

# STATE OF COLORADO

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Dedicated to protecting and improving the health and environment of the people of Colorado

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Colorado Department  
of Public Health  
and Environment

## CDPHE Public Water Fluoridation Guidelines

### I. Fluoridation Benefits Oral Health

Tooth decay is the most prevalent chronic disease of man. By age 17, the average American will have 6.3 decayed, missing or filled teeth. In 2004, a statewide clinical survey of 2,031 Colorado 3rd graders revealed that over 57% had tooth decay experience.

Tooth decay is a complex process characterized by a loss of tooth structure as a result of destruction of these tissues by acids released from specific kinds of bacteria. About 7 of around 500 bacteria identified in the mouth have the ability to cause tooth decay; yet, these bacteria can spread and infect children by vertical transmission from the mother.

No other public health measure is as effective or as equitable in building decay-resistant teeth as public water fluoridation. Fluoride is naturally present in small yet varying amounts in soil, water, plants, and animals and, thus, is a normal constituent of all diets. In mammals, the highest concentrations of fluoride are found in the bones and teeth.

Water fluoridation is the deliberate addition of fluoride into drinking water in accordance with scientific guidelines. In 1945 and 1947, data from four studies demonstrated the oral health benefits of fluoridated water in several communities (Grand Rapids, Michigan; Newburgh, New York; Brantford, Ontario [Canada]; and Evanston, Illinois) and established water fluoridation as a practical, effective public health measure that would prevent tooth decay. Since then, hundreds of studies in the U.S. and other countries have concurred that water fluoridation is a safe and effective way to prevent tooth decay.

These guidelines provide information that will enable the Colorado Department of Public Health and Environment (CDPHE), Water Quality Control Division (WQCD) and Prevention Services Division, Oral Health Program (PSD/OH), public water system officials, consulting water engineers, and Certified Waterworks Operators to design and operate public water fluoridation programs.

## II. Starting a Water Fluoridation Program

**A. Eligibility:** Public water systems (PWS) that serve 2,000 people or more are eligible to receive CDPHE funds in the form of a grant for the capital and associated costs required to begin fluoridation at the water facility. The PWS must be located in Colorado and willing to comply with all safety monitoring and reporting requirements. Funding for PWS that serve less than 2,000 people may be considered on a case-by-case basis when requested by public water system officials.

**B. Funding Assistance:** The CDPHE is periodically able to fund new water fluoridation programs based on the availability of monies from several sources, such as foundation grants. Public leaders that approve a community water fluoridation program may request a contract to receive CDPHE funding to pay for water fluoridation equipment, installation, and associated costs. The contractor must agree to abide by all terms and conditions as stated by the CDPHE in the contract agreement (appended). Additionally, PWS that receive funding must agree to operate the water fluoridation program for at least five years unless otherwise required to de-fluoridate the public water system by the CDPHE, and attend yearly fluoridation training by the State.

### C. Fluoridation System Design:

#### Engineering Guidelines

- 1) The fluoride feed system must be installed so that it cannot operate unless raw water pumps are operating (interlocked). To assure this, the metering pump must be wired electrically in series with the main well pump or the service pump. If a gravity flow situation exists, a flow switch or pressure device should be installed.
- 2) When the fluoridation system is connected electrically to the well pump, the fluoride-metering pump cannot be plugged into any continuously active ("hot") electrical outlet. The fluoride-metering pump must only be plugged into the circuit that contains the interlock protection.<sup>1</sup>
- 3) A secondary flow-based control device (e.g., a flow switch or a pressure switch) should be installed for back-up protection in water systems that serve populations of <500 persons.
- 4) The fluoride injection point should be located where all the water to be treated passes; however, fluoride should not be injected at sites where substantial losses of fluoride can occur (e.g., the rapid-mix chemical basin).<sup>2</sup>
- 5) The fluoride injection point in a water line should be located in the lower one-third of the pipe (4-8 O'clock), and the end of the injection line should extend into the pipe approximately one-third of the pipe's diameter.

<sup>1</sup> One method of ensuring interlock protection is to install a special clearly labeled plug on the metering pump that is compatible with a special outlet on the appropriate electrical circuit. Another method of providing interlock protection is to wire the metering pump directly into the electrical circuit that is tied electrically to the well pump or service pump.

<sup>2</sup> In a surface-water treatment plant, the ideal location for injecting fluoride is the rapid sand filter effluent line going into the clear well.

6) A corporation stop valve should be used in the line at the fluoride injection point when injecting fluoride under pressure. A safety chain must always be installed in the assembly at the fluoride injection point to protect the water plant operator if a corporation stop valve assembly is used.

