

4720.3947 SLOW RATE GRAVITY FILTERS.

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

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

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

- A. no less than two filter units;
- B. a cover or superstructure;
- C. headroom to permit normal movement by operating personnel for scraping and sand removal operations;
- D. manholes and access ports for handling sand; and
- E. filtration to waste and overflow at the maximum filter water levels.

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

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

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

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

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

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

- A. a loss-of-head gauge;
- B. an orifice, Venturi meter, or other suitable metering device installed on each filter to enable control of the rate of filtration; and
- C. an effluent pipe located at an elevation which maintains the water level in the filter above the top of the sand.

Statutory Authority: *MS s 144.383*

History: *15 SR 1842*

Published Electronically: *October 27, 2003*