

**Standard for the
Supply of Fluoride
for Use in Water
Treatment**

Second Edition

January 1997



STANDARD FOR THE SUPPLY OF FLUORIDE FOR USE IN WATER TREATMENT

Second Edition

January 1997

The first edition of this standard was prepared for the Water Supply Managers' Group of the New Zealand Water & Wastes Association and the Ministry of Health by Works Consultancy Services Ltd in 1995.

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1 GENERAL

1.1 Scope

This Standard covers hydrofluosilicic acid (sometimes called hydrofluorosilicic acid), sodium fluoride and sodium silicofluoride, for the addition to water supplies.

1.2 Purpose

The main purpose of this Standard is to provide purchasers, manufacturers and suppliers with the minimum requirements for hydrofluosilicic acid, sodium fluoride and sodium silicofluoride, including physical, chemical and testing requirements.

1.3 Application

This Standard can be referenced in specifications for purchasing and receiving hydrofluosilicic acid, sodium fluoride and sodium silicofluoride, and can be used as a guide for testing the physical and chemical properties of samples of them. The stipulations of this Standard apply when this document has been referenced and only to hydrofluosilicic acid, sodium fluoride or sodium silicofluoride when used for the dosage of water supplies.

1.4 Uses in Water Treatment

Fluoride is added to the water supply to reduce the incidence of dental caries. Hydrofluosilicic acid, sodium fluoride and sodium silicofluoride are the fluoride compounds that are commonly used for this purpose.

1.5 Manufacture of Fluoride Compounds

1.5.1 Hydrofluosilicic acid is produced as a co-product in the manufacture of phosphate fertilisers. Phosphate rock, which contains fluoride and silica, is treated with sulphuric acid. This produces two gases: silicon tetrafluoride and hydrogen fluoride. These gases are passed through scrubbers where they react with water to form hydrofluosilicic acid.

1.5.2 Sodium fluoride is generally produced by neutralising hydrofluosilicic acid with caustic soda (sodium hydroxide) or soda ash.

1.5.3 Sodium silicofluoride is generally produced from the addition of sodium carbonate or sodium chloride to hydrofluosilicic acid.

1.6 Description of Fluoride Compounds

1.6.1 Hydrofluosilicic acid is a strong, corrosive, pale yellow liquid with a characteristic sour odour.

1.6.2 Sodium fluoride is white, odourless, free-flowing, powder or crystals.

1.6.3 Sodium silicofluoride is a white, odourless, free-flowing crystalline powder.

1.7 Methods of Dosing

- 1.7.1 Hydrofluosilicic acid is normally fed directly into water by means of various liquid feeding devices and metering pumps. Dilution of the acid in the range of 10 to 1 and 20 to 1 (parts water to parts acid) before feeding is not recommended due to the possible formation of an insoluble silica precipitate.
- 1.7.2 Sodium fluoride is proportionally added to water either as a dry powder, or as a solution of varying strengths. A saturated solution tank eliminates the necessity of weighing the compound, but does require a water meter to measure the amount of water that is used to make up a solution of known strength.
- 1.7.3 Sodium silicofluoride is fed into water by means of mechanical dry feeders equipped with solution tanks, which should completely dissolve the compound before its introduction into the water. Sodium silicofluoride is less soluble than sodium fluoride, so liquid proportioning of solutions is rarely used and feeding of slurries is not recommended.

1.8 Definitions

The following definitions shall apply in this Standard:

- 1.8.1 *Fluoride Compounds:* A group of chemical compounds, consisting of hydrofluosilicic acid, sodium fluoride and sodium silicofluoride, presently used for fluoridation of water.
- 1.8.2 *Hydrofluosilicic Acid:* Hydrofluosilicic acid (HFA), or hydrofluorosilicic acid, or fluosilicic acid is an aqueous solution of H_2SiF_6 .
- 1.8.3 *Sodium Fluoride:* Sodium fluoride is a powder, or crystals, or a combination of both, consisting essentially of NaF.
- 1.8.4 *Sodium Silicofluoride:* Sodium silicofluoride, or sodium fluosilicate, is a crystalline powder consisting essentially of Na_2SiF_6 .
- 1.8.5 *Manufacturer:* The party and manufacturers, fabricates, or produces materials or products.
- 1.8.6 *Purchaser:* The person, company or organisation that purchases any materials or work to be performed.
- 1.8.7 *Reception Point:* The point of physical transfer of materials from the supplier to the purchaser.
- 1.8.8 *Supplier:* The party who supplies material or services. A supplier may or may not be the manufacturer.
- 1.8.9 *w/w* weight per unit weight, for example g/kg.

