

# Guidance for R309-520. Facility Design and Operation: Disinfection.

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## R309-520-4. Primary Disinfectants.

### Iodine.

- *Iodine disinfection is no longer allowed because of adverse health implications for the public.*

## R309-520-6. General.

### ANSI/NSF Standard 60 Certification.

- *Third-party organizations, such as NSF, UL, and the Water Quality Association, are accredited to provide product certification to ANSI/NSF Standard 60.*
- *Hypochlorite tablets for swimming pools are not approved for use in drinking water. Swimming pool grade hypochlorite tablets contain chemicals to retard the photodecomposition of hypochlorite and typically lack approval for use in drinking water.*

### Site Selection.

- *Public water systems should work closely with local fire code officials to evaluate hazards associated with chlorine gas when subdivisions or other populations encroach upon previously remote facilities or when new geologic hazards are identified.*

## R309-520-7. Chlorine.

### Chemical Types.

- *For small supplies requiring less than four pounds per day, liquid hypochlorite feed systems are advised.*

### Automatic Proportioning.

- *Chlorine gas chlorinators that respond to a 4-20 milliamp signal from an electronic flow meter are recommended for flow-proportioning. Chlorine gas chlorinators that respond to on-line chlorine residual concentration feedback signal are recommended for dose-proportioning.*

### Point of Application for Surface Water.

- *Consider adding chlorine to raw water, settled water, filtered water, and water entering the distribution system.*

### **Flow Measurement.**

- *In most circumstances, a commercial flow meter will be necessary to satisfy this requirement. In unusual circumstances, for example, where the availability of electrical power may be problematic, an exception-to-rule may be warranted to allow the use of a calibrated staff gauge or a calibrated v-notch weir, in an appropriate hydraulic structure such as a surface water intake box or a spring collection box outlet wall.*

### **Residual Testing Equipment.**

- *Chlorine residual recorders should be provided where the chlorine demand varies appreciably over a short period of time. The N,N-Diethyl-p-phenyldiamine (DPD) method of chlorine residual or other EPA-approved method determination is recommended.*

### **Additional Requirements for Gas Chlorinators - Heat.**

- *Chlorinator rooms should be heated to 50 degrees F, and be protected from room temperatures in excess of 70-80 degrees F. Where space heaters are used, the cylinders should be protected from direct heat. Care should be taken to avoid chlorine condensation in feed lines caused by the feed equipment being cooler than the chlorine cylinder.*

### **Additional Requirements for Gas Chlorinators - Ventilation.**

- *For the safety of the operators, chlorination facility should not be located in a vault that has inadequate ventilation or in a location that is considered a confined space.*

### **Additional Requirements for Hypochlorite Systems - Feed Equipment.**

- *Hypochlorite feed equipment should conform with the following regulations as applicable R309-525-11(6) for storage and safe handling; with R309-525-11(7) for feeder design, location, and control; with R309-525-11(8) for feeder appurtenances such as pumps, day tanks, bulk storage tanks, and feed lines; and R309-525-11(9) for make-up water supply and protection.*

### **Additional Requirements for Hypochlorite Systems – Household Bleach.**

- *Non-NSF-certified, over-the-counter household bleach is not approved for normal use in drinking water principally because of trace metal contamination.*

## **R309-520-10. Chlorine Dioxide.**

### **Pre-design Proposal.**

- *It is recommended that the plans, specifications, operating procedures, and emergency response plans be reviewed by a certified safety consultant. Individuals which meet these requirements should maintain and supervise safety programs and procedures.*

### **Chlorine Dioxide Generators.**

- *Concentrations of chlorine dioxide and chlorite in the plant effluent need to be considered in design and operation to avoid exceeding the MRDL and MCL respectively.*
- *Typically a well-run generator can operate at more than 95% yield ( $[ClO_2]/\{[ClO_2] + [ClO_2^-] + 67.45/83.45[ClO_3^-]\}$ ). Maximizing yield will minimize chlorite demand and the possibility of exceeding the chlorite MCL. Discharge of free chlorine from the generator can typically be limited to less than 2% by weight. Free chlorine can contribute to DBP formation.*

### **Chlorine Dioxide Permissible Exposure Limit.**

- *Chlorine dioxide has a permissible exposure limit (PEL) in air based on 8 hour work day of 0.1 ppm and a short term exposure limit (STEL) of 0.3 ppm. The odor threshold of chlorine dioxide is about 0.1 ppm. Special measures are needed to protect treatment plant personnel.*

### **Operation and Maintenance – Handling Solid Chlorite.**

- *Solid chlorite is an explosion hazard. Solid chlorite should be handled with care.*

## **R309-520-11. Chloramines.**

### **Proposals for the Use of Chloramines as a Disinfectant.**

- *Chloramines are a much weaker oxidant than free chlorine, ozone or chlorine dioxide and therefore the “CT” values for inactivation of Giardia cysts by chloramines are extremely high and may not be achievable for some systems. Chloramines may be utilized only for secondary disinfection, as necessary to maintain required disinfectant residual concentrations in water entering, or throughout, the distribution system. Chlorine may be added prior to ammonia in producing chloramines, or ammonia prior to chlorine, or even ammonia and chlorine added concurrently. The order of application of chlorine and ammonia to form chloramines is important and source waters must be evaluated to determine which method is most effective.*