentration. The magnitude of the modifying factor reflects the scientific uncertainties of the study and database not explicitly treated with standard uncertainty factors (e.g., the completeness of the overall database). A modifying factor is greater than zero and less than or equal to ten, and the default value for the modifying factor is one.

Subp. 27. **Multimedia health risk value or MHRV.** "Multimedia health risk value" or "MHRV" means the total daily dose of a chemical or defined mixture of chemicals that results from an emission to ambient air, at or below which is unlikely to cause an adverse health effect to the general public over a lifetime exposure. Total daily dose is the sum of the exposure doses calculated from applicable inhalation or noninhalation exposure pathways. The MHRV is expressed in units of micrograms of the chemical or defined mixture of chemicals per kilogram of body weight per day (µg/kg-day).

Subp. 28. **No observed adverse effect level or NOAEL.** "No observed adverse effect level" or "NOAEL" means the highest exposure level at which there are no statistically or biologically significant increases in the frequency or severity of adverse effect between the exposed population and its appropriate control. Some effects may be produced at this level, but they are not considered adverse or precursors to adverse effects. The NOAEL is expressed in units of milligrams of chemical or defined mixture of chemicals per cubic meter

of air (mg/m^3) or milligrams of chemical or defined mixture of chemicals per kilogram of body weight per day (mg/kg-day).

Subp. 29. **No observed adverse effect level adjusted or $NOAEL_{[ADJ]}$.** "No observed adverse effect level adjusted" or "$NOAEL_{[ADJ]}$" means the no observed adverse effect level for a chemical or defined mixture of chemicals adjusted to a specific period of time. For the chronic HRVs, the concentration is adjusted to a 24-hour per day, seven-day per week exposure period. For acute HRVs, the adjustment may include either a time adjustment to the scientific study data to a one-hour exposure period or an adjustment for concentration as indicated in part 4717.8500, subparts 3 and 4.

Subp. 30. **Potency slope or slope factor.** "Potency slope" or "slope factor" means an upper bound, approximating a 95 percent confidence limit, on the increased cancer risk from a lifetime exposure to a chemical or defined mixture of chemicals. This estimate, usually expressed in units of proportion (of a population) affected per mg/kg/day, is generally reserved for use in the low-dose region of the dose-response relationship, that is, for exposures corresponding to risks less than one in 100. This number is derived from a mathematical extrapolation model that uses toxicologic data specific to each carcinogen. The potency slope for a carcinogen by ingestion is expressed in units of the inverse of milligrams of the chemical or defined mixture of chemicals per kilogram of body weight per day $(mg/kg\text{-}day)^{-1}$.

Subp. 31. **Reference concentration or RfC.** "Reference concentration" or "RfC" means an estimate, with uncertainty spanning perhaps an order of magnitude, of a continuous inhalation exposure to the human population, including sensitive subgroups, that is likely to be without an appreciable risk or deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark concentration, with uncertainty factors generally applied to reflect limitations on the scientific data available. The RfC is expressed in units of milligrams of the chemical or defined mixture of chemicals per cubic meter of air (mg/m^3).

Subp. 32. **Reference dose or RfD.** "Reference dose" or "RfD" means an estimate, with uncertainty spanning perhaps an order of magnitude, of a daily oral exposure to the human population, including sensitive subgroups, that is likely to be without an appreciable risk of deleterious effects during a lifetime. It can be derived from a NOAEL, LOAEL, or benchmark dose, with uncertainty factors generally applied to reflect limitations of the scientific data available. The RfD is expressed in units of milligrams of the chemical or defined mixture of chemicals per kilogram of body weight per day (mg/kg-day).

Subp. 33. **Reference exposure level or REL.** "Reference exposure level" or "REL" means the concentration level of a chemical or defined mixture of chemicals at or below which no adverse health effects are anticipated for a specified exposure duration. Reference exposure levels have been derived by the California Environmental Protection Agency, the Office of Environmental Health Hazard Assessment, under the Air Toxics "Hot Spots" Information and Assessment Act of 1987. The exposure levels are available on the Internet at the Web site of the Office of Environmental Health Hazard Assessment (www.oehha.org/air/acute_rels/acuterel.html).

Subp. 34. **Regional deposited dose or RDD.** "Regional deposited dose" or "RDD" means the deposited dose of particles calculated for a respiratory tract region of interest as related to an observed toxicity. For respiratory effects of particles, the deposited dose is adjusted for ventilatory volumes and the surface area of the respiratory region affected and is expressed as milligrams per minute per square centimeter (mg/min-sq. cm). For extrarespiratory effects of particles, the deposited dose in the total respiratory system is adjusted for ventilatory volumes and body weight and is expressed as milligrams per minute per kilogram (mg/min-kg).

Subp. 35. **Regional deposited dose ratio or RDDR.** "Regional deposited dose ratio" or "RDDR" means the ratio of the regional deposited dose calculated for a given exposure in the animal species of interest (RDD_A) to the regional deposited dose of the same exposure

in a human (RDD_H). This ratio is used to adjust the exposure effect level for interspecies dosimetric differences to derive a human equivalent concentration (HEC) for particles.

Subp. 36. **Regional gas dose or RGD.** "Regional gas dose" or "RGD" means the gas dose calculated for the respiratory system region of interest as related to the observed effect for respiratory effects. The deposited dose is adjusted for ventilatory volumes and the surface area of the respiratory region affected. RGD is calculated per minute expressed as milligrams per minute per square centimeter (mg/min-sq. cm).

Subp. 37. **Regional gas dose ratio or RGDR.** "Regional gas dose ratio" or "RGDR" means the ratio of the regional gas dose calculated for a given exposure in the animal species of interest (RGD_A) to the regional gas dose of the same exposure in humans (RGD_H). This ratio is used to adjust the exposure effect level for interspecies dosimetric differences to derive a human equivalent concentration (HEC) for gases with respiratory effects.

Subp. 38. **Respiratory effect.** "Respiratory effect" means a toxic effect produced in the respiratory system. Respiratory effects are divided into the categories of upper respiratory effects and lower respiratory effects. Effects in the upper respiratory system consist of effects primarily in the extrathoracic (ET) region, consisting of the nose, mouth, nasopharynx, oropharynx, laryngopharynx, and larynx, and in the upper tracheobronchial (TB) region consisting of the trachea, bronchi, and bronchioles.

The lower respiratory system effects consist of effects primarily in the pulmonary (PU) region, consisting of the respiratory bronchioles, alveolar ducts, alveolar sacs, and alveoli, and effects in the lower tracheobronchial (TB) region, consisting of the trachea and bronchioles to the terminal bronchioles.

Subp. 39. **Respiratory system.** "Respiratory system" means the nose, mouth, nasopharynx, oropharynx, larynx, trachea, bronchi, bronchioles, and the alveolar ducts, alveolar sacs, and alveoli of the lung.

