

Guidelines for Fluoridation of Drinking Water Supplies

Health (Fluoridation) Act 1973

Draft – For Consultation

Department of Human Services, Victoria

29 August 2008

DRAFT – FOR CONSULTATION

Table of Contents

1	Introduction	1
1.1	Objective	1
1.2	Scope	1
1.3	Terminology	2
2	Regulatory framework	3
2.1	Legislation	3
2.2	Roles and Responsibilities	4
2.3	Procedure to fluoridate	5
3	Design of fluoridation plant	7
3.1	Design Criteria	7
3.2	Equipment	10
3.3	Chemical Delivery, Handling & Storage	10
3.4	Chemical Mixing & Dosing	12
3.5	Process Control & Instrumentation	12
3.6	Safety in Design & Environmental Risks	14
3.7	Risks to drinking water quality	16
4	Operation	17
4.1	Commissioning	17
4.2	Monitoring	17
4.3	Quality Assurance	18
4.4	Maintenance and Calibration	18
4.5	Operational Personnel	18
4.6	Occupational Health and Safety	19
5	Documentation	20
5.1	Required Documentation for Approval	20
5.2	New or Upgraded Fluoridation Plant	20
5.3	Completion of Work	20
5.4	Record Keeping & Reporting	20
5.5	Operation Manual	22
5.6	Emergency Response Plan	22
6	Environmental Policy	24
6.1	Regulatory	24
6.2	Risks to the Environment	24
7	References	25

FOREWORD

DRAFT – FOR CONSULTATION

1 Introduction

The Health (Fluoridation) Act 1973 ('the Act') regulates the safe and effective addition of fluoride into the drinking water supply. These Guidelines specify the minimum requirements to assure the safe and effective operation of a fluoridation plant.

These Guidelines require the adoption of a preventive risk management approach in the design, installation, and operation of water fluoridation plants. Preventive risk management systems are the most effective way to assure the safe and effective addition of fluoride into a drinking water supply. These systems underpin the *Australian Drinking Water Guidelines* and the *Safe Drinking Water Act 2003*. These Guidelines require the inclusion of water fluoridation practice into the Authority's overall quality management system.

Under the Act, before adding fluoride to any public water supply, a water supply authority ('the Authority') is required to submit to the Department of Human Services ('the department') information ('the submission') including plans and specifications for the proposed scheme for fluoridation. The submission relates to the aspects of public health and the ability of the authority to operate the scheme satisfactorily.

These Guidelines describe the requirements for compliance with the provisions of the Act, and have been designed to assist the Authority in preparing their submission, including plans and specifications for the proposed fluoridation scheme.

1.1 Objective

The overall objective of these Guidelines is to provide for the safe and effective addition of fluoride into the drinking water supply.

To achieve this objective, these Guidelines:

- specify the optimum fluoride levels for drinking water supplies and the design control limits for water fluoridation plants; and
- specify the minimum requirements for the safe and effective addition of fluoride chemicals to drinking water supplies, covering the design, installation and operation of a fluoridation plant.

1.2 Scope

These Guidelines apply to the installation of new and upgraded fluoridation plants.

These Guidelines integrate the practice of water fluoridation with the *Safe Drinking Water Act 2003*, through:

- the integration of water fluoridation into the Authority's risk management plan and auditing process
- compliance with the *Australian Drinking Water Guidelines*
- integration and compliance with the monitoring and reporting requirements

These Guidelines also describe:

- the regulatory framework including the procedure to fluoridate (section 2);
- requirements for the design and control of fluoridation facilities (section 3);
- requirements for plant operation including monitoring, training of personnel, and occupational health and safety (section 4);
- documentation for approval, record keeping requirements, components of the operation manual, and emergency response plan (section 5); and
- environmental protection considerations (section 6).

1.3 Terminology

Health (Fluoridation) Act 1973 ('the Act')

The Health (Fluoridation) Act 1973 is also referred to as 'the Act' in these Guidelines.

Safe Drinking Water Act 2003 ('the SDWA')

In these Guidelines, the *Safe Drinking Water Act* 2003 is referred to as 'SDWA' in these Guidelines.

Department of Human Services ('the department')

Reference to the Department of Human Services includes the statutory function of the Secretary as described in the *Health (Fluoridation) Act* 1973.

Water Supply Authority ('the Authority')

Under the Health (Fluoridation) Act 1973 a 'Water Supply Authority' means:

- (a) the holder of a water licence, water and sewerage licence or water headworks licence issued under Division 1 of Part 2 of the *Water Industry Act* 1994; or
- (b) an Authority within the meaning of the *Water Act* 1989 that has a water district; or
- (c) a council performing water supply functions under the *Local Government Act* 1989; or
- (d) Melbourne Water Corporation.

A 'Water Supply Authority' is referred to as 'the Authority' in these Guidelines.

Fluoride concentration

In these Guidelines, the fluoride concentration value refers to the total amount of fluoride present, regardless of its form and is expressed in milligrams per litre (mg/L).

'Must' and 'Should'

The word 'must' identifies a mandatory requirement for compliance with these Guidelines.
The word 'should' refers to practices, which are advised or recommended.

2 Regulatory framework

2.1 Legislation

These Guidelines are intended to complement, and should be read in conjunction with, the following legislation governing the fluoridation of drinking water supplies.

2.1.1 Health (Fluoridation) Act 1973

The *Health (Fluoridation) Act 1973* ("the Act") regulates the fluoridation of drinking water supplies.

The Act provides that the Authority may decide to fluoridate, or may be required to fluoridate by the department. The Authority must, however, receive written consent from the department prior to adding fluoride to a water supply.

The Act also specifies the procedure that the Authority must undertake before adding fluoride to any water supply. The procedure to fluoridate is described in section 2.3. This includes the requirement for the Authority to submit to the department the proposed scheme for fluoridation. The department considers the submission in relation to public health and the ability of the Authority to operate the scheme satisfactorily. Under the Act, the submission must include the fluoridation plans and specifications. The documentation required for approval is identified in section 5.1.

2.1.2 Safe Drinking Water Act 2003

The *Safe Drinking Water Act 2003* (SDWA) regulates the supply of safe drinking water. The SDWA requires that the Authority prepare, implement and review the risk management plan for a water supply.

The Authority must ensure that the water fluoridation scheme is managed in accordance with the provisions of the SDWA. Specifically, the Authority must ensure that the water fluoridation scheme is incorporated into the risk management plan for a drinking water supply, and is covered by the auditing requirements as defined in the SDWA.

Under the SDWA, the department must be notified of circumstances where drinking water supplied to the public does not comply or is not likely to comply with any relevant water quality standard, or where drinking water is supplied such that it may pose a risk to human health or cause widespread public complaint. These obligations are set out in sections 18 and 22 of the SDWA. If the fluoride concentration in the drinking water supply exceeds 1.5 mg/L, then the department must be notified immediately under section 22 of the SDWA. The notification and reporting requirements are further discussed in section 5.4.

These Guidelines aim to integrate the management of the fluoridation scheme, including operation, monitoring, notifications, reporting and auditing requirements with the requirements under the SDWA

2.1.3 Other Legislation

There are several other relevant legislative requirements relevant to the design and management of a water fluoridation scheme. These include, but not limited to:

- *Health Act 1958*
- *Environment Protection Act 1970*
- *Occupational Health and Safety Act 2004*
- *Dangerous Goods Act 1985*
- *Road Transport (Dangerous Goods) Act 1995*
- *Road Transport Reform (Dangerous Goods) Act 1995*
- *Building Act 1993*
- *Planning and Environment Act 1987*

2.2 Roles and Responsibilities

2.2.1 Department of Human Services

The department is responsible for the implementation and oversight of the *Health (Fluoridation) Act 1973* and *Safe Drinking Water Act 2003*.