7) Operation of a fluoridation system without a functional anti-siphon device can lead to overfeed that exceeds 4 mg/L. Two diaphragm-type, anti-siphon devices must be installed in the fluoride feed line when a metering pump is used. The anti-siphon device should have a diaphragm that is spring-loaded in the closed position. These devices should be located at the fluoride injection point and at the metering pump head on the discharge side. The anti-siphon device on the head of the metering pump should be selected so that it will provide the necessary back pressure required by the manufacturer of the metering pump. Oversized metering pumps should not be used because serious overfeeds (i.e., overfeed that exceeds 4 mg/L) can occur if they are set too high. Conversely, undersized metering pumps can cause erratic fluoride levels.<sup>3</sup>

8) The fluoride metering pump should be located on a shelf not more than 4 feet (1.2 m) higher than the lowest normal level of liquid in the carboy, day tank, or solution container. A flooded suction line is not recommended in water fluoridation.

9) For greatest accuracy, metering pumps should be sized to feed fluoride near the midpoint of their range. Pumps should always operate between 30%-70% of capacity. Metering pumps that do not meet design specifications should not be installed. The priming switch on the metering pump should be spring-loaded to prevent the pump from being started erroneously with the switch in the priming position.

10) An in-line mixer or a small mixing tank should be installed in the finished water line exiting from the water plant if the first customer is less than or equal to 100 feet (30.5 m) from the fluoride injection point and if there is no storage tank located in the line before the water reaches the customer. The minimum distance is 100 feet, assuming there are typical valves and bends in the water line that allow for adequate mixing.

11) Flow meter-paced systems should not be installed unless the rate of water flow past the point of fluoride injection varies by more than 20%.

12) A master meter on the main water service line must be provided so that calculations can be made to confirm that the proper amounts of fluoride solution are being fed.

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<sup>3</sup> Vacuum testing for all anti-siphon devices should be done semiannually. All anti-siphon devices must be dismantled and visually inspected at least once a year. Schedules of repairs or replacements should be based on the manufacturer's recommendations.

- 13) The fluoride feed line(s) should be either color coded, when practical, or clearly identified by some other means. Color coding helps prevent possible errors when taking samples or performing maintenance. The pipes for all fluoride feed lines should be painted light blue with red bands. The word "fluoride" and the direction of the flow should be printed on the pipe.
- 14) Fluoride feed equipment, controls, safety equipment, accessory equipment, and other appurtenances must be inspected annually.
- 15) All hose connections within reach of the fluoride feed equipment should be provided with a hose bibb vacuum breaker.
- 16) All fluoride chemicals must conform to the appropriate American Water Works Association (AWWA) standards (B-701, 3-702, and B-703) to ensure that the drinking water will be safe and potable.
- 17) Storage should be provided for at least a three-month supply of fluoride chemical to minimize the effect of a possible fluoride chemical shortage. Shortages have occurred sporadically in the past (CDC, unpublished report, 1986).
- 18) Cross-connection controls that conform to state regulations must be provided.

#### **Sodium Fluoride Saturator System Requirements**

- 1) The minimum depth of sodium fluoride in a saturator should be 12 inches (30.5 cm). This depth should be marked on the outside of the saturator tank. The saturator should never be filled so high that the undissolved chemical is drawn into the pump suction line.
- 2) Only granular sodium fluoride should be used in saturators, because both powdered and very fine sodium fluorides tend to cause plugging in the saturator.
- 3) The water used for sodium fluoride saturators should be softened whenever the hardness exceeds 50 parts per million (ppm). Only the water used for solution preparation (i.e., the make-up water) needs to be softened.
- 4) A flow restrictor with a maximum flow of two gallons (7.6 L) per minute should be installed on all up-flow saturators.
- 5) In the event of a plant shut down, the make-up water solenoid valve should be physically disconnected from the electrical service.
- 6) For systems that use  $\leq 10$  gallons ( $\leq 38$  L) of saturator solution per day, operators should consider using an up-flow saturator that is manually filled with water.
- 7) In an up-flow saturator, either an atmospheric vacuum breaker must be installed or a backflow prevention device must be provided in accordance with state or local requirements. The vacuum breaker must be installed according to the manufacturer's recommendations.

8) A sediment filter (20 mesh) should be installed in the water make-up line going to the sodium fluoride saturators. The filter should be placed between the softener and the water meter.

9) A water meter must be provided on the make-up water line for the saturator so that calculations can be made to confirm that the proper amounts of fluoride solution are being fed. This meter and the master meter should be read daily and the results recorded.

10) Unsaturated (batch-mixed) sodium fluoride solution should not be used in water fluoridation.