Subp. 40. **Statistical significance.** "Statistical significance" means the probability that a result is likely to be due to chance alone. By convention, a difference between two groups is usually considered statistically significant if chance could explain it only five percent of the time or less. Study design considerations may influence the *a priori* choice of a different statistical significance level.

Subp. 41. **Subchronic health risk value or subchronic HRV.** "Subchronic health risk value" or "subchronic HRV" means the concentration of a chemical or defined mixture of chemicals in ambient air at or below which the chemical or defined mixture of chemicals is unlikely to cause an adverse health effect to the general public when exposure occurs on a continuous basis over a less than lifetime exposure. For implementation purposes, subchronic HRVs are compared to a 13-week averaged concentration of a chemical or defined mixture of chemicals in ambient air. A subchronic HRV is expressed in units of micrograms of the chemical or defined mixture of chemicals per cubic meter of air ($\mu g/m^3$).

Subp. 42. **Uncertainty factor.** "Uncertainty factor" means the numerical factors used to account for the variation in sensitivity among members of the human population; the uncertainty in extrapolating laboratory animal data to humans; the uncertainty in extrapolating from data obtained in a study that involves less than lifetime exposure to lifetime exposure; the uncertainty in using LOAEL data due to the absence of NOAEL data; and the inability of any single study to adequately address all possible adverse outcomes in humans.

Subp. 43. **Unit risk.** "Unit risk" means the upper bound excess cancer risk from a continuous lifetime exposure to a chemical or defined mixture of chemical concentration at one microgram per cubic meter ($1\ \mu g/m^3$) in air.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*

4717.8100 TABLE OF CHRONIC HRVs.

The heading for each item contains the chemical name and, in parenthesis, the CAS RN. Each item lists the chronic HRV, the equation used to develop the chronic HRV, and the variables necessary for the equation. The equations used to develop the chronic HRV are designated as follows: "A" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part 4717.8300, subpart 3, and applying the general equation under part 4717.8300, subpart 2; "B" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part 4717.8300, subpart 4, and applying the general equation under part 4717.8300, subpart 2; "C" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part 4717.8300, subpart 5, and applying the general equation under part 4717.8300, subpart 2; "D" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part 4717.8300, subpart 6, and applying the general equation under part 4717.8300, subpart 2; and "E" means applying the equation under part 4717.8400, subpart 2. The endpoint of concern is listed for use in determining a cancer index under part 4717.8550 or a hazard index under part 4717.8600. The unit risk for carcinogens is expressed as risk per ($\mu g/m^3$).

TABLE OF CHRONIC HRVs

A. Acetaldehyde (75-07-0)

Chronic HRV ($\mu g/m^3$)	**5**
Endpoint of concern	Cancer
Equation	E
Unit risk	2.2E-6

B. Acetonitrile (75-05-8)

Chronic HRV ($\mu g/m^3$)	**60**
Endpoint of concern	Mortality
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	6E1
Uncertainty factor	1,000

C. Acrylonitrile (107-13-1)

Chronic HRV ($\mu g/m^3$)	**0.1**
Endpoint of concern	Cancer
Equation	E
Unit risk	6.8E-5

D. Ammonia (7664-41-7)

Chronic HRV ($\mu g/m^3$)	**80**
Endpoint of concern	Upper and lower respiratory system
Equation	C
$NOAEL_{[HEC]}$ (mg/m^3)	2.3
Uncertainty factor	30

E. Antimony trioxide (1309-64-4)

Chronic HRV ($\mu g/m^3$)	**0.2**
Endpoint of concern	Lower respiratory system
Equation	A
$BMC_{[HEC]}$ (mg/m^3)	7.4E-2
Uncertainty factor	300

F. Arsenic (7440-38-2)

Chronic HRV ($\mu g/m^3$)	**0.002**
Endpoint of concern	Cancer
Equation	E
Unit risk	4.3E-3

G. Benzene (71-43-2)

Chronic HRV ($\mu g/m^3$)	**1.3 - 4.5**
Endpoint of concern	Cancer
Equation	E
Unit risk	2.2E-6 to 7.8E-6

H. Benzidine (92-87-5)

Chronic HRV ($\mu g/m^3$)	**0.0002**
Endpoint of concern	Cancer
Equation	E
Unit risk	6.7E-2

I. Beryllium (7440-41-7)

Chronic HRV ($\mu g/m^3$)	**0.004**
Endpoint of concern	Cancer
Equation	E
Unit risk	2.4E-3

J. Bis(chloromethyl)ether (542-88-1)

Chronic HRV ($\mu g/m^3$)	**0.0002**
Endpoint of concern	Cancer
Equation	E
Unit risk	6.2E-2

K. Bromomethane (74-83-9)

Chronic HRV ($\mu g/m^3$)	**5**
Endpoint of concern	Upper respiratory system

Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	4.8E-1
Uncertainty factor	100

L. 1,3-Butadiene (106-99-0)

Chronic HRV ($\mu g/m^3$)	**0.04**
Endpoint of concern	Cancer
Equation	E
Unit risk	2.8E-4

M. Cadmium (7440-43-9)

Chronic HRV ($\mu g/m^3$)	**0.006**
Endpoint of concern	Cancer
Equation	E
Unit risk	1.8E-3

N. Carbon disulfide (75-15-0)

Chronic HRV ($\mu g/m^3$)	**700**
Endpoint of concern	Nervous system
Equation	D
$BMC_{[HEC]}$ (mg/m^3)	1.97E1
Uncertainty factor	30

O. 2-Chloroacetophenone (532-27-4)

Chronic HRV ($\mu g/m^3$)	**0.03**
Endpoint of concern	Upper and lower respiratory system
Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	3E-2
Uncertainty factor	1,000

P. Chromium VI (18540-29-9)

Chronic HRV ($\mu g/m^3$)	**0.0008**
Endpoint of concern	Cancer
Equation	E
Unit risk	1.2E-2

Q. Coke oven emissions (8007-45-2)

Chronic HRV ($\mu g/m^3$)	**0.02**
Endpoint of concern	Cancer

Equation	E
Unit risk	6.2E-4

R. 1,2-Dibromoethane (106-93-4)

Chronic HRV ($\mu g/m^3$)	**0.05**
Endpoint of concern	Cancer
Equation	E
Unit risk	2.2E-4

S. Dichloromethane (75-09-2)

Chronic HRV ($\mu g/m^3$)	**20**
Endpoint of concern	Cancer
Equation	E
Unit risk	4.7E-7

T. 1,3-Dichloropropene (542-75-6)

Chronic HRV ($\mu g/m^3$)	**20**
Endpoint of concern	Upper respiratory system
$BMC_{[HEC]}$ (mg/m^3)	7.2E-1
Equation	C
Uncertainty factor	30