The department may require the Authority to add fluoride to any water supply for dental health purposes as specified under Section 5(1) of the Act.

Prior to the Authority adding fluoride to any water supply, in accordance with Section 6(2) of the Act, the department is required to consider the proposed scheme in relation to public health and the ability of the Authority to operate the scheme satisfactorily.

The department may direct the Authority to cease to use any plant or equipment used for adding fluoride to a drinking water supply.

The net capital costs and expenses incurred by the Authority in the installation of the necessary equipment and control measures for an approved system for adding fluoride to a drinking water supply will be paid to the Authority out of moneys provided by the Parliament (section 8 of the Act). This specifically includes:

- fluoride storage equipment;
- dosing system;
- instrumentation and control systems;
- electrical control system;
- safety equipment for material handling and spill management; and
- testing and commissioning.

2.2.2 Water Supply Authority

The Authority is responsible for the design and operation of the fluoridation scheme in accordance with these Guidelines.

Prior to the construction of a fluoridation plant, the Authority must provide the necessary information to demonstrate the safe and effective operation of the plant, and include:

- the plans and specifications for the proposed scheme for fluoridation;
- details of the public water supply and the district(s); and
- any additional information required by the department.

The Authority must manage the fluoridation scheme in accordance with these Guidelines.

The Authority is responsible for ensuring that the design, installation and operation of the fluoridation plant, and the transport, storage and handling of chemicals are in accordance with all the relevant legislative requirements.

The Authority must cease to use any plant or equipment used for adding fluoride to a drinking water supply when directed by the department.

For the installation and operation of a fluoridation plant, the Authority is responsible for funding:

- project management.
- civil works such as buildings, site preparation works, drainage and roads; and
- operating costs including chemical purchase, plant upgrades, equipment replacement and staff training.

2.3 Procedure to fluoridate

This section describes the procedure the Authority should follow to satisfy section 6 of the Act. The procedure to fluoridate is summarised in Figure 1.

2.3.1 Initial Procedure

The Authority should undertake a feasibility study to determine the appropriate fluoridation system. This provides the basis of the plans and specifications for the fluoride plant. These should include cost estimates for the installation of the necessary equipment and control measures.

The feasibility report should be discussed with the department to ensure the plans and specifications will be consistent with these Guidelines.

2.3.2 Documentation

The documentation required for submission to the department is listed in section 5.2.

The Authority should prepare and submit preliminary plans and specifications for the proposed fluoridation scheme, to the department for comment. If the Authority or external contractors subsequently amend the plans and specifications, these amendments must be provided to the department.

Any deviations from the requirements of these Guidelines for a new or upgraded fluoridation plant must be highlighted with justification in the documentation submitted to the department.

The submission to the department should detail:

- the drinking water supply and the district(s) supplied;
- the documentation including plans and specifications as listed in section 5.2, demonstrating compliance with these Guidelines;
- project plan including timelines; and
- any additional information required by the department.

2.3.3 Department approval

Pursuant to Section 6(2) of the Act, the department will consider the documentation, including the plans and specifications, and based on this, will make an assessment whether to approve the addition of fluoride into the drinking water supply. The Authority must not introduce fluoride to the drinking water supply until written approval from the department has been provided.

2.3.4 Commissioning

The fluoride dosing plant must be tested prior to the addition of fluoride into the drinking water supply.

Commissioning verifies that the Works and all relevant systems, equipment and assemblies have been installed, tested, operated and maintained in accordance with the final plans and specifications. This includes testing and verifying the control philosophy for the fluoride dosing system including critical limit alarms and corrective actions.

The addition of fluoride into the drinking water supply must not commence operation until these Works have been certified by a suitably qualified engineer.

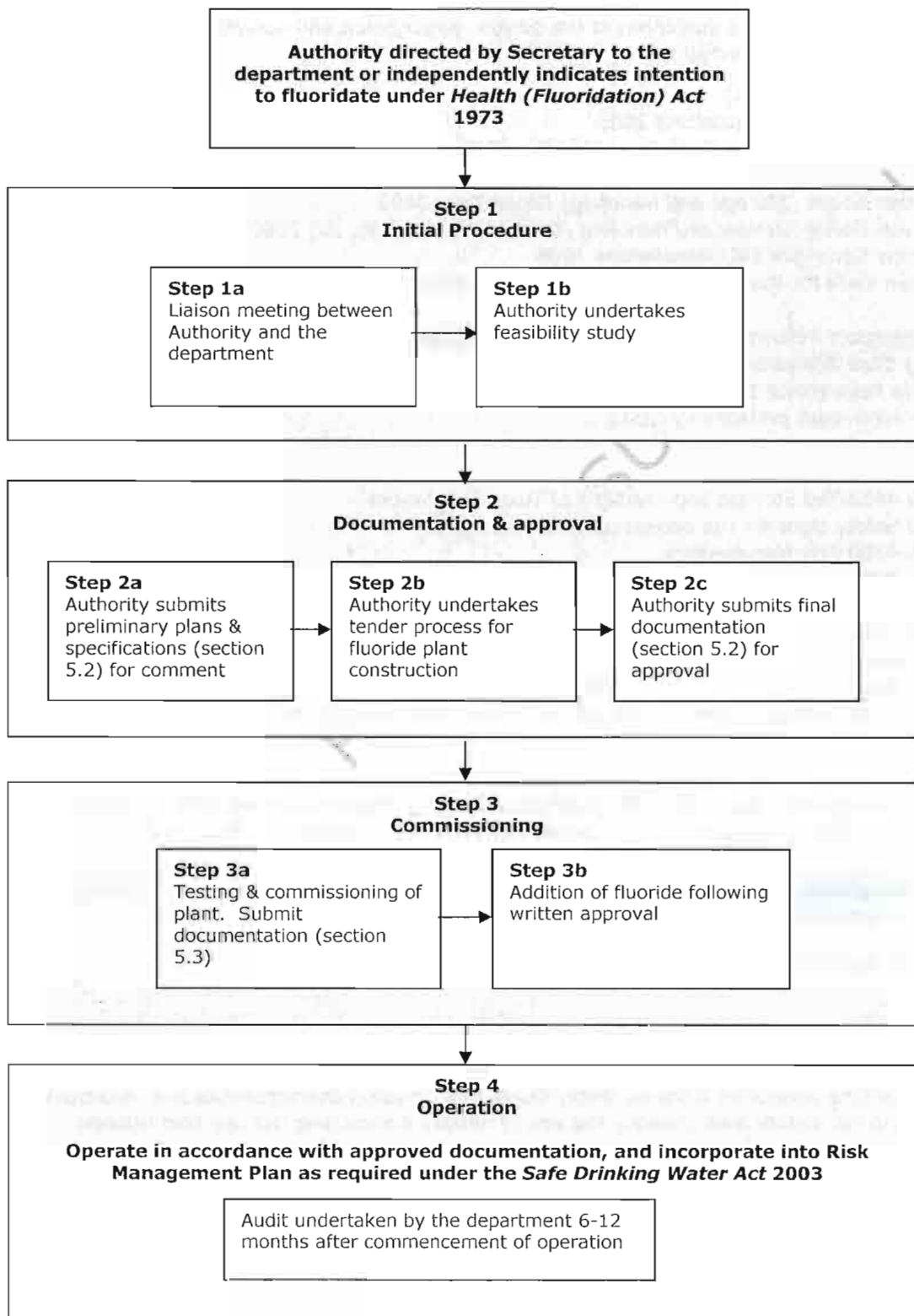
The Authority must provide documentation to the department upon completion of the plant to confirm that the fluoridation plant has been constructed and is operating in accordance with the approved plans and specifications. This documentation is specified in section 5.3.