2 MATERIALS

2.1 Physical Properties

Table 1 gives some physical properties of fluoride compounds.

Property	Fluoride Compound																				
	Hydrofluosilicic Acid	Sodium Fluoride	Sodium Silicofluoride																		
Appearance	Hydrofluosilicic acid is a clear pale yellow aqueous solution	Sodium fluoride is a fine dry powder or a dry crystalline material with no lumps	Sodium silicofluoride is a fine, dry powder containing no lumps																		
Molecular Formula	H ₂ SiF ₆	NaF	Na ₂ SiF ₆																		
Molecular Weight	144.09	41.99	188.06																		
pH	1.2 (25% w/w solution)	close to neutral (solution)	3.5 – 4.0 (solution)																		
Specific Gravity	1.18 – 1.20 (20°C) of 25% w/w solution	2.7 (18°C) 2.56 (41°C)	2.70 (20°C)																		
Solubility in Water	Completely miscible	1.0 g/100 mL @ 20°C 4.3 g/100 mL @ 25°C	0.43 g/100 mL water (0°C) 0.65 g/100 mL water (17°C) 0.76 g/100 mL water (25°C) 0.94 g/100 mL water (35°C)																		
Particle Size	N/A	<table border="1"> <thead> <tr> <th>Mesh</th> <th>% Passing</th> </tr> </thead> <tbody> <tr> <td>No 200 (74 µm)</td> <td>90-99</td> </tr> <tr> <td>No 325 (43 µm)</td> <td>40-75</td> </tr> <tr> <td>No 400 (38 µm)</td> <td>30-45</td> </tr> </tbody> </table>	Mesh	% Passing	No 200 (74 µm)	90-99	No 325 (43 µm)	40-75	No 400 (38 µm)	30-45	<table border="1"> <thead> <tr> <th>Mesh</th> <th>% Passing</th> </tr> </thead> <tbody> <tr> <td>No 32 (495 µm)</td> <td>100</td> </tr> <tr> <td>No 100 (147 µm)</td> <td>50-90</td> </tr> <tr> <td>No 200 (74 µm)</td> <td>15.50</td> </tr> <tr> <td>No 325 (43 µm)</td> <td>0-20</td> </tr> </tbody> </table>	Mesh	% Passing	No 32 (495 µm)	100	No 100 (147 µm)	50-90	No 200 (74 µm)	15.50	No 325 (43 µm)	0-20
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Bulk Density	-		about 1.44 kg/L																		

Table 1: Some Physical Properties of Fluoride Compounds

2.2 Chemical Requirements

- 2.2.1 Hydrofluosilicic acid shall contain between 18% and 20% hydrofluosilicic acid, H₂SiF₆, w/w.
- 2.2.2 Sodium fluoride shall have a minimum of 97% w/w sodium fluoride, NaF, corresponding to approximately 43.9% fluoride ions. Moisture shall not exceed 0.3% w/w on delivery at the reception point.
- 2.2.3 Sodium silicofluoride shall have a minimum of 98% w/w sodium silicofluoride, Na₂SiF₆, corresponding to approximately 59.4% fluoride ions. Moisture shall not exceed 0.3% w/w on delivery at the reception point.

2.3 Impurities

2.3.1 Specific Impurity Limits

- 2.3.1.1 Based on a maximum dosage of 1.2 mg of fluoride ion/litre of water, commercially available hydrofluosilicic acid, sodium fluoride and sodium silicofluoride are not known to contribute significant quantities of contaminants that adversely affect the potability of drinking water.
- 2.3.1.2 The limits of specific impurities in fluoride compounds may be set by the purchaser to ensure that the material supplied is suitable for adding to water supplies. In setting impurity limits the purchaser shall take into consideration the expected maximum dosage (MD) of fluoride ion, the maximum acceptable value (MAV) of a parameter, generally taken from the Drinking-Water Standards for New Zealand 1995, and a safety factor which reflects the maximum percentage of a MAV that may be contributed by a specific impurity. The specific impurity limits may be calculated using the following equation:

$$SIL = \frac{MAV (mg / litre) \times 10^6 (mg / kg)}{MD (mg / litre) \times SF}$$