U. Dichlorvos (62-73-7)

Chronic HRV ($\mu g/m^3$)	**0.5**
Endpoint of concern	Nervous system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	5E-2
Uncertainty factor	100

V. Diesel particulates (*)

Chronic HRV ($\mu g/m^3$)	**5**
Endpoint of concern	Lower respiratory system
Equation	A
$NOAEL_{[HEC]}$ (mg/m^3)	1.55E-1
Uncertainty factor	30

W. N,N-dimethylformamide (68-12-2)

Chronic HRV ($\mu g/m^3$)	**30**
Endpoint of concern	Gastrointestinal system and hepatic system
Equation	D

$LOAEL_{[HEC]}$ (mg/m^3)	7.9
Uncertainty factor	300

X. Epichlorohydrin (106-89-8)

Chronic HRV ($\mu g/m^3$)	**8**
Endpoint of concern	Cancer
Equation	E
Unit risk	1.2E-6

Y. 1,2-Epoxybutane (106-88-7)

Chronic HRV ($\mu g/m^3$)	**20**
Endpoint of concern	Upper respiratory system
Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	4.8
Uncertainty factor	300

Z. Ethylene glycol monobutyl ether (111-76-2)

Chronic HRV ($\mu g/m^3$)	**13,000**
Endpoint of concern	Hematologic system
Equation	D
$BMC_{[HEC]}$ (mg/m^3)	3.8E2
Uncertainty factor	30

AA. Formaldehyde (50-00-0)

Chronic HRV ($\mu g/m^3$)	**0.8****
Endpoint of concern	Cancer
Equation	E
Unit risk	1.3E-5

BB. 1,6-Hexamethylene diisocyanate (822-06-0)

Chronic HRV ($\mu g/m^3$)	**0.01****
Endpoint of concern	Upper and lower respiratory system
Equation	C
$NOAEL_{[HEC]}$ (mg/m^3)	1E-3
Uncertainty factor	100

CC. n-Hexane (110-54-3)

Chronic HRV ($\mu g/m^3$)	**2,000**
Endpoint of concern	Nervous system and upper respiratory system

Equation	D
$LOAEL_{[HEC]}$ (mg/m^3)	7.3E1
Uncertainty factor	30

DD. Hydrazine/Hydrazine sulfate (302-01-2)

Chronic HRV ($\mu g/m^3$)	**0.002**
Endpoint of concern	Cancer
Equation	E
Unit risk	4.9E-3

EE. Hydrogen chloride (7647-01-0)

Chronic HRV ($\mu g/m^3$)	**20**
Endpoint of concern	Upper respiratory system
Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	6.1
Uncertainty factor	300

FF. Hydrogen cyanide (74-90-8)

Chronic HRV ($\mu g/m^3$)	**3**
Endpoint of concern	Endocrine system and nervous system
Equation	D
$LOAEL_{[HEC]}$ (mg/m^3)	2.5
Uncertainty factor	1,000

GG. Manganese (7439-96-5)

Chronic HRV ($\mu g/m^3$)	**0.2**
Endpoint of concern	Nervous system
Equation	B
$BMC_{[HEC]}$ (mg/m^3)	1.9E-2
Uncertainty factor	100

HH. Methyl methacrylate (80-62-6)

Chronic HRV ($\mu g/m^3$)	**700****
Endpoint of concern	Upper and lower respiratory system
Equation	C
$BMC_{[HEC]}$ (mg/m^3)	7.2
Uncertainty factor	10

II. Methylene diphenyl diisocyanate (MDI) and polymeric MDI (101-68-8 and 9016-87-9)

Chronic HRV (μg/m^3)	**0.6****
Endpoint of concern	Upper and lower respiratory system
Equation	A
$BMC_{[HEC]}$ (mg/m^3)	6E-2
Uncertainty factor	100

JJ. Nickel refinery dust (*)

Chronic HRV (μg/m^3)	**0.04**
Endpoint of concern	Cancer
Equation	E
Unit risk	2.4E-4

KK. Nickel subsulfide (12035-72-2)

Chronic HRV (μg/m^3)	**0.02**
Endpoint of concern	Cancer
Equation	E
Unit risk	4.8E-4

LL. 2-Nitropropane (79-46-9)

Chronic HRV (μg/m^3)	**20**
Endpoint of concern	Hepatic system
Equation	D
$LOAEL_{[HEC]}$ (mg/m^3)	1.6E1
Uncertainty factor	1,000

MM. Propylene oxide (75-56-9)

Chronic HRV (μg/m^3)	**3**
Endpoint of concern	Cancer
Equation	E
Unit risk	3.7E-6

NN. Styrene (100-42-5)

Chronic HRV (μg/m^3)	**1000**
Endpoint of concern	Nervous system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	3.4E1
Uncertainty factor	30

OO. Toluene (108-88-3)

Chronic HRV ($\mu g/m^3$)	**400**
Endpoint of concern	Nervous system and upper respiratory system
Equation	D
$LOAEL_{[HEC]}$ (mg/m^3)	1.19E2
Uncertainty factor	300

PP. 2,4-/2,6-Toluene diisocyanate (26471-62-5)

Chronic HRV ($\mu g/m^3$)	**0.08****
Endpoint of concern	Lower respiratory system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	2.3E-3
Uncertainty factor	30

QQ. Vinyl acetate (108-05-4)

Chronic HRV ($\mu g/m^3$)	**200**
Endpoint of concern	Upper respiratory system
Equation	C
$NOAEL_{[HEC]}$ (mg/m^3)	5
Uncertainty factor	30

RR. Vinyl chloride (75-01-4)

Chronic HRV ($\mu g/m^3$)	**1**
Endpoint of concern	Cancer
Equation	E
Unit risk	8.8E-6

* This HRV is for a chemical mixture which, therefore, does not have a chemical-specific number assigned by the Chemical Abstracts Service.

** This HRV may not provide protection for individuals who have been previously sensitized to this chemical.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*

4717.8150 TABLE OF SUBCHRONIC HRVs.

The heading for each item contains the chemical name and, in parenthesis, the CAS RN. Each item lists the subchronic HRV, the equation used to develop the subchronic HRV, and the variables necessary for the equation. The equations used to develop the subchronic HRV are designated as follows: "A" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part 4717.8300, subpart 3, and applying the general equation under part 4717.8300, subpart 2; "B" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part 4717.8300, subpart 4, and applying the general equation under part 4717.8300, subpart 2; "C" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part

4717.8300, subpart 5, and applying the general equation under part 4717.8300, subpart 2; and "D" means calculating the $NOAEL_{[HEC]}$ or $LOAEL_{[HEC]}$ or $BMC_{[HEC]}$ under part 4717.8300, subpart 6, and applying the general equation under part 4717.8300, subpart 2. The endpoint of concern is listed for use in determining a hazard index under part 4717.8600.