2.3.5 Operation

The Authority must ensure that the fluoridation plant is operated in accordance with the approved documentation. The Authority must also ensure that management of the plant is incorporated into the risk management plan as required under the SDWA.

Within 6-12 months of operation, the department will undertake an audit to verify that the recommendations associated with the approval have been implemented.

**Figure 1
Procedure to fluoridate**



3 Design of fluoridation plant

3.1 Design Criteria

3.1.1 Legislation, Regulations, Guidelines and Guidelines

The Authority must ensure the fluoridation plant complies with all relevant and current legislative requirements, Guidelines and guidelines in the design, construction and operation of a fluoridation plant. These include, but are not limited to:

- Acts (refer to section 2.1)
- *Safe Drinking Water Regulations* 2005
- Australian Drinking Water Guidelines (ADWG) 2004
- *Occupational Health and Safety Regulations* 2007
- *Dangerous Goods (Storage and Handling) Regulations* 2000
- *Dangerous Goods Storage and Handling (Code of Practice) No. 27, 2000*
- *Dangerous Goods (HCDG) Regulations* 2005
- *Australian Code for the Transport of Dangerous Goods by Road and Rail (ADG Code)* 7th Edition, 2007
- *Road Transport Reform (Dangerous Goods) Regulations* 1997
- *Building Code Australia (BCA)*
- *Plumbing Regulations* 1998
- State environment protection policies
- EPA Victoria Publication 347, *Bunding Guidelines*, December 1992
- AS 3780 The Storage and Handling of Corrosive Substances
- AS/NZS 4452 The Storage and Handling of Toxic Substances
- AS1319 Safety signs for the occupational environment
- AS/NZS 4360 Risk Management
- AS/NZS 4801 Occupational health and safety management systems – Specification with guidance for use
- AS/NZS 1715 Selection, use and maintenance of respiratory protective devices
- Manual Handling Code of Practice
- AS 1345 Identification of the contents of pipes, conduits and ducts
- AS/NZS 4020 Testing of Products for Use in Contact with Drinking Water

3.1.2 Chemical Selection and Approval

Only fluoride compounds approved in the *Australian Drinking Water Guidelines* 2004 (ADWG) are permitted to be used to fluoridate a water supply. At the time of publication these were:

Fluoride compound	Formula	CAS No.	Alternative names
Disodium hexafluorosilicate	Na ₂ SiF ₆	39413-34-8	Sodium fluorosilicate Sodium silicofluoride
Dihydrogen Hexafluorosilicate	H ₂ SiF ₆	16961-83-4	Fluorosilicic acid Hexafluorosilicic acid
Sodium fluoride	NaF	7681-49-4	Sodium monofluoride

Any impurities in the fluoridating agent must not cause health problems for consumers or result in non-compliance with the Australian Drinking Water Guidelines. Physical characteristics and variations in strength should not significantly increase the risk of reliably maintaining the required fluoride concentration in the treated water.

The Authority is responsible for selecting the most suitable fluoride chemical for their water treatment application. Evidence of the selection process (i.e. a risk assessment) must be provided to the department for final approval.

The Authority must develop and use a suitable chemical specification for purchasing the required fluoridating agent, based on the current American Water Works Association Standard for the specific fluoride chemical. The Authority should require regular chemical analysis by suppliers in supply contracts.

3.1.3 Concentration of Fluoride in Water

The purpose of fluoridation is to adjust the natural fluoride content of drinking water to the optimal level to provide a dental health benefit. The optimal fluoride level in a water supply is based water consumption, which is influenced by the average ambient temperature.

The target concentration of fluoride in treated water must be determined using Table 1. Notwithstanding Table 1, pursuant to Section 5(3) of the Act, the average optimal concentration of fluoride measured, in supplies to consumers, over any twelve month period must not exceed 1 mg/L.

Table 1
Optimal Fluoride Levels[^]

Annual Average of Maximum Daily Air Temperatures (°C)*	Recommended Total Fluoride Concentrations[†] (mg/L)
14.7 – 17.6	1.0
17.7 – 21.4	0.9
21.5 – 26.2	0.8
26.3 – 32.5	0.7

[^]Adapted from *Water Fluoridation Principles and Practice, Manual of Water Supply Practices, American Water Works Association, Fifth Edition, 2004.*

*Based on temperature data for a minimum of five years.

[†]Division of Oral Health, Centre for Disease Control and Prevention, US Public Health Service, Atlanta, Ga.

The selected dosing concentration and the basis for the selection (including allowance for the fluoride background concentration in the raw water) must be submitted to the department for approval. An historical record of fluoride background concentration in the raw water over the past five years must be supplied by the Authority.

It is recommended that the target concentration should be reviewed every 10 years utilising data from the Australian Bureau of Meteorology, and be based on temperature data for 30 years.

3.1.4 Design Control Limits

The design of the fluoridation plant must:

- Use a fluoride dosing concentration as determined using section 3.1.3 and approved by the department, and be controlled to the limits specified in Table 2.
- At no time allow the fluoride concentration to exceed 1.50 mg/L (as specified in the ADWG).
- Maintain a consistent fluoride concentration throughout the distribution system.

Table 2
Fluoride Plant Control Limits

Parameter	Total Fluoride Concentration (mg/L)
Operating target dose rate (average yearly optimal concentration)	As determined using section 3.1.3 of this Standard.
Operating range (must operate in this range 95% of the time)	Annual Average \pm 0.05
Lower Action Process Limit	0.6
Upper Action Process Limit	1.2 [^]
Emergency Process Limit	1.5 [†]

[^] This action level is based on a slightly lower dose than the maximum level of fluoride permitted in the ADWG, and has been established to ensure that the ADWG level is never exceeded.

[†] Australian Drinking Water Guidelines, NHMRC 2004

3.1.5 Functionality of the Fluoridation Plant

The fluoridation plant must be designed to meet the following requirements:

- (a) The design of the fluoridation plant must provide plant operational staff with all that is required to monitor and control the fluoridation process accurately and consistently, and in a timely manner.
- (b) The fluoridation plant must be able to operate 24 hours a day, seven days a week.
- (c) The treated water fluoride concentration must comply with the requirements set out in Section 3.1.3 and 3.1.4 of this Standard.
- (d) The plant must be fully automated and able to be operated by treatment plant-based control (SCADA system). If possible it should be able to be remotely monitored.
- (e) Must ensure dependable automatic operation with reliable stopping and starting of the system during plant shut-down and start-up.
- (f) The plant must have provision for alarms (including to duty operator after hours) and automatic shut-downs.
- (g) For fluorosilicic acid the fluoride transfer from the bulk tank to the day tank must be controlled, and not occur more than once in any 24 hour period.
- (h) Bulk tanks (fluorosilicic acid) and day tanks (fluorosilicic acid and saturated sodium fluoride) must be equipped with online level indicators and an easily readable graduated volume scale.
- (i) For fluorosilicic acid and saturated sodium fluoride the day tank must be equipped with online weight measurement.
- (j) Fluoride dosing must be flow paced based on the measured flow into which the fluoride is being dosed. This will typically be achieved using a suitably placed flowmeter and variable speed dosing pumps.
- (k) The maximum physical dosing capacity of the fluoridation chemical feeding equipment must be limited by design to a maximum value that is as close as practicable to the operating target dose rate at the maximum water flow rate. This maximum value must not exceed 110% of the operating target dose rate at the maximum plant capacity.
- (l) There must be an online fluoride analyser installed on the fluoridated water stream.
- (m) Dosing pumps must be in a duty/standby arrangement.