Where	SIL	=	Specific Impurity Limit
	MAV	=	Maximum Acceptable Value
	MD	=	Maximum Dosage
	SF	=	Safety Factor

- 2.3.1.3 Appendix A sets out an example calculation of a specific impurity limit, along with a table of MAVs taken from the Drinking-water Standards for New Zealand 1995. Alternative MAVs to those in the Drinking-water Standards for New Zealand may be chosen by the purchaser to reflect their individual requirements. The purchaser may also vary the SF to suit.
- 2.3.1.4 Specific impurity limits shall be given as weight of impurity by weight of fluoride ion (F⁻).
- 2.3.2 Insoluble Matter**
- 2.3.2.1 Insoluble matter in hydrofluosilicic acid shall not exceed 0.2% w/w.
- 2.3.2.2 Insoluble matter in sodium fluoride shall not exceed 0.6% w/w.
- 2.3.2.3 Insoluble matter in sodium silicofluoride shall not exceed 0.5% w/w.
- 2.3.3 Heavy Metals**
- 2.3.3.1 Test procedures for heavy metals contents calculated as lead are detailed in the ANSI/AWWA Standards for Hydrofluosilicic Acid, Sodium Fluoride and Sodium Silicofluoride (B703-89, B701-89 and B702-89 respectively). See Section 5.4.
- 2.3.3.2 For the purposes of this Standard the term heavy metals refers to the following metals: barium, cadmium, chromium, copper, lead, mercury and nickel.
- 2.3.3.3 Hydrofluosilicic acid shall not contain more than 0.02% w/w heavy metals expressed as lead (Pb).
- 2.3.3.4 Sodium fluoride shall not contain more than 0.04% w/w heavy metals expressed as lead (Pb).
- 2.3.3.5 Sodium silicofluoride shall not contain more than 0.05% w/w heavy metals expressed as lead (Pb).

2.3.4 **General Impurities**

In addition to any specific impurity limits, fluoride compounds shall not contain any other impurities that may be deleterious to health or aesthetically objectionable as determined in the Drinking-Water Standards for New Zealand 1995. General impurity limits shall be based on a maximum fluoride ion dosage of 1.2 mg/L, the MAV of determinands and a minimum safety factor of 10.

3 DELIVERY

3.1 Packaging and Shipping

- 3.1.1 Fluoride compounds are toxic and should be handled with care. Suppliers of fluoride compounds must comply with the relevant regulations for classification, marking, packaging, labelling and transporting of material, including the Toxic Substances Regulations 1983 and NZS 5433: 1988, Code of Practice for the Transport of Hazardous Substances on Land.
- 3.1.2 Hydrofluosilicic acid may be shipped in bulk in road tankers and trailers. Sodium fluoride and sodium silicofluoride may be shipped in 25 kg or 50 kg multi-wall paper bags with polyethylene inner coating.
- 3.1.3 Tanks for transporting hydrofluosilicic acid shall comply with all conditions as required under the Transport Act 1992 and the Toxic Substances Regulations, and shall not contain any substances that might affect the quality of the hydrofluosilicic acid added to water supplies as specified by this Standard. Refer also to Sections 3.1.3 and 4.1.1.

3.2 Labelling

Each shipment of material shall comply with the New Zealand Standard NZS 5433:1988, *Code of Practice for the Transport of Hazardous Substances on Land* and specifically must be clearly identifiable and be marked and/or accompanied by clear means of giving the following information:

Contents : (Proper Shipping Name)
UN Number:
Hazardous Chemical Classification:
Name of Manufacturer:
Net weight

3.3 Unloading and Storage

- 3.3.1 Bulk hydrofluosilicic acid shall be unloaded at the purchaser's premises using either a gravity discharge or a pump into an appropriate receiving vessel. The supplier shall provide an appropriate "camlock" or other type of coupling as agreed with the purchaser for connection to the storage tank inlets, if required, which should prevent an incorrect discharge.
- 3.3.2 Bagged sodium fluoride and sodium silicofluoride shall be transported on pallets for unloading with a forklift or by hand. Bags shall be stored in a dry covered designated storage area. Bagged product shall have an expected shelf life on delivery in dry storage conditions of two years minimum.
- 3.3.3 Bags damaged prior to delivery will be the responsibility of the supplier, and bags damaged during unloading at the purchaser's premises will be the responsibility of the agent undertaking the unloading.
- 3.3.4 The condition on delivery of the paper outers of the bags shall not have deteriorated to any extent so as to impede handling or emptying of the bags. Bags with deteriorated paper outers on delivery shall be replaced by the supplier at no cost to the purchaser.