TABLE OF SUBCHRONIC HRVs

A. Acrolein (107-02-8)

Subchronic HRV ($\mu g/m^3$)	**0.2**
Endpoint of concern	Upper respiratory system
Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	2E-2
Uncertainty factor	100

B. Acrylic acid (79-10-7)

Subchronic HRV ($\mu g/m^3$)	**3**
Endpoint of concern	Upper respiratory system
Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	3.3E-1
Uncertainty factor	100

C. Allyl chloride (107-05-1)

Subchronic HRV ($\mu g/m^3$)	**10**
Endpoint of concern	Nervous system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	3.6
Uncertainty factor	300

D. Arsine (7784-42-1)

Subchronic HRV ($\mu g/m^3$)	**0.1**
Endpoint of concern	Hematologic system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	1.4E-2
Uncertainty factor	100

E. Chlordane (12789-03-6)

Subchronic HRV ($\mu g/m^3$)	**7**
Endpoint of concern	Hepatic system
Equation	B
$NOAEL_{[HEC]}$ (mg/m^3)	6.5E-1
Uncertainty factor	100

F. Chlorine dioxide (10049-04-4)

Subchronic HRV ($\mu g/m^3$)	**0.6**
Endpoint of concern	Lower respiratory system
Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	6.4E-1
Uncertainty factor	1,000

G. Chromic acid mists and dissolved Cr (VI) aerosols (18540-29-9)

Subchronic HRV ($\mu g/m^3$)	**0.02**
Endpoint of concern	Upper and lower respiratory system
Equation	C
$LOAEL_{[ADJ]}$ (mg/m^3)	7.1E-4
Uncertainty factor	30

H. Cr (VI) particulates (18540-29-9)

Subchronic HRV ($\mu g/m^3$)	**1**
Endpoint of concern	Lower respiratory system
Equation	A
$BMC_{[HEC]}$ (mg/m^3)	3.5E-2
Uncertainty factor	30

I. Cumene (98-82-8)

Subchronic HRV ($\mu g/m^3$)	**4,000**
Endpoint of concern	Renal system and endocrine system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	4.35E2
Uncertainty factor	100

J. 1,2-Dibromo-3-chloropropane (96-12-8)

Subchronic HRV ($\mu g/m^3$)	**2**
Endpoint of concern	Male reproductive system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	1.7E-1
Uncertainty factor	100

K. 1,4-Dichlorobenzene (106-46-7)

Subchronic HRV ($\mu g/m^3$)	**800**
Endpoint of concern	Hepatic system
Equation	D

$NOAEL_{[HEC]}$ (mg/m^3)	7.5E1
Uncertainty factor	100

L. 1,2-Dichloropropane (78-87-5)

Subchronic HRV ($\mu g/m^3$)	**10**
Endpoint of concern	Upper respiratory system
Equation	C
$LOAEL_{[HEC]}$ (mg/m^3)	1.3
Uncertainty factor	100

M. Dicyclopentadiene (77-73-6)

Subchronic HRV ($\mu g/m^3$)	**3**
Endpoint of concern	Renal system
Equation	D
$LOAEL_{[HEC]}$ (mg/m^3)	9.6E-1
Uncertainty factor	300

N. 2-Dimethylamino ethanol (101-01-0)

Subchronic HRV ($\mu g/m^3$)	**70**
Endpoint of concern	Upper respiratory system
Equation	C
$NOAEL_{[HEC]}$ (mg/m^3)	1.96
Uncertainty factor	30

O. Ethylene glycol monomethyl ether (EGME) or 2-methoxyethanol (109-86-4)

Subchronic HRV ($\mu g/m^3$)	**60**
Endpoint of concern	Male reproductive and hematologic systems
Equation	D
$NOAEL_{[HEC]}$(mg/m^3)	1.7E1
Uncertainty factor	300

P. Hydrogen sulfide (7783-06-4)

Subchronic HRV ($\mu g/m^3$)	**10**
Endpoint of concern	Upper respiratory system
Equation	C
$NOAEL_{[HEC]}$ (mg/m^3)	1.01
Uncertainty factor	100

Q. Phosphine (7803-51-2)

Subchronic HRV ($\mu g/m^3$)	**3**
Endpoint of concern	Decreased body weight
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	2.5E-1
Uncertainty factor	100

R. Propylene glycol monomethyl ether (107-98-2)

Subchronic HRV ($\mu g/m^3$)	**20,000**
Endpoint of concern	Nervous system
Equation	D
$NOAEL_{[HEC]}$ (mg/m^3)	6.58E2
Uncertainty factor	30

S. Triethylamine (121-44-8)

Subchronic HRV ($\mu g/m^3$)	**70**
Endpoint of concern	Upper respiratory system
Equation	C
$NOAEL_{[HEC]}$ (mg/m^3)	1.95E1
Uncertainty factor	300

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*

4717.8200 TABLE OF ACUTE HRVs.

The heading for each item contains the chemical name and, in parenthesis, the CAS RN. Each item lists the acute HRV, the equation used to develop the acute HRV, and the variables necessary for the equation. The equations used to develop the acute HRV are designated as follows: "A" means calculating the NOAEL or LOAEL or $BMC_{[ADJ]}$ under part 4717.8500, subpart 3, and applying the general equation under part 4717.8500, subpart 2; "B" means calculating the $NOAEL_{[ADJ]}$ or $LOAEL_{[ADJ]}$ or $BMC_{[ADJ]}$ under part 4717.8500, subpart 4, and applying the general equation under part 4717.8500, subpart 2; "C" means calculating the BMC or $BMC_{[ADJ]}$ under part 4717.8500; and "D" means applying the equation under part 4717.8500, subpart 5. The endpoint of concern is listed for use in determining a hazard index under part 4717.8600.