3.1.6 Other Design Considerations

- (a) Water service off-takes

No water service within the plant or to consumers should be taken directly off the water line to which fluoride is dosed. A storage reservoir (or similar barrier) should be provided between the fluoride dosing point and all water service off-takes.

(b) Anti-siphonage and back-flow protection

The dosing system should in all cases be fitted with back pressure, anti-siphon and pressure relief valves.

Any water supply used for dissolving the fluoridating agent or as carry water must have a backflow prevention device fitted upstream of where the fluoridating agent is dissolved or diluted (e.g. mixing tanks), or injected (e.g. dosing pumps). In some situations this can be achieved simply through use of an air gap. Where relevant the device should comply with the current Australian Standard.

(c) Electrical and controls

It must be made physically impossible for any component of the fluoridation feeding or control equipment to be manually plugged into standard electrical outlets (GPOs) for continuous operation. Any manual mode (or 'test') switch for the fluoridation chemical feeding equipment must not permit permanent selection (e.g. spring loaded switches) and must return to the off position when released to prevent unattended manual operation.

All key components of the fluoride dosing system must be interlocked in the control system to ensure total fluoride dosing system shutdown on the failure of any individual equipment item. These key components include, but are not limited to: stop/start/pacing signals, feeders, dosing pumps, solution transfer pumps, solution tank levels, solution tank weight, dilution water pumps, on-line monitoring system.

A risk assessment of the possible causes of overdosing must be conducted on the plant design and, where appropriate, interlocks and alarms designed into the system.

3.2 Equipment

All equipment used for adding fluoride to a drinking water supply is required to operate in a safe, reliable and precise manner to the satisfaction of the department and must meet all requirements set out in these Guidelines.

The equipment used, including instrumentation, must be determined by the Authority and should consider, but not be limited to, the following issues: size, availability of fluoridating agent, costs, staffing availability/limitations, ease of operation, management limitations, safety in design and operation.

The Authority must ensure that the equipment and associated controls have safety measures against over-dosing and under-dosing of chemical through human or operational malfunctions and that the equipment is safe to operate and maintain.

3.3 Chemical Delivery, Handling & Storage

The delivery, handling and storage of chemicals must be in accordance with occupational health and safety and environment protection requirements to ensure the safety of staff, the community, the environment and the drinking water supply.

3.3.1 Chemical Delivery

The Authority must have quality assurance procedures for the supply and delivery of the fluoridating agent to ensure its chemical purity, safe delivery and use. Specifically and consistent with the SDWA, the Authority must implement procedures and management systems for:

- ensuring that the amount and purity of fluoride chemicals added to the drinking water does not adversely affect the quality of that water or pose a risk to human health;
- controlling any residue or chemical byproducts imparted to drinking water as a result of the addition of chemicals to water supplied for drinking water purposes; and
- supervision of deliveries by competent staff for the entire duration of the operation and ensuring that the correct chemical has been delivered by checking the documentation.

Refer to section 3.1.2 for further discussion on chemical Guidelines.

The site and plant must be designed to allow for the safe delivery of chemical in accordance with the legislative requirements for transporting and handling of chemicals.

The delivery area and sump must comply with the EPA Bunding Guidelines. For fluorosilicic acid deliveries the delivery truck must be fully standing on the delivery bund during chemical transfer. For dry fluoride chemicals a delivery bund is not required, however the Authority must ensure unloading can be undertaken in a safe and environmentally responsible manner. This includes ensuring that spills of the dry chemical can be cleaned up and disposed of safely.

The Authority must provide evidence of an Emergency Response Plan for the event of a chemical spill, addressing occupational health and safety issues, safe access, spill containment and removal, environment protection and security issues.

3.3.2 Bulk Chemical Storage

The Authority must ensure that there is sufficient chemical available and readily accessible to ensure continuity of water fluoridation. The Authority must document their storage assessment (taking into consideration availability of the fluoridating agent, transport, procurement strategies, and itinerant populations) and submit that documentation to the department for approval.

Design of the bulk chemical storage must take into consideration the following:

- (a) Material selection (fit for purpose).
- (b) Safety in design for operation and maintenance ensuring compliance with relevant codes, Guidelines and regulations.
- (c) Stored separate from all other chemicals where required as per the *Occupational Health & Safety Act*.
- (d) For fluorosilicic acid – a chemical storage bund meeting Environment Protection Authority Bunding Guideline requirements.
- (e) For dry fluoride chemicals – handling equipment suited to the form and unit size of the delivered chemical.
- (f) Spill removal and clean up.
- (g) Ventilation and dust extraction as appropriate for selected chemical.
- (h) Weather protection as appropriate.
- (i) Controls and instrumentation including alarms, and visual display of tank contents.
- (j) Access authorisation

3.3.3 Transfer & Day Tank

All fluorosilicic acid and sodium fluoride saturator fluoridation plants must include the provision of a day tank to guard against the possibility of the entire contents of the bulk storage tank discharging into the water supply. Arrangements for the transfer of the fluoridation chemical from the bulk tank to the day tank must meet the following basic principles:

- (a) Transfer must be by controlled pumping and gravity transfer must be prevented by appropriate hydraulic (for example, anti-siphon loop) and/or mechanical design.
- (b) All equipment, pumps and day storage should be located within a bunded area and chemical spillage must be captured in a safe manner.
- (c) The day tank must not be filled more than once in any 24 hour period. If a “day tank” holds less than 24 hours supply of the chemical, it must not be filled more than once in the number of hours of supply that it does hold.
- (d) The day tank must contain no more than 24 hours storage volume at maximum flow and average dose rate.
- (e) Corrosion prevention and/or dust suppression must be taken into consideration. Air ventilation or extraction must be provided if required to address fumes or dust events.

3.3.4 Bag Loaders

Where a dry fluoridating agent is used, the design of the plant must minimise airborne dust and the need for any manual handling. Where manual handling is appropriate the design must minimise the number of

lifts required, the amount of bending, and the distance and height through which bags are lifted. Any manual handling must be in accordance with the *Occupational Health and Safety Regulations 2007*.

3.4 Chemical Mixing & Dosing

3.4.1 Mixers

Fluoride solutions must be homogeneous, no matter which method is used to prepare them. Mechanical mixers if required are preferred for the preparation of a dilute solution.

3.4.2 Softeners

Water used for sodium fluoride dissolution should be softened whenever the hardness exceeds 50mg/L; hardness values greater than this will result in an excessive amount of work in clearing blockages or removing scale.