#### **Fluorosilicic Acid System Requirements**

1) To reduce the hazard to the water plant operator, Fluorosilicic Acid (Hydrofluosilicic acid) must not be diluted. Small metering pumps are available that will permit the use of Fluorosilicic Acid for water plants of any size.

2) No more than a seven-day supply of Fluorosilicic Acid should be connected at any time to the suction side of the chemical feed pump. All bulk storage tanks with more than a seven-day supply must have a day tank. A day tank should only contain a small amount of acid, usually a one- or two-day supply.

3) Day tanks or direct acid-feed carboys/drums should be located on scales; daily weights should be measured and recorded. Volumetric measurements, such as marking the side of the day tank, are not adequate for monitoring acid feed systems.

4) Carboys, day tanks, or inside bulk storage tanks containing Fluorosilicic Acid must be completely sealed and vented to the outside.

5) Fluorosilicic Acid should be stored in bulk, if economically feasible.

6) Bulk storage tanks must be provided with secondary containment (i.e., berms) in accordance with state/local codes or ordinances.

#### **Fluoride Dry Feed System Requirements**

1) A solution tank that has a dry feeder (both volumetric and gravimetric) must be provided.

2) Solution tanks should be sized according to CDC guidelines.

3) A mechanical mixer should be used in every solution tank of a dry feeder when sodium fluorosilicate (i.e., silicofluoride) is used.

4) Scales must be provided for weighing the amount of chemicals used in the dry feeder.

### III. Water System Monitoring and Reporting

#### A. Fluoride Testing Requirements:

- 1) Water system personnel must test water samples for stable and consistent fluoride levels in the water system.<sup>4</sup> Water samples must be taken on a regular basis as determined by the CDPHE, and sample taking should be performed at all entry points throughout the water system.
- 2) At least once each month, water system personnel shall divide (split) one sample and have one portion analyzed for fluoride by water system personnel and the other portion analyzed by the CDPHE Laboratory.
- 3) Each PWS shall follow the CDPHE guidelines in reporting and submit a current and official State Fluoride Report each month of the results of required water sample testing to the CDPHE PSD and Oral Health.<sup>5</sup> These reports must be fully completed, signed by the ORC, and include:
  - a. The amount and type of chemicals fed and the total number of gallons of water treated per day;
  - b. The results of required daily monitoring for fluoride in the water distribution system; and
  - c. The results of monthly split sample(s).
  - d. Reserved
  - e. Reserved
- 4) The calculated dosage should be cross-checked against the reported fluoride levels to identify chronic non-optimal operation.
- 5) Samples of the PWS raw water source (i.e., water that has not been treated) should be submitted regularly per the Water Quality monitoring schedule for fluoride content analysis at the CDPHE Lab.
- 6) Samples results of the PWS background or raw water source (i.e., water that has not been treated) should be submitted monthly on the official State Fluoride Report.

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<sup>4</sup> The optimal control range in Colorado for adjusting fluoride in water is +/- 0.2 parts per million fluoride (ppm) with the optimal fluoride level being a range of 0.9-1.1 ppm.

<sup>5</sup> Required samples include a fluoride sample taken each whole day the plant or fluoridation equipment is running for that month and submitted monthly between the 1<sup>st</sup> and 10<sup>th</sup> of the next month, (with submission of a monthly split water sample) to the CDPHE Lab for testing.

7) PWS that are successful in "optimally" fluoridating their water supplies will be awarded a special certificate of recognition by the CDPHE.<sup>6</sup>

**B. Fluoride Testing:** Substances such as chloride and sulfate may interfere with the analysis of fluoride ion in water; however using an appropriate testing method allows the operator to account for the interference in the daily monitoring results.

**Colorimeter (SPADNS Method)**

1) The calorimetric method (SPADNS) of fluoride analysis is based on a reaction in which a deep color (from zirconium in dye) turns lighter in the presence of fluoride (fluoride removes zirconium). The calorimetric method can be used where no interference occurs or where the interferences are consistent (e.g., from iron, chloride, phosphate, sulfate or color). Consistent interferences can be accounted for by collecting a split sample and comparing the calorimetric results with results provided for by CDPHE Lab personnel. State laboratory personnel, CDPHE PSD, and the water plant operator can then make the appropriate adjustment.

2) The calorimetric method (SPADNS) of fluoride analysis is applicable for daily testing of fluoride levels in the range 0.1 to 2.0 ppm. Beyond this range, dilutions must be made using deionized water to obtain accurate measures of the fluoride concentration.

**Specific Ion Meter (Electrode Method)**

The electrode method is capable of measuring fluoride concentrations from 0.1 to 10 ppm.