TABLE OF ACUTE HRVs

A. Ammonia (7664-41-7)

Acute HRV ($\mu g/m^3$)	**3,200**
Endpoint of concern	Irritant - eye, respiratory system
Equation	C
BMC (mg/m^3)	9.5
Uncertainty factor	3

B. Arsine (7784-42-1)

Acute HRV (µg/m^3)	**200**
Endpoint of concern	Hematologic*
Equation	A
$NOAEL_{[ADJ]}$ (mg/m^3)	1.6E1
Uncertainty factor	100

C. Benzene (71-43-2)

Acute HRV (µg/m^3)	**1,000**
Endpoint of concern	Reproductive/developmental
Equation	D
NOAEL (mg/m^3)	1.3E2
Uncertainty factor	100

D. Carbon disulfide (75-15-0)

Acute HRV (µg/m^3)	**6,000**
Endpoint of concern	Reproductive/developmental
Equation	D
NOAEL (mg/m^3)	6.2E2
Uncertainty factor	100

E. Chlorine (7882-50-5)

Acute HRV (µg/m^3)	**290**
Endpoint of concern	Irritant - respiratory system
Equation	A
NOAEL (mg/m^3)	2.9
Uncertainty factor	10

F. Chloroform (67-66-3)

Acute HRV (µg/m^3)	**150**
Endpoint of concern	Reproductive/developmental
Equation	D
LOAEL (mg/m^3)	1.5E2
Uncertainty factor	1,000

G. Dichloromethane (75-09-2)

Acute HRV (µg/m^3)	**10,000**
Endpoint of concern	Nervous system
Equation	A

$NOAEL_{[ADJ]}$ (mg/m^3)	6.8E2
Uncertainty factor	60

H. 1,4-Dioxane (123-91-1)

Acute HRV ($\mu g/m^3$)	**3,000**
Endpoint of concern	Irritant - eye and nasal
Equation	A
$LOAEL_{[ADJ]}$ (mg/m^3)	1.8E2
Uncertainty factor	60

I. Ethyl benzene (100-41-4)

Acute HRV ($\mu g/m^3$)	**10,000**
Endpoint of concern	Reproductive/developmental
Equation	D
NOAEL (mg/m^3)	4.3E2
Uncertainty factor	30

J. Ethyl chloride (75-00-3)

Acute HRV ($\mu g/m^3$)	**100,000**
Endpoint of concern	Reproductive/developmental
Equation	D
NOAEL (mg/m^3)	4E3
Uncertainty factor	30

K. Ethylene glycol monoethyl ether (110-80-5)

Acute HRV ($\mu g/m^3$)	**400**
Endpoint of concern	Reproductive/developmental
Equation	D
NOAEL (mg/m^3)	3.7E1
Uncertainty factor	100

L. Ethylene glycol monoethyl ether acetate (111-15-9)

Acute HRV ($\mu g/m^3$)	**100**
Endpoint of concern	Reproductive/developmental
Equation	D
LOAEL (mg/m^3)	1.4E2
Uncertainty factor	1,000

M. Ethylene glycol monomethyl ether (EGME) (109-86-4) or 2-methoxyethanol

Acute HRV ($\mu g/m^3$)	**90**
Endpoint of concern	Reproductive/developmental
Equation	D
NOAEL (mg/m^3)	9.3
Uncertainty factor	100

N. Formaldehyde (50-00-0)

Acute HRV ($\mu g/m^3$)	**94**
Endpoint of concern	Irritant - eye and respiratory system
Equation	C
BMC (mg/m^3)	9.4E-1
Uncertainty factor	10

O. Hydrogen chloride (7647-01-1)

Acute HRV ($\mu g/m^3$)	**2,700**
Endpoint of concern	Irritant - eye and respiratory system
Equation	A
NOAEL (mg/m^3)	2.7
Uncertainty factor	1

P. Hydrogen cyanide (74-90-8)

Acute HRV ($\mu g/m^3$)	**700**
Endpoint of concern	Nervous system*
Equation	A
NOAEL (mg/m^3)	6.8E1
Uncertainty factor	100

Q. Hydrogen fluoride (7664-39-3)

Acute HRV ($\mu g/m^3$)	**240**
Endpoint of concern	Irritant - respiratory system
Equation	A
$NOAEL_{[ADJ]}$ (mg/m^3)	2.4
Uncertainty factor	10

R. Methanol (67-56-1)

Acute HRV ($\mu g/m^3$)	**25,000**
Endpoint of concern	Nervous system
Equation	A

$NOAEL_{[ADJ]}$ (mg/m^3)	2.5E2
Uncertainty factor	10

S. Methyl bromide (74-83-9)

Acute HRV ($\mu g/m^3$)	**2,000**
Endpoint of concern	Nervous system*
Equation	A
$LOAEL_{[ADJ]}$ (mg/m^3)	1.4E2
Uncertainty factor	60

T. Methyl ethyl ketone (78-93-3)

Acute HRV ($\mu g/m^3$)	**10,000**
Endpoint of concern	Irritant - eye and respiratory system
Equation	A
$LOAEL_{[ADJ]}$ (mg/m^3)	8E2
Uncertainty factor	60

U. Nickel and nickel compounds (**)

Acute HRV ($\mu g/m^3$)	**11**
Endpoint of concern	Irritant - respiratory system
Equation	A
LOAEL (mg/m^3)	6.7E-2
Uncertainty factor	6

V. Nitric acid (7697-37-2)

Acute HRV ($\mu g/m^3$)	**130**
Endpoint of concern	Irritant - respiratory system
Equation	A
NOAEL (mg/m^3)	1.29E-1
Uncertainty factor	1

W. Phenol (108-95-2)

Acute HRV ($\mu g/m^3$)	**5,800**
Endpoint of concern	Irritant - eye and respiratory system
Equation	B
$NOAEL_{[ADJ]}$ (mg/m^3)	5.8E1
Uncertainty factor	10

X. Phosgene (75-44-5)

Acute HRV ($\mu g/m^3$)	**4**
Endpoint of concern	Irritant - respiratory system*
Equation	A
$NOAEL_{[ADJ]}$ (mg/m^3)	4E-1
Uncertainty factor	100

Y. Sodium hydroxide (1310-93-2)

Acute HRV ($\mu g/m^3$)	**8**
Endpoint of concern	Irritant - eye, skin, and respiratory system
Equation	A
$LOAEL_{[ADJ]}$ (mg/m^3)	5E-1
Uncertainty factor	60

Z. Styrene (100-42-5)

Acute HRV ($\mu g/m^3$)	**21,000**
Endpoint of concern	Irritant - eye and respiratory system
Equation	A
$NOAEL_{[ADJ]}$ (mg/m^3)	2.1E2
Uncertainty factor	10

AA. Tetrachloroethylene or perchlorethylene (127-18-4)

Acute HRV ($\mu g/m^3$)	**20,000**
Endpoint of concern	Irritant - eye and respiratory and nervous systems
Equation	B
$LOAEL_{[ADJ]}$ (mg/m^3)	1.2E3
Uncertainty factor	60

BB. Toluene (108-88-3)

Acute HRV ($\mu g/m^3$)	**37,000**
Endpoint of concern	Irritant - eye and respiratory and nervous systems
Equation	B
$NOAEL_{[ADJ]}$ (mg/m^3)	3.7E2
Uncertainty factor	10

CC. 1,1,1-Trichloroethane or methyl chloroform (71-55-6)

Acute HRV ($\mu g/m^3$)	**140,000**
Endpoint of concern	Nervous system

Equation	A
NOAEL (mg/m^3)	1.37E3
Uncertainty factor	10

DD. Trichloroethylene (79-01-6)