3.4.3 Dosing Pumps

Dosing pumps must be able to accurately deliver the required flow rate, and be sized such that they operate at their maximum output at the maximum flow of the treatment plant. Any risk of gravity flow or siphoning of the fluoride chemical through the dosing pump must be prevented. The transfer pump and dosing pumps must be located above the maximum spillage level of the storage tank should they be located within the bunded area.

A calibration tube must be included.

3.4.4 Dry Feeder Systems

Dry feeder systems must be able to accurately deliver the required volume or weight of fluoridation chemical for the quantity of water being treated and must be sized for the maximum flow of the treatment plant.

3.4.5 Injection Point

The location and detailing of the chemical injection point must be designed to ensure:

- (a) Homogenous mixing of the chemical in the treated water. Where necessary carry water or mixing devices may be used.
- (b) Reducing loss of fluoride by precipitation with other chemicals (e.g. those containing calcium, aluminium and magnesium) or treatment processes (e.g. coagulation, filtration and pH correction). The dosing point should be positioned after any coagulation, filtration and pH adjustment.
- (c) Reducing the possibility of siphonage and overfeeding.
- (d) Provision of a sampling point and the associated analytical and control equipment for automatic shutdowns.
- (e) Location upstream of buffer storage of treated water.
- (f) No bypass or secondary pipework (or channel) into which the fluoride chemical will not be dosed.

3.5 Process Control & Instrumentation

3.5.1 Minimum Instrumentation

For the process control of the fluoridation plant a minimum of the following instrumentation must be provided:

- (a) Fluoride analyser (online). Sampling point for analyser to be located sufficiently far downstream of the injection point to ensure adequate mixing, but upstream of buffer storage.
- (b) Flow meter on process stream into which fluoride is being dosed (flow and volume).
- (c) Load cell on the day tank.
- (d) Level or pressure indicators on bulk tank and saturator/mixing tank.

(a) Online Fluoride Analyser

The ion activity of fluoride measured by the fluoride electrode must provide an accurate measurement of the total fluoride concentration in the water. The Authority must carry out the analysis of water for fluoride content by means of the ion-selective electrode method. The method should conform to that described in the latest edition of *Standard Methods for the Examination of Water and Wastewater*.

The on-line fluoride analyser must correct for temperature and pH, and must include buffering if interferences cause errors in the measurement of the fluoride ion of 0.05 mg/L or greater. Interferences are caused when fluoride forms complexes with several cations (for example aluminium and iron). The extent to which complexes are formed depends on solution pH, relative levels of fluoride, and concentration of complexing species.

The accuracy of measurement must be within the limits established for the maximum permissible variation from the optimal concentration. For example, if a concentration of 0.95-1.05 (1.0±0.05) mg/L is selected for a certain plant, the analysis must be accurate to 0.05mg/L or less to ensure that the actual concentration falls within these limits. The online fluoride analyser should alarm (visual and audible) and shut down the fluoridation plant at the upper action and emergency process limit as described in Table 3. It must include local display within immediate vicinity of the instrument.

Other means of analysis that are at least as accurate as the Ion Selective Electrode method may be approved by the department. Where the Authority adopts other means of analysis that are at least as accurate as the Ion Selective Electrode method an assessment must be undertaken to verify that the analyser is appropriate for their system and demonstrates that it provides an equivalent level of accuracy to the ISE method. In its assessment, the Authority must evaluate the chemistry of the water, taking into consideration raw source water characteristics, purity of the fluoridating agent, process treatment, and the addition of other chemicals including concentration of complexing species.

Specifically in relation to bench-top and laboratory analysis of fluoride, the analysis must correct for temperature and pH, and must include total ionic strength adjustment buffers.

In its submission to the department, the Authority needs to justify its control strategy, including the suitability of the analysers (continuous online and bench-top). This should also include the details of the QA/QC program that will be implemented to verify the accuracy of the results, and the corrective actions and process by which operators will be informed in the event the fluoride dosing system is either under-dosing or over-dosing.

(b) Flow Meters

A treated water flowmeter(s) must be provided to measure and integrate the water flow, and to pace the fluoride dosing equipment where the plant design calls for such, over the full water flow rate range approved by the department. The metered flow must be truly representative of the flow into which the fluoride is dosed.

The flowrate signal must be fed back to the fluoride dosing system, for adjustment of the fluoride dose rate. Where possible the use of electromagnetic flowmeters is recommended with an accuracy of ± 1% over the complete range of flow, but not exceed ±3% under any circumstances.

If a sodium fluoride saturator is used, a flow meter must be placed in the service water line to monitor and record the dilution water volumes.

(c) Load Cells

Load cells must be provided for online measurement of the loss of mass in the day tank, as a check of the average concentration being dosed compared to results for the online fluoride analyser. The accuracy of the load cell measurements must be within ± 1% of the range being measured.

Where dry fluoride chemical is used, the mass used each day must be measured, recorded, and similarly compared.

(d) Level & Pressure Indicators

All fluorosilicic acid storage tanks and saturator/mixing tanks must be equipped with level or pressure indicators to measure, display and alarm the liquid level in the storage tank. Daily changes must be recorded and used as an additional check of the volume of fluoride chemical consumed in the process, as compared to results from the day tank load cell and the online fluoride analyser. The accuracy of the instruments must be within $\pm 1\%$ over the full range of the instruments.

3.5.2 Control & Alarms

As a minimum requirement, the fluoridation plant should respond to the following alarms:

**Table 3
Fluoride Concentration Alarms**

Parameter	Fluoride Concentration (mg/L)	Response
Lower Action Process Limit	0.6	Change to standby pump. Dosing correction. No shut down required.
Upper Action Process Limit	1.2	Fluoridation plant to be shut down immediately and dosing corrected. The on-line monitoring system must be interlocked with the dosing system to shut it down.
Emergency Process Limit	1.5	Fluoridation plant to be shut down immediately until underlying cause rectified and measures taken to prevent its recurrence. DHS to be notified immediately. The on-line monitoring system must be interlocked with the dosing system to shut it down.

All dosing systems should be configured so as to 'fail safe', i.e. failure of a critical component leads to the cessation of dosing and generation of an alarm. Fluoride concentration alarms from the instrument must be transmitted to the duty operator. Loss of water to the online fluoride analyser must also generate an alarm.

Where dosing is stopped during automatic operation which is outside of the normal operating parameters of the plant (be it manually, or by shutdown alarms), dosing should not restart automatically without manual on-site intervention.

Where automatic shutdown systems can be manually overridden (e.g. for maintenance purposes) any override events must be logged and the override facility configured such that the operator is aware that an override is activated (e.g. by the activation of a local or telemetry alarm).

The full operation of all shutdown systems must be fully tested at least once every six months, and the outcome of these tests recorded.

3.6 Safety in Design & Environmental Risks

3.6.1 Approach

The safety in design process is the integration of hazard identification and risk assessment methods early in the design process to eliminate or minimise the risks of injury throughout the life of what is being designed. It encompasses all design including facilities, hardware, systems, equipment, products, tooling, materials, energy controls, layout, and configuration.

Safety in design principles must be followed in the design of the fluoridation plant and the documentation provided to DHS. This must include but not be limited to the following:

- Risk Assessment
- HAZard and OPerability analysis
- Hazard Analysis and Critical Control Point

3.6.2 Risk Assessment

The Authority must carry out and document a site-specific Risk Assessment covering all aspects of safety and environmental risk associated with the design and operation of the fluoridation plant. Where risks are identified, appropriate control measures (based on the hierarchy of controls) should be implemented.