**EC 300.0 EPA Method**

The 300.0 Environmental Protection Agency (EPA) Sampling method is capable of measuring fluoride concentrations from 0.1 to 10 ppm and is approved.

**In-Line Meter**

The EPA has not approved the In-Line fluoride-analyzing meter for reporting results.

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<sup>6</sup> For a water system to be considered optimally fluoridating:

- a) Pass the fluoridation specialist's inspection;
- b) Report in a timely manner a certain percentage as near 100 percent of the days of the month on the self-monitoring form as possible;
- c) In that report, the average must be in an optimal range (+/- 0.20 mg/L);
- d) In that same report, there must be a certain percentage as near 100 percent of the days as possible of the month within the optimal level (+/- 0.20 mg/L)- in other words, the results cannot go out of the optimal level set for your plant too many days out of the month (Reference your water treatment plant on the web at "My Water's Fluoride" page to view the treatment plant's optimal level if you are unsure);
- e) You must have mailed to the state laboratory within the first 10 days of the month your split sample;
- f) In that split sample report; your results must match within +/- 0.20 mg/L of the State's result;
- g) The plant's and the state laboratory split sample results and the plant's self monitoring form averages must also all correlate.

## **IV. Safety and Reporting**

### **A. Water Operator Safety**

- 1) The water supply industry has a high incidence of unintentional injuries as compared with other industries in the United States; with proper safety procedures, injuries can be avoided.
- 2) Water operators should follow proper safety procedures to avoid injuries and overexposure to chemicals. Water plant personnel should regularly receive safety training on all chemicals, including fluoride, as fluoride is just one of over 200 possible chemicals used in the treatment of the quality of water. Exposure hazards and first aid should be reviewed and emergency spill procedures should be established and explained to workers.

### **B. Protective Equipment**

- 1) The use of personal protective equipment (PPE) is required when handling fluoride chemicals or when maintenance on fluoridation equipment is performed.
- 2) Required PPE for handling sodium fluoride or sodium fluorosilicate includes:
  - a. NIOSH/MSHA approved high efficiency dust respirator (chemical mask) with soft rubber face-to-mask seal and replaceable cartridges.
  - b. Gauntlet neoprene gloves (12" glove minimum length)
  - c. Heavy duty neoprene aprons.
- 3) Required PPE for handling Fluorosilicic Acid includes:
  - a. Gauntlet neoprene gloves (12" glove minimum length)
  - b. Heavy duty neoprene aprons.
  - c. Full 80 face shield or acid type safety goggles
  - d. Safety shower/eye washer in easily accessible location (or pint-size bottle of eyewash solution).

### **C. Chemical Storage**

- 1) Do not allow unauthorized personnel, especially small children, in areas where fluoride chemicals are applied or stored. Do not eat in, or keep food in areas where fluoride is stored.
- 2) Store dry fluoride on pallets, in stacks preferably not more than six bags high. If fiber drums are used, keep the tops closed to prevent moisture contamination.



3) Vapors from Fluorosilicic Acid are corrosive; containers should be kept tightly closed, vented to the outdoors, and stored away from hot temperature areas. Bulk storage tanks can be made of fiberglass polyethylene or rubber-lined steel.

4) Fluoride waste should be disposed of in accordance with Colorado's Environmental Protection Program. Chemical spills should be cleaned and reported immediately.

**D. Fluoridation System Overfeed**

1) When a community fluoridates its drinking water, a chance of a fluoride overfeed exists. However, it is difficult for consumers to swallow large enough doses of fluoride to cause toxic effects because one of the symptoms of fluoride poisoning is severe nausea; people purge the ingested fluoride by vomiting.

2) Specific actions should be taken when equipment malfunctions or an adverse event occurs in a PWS that causes a fluoride chemical overfeed (Table 1).

3) When a fluoride test result is at or near the top end of the analyzer scale, the water sample must be diluted and retested to ensure that high fluoride levels are accurately measured.

**Table 1: Emergency Procedures for Fluoride Overfeeds**

Fluoride Content (mg F-/L)	Recommended Actions
0.1 mg/L above routine to 4.0 mg/L	1. Leave the fluoridation system on. 2. Determine malfunction and repair. 3. Notify supervisor and report the incident.
4.1 mg/L to 10.0 mg/L	1. Consider turning off the fluoridation system if the problem is not found quickly. 2. Notify supervisor and report the incident. 3. Take water samples at several points in the distribution system and test the fluoride content. 4. Determine malfunction and repair.
10.1 mg/L or greater	1. Turn off the fluoridation system immediately. 2. Notify supervisor and report the incident. 3. Take water samples at several points in the distribution system and test the fluoride content. 4. Send water sample to CDPHE Lab for testing. 5. Determine malfunction and repair.