Acute HRV ($\mu g/m^3$)	**2,000**
Endpoint of concern	Reproductive/developmental
Equation	D
LOAEL (mg/m^3)	5.4E2
Uncertainty factor	300

EE. Triethylamine (121-44-8)

Acute HRV ($\mu g/m^3$)	**2,800**
Endpoint of concern	Irritant - eye; transient corneal edema
Equation	B
$NOAEL_{[ADJ]}$ (mg/m^3)	2.8E1
Uncertainty factor	10

FF. Vanadium pentoxide (1314-62-1)

Acute HRV ($\mu g/m^3$)	**30**
Endpoint of concern	Irritant - respiratory system
Equation	B
$LOAEL_{[ADJ]}$ (mg/m^3)	3E-1
Uncertainty factor	10

GG. Xylenes (1330-20-7)

Acute HRV ($\mu g/m^3$)	**43,000**
Endpoint of concern	Irritant - eye and respiratory and nervous systems
Equation	A
NOAEL (mg/m^3)	4.3E2
Uncertainty factor	10

* This HRV is for a chemical where there is little magnitude difference between the level where mild irritancy occurs and levels where more severe adverse health effects occur.

** This HRV is for a chemical mixture which, therefore, does not have a chemical-specific number assigned by the Chemical Abstracts Service.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*

4717.8250 TABLE OF MHRVs FOR MULTIMEDIA EXPOSURE TO AIR TOXICS.

The heading for each item contains the chemical name and, in parenthesis, the CAS RN. Each item lists the MHRV and the variables necessary for the equation. The equations

used to develop the MHRV are designated as follows: "A" means applying the equation under part 4717.8350 for noncarcinogenic effects of toxicants and "B" means applying the equation under part 4717.8450 for carcinogens. The endpoint of concern is listed for use in determining a cancer index under part 4717.8550 or a hazard index under part 4717.8600.

TABLE OF MHRVs

A. Antimony (7440-36-0)

MHRV (µg/kg-day)	**0.4**
Endpoint of concern	Hematologic system
Equation	A
LOAEL (mg/kg-day)	3.5E-1
Uncertainty factor	1,000

B. Arsenic (7440-38-2)

MHRV (µg/kg-day)	**0.007**
Endpoint of concern	Cancer
Equation	B
Potency slope $[mg/kg\text{-}day]^{-1}$	1.5

C. Benzo[a]pyrene (50-32-8)

MHRV (µg/kg-day)	**0.001**
Endpoint of concern	Cancer
Equation	B
Potency slope $[mg/kg\text{-}day]^{-1}$	7.3

D. Cadmium (7440-43-9)

MHRV (µg/kg-day)	**0.5**
Endpoint of concern	Renal system
Equation	A
NOAEL (mg/kg-day)	5E-3
Uncertainty factor	10

E. Manganese (7439-96-5)

MHRV (µg/kg-day)	**140**
Endpoint of concern	Nervous system
Equation	A
NOAEL (mg/kg-day)	1.4E-1
Uncertainty factor	1

F. Methylmercury (22967-92-6)

MHRV (µg/kg-day)	**0.1**
Endpoint of concern	Nervous system and developmental

Equation	A
BMD (mg/kg-day)	1E-3
Uncertainty factor	10

G. Nickel (7440-02-0)

MHRV (µg/kg-day)	**20**
Endpoint of concern	Decreased body and organ weights
Equation	A
NOAEL (mg/kg-day)	5
Uncertainty factor	300

H. Polychlorinated biphenyls (PCB) (1336-36-3)

MHRV (µg/kg-day)	**0.05**
Endpoint of return	Developmental
Equation	A
LOAEL (mg/kg-day)	5E-4
Uncertainty factor	10

Statutory Authority: *MS s 144.12*

History: *26 SR 1229*

4717.8300 EQUATIONS FOR CALCULATION OF HRVs FOR NONCARCINOGENIC EFFECTS OF TOXICANTS.

Subpart 1. **Scope.** This part establishes the method for determining the health risk values (HRVs) for noncarcinogenic effects of toxicants.

Subp. 2. **General equation; calculating HRV for noncarcinogenic effect of toxicant.** The equation for calculating an HRV for a noncarcinogenic effect of a toxicant is:

$$HRV = \frac{NOAEL_{[ADJ]} \text{ or } LOAEL_{[ADJ]} \text{ or } BMC_{[ADJ]}}{\text{(Uncertainty factor)(Modifying factor)}} \times 1{,}000$$

or

$$HRV = \frac{NOAEL_{[HEC]} \text{ or } LOAEL_{[HEC]} \text{ or } BMC_{[HEC]}}{\text{(Uncertainty factor)(Modifying factor)}} \times 1{,}000$$

Where:

A. HRV is expressed in units of micrograms per cubic meter ($\mu g/m^3$) of air;

B. $NOAEL_{[ADJ] \text{ or } [HEC]}$, $LOAEL_{[ADJ] \text{ or } [HEC]}$, or $BMC_{[ADJ] \text{ or } [HEC]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;

C. uncertainty factor and modifying factor are unitless;

D. the default value for modifying factor is one unless otherwise specified in part 4717.8100 or 4717.8150; and

E. 1,000 is a factor to convert milligrams to micrograms.

Subp. 3. **Equation for $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$; particles with respiratory effect.** The equation for calculating a $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ for a particle having a respiratory effect is:

$$NOAEL_{[HEC]} \text{ or } LOAEL_{[HEC]} \text{ or } BMC_{[HEC]} =$$
$$NOAEL_{[ADJ]} \text{ or } LOAEL_{[ADJ]} \text{ or } BMC_{[ADJ]} \times RDDR$$

Where:

A. $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;

B. $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air; and

C. RDDR is the regional deposited dose ratio and is unitless.

Subp. 4. **Equation for $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$; particles with extrarespiratory effect.** The equation for calculating a $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ for particles with an extrarespiratory effect is:

$$NOAEL_{[HEC]} \text{ or } LOAEL_{[HEC]} \text{ or } BMC_{[HEC]} =$$
$$NOAEL_{[ADJ]} \text{ or } LOAEL_{[ADJ]} \text{ or } BMC_{[ADJ]} \times RDDR_{ER}$$

Where:

A. $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;

B. $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air; and

C. $RDDR_{ER}$ is the regional deposited dose ratio for extrarespiratory effects and is unitless.

Subp. 5. **Equation for $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$; gas with respiratory effect.** The equation for calculating the $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ for a gas having a respiratory effect is:

$$NOAEL_{[HEC]} \text{ or } LOAEL_{[HEC]} \text{ or } BMC_{[HEC]} =$$
$$NOAEL_{[ADJ]} \text{ or } LOAEL_{[ADJ]} \text{ or } BMC_{[ADJ]} \times RGDR$$