Based on the hierarchy of controls, hazards should be eliminated wherever possible, followed by use of engineering controls. Fluoridation plant designers should only rely on personal protective equipment as a risk control measure as a last resort.

A separate Risk Assessment should be carried out at the various stages of the project, including concept phase, detailed design and construction. It is necessary for all members of the design team and the owner and operator of the plant to have input into the Risk Assessments.

The Risk Assessment for the fluoridation plant and the effectiveness of implemented control measures should be reviewed on a regular basis. Initial design risk control measures must not be degraded through subsequent modifications of the fluoridation plant and/or the water supply system.

3.6.3 Hazard Analysis and Critical Control Point Plan

A Hazard Analysis and Critical Control Point (HACCP) plan is a process control tool and is required for all fluoridation plants prior to commissioning. The HACCP must comply with the Codex Alimentarius guidelines for HACCP developed by the World Health Organisation and the Food and Agriculture Organisation, and the process control element in the ISO 9000 series for Quality Assurance systems.

The HACCP process must systematically identify specific hazards and measures for their control to ensure public health and quality of products. A critical control point is an activity, procedure or process where control can be applied, and that is essential for preventing hazards that represent high risks or reducing them to acceptable levels.

Summary of Actions:

- Assess preventive measures throughout the fluoride system to identify critical control points.
- Establish mechanisms for operational control.
- Document the critical control points, critical limits and target criteria, and corrective actions.

As an illustration, the most significant risk is the dosing of fluoride resulting in a concentration greater than required for dental protection. This may be caused by using a fluoridating agent that is off-specification or variable in strength, incorrect preparation of the solution, gravity and/or siphonage action, dosing system malfunction, dose rate set incorrectly, controls are incorrectly programmed or fail, flow meter or analyser out of calibration or malfunctioning, and incorrect measurements. Through the HACCP process, controls to mitigate this risk including associated critical limits and corrective actions, would be identified.

3.6.4 HAZard and OPerability analysis

The water authority must carry out a HAZard and OPerability analysis (HAZOP) complying with Australian Guidelines 61882—2003. The HAZOP must involve the application of a formal systematic critical examination to the process and engineering intentions of the new fluoridation plant to assess the hazard potential of mal-operation or mal-function of individual items of equipment and their consequential effects on the water treatment plant as a whole.

The actions arising from the HAZOP must be incorporated into the design and/or operation of the fluoridation plant.

3.6.5 Plant Security

The Authority should control access to the fluoridation plant in order to minimise the risk of untrained staff or public being injured. Access to the fluoridation room must be restricted through provision of a security locking system. Appropriate signage must be provided to indicate the presence of the fluoridating agent, and that authorised entry only is permitted.

3.7 Risks to drinking water quality

Risk management activities for controlling water fluoridation must be included in the risk management plan that is required under the SDWA. This may include the risk management activities described in section 3.6, but would also include any other activities required by the SDWA. The risk management activities undertaken in relation to fluoridation are auditable under the risk management plan audits conducted under the SDWA.

DRAFT – FOR CONSULTATION

4 Operation

All plant and equipment used for adding fluoride to a drinking water supply must operate in a safe, reliable and precise manner. The Authority must only use plant and equipment as specified in the plans and specification and as approved by the department, and must ensure that this plant and equipment is maintained.

4.1 Commissioning

The Authority, in its submission to the Department for a new or upgraded fluoridation plant, must provide a commissioning plan describing the manner in which the plant and equipment will be tested, and the acceptability criteria. The commissioning process will typically culminate in a surveillance period of at least 10 days during which daily water samples are submitted to an appropriate laboratory for verification.

Where a significant component of the dosing system has been replaced (e.g. a monitor) or dosing has ceased for more than 30 consecutive days, the Authority should prepare an appropriate re-commissioning plan.

4.2 Monitoring

4.2.1 Monitoring of Fluoride Concentration in the Raw Water

The Authority must take samples of the raw water every three months to establish any variation in the natural fluoride concentration of the water. Any variation so detected must be taken into account when designing the control mechanisms for a dosing plant installation. If, after two years, the monitoring shows limited variation, then the raw water monitoring can be relaxed to 12-monthly.

4.2.2 Check of Mass of Fluoride Dosed

Every 24 hours the mass of fluoride consumed by the plant must be calculated and divided by the volume of water that has passed the fluoride dosing point, as an independent check of the average concentration dosed over each 24 hours. Any inconsistencies must be investigated and remedial actions taken to bring the actual dose within the Fluoride Dosing Concentration Operational Range (refer section 3.1.4).

4.2.3 On-line Monitoring at the Fluoride Plant

Continuous fluoride monitoring, linked to an appropriate alarm monitoring system and automatic plant shut down, is required for all fluoridation plants. Instrument performance must be compared to the results from the laboratory analysis of samples at a frequency not less than monthly. The performance of the analysers must also be compared to the daily manual check of fluoride residual as discussed in section 4.2.4.

4.2.4 Manual Check of Fluoride Residual

The Authority must manually test the fluoride concentration in the dosed water as an additional quality assurance check and as a means of confirming the accuracy and reliability of the on-line analyser in measuring total fluoride concentration. The Authority must take a sample of water after the fluoride dosing point and analyse it for fluoride at least once in each 24 hours. The Authority must have in place guidance to operators on the permitted variance of manual test results from the on-line monitor readings and instructions as to the action(s) to be taken on exceeding this permitted variance.

The bench analyser used for the analysis of these samples (and also the distribution samples referred to in section 4.2.5) must include buffering as per the requirements of section 3.5.1(a).

4.2.5 Monitoring in the Distribution System

The Authority must take samples of water from at least two water points in the reticulation system registered with the department pursuant to the *Safe Drinking Water Regulations 2005*, and analyse these for fluoride at least once a week.

For verification purposes of the analytical methods adopted, once a month one sample from the reticulation system is to be pre-analysed by the operator with the on-site fluoride testing equipment and labelled with the fluoride concentration, sample location and date of collection, and forwarded to a laboratory accredited by National Association of Testing Authorities (NATA) for fluoride analysis.

4.3 Quality Assurance

Appropriate regular quality assurance checks must be in place to ensure the accuracy and reliability of fluoride measurements in the treated water.

The Quality Assurance system must ensure the fluoridation process is adequately monitored and maintained such that any discrepancy, equipment reliability issue, or unacceptable variability in the final fluoride concentration is readily identified and effectively rectified.

The Authority must ensure that the Operation Manual is a controlled document with defined procedures/processes for amendment.

4.4 Maintenance and Calibration

The Authority must carry out weekly plant inspections. Plant inspections will help ensure effective process control, determine whether equipment is operating normally, and identify the need for maintenance.

All equipment and instruments considered vital for the process control must be maintained and calibrated regularly according to a maintenance schedule and a calibration schedule documented in the Operation Manual. The performance of dosing pumps should be calibrated at least monthly by measuring the volume of solution pumped during a measured time interval.

Upon request, or as part of a risk management plan audit, under the SDWA, the Authority must provide evidence to the department, or an approved auditor, of maintenance and calibration of all plant items and equipment.

4.5 Operational Personnel

Operational personnel should have a sound knowledge base from which to make effective operational decisions. This requires training in the methods and skills required to perform their tasks efficiently and competently. Employees need to be aware of the potential consequences of system failures, and of how their decisions can affect the safety of the scheme.