4 SAFETY

4.1 Health and Safety and Environmental Protection

4.1.1 Suppliers of fluoride compounds must comply with the requirements of the Health and Safety in Employment Act 1992, the Transport Act 1962, the Resource Management Act 1991, the Toxic Substances Regulations 1983, and NZS 5433: 1988, and take all practicable steps to protect the purchaser and others and the environment from hazards arising from the transportation, delivery and supply of fluoride compounds.

4.1.2 Within two weeks of award of a contract to supply product, and prior to delivery, the supplier shall provide to the purchaser the following information:

(a) An updated copy of the Material Safety Data Sheet, which as a minimum shall include the following information, as detailed in *Guidance Note for Completion of a Material Safety Data Sheet*, [NOHSC:3001 (1991)]:

- Introductory and Company Details
 - Page numbers and total
 - Date of issue
 - Company, address and phone numbers
- Identification
 - Product names, codes and numbers
 - Physical description/properties
 - Chemical properties
 - Other properties
 - Uses
- Health Hazard Information
 - Health effects
 - First aid
- Precautions for Use
- Safe Handling Information
- Other Information and Emergency Contacts

(b) Evidence that drivers have been adequately trained and have adequate knowledge and experience in the handling and delivery of fluoride compounds, including an endorsement on their licence as required under the Transport Act.

4.1.3 A copy of the purchaser's Health and Safety Management Plan shall be made available to the supplier of fluoride compounds. Any practices by the supplier which do not comply with the Health and Safety Management Plan may be grounds for the termination of a supply contract. Health and Safety Management Plans are discussed in the National Guidelines for Health and Safety in the New Zealand Water Industry (1997).

4.2 Protective Equipment

The purchaser and the supplier will be responsible for providing their respective personnel or agents with any necessary safety and protective equipment identified in their Health and Safety Management Plans and ensuring it is used as required.

4.3 Spills

The supplier, their agent or the authorised purchaser's representative responsible for unloading the fluoride compounds, shall immediately attend to and report any spills within the grounds of the property in which the fluoride compound reception point is located. Clean-up and reporting procedures should be specified in Health and Safety Management Plans; they may also be specified in the water treatment plant Consent issued by the Regional Council.

5 TESTING METHODS

5.1 General

- 5.1.1 The manufacturer or supplier shall test the materials at their own cost in order to provide a Certificate of Compliance as required in Section 7.1.
- 5.1.2 The purchaser may randomly take samples of the material and have these samples analysed for conformance with this Standard, at the cost of the purchaser. These samples shall be taken at the place of manufacture and/or at the delivery point, as may be agreed upon by the manufacturer or supplier and the purchaser.
- 5.1.3 When inspection and sampling are to be conducted at the point of manufacture, the manufacturer shall afford the inspector representing the purchaser all reasonable facilities for inspection and sampling of finished material, which shall be so conducted as not to interfere unnecessarily with the operation of the plant.
- 5.1.4 Analytical testing methods shall be as specified in this Standard in Section 5.4.
- 5.1.5 If the analysis of a sample taken at the place of manufacture shows the material does not comply with the requirements of this Standard, the purchaser may require that the manufacturer provide a certified analysis from a suitably Telarc registered organisation (or equivalent) for successive deliveries.
- 5.1.6 If the analysis of a sample taken at the point of delivery shows the material does not comply with the requirements of this Standard, a notice of non-conformance must be provided by the purchaser to the supplier in accordance with Section 7.4.

5.2 Sampling

- 5.2.1 The sampling procedure shall be agreed by the purchaser and supplier prior to the award of a contract to supply product.
- 5.2.2 The sample size shall be determined in order to provide a representative sample of the material and shall be agreed by the purchaser and the supplier.
- 5.2.3 A suitable sampling procedure is set out in Appendix B of this Standard.