Where:

A. $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;

B. $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air; and

C. RGDR is the regional gas dose ratio in the specific region of the respiratory tract and is unitless.

Subp. 6. **Equation for $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$; gas with extrarespiratory effect.** The equation for calculating the $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ for a gas having an extrarespiratory effect is:

$$NOAEL_{[HEC]} = NOAEL_{[ADJ]} \times \frac{(H_{b/g})_A}{(H_{b/g})_H}$$

or

$$LOAEL_{[HEC]} = LOAEL_{[ADJ]} \times \frac{(H_{b/g})_A}{(H_{b/g})_H}$$

or

$$BMC_{[HEC]} = BMC_{[ADJ]} \times \frac{(H_{b/g})_A}{(H_{b/g})_H}$$

Where:

A. $NOAEL_{[HEC]}$, $LOAEL_{[HEC]}$, or $BMC_{[HEC]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;

B. $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air; and

C. $(H_{b/g})_A/(H_{b/g})_H$ is the ratio of the blood:gas (air) partition coefficient of the chemical in the experimental animal to the blood:gas (air) partition coefficient of the chemical in a human; the ratio is unitless. If $(H_{b/g})_A > (H_{b/g})_H$ or if the partition coefficient values are unknown, $(H_{b/g})_A/(H_{b/g})_H = 1.0$.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*

4717.8350 EQUATION FOR CALCULATION OF MHRV FOR NONCARCINOGENIC EFFECTS OF TOXICANTS.

Subpart 1. **Scope.** This part establishes the method for determining the multimedia health risk value (MHRV) for a noncarcinogenic effect of a toxicant emitted to the air.

Subp. 2. **Equation for MHRV for noncarcinogenic effect of toxicant.** The equation for calculating a MHRV for a noncarcinogenic effect of a toxicant is:

$$MHRV = \frac{\text{NOAEL or LOAEL or BMD}}{\text{(Uncertainty factor) (Modifying factor)}} \times 1{,}000$$

Where:

A. MHRV is expressed in units of micrograms of chemical or defined mixture of chemicals per kilogram of body weight per day (µg/kg-day);

B. NOAEL, LOAEL, or BMD is expressed in units of milligrams of chemical or defined mixture of chemicals per kilogram body weight per day (mg/kg-day);

C. uncertainty factor and modifying factor are unitless;

D. the default value for modifying factor is one unless otherwise specified in part 4717.8250; and

E. 1,000 is a factor to convert milligrams to micrograms.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*

4717.8400 EQUATION FOR CALCULATION OF HRVs FOR CARCINOGENS.

Subpart 1. **Scope.** This part establishes the method for determining the health risk values (HRVs) for a carcinogen.

Subp. 2. **Equation for carcinogens.** The equation for determining the HRV for a carcinogen is:

$$HRV = \frac{\text{Additional lifetime risk}}{\text{Unit risk}}$$

Where:

A. HRV is expressed in units of micrograms per cubic meter ($\mu g/m^3$) of air;

B. unit risk is expressed in units of micrograms of the chemical or defined mixture of chemicals per cubic meter of air; and

C. additional lifetime risk is unitless.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229*

4717.8450 EQUATION FOR CALCULATION OF MHRV FOR CARCINOGENS.

Subpart 1. **Scope.** This part establishes the methods for determining the multimedia health risk values (MHRVs) for carcinogens emitted to the air.

Subp. 2. **General equation for calculating MHRVs for carcinogens.** The general equation for calculating MHRVs for carcinogens is:

$$MHRV = \frac{\text{Additional lifetime risk}}{\text{Potency slope}} \times 1{,}000$$

Where:

A. MHRV is expressed in units of micrograms per kilogram of body weight per day ($\mu g/kg\text{-}day$);

B. potency slope is expressed in units of the inverse of milligrams per kilogram of body weight per day $(mg/kg\text{-}day)^{-1}$;

C. additional lifetime risk is unitless; and

D. 1,000 is a factor to convert milligrams to micrograms.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229*

4717.8500 EQUATIONS FOR CALCULATION OF HRVs FOR ACUTE TOXICITY.

Subpart 1. **Scope.** This part establishes the method for determining the health risk value (HRV) for toxicants having acute toxicity effects.

Subp. 2. **General equation for calculating an HRV for an acute irritant.** The equation for calculating an HRV for an acute irritant is:

$$HRV = \frac{\text{NOAEL or NOAEL}_{[ADJ]}}{\text{(Uncertainty factor)(Modifying factor)}} \times 1{,}000$$

or

$$HRV = \frac{\text{LOAEL or LOAEL}_{[ADJ]}}{\text{(Uncertainty factor)(Modifying factor)}} \times 1{,}000$$

or

$$HRV = \frac{BMC \text{ or } BMC_{[ADJ]}}{(\text{Uncertainty factor})(\text{Modifying factor})} \times 1{,}000$$

Where:

A. HRV is expressed in units of micrograms per cubic meter ($\mu g/m^3$) of air;

B. NOAEL, $NOAEL_{[ADJ]}$, LOAEL, $LOAEL_{[ADJ]}$, BMC, or $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air;

C. uncertainty factors and modifying factor are unitless;

D. the default value for modifying factor is one unless otherwise specified in part 4717.8200; and

E. 1,000 is a factor to convert milligrams to micrograms.

Subp. 3. **Methods of calculation for acute irritant; study exposure time from 30 minutes to two hours.** For acute irritants where the study time is 30 minutes to two hours, the study NOAEL or LOAEL will be used without adjustment. For studies where the exposure time is 30 minutes to two hours and a BMC approach is used, a time adjustment may be necessary. When a BMC approach is used, the equation for calculating a $BMC_{[ADJ]}$ is:

$$BMC_{[ADJ]} \text{ x } 60 \text{ minutes} = BMC_{(study)} \text{ x exposure duration}$$

Where:

A. $BMC_{(study)}$ is expressed in units of milligrams of a chemical or defined mixture of chemicals per cubic meter (mg/m^3) of air used in the study as the exposure concentration; and

B. $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air.

Subp. 4. **Equation for acute irritant; study exposure time from two to eight hours.** The equation for calculating a $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ for an acute irritant based on data from a study where the exposure time or adverse health effect onset time is greater than two hours but less than or equal to eight hours is:

$(NOAEL_{(study)}^{n} \text{ or } LOAEL_{(study)}^{n} \text{ or } BMC_{(study)}^{n})$ (exposure duration or onset of critical effect) = $NOAEL_{[ADJ]}$ or $LOAEL_{[ADJ]}$ or $BMC_{[ADJ]}$

Where:

A. $NOAEL_{(study)}$, $LOAEL_{(study)}$, or $BMC_{(study)}$ is expressed in units of milligrams of a chemical or defined mixture of chemicals per cubic meter (mg/m^3) of air used in the study as the exposure concentration;

B. the default value for n is 2 unless noted otherwise;

C. the exposure duration represents the time at which the critical effect occurred. This most often is the exposure duration, but in some instances the critical effect may differ from the exposure duration, depending on the critical endpoint being observed; and

D. $NOAEL_{[ADJ]}$, $LOAEL_{[ADJ]}$, or $BMC_{[ADJ]}$ is expressed in units of milligrams per cubic meter (mg/m^3) of air.