**E. Chemical Exposure**

1) Skin contamination of the PWS Operator - If the operator gets concentrated wet or dry chemicals on the skin, he or she should thoroughly wash the contaminated skin area immediately. If the operator's clothing is contaminated with a wet chemical, he or she should remove the wet contaminated clothing immediately. If the operator's clothing becomes contaminated with dry chemicals, he or she should change their work clothing no later than the close of the work day.

2) Ingestion of Excessive Amounts of Fluoride - Refer to Tables 2 and 3.

**Table 2: Recommended Emergency Treatment for persons who ingest dry fluoride chemicals (NaF and Na<sub>2</sub>SiF<sub>6</sub>)**



**RECOMMENDED EMERGENCY  
TREATMENT FOR PERSONS  
WHO INGEST  
DRY FLUORIDE CHEMICALS  
(NaF and Na<sub>2</sub>SiF<sub>6</sub>)**

Milligrams fluoride ion/Body Weight	Treatment
Less than 5.0 mg F/kg*	<ol style="list-style-type: none"> <li>1. Give calcium (milk) orally to relieve gastrointestinal symptoms. Observe for a few hours. (Note: A can of evaporated milk should be available at all times to use for emergency treatment.)</li> <li>2. Induced vomiting is not necessary.</li> </ol>
5.0 mg F/kg and Over	<ol style="list-style-type: none"> <li>1. Move the person away from any contact with fluoride and keep him or her warm.</li> <li>2. Call Poison Control Center.  Phone _____</li> <li>3. If the victim is conscious, induce vomiting by rubbing the back of the throat with a spoon or your finger; or use syrup of Ipecac. To prevent aspiration of vomitus, the person should be placed face down with the head lower than the body.</li> <li>4. Give the person a glass of milk or any source of soluble calcium. (5% calcium gluconate, or calcium lactate solution).</li> <li>5. Take the person to the hospital as quickly as possible.</li> </ol>

\*Average weight/age: 15 kg/1-2 years; 20 kg/4-5 years; 23 kg/6-8 years; 70 kg/21 years.

**Note: 5 mg of fluoride(F) is equivalent to 11 mg of sodium fluoride (8 mg of sodium fluorosilicate). Ingesting 5 mg F/kg is equivalent to a 154 lb.(70 kg) person consuming 0.8 grams of sodium fluoride (0.6 grams of sodium fluorosilicate).**

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Table 3: Recommended Emergency Treatment for persons who ingest Fluorosilicic Acid



**RECOMMENDED EMERGENCY  
TREATMENT FOR PERSONS  
WHO INGEST  
FLUOROSILICIC ACID  
( H<sub>2</sub>SiF<sub>6</sub> )**

Milligrams fluoride ion/Body Weight	Treatment
Less than 5.0 mg F/kg*	<ol style="list-style-type: none"> <li>1. Give calcium (milk) orally to relieve gastrointestinal symptoms. Observe for 2-4 hours. (Note: A can of evaporated milk should be available at all times to use for emergency treatment.)</li> <li>2. Induced vomiting is not necessary..</li> </ol>
Over 5.0 mg F/kg	<ol style="list-style-type: none"> <li>1. Move the person away from any contact with fluoride and keep him or her warm.</li> <li>2. Call Poison Control Center.</li> </ol> <p>Phone _____</p> <ol style="list-style-type: none"> <li>3. If advised by the Poison Control Center and if the person is conscious, induce vomiting by rubbing the back of the throat with a spoon or your finger; or use syrup of Ipecac. To prevent aspiration of vomitus, the person should be placed face down with the head lower than the body.</li> <li>4. Give the person a glass of milk or any source of soluble calcium. (5% calcium gluconate, or calcium lactate solution).</li> <li>5. Take the person to the hospital as quickly as possible. <b>It is important that whoever takes the person to the hospital notify physicians that the person is at risk for pulmonary edema as late as 48 hours afterwards.</b></li> </ol>

\*Average weight/age: 15 kg/1-2 years; 20 kg/4-5 years; 23 kg/6-8 years; 70 kg/21 years.

**Note: 5 mg of fluoride(F) is equivalent to 27 mg of 23% fluorosilicic acid. Ingesting 5 mg F/kg is equivalent to a 154 lb.(70 kg) person consuming 2 grams of fluorosilicic acid.**

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## **V. Water Fluoridation Program Maintenance Guidelines**

To ensure that a fluoridation system is functioning properly it is necessary that equipment, including feed lines and testing equipment, be maintained. Fluoridation systems that are not properly maintained tend to have a higher rate of malfunction that deprives the public of the benefits of water fluoridation. Water operators should read and follow all maintenance guidelines found in the equipment manufacturer's user's manuals and other manuals such as the CDC's Manual for Water Plant Operators, April 1994.