5.3 Sample Preparation

- 5.3.1 Prior to the award of the contract to supply product the preparation of the sample for analysis shall be agreed by the purchaser and supplier giving consideration to the analytical testing to be undertaken, given that samples prepared by different methods may give different results when tested.
- 5.3.2 A suitable sample preparation procedure for the analytical tests detailed in Section 5.4 is set out in Appendix B of this Standard.

6 SUPPLY CONTRACT

6.1 Contract

The purchaser may enter into a contract with a supplier for the supply of hydrofluosilicic acid, sodium fluoride, or sodium silicofluoride, in accordance with this Standard.

6.2 Acceptable Conditions

Acceptable conditions of supply are outlined in Appendix C of this Standard or as agreed between the supplier and the purchaser.

7 QUALITY ASSURANCE

7.1 Certificate of Compliance

- 7.1.1 The manufacturer or supplier shall provide the purchaser with a certificate of compliance that states that the material furnished in accordance with the purchaser's order complies with all applicable requirements of this Standard.
- 7.1.2 The purchaser may require that the supplier provide a certified analysis of the material, from a mutually agreed upon laboratory at the commencement of the contract and thereafter at three monthly intervals or as agreed between purchaser and supplier. The purchaser may also require that the supplier provide a certified analysis for insoluble matter or particular impurities, from a mutually agreed upon laboratory, for each delivery or as agreed between purchaser and supplier.

7.2 Method of Manufacture

- 7.2.1 The quality of a water supply chemical is greatly influenced by the method of manufacture and quality of raw material used. If other than recognised methods of manufacture, or if unusual raw materials are used, the potential may exist for impurities to be present, or poor quality chemical to be produced, that may be inconsistent with good water supply practice.
- 7.2.2 If the method of manufacture, source and/or quality of raw material used is changed during the period of the contract, then additional samples shall be analysed at the manufacturer's or supplier's cost, to demonstrate that the changes have not affected compliance with this Standard.

7.3 Weight Certificate

Delivered bulk product shall be weighed over certified weighbridges and the docket produced on delivery.

7.4 Rejection

7.4.1 Notice of Non-conformance

If the fluoride compound delivered does not meet the requirements of this Standard, a notice of non-conformance must be provided by the purchaser to the supplier within 10 working days after receipt of the shipment at the point of destination. The results of the purchaser's tests shall prevail unless the supplier notifies the purchaser within five working days after receipt of the notice of complaint that a retest or inspection is desired. On receipt of the request for a retest, the purchaser shall forward to the supplier one of the sealed samples taken in accordance with Section 5. In the event that the results obtained by the supplier upon retesting do not agree with the results obtained by the purchaser, the other sealed sample shall be forwarded, unopened, for analysis to a referee laboratory agreed upon by both parties. The results of the referee analysis or inspection shall be accepted as final.

The cost of the referee analysis shall be paid by the supplier if the material does not meet the requirements of this Standard, and shall be paid by the purchaser if the material does meet the requirements of this Standard.

7.4.2 **Material Removal**

- 7.4.2.1 If the material does not meet the impurity limit requirements of this Standard, the supplier shall remove the material from the premises of the purchaser when requested by the purchaser. Removal of material shall be at no cost to the purchaser.
- 7.4.2.2 If the material meets the impurity limits but not the fluoride content requirements of this Standard, a price adjustment may be agreed between the supplier and the purchaser. In the event that a price adjustment cannot be agreed, the supplier shall remove the material from the premises of the purchaser if required by and at no cost to the purchaser.
- 7.4.2.3 The material that shall be removed shall include the rejected material and any other material the rejected material may have contaminated, for example contents of a tank into which a bulk delivery has been unloaded, if required by the purchaser.
- 7.4.2.4 All material removed shall be concurrently replaced with material conforming to this Standard with an appropriate compliance certificate at no cost to the purchaser.

Appendix A: Specific Impurity Limits

Commercially available hydrofluosilicic acid, sodium fluoride and sodium silicofluoride are not known to contribute significant quantities of contaminants that adversely affect the potability of drinking water.