The Authority must ensure that operational personnel (employees or contractors) are appropriately skilled and trained in the management and operation of the fluoridation plant. The Authority must ensure that operational personnel have an adequate knowledge of the principles of fluoridation, the type of plant or equipment and its operation and maintenance and the methods of estimation of fluoride.

The Authority must ensure that the operation of the fluoridation plant is supervised and operated by competent personnel (employees and contractors). Certificate III in water treatment, as described in the National Water Industry Training Package NWP07, delivered by a Registered Training Organisation within the Australian Quality Training Framework is recommended.

The Authority must develop, give training in, and implement standard operating procedures (SOPs) for carrying out routine operational duties associated with the fluoridation plant. This includes implementation of preventive strategies, chemical deliveries (including cross-checking each delivery against order), carrying out calibration of fluoride analysers and determining the fluoride concentration in a treated water sample. All operators must be competent in carrying out these SOPs.

The Authority must ensure that it has a sufficient number of trained people available to enable operation of the fluoridation plant at all times.

4.6 Occupational Health and Safety

The Authority must comply with the *Occupational Health and Safety Act 2004*, the *Dangerous Goods Act 1995*, and associated regulations. In the area of safety, and the handling and storage of dangerous goods, these Acts have precedence over this Standard. If clarification is required in these areas then WorkSafe Victoria will provide the defining interpretation.

The following guide notes in this section of the Standard provide a basis for an Authority to assess the minimum control measures it should employ to manage occupational and safety risks associated with fluoridation systems. The control measures listed are not exhaustive, and the use of these control measures in no way infers that this is sufficient to comply with these Acts and Regulations.

Health and safety measures to be put in place at the fluoride facility are as follows:

- (a) The Authority must ensure the plant operators are adequately trained as to the hazards associated with the fluoridating agent.
- (b) The Authority must keep a Material Safety Data Sheet for the fluoride chemical in the Operation Manual, and a copy must be placed close to where the substance is used to enable reference to it by operators who handle the substance.
- (c) All pipework and tanks used for storage and distribution of fluoride chemicals must be appropriately labelled.
- (d) The installation and arrangement of the equipment must ensure that the handling and operation of the equipment meet workplace health and safety requirements.
- (e) Where the risk assessment identifies that a worker could be exposed to hazardous substances such as those used for water fluoridation, the Authority must ensure that effective control measures are applied.
- (f) Appropriate personal protective equipment must be supplied and maintained by the Authority for operator use.
- (g) Emergency eyewash/showers must be available where ever fluoridating agents are stored and handled.

DRAFT – FOR CONSULTATION

5 Documentation

5.1 Required Documentation for Approval

The Authority, as discussed in section 2.3, must submit documentation for approval of new fluoridation plants, for approval of significant fluoridation plant upgrades and on completion of construction/upgrades. Documentation must be incorporated in the Authority's quality management system. Plant operational staff must be aware of the location of these documents and be familiar with their content.

5.2 New or Upgraded Fluoridation Plant

The Authority must provide the following documentation to the department for approval of a new or upgraded fluoridation facility:

- Evidence of the chemical selection process
- Concentration selected and basis for the selection
 - Fluoride background concentration in the raw water over the past five years
- Plans and specifications
 - Design report or Technical Specification
 - Functional Description
 - Drawings (P&IDs and layout drawings as a minimum)
 - Justification for the choice of analysers [on-line and bench-top (if used)] including buffering
- Risk Assessment of the facility, plant, equipment and dosing point
 - HAZOP and HACCP report
- Work plan
- Commissioning plan

For any significant fluoridation plant upgrade, the department must be consulted in advance and, if required by the department, the Authority must submit a new application for approval to fluoridate the water supply.

The department does not need to be notified when the Authority replaces equipment within a fluoridation plant, without changing the sizing of the equipment or negatively impacting on any existing control measures (e.g. interlocks etc). Improvements to the plant are to be recorded and the relevant documents and drawings are to be updated accordingly.

5.3 Completion of Work

The Authority must provide the following documentation to the department upon completion of the plant construction:

- Operation Manual including As-Constructed drawings and Functional Description.
- Emergency Response Plan
- Maintenance and calibration schedules for major equipment items.
- Commissioning records including proof of homogenous mixing of fluoride, instrument calibration records and the accuracy of the instruments as determined during installation.

5.4 Record Keeping & Reporting

5.4.1 Record Keeping

The Authority must record the following parameters:

Continuously

- Treated water flow.
- Online fluoride concentration

Daily

- The volume of water treated.
- The quantity of fluoride added to the water.
- The weight of the day tank at prior to refilling and following refilling
- The stock of fluoride on hand.
- The results of fluoride analyse of the samples of water taken from the treated water.
- Average fluoride concentration over the day on the basis of the online analyser records.
- Average fluoride concentration over the day on the basis of the loss of volume in the day tank.
- A reconciliation of the measured fluoride concentration (based on online analyser records) with the calculated fluoride concentration (based on day tank weight and loss of volume).

Weekly

- Fluoride distribution system sampling results
- Average weekly fluoride concentration using total weekly figures of water treated and fluoride used.

Monthly

- The fluoride concentration in the reticulation system. The sample must be pre-analysed by the operator with the on-site fluoride testing equipment and labelled with the fluoride concentration, sample location and date of collection. The sample must then be forwarded to a laboratory which is NATA accredited for fluoride analysis in water.

The Authority must record these parameters. Appendix 1 provides an example recording form for solution and dry feed equipment.

The Authority should also keep records verifying that the fluoride plant is managed and operated in accordance with these Guidelines, for example:

- regular chemical analysis of fluoridating agent delivered;
- regular analysis of concentration of fluoride in raw water;
- plant and equipment calibration and maintenance;
- routine testing of critical alarms and corrective actions;
- outcomes of the six monthly testing of all shutdown systems;
- surveillance monitoring and audits records; and
- staff training records.

The records must be made available for inspection upon request by the department or by any person authorised by the department. This may include approving auditors conducting risk management plan audits under the SDWA.

5.4.2 Reporting

The SDWA requires the Authority to provide the department with an annual report covering each financial year. With regard to fluoride, this annual report must include any details specified in the relevant guidance note on the preparation of annual reports issued by the department. An indicative list of what might be required to be reported is detailed below:

- An analysis of the monitoring data for fluoride collected from the treated water at the plant including:
 - the annual average fluoride concentration
 - the fluoride dosing concentration operating range (at 95% of the time)
 - the minimum fluoride concentration
 - the maximum fluoride concentration
- A statement on the accuracy and reliability of the means of fluoride measurement, including a comparison of calculated dose and actual measured dose from the on-line analysers, bench-top analysers, and laboratory samples.
- A summary of incidents and emergencies including plant shutdowns, failures in the control strategy (i.e. failure in corrective actions), and spills.
- An exception report to address any deviations from the requirements of these Guidelines, and the corrective actions, including a summary of notifications as per section 5.4.3

5.4.3 Emergency and Exceptional Notification Requirements

The department's Drinking Water Regulatory section must be notified of emergency and exceptional situations as described in Table 4.