## **VI. State Monitoring and Surveillance**

### **A. CDPHE Prevention Services Division (CDPHE/PSD)**

The CDPHE/PSD shall be responsible for: a) managing the Fluoridation Program; b) promoting water fluoridation; c) providing liaison with other state and federal agencies; (d) assisting CDPHE Water Quality Control Division (CDPHE/WQCD) with resolution of problems, and (e) surveillance and reporting of all official State Fluoridation Reports. When feasible, CDPHE/PSD Oral, Rural, and Primary Care Section (ORPCS) staff will accompany CDPHE/WQCD personnel on inspection visits, certification visits and water operator training courses. CDPHE PSD OH shall have access to all CDPHE/WQCD Public Water System files.

1) The CDPHE/PSD/ORPCS Oral Health Program (OH) shall submit the following information to the CDC:

- a. Names of all fluoridated water systems in the state;
- b. Names of all consecutive systems (i.e., a public water system that buys water from another public water system) that purchase water from fluoridated water systems;
- c. Names of all communities served by optimally fluoridated water systems and their consecutive water systems.

2) The CDPHE/PSD/ORPCS/OH shall participate in the CDC's Water Fluoridation Reporting System (WFRS).

3) CDPHE/PSD/ORPCS/OH must report, at least annually, the state's water fluoridation statistics to the State Board of Health.

4) The CDPHE/PSD/ORPCS/OH must notify the CDPHE/WQCD and area health-care providers (i.e., those that may prescribe fluoride supplements) when a fluoridation system is started or discontinued. PWS will supply to CDPHE/PSD their letter to their local health professionals via courtesy copy.

5) The CDPHE/PSD/ORPCS/OH shall make available to area health-care providers the most recent fluoride content of Colorado community water supplies through the use of WFRS.

### **B. CDPHE Division of Water Quality Control (CDPHE/WQCD)**

The CDPHE/WQCD shall be responsible for: (a) site visits; (b) start-up visits; (c) training of water plant operators; (d) periodic inspections of

all fluoridated water systems; (e) resolution of problems, and (f) enforcement.

1) CDPHE/WQCD must provide a detailed, on-site inspection of each new fluoridation system before the system start-up to ensure that construction and installation are in accordance with state-approved plans and specifications.

2) CDPHE/WQCD should conduct on regular schedule sanitary surveys covering individual water fluoridation systems. This sanitary survey should include, at a minimum, the following:

a. Evaluation of the use of fluoride testing equipment;

b. Inspection of the fluoridation system and chemical (fluoride) storage area;

c. Inspection of the operation and maintenance guidelines;

d. Inspection of the CDPHE/PSD/ORPCS/OH latest comprehensive fluoridation inspection.

e. Inspection of the official monthly State Fluoride Reports for ORC approving signature.

f. Assessment of state-approved backflow and anti-siphon devices (as well as testing procedures for such equipment);

g. Assessment of on-site emergency protocols (activities followed in case of overfeed and public-notification procedures) if permitted by law.

3) CDPHE/WQCD must provide water operators with test results of monthly split or check samples that are submitted to the CDPHE lab, and forward a copy of these results to the CDPHE/PSD/ORPCS/OH Program.

4) Both CDPHE WQCD and PSD staff shall stay informed regarding new and emerging scientific findings concerning water fluoridation.

5) CDPHE/WQCD shall defer to the Oral Health Program in offering training to all water plant operators about the Community Water Fluoridation Program. Training for personnel working with new fluoridation programs shall at a minimum include:

a. Information about equipment and monitoring, including how to test water for fluoride and report to the CDPHE;

b. Safety requirements and what to do in event of an emergency;

c. Information about the public health benefits of fluoride.

## VII. References

- A. Centers for Disease Control and Prevention (CDC): Morbidity and Mortality Weekly Report - September 29, 1995/Volume 44/No. RR - 13
- B. Association of State and Territorial Dental Directors:  
astdd.org>best practices>community water fluoridation
- C. CDPHE/WQCD: Recommended Minimum Design Criteria For Colorado Public Water Systems
- D. CDPHE/WQCD: Recommended Minimum Job Performance Guidelines Regulation Governing the Certification of Waterworks Operators in the State of Colorado
- E. CDC Water Fluoridation Website:  
<http://www.cdc.gov/OralHealth/topics/fluoridation.htm>
- F. CDC-Basic Water Fluoridation Engineering Course, Murfreesboro, TN, June 2-5,2003 (Course Manual)
- G. CDC-Water Fluoridation, A Manual for Water Plant Operators, April 1994.