Subp. 5. **Calculation of HRV for chemical causing reproductive/developmental toxicity.** The equation for calculating an HRV for a chemical or defined mixture of chemicals causing reproductive/developmental toxicity is:

$$HRV = \frac{NOAEL \text{ or } LOAEL \text{ or } BMC}{(\text{Uncertainty factor})(\text{Modifying factor})} \times 1{,}000$$

Where:

A. HRV is expressed in units of micrograms per cubic meter ($\mu g/m^3$) of air;

B. NOAEL, LOAEL, or BMC is expressed in units of milligrams per cubic meter (mg/m^3) of air;

C. uncertainty factor and modifying factor are unitless;

D. the default value for modifying factor is one unless otherwise specified in part 4717.8200; and

E. 1,000 is a factor to convert milligrams to micrograms.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*

CANCER INDEX AND HAZARD INDEX

4717.8550 PROCEDURE FOR DETERMINING CANCER INDEX FOR SIMULTANEOUS EXPOSURE TO MULTIPLE CARCINOGENS.

Subpart 1. **Cancer index.** To evaluate simultaneous exposure for multiple carcinogens, a cancer index must be calculated using the procedure in this part.

Subp. 2. **Carcinogenic HRVs.** For health risk values (HRVs) that have cancer endpoints, items A to C apply.

A. A cancer index is determined for chemicals or defined mixtures of chemicals with an inhalation endpoint of cancer using the following equation:

$$\text{Cancer index} = \frac{E_{C1}}{HRV_{C1}} + \frac{E_{C2}}{HRV_{C2}} + \ldots + \frac{E_{Cn}}{HRV_{Cn}}$$

Where:

(1) E_{Cn} represents the measured or modeled ambient air concentration as expressed in units of micrograms per cubic meter ($\mu g/m^3$) of the first, second, through the n^{th} carcinogen; and

(2) HRV_{Cn} represents the chronic HRV of the first, second, through n^{th} carcinogen as expressed in units of micrograms per cubic meter ($\mu g/m^3$).

B. A cancer index of one is equivalent to a cumulative HRV. A cancer index greater than one exceeds the cumulative HRV.

Subp. 3. **Carcinogenic MHRVs.** For mixtures of multimedia health risk values (MHRVs) that have cancer endpoints, items A to C apply.

A. A cancer index is determined for chemicals or defined mixtures of chemicals with an endpoint of cancer using the following equation:

$$\text{Cancer index} = \frac{D_{C1}}{MHRV_{C1}} + \frac{D_{C2}}{MHRV_{C2}} + \ldots + \frac{D_{Cn}}{MHRV_{Cn}}$$

Where:

(1) D_{Cn} represents the calculated lifetime averaged daily dose of the first, second, through the n^{th} carcinogen as expressed in units of micrograms per kilogram of body weight per day (µg/kg-d); and

(2) $MHRV_{Cn}$ represents the MHRV of the first, second, through the n^{th} carcinogen as expressed in units of micrograms per kilogram of body weight per day (µg/kg-d).

B. A cancer index of one is equivalent to a cumulative MHRV. A cancer index greater than one exceeds the cumulative MHRV.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229*

4717.8600 PROCEDURE FOR DETERMINING HAZARD INDEX FOR ASSESSING SIMULTANEOUS EXPOSURE TO MULTIPLE TOXICANTS WITH NONCARCINOGENIC EFFECTS.

Subpart 1. **Hazard index.** When simultaneous exposure is evaluated for multiple toxicants with noncarcinogenic effects, a hazard index must be calculated using the procedure in this part.

Subp. 2. **HRVs for toxicants with noncarcinogenic effects.** For health risk values (HRVs) that have endpoints other than cancer, items A to D apply.

A. The chemicals or defined mixtures of chemicals detected in the air must be first grouped by endpoint of concern and by HRV type (acute, subchronic, chronic).

B. A separate hazard index is then calculated for each same endpoint of concern group within the chronic, subchronic, and acute categories.

C. When two or more chemicals or defined mixtures of chemicals have the same endpoint, a hazard index must be determined using the following equation:

$$\text{Hazard index} = \frac{E_{ST1}}{HRV_{ST1}} + \frac{E_{ST2}}{HRV_{ST2}} + \ldots + \frac{E_{STn}}{HRV_{STn}}$$

Where:

(1) E_{STn} represents the measured or modeled ambient air concentration of the first, second, through the n^{th} toxicant with noncarcinogenic effects in air as expressed in units of micrograms per cubic meter ($\mu g/m^3$); and

(2) HRV_{STn} represents the HRV of the first, second, through the n^{th} toxicant with noncarcinogenic effects as expressed in units of micrograms per cubic meter ($\mu g/m^3$).

D. A hazard index of one or less indicates a combined concentration of chemicals unlikely to cause an adverse health effect to the general public.

E. A hazard index of one equals the cumulative HRV.

Subp. 3. **MHRVs for toxicants with noncarcinogenic effects.** For multimedia health risk values (MHRVs) that have endpoints other than cancer, items A to C apply.

A. The chemicals or defined mixtures of chemicals measured or modeled in ambient air must first be grouped by endpoint of concern.

B. When two or more chemicals or defined mixtures of chemicals have the same endpoint, a hazard index must be determined using the following equation:

$$\text{Hazard index} = \frac{D_{ST1}}{MHRV_{ST1}} + \frac{D_{ST2}}{MHRV_{ST2}} + \ldots + \frac{D_{STn}}{MHRV_{STn}}$$

Where:

(1) $D_{STn,}$ represents the calculated dose of the first, second, through the n^{th} toxicant with noncarcinogenic effects as expressed in micrograms per kilogram of body weight per day (μg/kg-d); and

(2) $MHRV_{STn}$ represents the MHRV of the first, second, through the n^{th} toxicant with noncarcinogenic effects as expressed in micrograms per kilogram of body weight per day (μg/kg-d).

C. A hazard index of one or less indicates a combined concentration of chemicals unlikely to cause an adverse health effect to the general public.

D. A hazard index of one equals the cumulative MHRV.

Statutory Authority: *MS s 144.12*

History: *26 SR 1229; 26 SR 1395*