Table 4
Emergency and exceptional notifications

Emergency and exceptional situation	Method of notification
Fluoride concentration in the reticulation system exceeds 1.5mg/L, or the water supplied may contain fluoride exceeding a concentration of 1.5mg/L.	Notification must occur immediately as per the Section 22 notification requirements in the <i>Drinking Water Regulation Guidance Note No.7 Notifications required under the SDWA</i> .
Fluoride concentration measured at the plant exceeds 1.5mg/L, however is not in the drinking water supply.	Notification must occur immediately to the Manager of the Drinking Water Regulatory section.
Fluoride dosing is out of action or less than lower action process limit for a continuous period of >72 hours.	The Manager of the Drinking Water Regulatory section must be notified within 24 hours.
If the rolling annual average fluoride concentration of drinking water at the plant exceeds the operating target dose rate in any 12 month period.	The Manager of the Drinking Water Regulatory section must be notified within 24 hours.
If the rolling annual average fluoride concentration of drinking water at the plant and in the reticulation system exceeds 1.0 mg/L in any 12 month period.	The Manager of the Drinking Water Regulatory section must be notified within 24 hours.

5.5 Operation Manual

The Operation Manual must contain adequate provisions and details to assist the operational staff in the operation and maintenance of the facility. The Manual should be a controlled document and reviewed 12 monthly or more frequently should any changes in the system occur. The Manual must contain as a minimum the following information:

- A copy of all software printouts and software design documentation.
- A copy of all inspection and test plans, and calibration test results.
- A copy of Factory Acceptance Test results.
- A copy of commissioning plans and commissioning test results.
- Acceptance testing plan and results.
- Equipment list and contact details for equipment manufacturers.
- Maintenance and calibration programme.
- Warranty information and details.
- As-constructed drawings including a minimum of a P&ID for the fluoridation plant and the integration in the overall treatment plant, layout plans, electrical, mechanical and civil drawings.
- Control philosophy detailing the overall control philosophy for the fluoride plant and the integration into the overall treatment process.
- Functional description detailing the functional requirements, alarming, operation etc of the fluoride system and the integration into the overall process

5.6 Emergency Response Plan

The Authority must develop an Emergency Response Plan to minimise (or preferably prevent) fluoride concentrations over 1.5 mg/L reaching consumers in the event of an overdosing incident.

An Emergency Response Plan must address as a minimum:

- Procedures for shutting down the equipment in the event of overdosing.
- The actions required to identify and rectify the problem.
- Action required to warn and protect the public in the event of a significant overdosing event.
- Reporting protocols including a clear chain of command and designated responsibility.

DRAFT – FOR CONSULTATION

6 Environmental Policy

6.1 Regulatory

In its management of the fluoridation plant and ancillary equipment and activities, the Authority must comply with the Environment Protection Act and must meet all environmental quality Guidelines and protection measures as set out in the following State environment protection policies:

- Waters of Victoria
- Groundwaters of Victoria
- Prevention and Management of Contamination of Land
- Ambient Air Quality
- Air Quality Management

The Authority needs to regularly review the requirements of the Act and the State environment protection policies to ensure compliance.

6.2 Risks to the Environment

6.2.1 Spills & Leaks

The Authority must ensure the fluoridation plant and equipment is designed and operated to both minimise the risk of fluoridating agent spills or leaks and to contain any spills or leaks should they occur.

Where fluorosilicic acid is used then appropriate bunding must be provided to contain any spillage. The design of bunding must facilitate the safe removal of any spillage. In designing the fluoridation plant, the inclusion of all elements containing concentrated fluorosilicic acid (including the feeding equipment) in the storage bund area may be an effective way of reducing environmental risks. The bunds must comply with the EPA Bunding Guidelines.

The water treatment plant's operating procedures must include provision for spills of the fluoridating agent, including in-built detection devices, surveillance, corrective actions and remedial works, and notification and reporting.

6.2.2 Release to the Atmosphere

Where dry fluoridating agents are used, powder should not be allowed to escape from the fluoridation room to the external atmosphere. The bag loading equipment and the fluoride plant building atmospheres should be contained and filtered. If powder is spilt then it should be removed either by hosing down, or preferably by vacuuming.

6.2.3 Waste Disposal

Any wastes produced that contain fluoride must be accompanied by a Transport Certificate as required by the Environment Protection (Prescribed Waste) Regulations 1998 and comply with any other requirements of these Regulations. Wastes must include fluoride chemical, and plant and equipment that have been in contact with fluoride chemical.

The Authority should prepare, document and implement an environmental waste disposal plan for fluoridating agent spills and leaks, contaminated fluoridating agent and fluoridating agent containers.

7 References

A systematic review of the efficacy and safety of fluoridation, NHMRC 2007.

Australian Drinking Water Guidelines, NHMRC 2004.

Code of Practice for the fluoridation of public water supplies, Fluoridation of Public Water Supplies Act 1957, Oral Health Branch NSW Department of Health, August 2002.

Code of Practice for the Fluoridation of Public Water Supplies, Queensland Health, January 2000.

Draft Code of Practice for the Fluoridation of Public Water Supplies, Queensland Health, July 2008.

Code of Practice on Technical Aspects of Fluoridation of Water Supplies 2005, Drinking Water Inspectorate, England and Wales, February 2005.

Fluorosilicic Acid, ANSI/AWWA B703-06, American Water Works Association Standard.

Guidance on the Principles of Safe Design for Work, Australian Safety and Compensation Council, Canberra, May 2006.

Regulations on Fluoridating Water Supplies, Government Notice, Department of Health, South Africa, 8 September 2000.

Sodium Fluoride, ANSI/AWWA B701-06, American Water Works Association Standard.

Sodium Fluorosilicate, ANSI/AWWA B702-06, American Water Works Association Standard.

Standard Methods for the Examination of Water and Wastewater, 21st Edition, American Public Health Association, American Water Works Association, Water Environment Federation.

Guidelines for Fluoridation of Public Water Supplies, Health (Fluoridation) Act 1973, Health and Community Services.

Water Fluoridation Principles and Practices, Manual of Water Supply Practices, Fifth Edition, American Water Works Association, 2004.

Schedules

Water Treatment Works Water Supply Authority
 Operation Log for Week Ending Saturday.....

Sunday	Monday	Tuesday	Wednesday	Thursday	Friday	Saturday	Weekly Summary	Date	
								Time of Reading	Water throughput in Cubic Metres (Kilolitres)
								No. 1 Meter today	
								No. 1 Meter yesterday	
								Water throughput since last reading	
								No. 2 Meter today	
								No. 2 Meter yesterday	
								Water throughput since last reading	
								Total Water Treated	Fluoride Chemical Used Quantities in Kilograms
								No. 1 Tank yesterday	
								No. 1 Tank today	
								Usage No. 1 Tank	
								No. 2 Tank yesterday	
								No. 2 Tank today	
								Usage No. 2 Tank	Tank Record Quantities in Kilograms
								Total Usage	
								No. 1 Tank Additions	
								Total in No. 1 Tank	
								No. 2 Tank Additions	
								Total in No. 2 Tank	Dry Stock Record after additions to Tanks Kilograms
								Total Additions	
								Tank Cleaning Losses	
								Total yesterday	
								Additions to Stock	
								Unopened Bulk Stock	Fluoride Ion Content in grams/cubic metre (parts per million)
								Container in Use	
								Spillage or weight variations	
								Total today	
								Feeder Setting	
								Calculated	By Analysis Distribution System
								Raw or Clear Water	
								Treated Water	
								1	
								2	
								3	
								4	
								5	
								Operator's Initials Official Use	

Fluoride Chemical Used Source Purity

Remarks.....

Supervisor Operator

Date.....