## Appendix A Glossary of Technical Terms

**Adjusted fluoridated water system:** A community public water system that adjusts the fluoride concentration in the drinking water to the optimal level for consumption (or within the recommended control range).

**Calculated dosage:** The calculated amount of fluoride (mg/L) that has been added to an adjusted fluoridated water system. The calculation is based on the total amount of fluoride (weight) that was added to the water system and the total amount of water (volume) that was produced.

**CDPHE:** Colorado Department of Public Health and Environment.

**CDPHE/PSD/ORPCS/OH:** Colorado Department of Public Health and Environment, Prevention Services Division, Oral, Rural and Primary Care Section, Oral Health Unit/Program

**CDPH/WQCD:** Colorado Department of Public Health and Environment, Division of Water Quality Control.

**CDPHE Lab:** The Colorado Department of Public Health and Environment Laboratory.

**Centers for Disease Control and Prevention (CDC):** An agency of the U.S. Department of Health and Human Services charged with promoting health and quality of life by preventing and controlling disease, injury, and disability.

**Census designated place:** A populated place, not within the limits of an incorporated place, which has been delimited for census purposes by the U.S. Bureau of the Census.

**Certified Waterworks Operator:** A water operator who meets the minimal criteria set by the Colorado State Department of Public Health & Environment, Water Quality Control Division, for certification as evident by passing a written examination.

**Check sample:** A distribution water sample forwarded to either the state laboratory or to a state-approved laboratory for analysis.

**Community:** A geographical entity that includes all incorporated places as well as all census-designated places as defined by the U.S. Bureau of the Census.

**Community water system (CWS):** Any water system serving piped water for human consumption to 15 or more individual service connections used year-round by consumers or regularly serving 25 or more individual consumers year-round, including, but not limited to, any collection, pretreatment, treatment, storage and/or distribution facilities or equipment used primarily as part of, or in connection with such system, regardless of whether or not such components are under the ownership or control of the operator of such system, or as defined in the Colorado Primary Drinking Water Regulations.

**Connection:** Generally speaking, water service into an individual housing unit or dwelling.

**Consecutive water system:** A public water system that buys water from another public water system. For purposes of water fluoridation record keeping, the consecutive water system should purchase at least 80% of its water from a fluoridated water system.

**Distribution sample:** A water sample taken from the distribution lines of the public water system that is representative of the water quality in the water system.

**Dry Fluoride Feed System:** A fluoridation system that uses a dry chemical compound (usually sodium fluorosilicate) as the means to fluoridate a PWS.

**Fluorosilicic Acid System:** A fluoridation system that uses fluorosilicic acid as the means to fluoridate a PWS.

**Fluorosis:** A clinical condition of the teeth where whitish to brownish staining occurs due to excessively high levels of fluoride exposure during tooth development.

**Incorporated place:** A populated place possessing legally defined boundaries and legally constituted government functions.

**MG/L:** Milligrams per liter; also, ppm.

**Monitoring, fluoride:** The regular analysis and recording by water system personnel of the fluoride ion content in the drinking water.

**Must:** See Shall.

**Natural fluoride level:** The background concentration of fluoride (mg/L) that is present in the water source from naturally occurring fluoride sources.

**Naturally fluoridated water system:** A public water system that supplies water that contains naturally occurring fluoride at levels that is beneficial to dental health.

**Operator:** The certified waterworks operator who directly supervises and is personally responsible for the daily operation and maintenance of a community or non-transient non-community public water system.

**Optimal Control Range:** A range within which adjusted fluoridated water systems shall operate to maintain optimal fluoride levels. In Colorado the range is +/- 0.2 parts per million.

**Optimal Fluoride Level:** The fluoride concentration (mg/L, which is the same as ppm) based on the annual average of the maximum daily air temperature in the geographical area of the fluoridated water system. In Colorado the optimal fluoride level can be 0.9, 1.0, or 1.1 ppm.



**Optimally Fluoridated Water System:** A public water system that has consistent optimal levels of fluoride for oral health from either naturally occurring sources, or by adjusting the fluoride level to optimal concentrations.

**Overfeed, fluoride:** Any fluoride analytical result above the recommended control range of the water system. Different levels of response are expected from the operator depending on the extent of the overfeed. (Table 1)

**PPM:** parts per million. See also, mg/L.

**Public water supply/system (PWS):** The definition as provided for in the CDPHE-DWS Colorado Primary Drinking Water Regulation as found in the 'Recommended Minimum Design Criteria for Colorado Public Water Systems'.

**Required Water Samples:** Required samples include a fluoride sample taken each whole day the plant or fluoridation equipment is operating for that month and submitted monthly, and submission of a monthly split water sample to the CDPHE-Lab for testing.

**Shall:** Indicates that which is mandatory; a requirement.

**Sodium Fluoride Saturator System:** A fluoridation system that uses a saturated solution of sodium fluoride as the means to fluoridate a PWS.

**Split sample:** A distribution water sample taken by the water plant operator, who analyzes a portion of the sample and records the results on the official monthly State Fluoride Report to the state and the necessary lab paper work. The operator then forwards the remainder of the sample to the CDPHE- Lab for analysis.

**Split sample tolerance:** The amount of variance allowed between the portion of the split sample tested by the water system operator and the CDPHE Lab. In Colorado the split sample tolerance is +/- 0.2 ppm.

**State:** This term refers to Colorado unless otherwise noted.

**State fluoridation administrator:** The CDPHE employee who is responsible for the administration of the fluoridation program.

**State Fluoride Report:** An official signed record submitted to the CDPHE of the treatment of the quality of water, where PWS adjust up the level of fluoride to a state specified optimal level for that PWS.

**State fluoridation Specialist:** The CDPHE employee (either Dental or Drinking Water) who is responsible for whose primary responsibility is to provide for site visits, assist in the training of water plant operators, provide surveillance of all fluoridated water systems, and resolve problems. This person may be either an engineer or a technician.

**Surveillance, fluoride:** The regular review of monitored data and split sample or check sample results to ensure that fluoride levels are maintained by the community water systems in a specific geographic area. The review is conducted by the CDPHE.

**Uniform flow:** When the rate of flow of the water past a point -varies by less than 20%.

**Upstream:** In a water line, a point closer to the source of water.

**Water, make-up:** Water that is used to replace the saturated solution from a sodium fluoride saturator; this saturated solution is pumped into the distribution lines.

**Water fluoridation:** The act of treating the quality of water by adjusting the fluoride concentration in the drinking water of a water system to the optimal level set by the state.

**Water Quality Control Division:** A division in the Colorado Department of Public Health and Environment.

APPENDIX B



CO Dept of Pub. Hlth & Env., Fluoridation,  
CDPHE/PSD/ORPC/OH/F-A5  
4300 Cherry Creek Dr South  
Denver, CO 80246-1530.

Phone: 303-692-2367  
Toll Free: 1-800-886-7689,  
Submit your State Fluoride Report by Email  
Email: Dan.Felzien@state.co.us

**Aaaa WTP**

CDPHE State Fluoride Reporting Form, No. 1025

Water System ID: CO- **0121125**

XLS File Name: **0412AAAA.xls**

Clear Template

Print

Save

E-Mail to State

Day	These fields must be numeric			Off-Line	Fluoridation Readings.			
	Flouride Level mg/L	Chemical Usage indicate type at right	Produced:MGD Effluent		Month	Year	Opt Level	FI Point
1				Y	12	2004	1.00	1
2				Y	Select Pounds or Gallons		Gallons	
3	1.00				Monthly Sample of Background F1 Level			
4	1.00		3.012		0.23	mg/L		
5	1.00		3.012		Flouride Chemical Used		Na2SiF6	
6	1.00		3.012		Testing Method		SPADNS Colorimetric	
7	1.00		3.012		Split sample field result and Date Sampled:			
8	1.10	0.50	3.012		1.02	mg/L	12/07/04	
9				Y	Split Sample Point:		ET001	
10	1.10		3.012		Monthly Comments			
11	1.10		3.012		<p>Dán, I just wanted to say that the plant was off for the month of December because we were recasing the clearwell and we notified all the local health officials because of the public health partnership the WTPOs have built with them. By the way, the sampling point for this month is for the inorganics sample. Normally, we let you know the location of the sampling point, but the sampling point this month is from WQCD monitoring schedule.</p>			
12	1.10		3.012					
13	0.90		3.012					
14	0.90	0.50	3.012					
15	0.90		3.012					
16	0.90		3.012					
17	0.90		3.012					
18	0.90	0.50	3.012					
19				Y				
20			2.990	Y				
21				Y				
22				Y				
23				Y				
24				Y				
25				Y				
26				Y				
27				Y	Number Local Health Professionals:	7		
28				Y	Submitted by:			
29				Y	Signature:			
30				Y	Typed Name and Title			
31				Y	Email			
TOTAL	14.80	1.50	45.158		Address for replies			
AVG	0.99	0.50	3.011		Phone			
Count	15	3	15	16	Most likely number to reach someone			
High	1.10	0.50	3.012		Fax			
Low	0.90	0.50	2.990		303-867-5309			