A1 Example Calculations

Specific Impurity Limits (SIL) have been calculated based on a maximum dosage (MD) of fluoride ion/litre of water and the maximum acceptable value (MAV) of a parameter taken from the Drinking-Water Standards for New Zealand 1995. The safety factor (SF) used in the calculation should be a minimum of 10, which reflects the view that no more than 10 percent of a MAV should be contributed by a given impurity in a water supply chemical.

The SIL, values were determined using the following equation:

$$SIL = \frac{MAV (mg/L) \times 10^6 mg/kg}{MD (mg/L) \times SF}$$

An example calculation is as follows:

Arsenic:	MAV	=	0.01 mg/litre
	MD	=	1.2 mg/litre
	SF	=	10

$$SIL (As) = \frac{0.01 \times 10^6}{1.2 \times 10}$$

$$= 833 mg As/kg F$$

For a 20% w/w H₂SiF₆ (HFA) solution, this SIL equates as follows:

$$SIL (As) = 833 mg \times 0.20 \times \frac{113.99 (6 \times MW \text{ of } F)}{144.09 (MW \text{ of } HFA)}$$

$$= 132 mg As/kg HFA$$

For a 97% NaF product, this SIL equates as follows:

$$SIL (As) = 833 mg \times 0.97 \times \frac{19.00 (MW \text{ of } F)}{41.99 (MW \text{ of } NaF)}$$

$$= 366 mg As/kg \text{ of } NaF \text{ product}$$

For a 98% Na_2SiF_6 product, this SIL equates as follows:

$$SIL (As) = 833 \text{ mg} \times 0.98 \times \frac{113.99 (6 \times MW \text{ of } F)}{188.06 (MW \text{ of } Na_2SiF_6)}$$

$$= 495 \text{ mg As/kg of } Na_2SiF_6 \text{ product}$$

A2 Specific impurity Limits based on maximum dosage of 1.2 mg of fluoride per litre of water, and a safety factor of 10

Determinand	mg of Determinand per kg of Product		
	<i>hydrofluosilicic acid</i>	<i>sodium fluoride</i>	<i>sodium silicofluoride</i>
Antimony	40	110	148
Arsenic	132	366	495
Cadmium	40	110	148
Chromium	660	1830	2475
Lead	132	366	495
Manganese	660	1830	2475
Mercury	26	73	99
Molybdenum	924	2562	3465
Nickel	264	732	990
Selenium	132	366	495

The above table of specific impurity limits has been calculated based on the maximum acceptable value (MAV) of a determinand taken from the Drinking-Water Standards for New Zealand 1995, as shown below. Because fluoride is dosed at such a low level, it is improbable that the determinands with a MAV greater than say 0.1 mg/L could ever be found in fluoride compounds to such an extent that the determinand would reach 50% of the MAV in the final water. Therefore the above table only lists those determinands with a MAV < 0.1 mg/L.

Antimony	0.003 mg/L
Arsenic	0.01 mg/L
Barium	0.7 mg/L
Boron	0.3 mg/L
Cadmium	0.003 mg/L
Chromium	0.05 mg/L
Copper *	1 mg/L
Iron *	0.2 mg/L
Lead	0.01 mg/L
Manganese *	0.5 mg/L
Mercury	0.002 mg/L
Molybdenum	0.07 mg/L
Nickel	0.02 mg/L
Selenium	0.01 mg/L
Zinc *	3 mg/L

* For aesthetic parameters, guideline values are given. In the case of copper and manganese, the health based MAV is higher than the aesthetic parameter guideline value.

Appendix B: Sampling Procedure

B1 Sampling Method

B1.1 General

B1.1.1 Sampling and preparation shall be conducted as expeditiously as possible in order to avoid undue exposure of the material to the air.

B1.1.2 The sampling method must give a gross sample that is representative of the material, and which may be divided to provide representative samples for analysis. Samples for analysis shall be provided in triplicate. Samples shall be sealed in airtight moisture proof containers.

B1.1.3 One sample is for the immediate use of the purchaser for testing of the shipment. The other two samples shall be retained until it is known from the results of the laboratory examination that the shipment meets the requirements of this Standard. The second sample shall be delivered to the supplier if requested within five days of notification of the examination results of the first sample. The third sample is for the use of a referee laboratory if there is a controversy over the analyses.

B1.1.4 Each sample shall be labelled to identify it by such information as the material, the name of the purchaser, package number, and date received. Each label shall be signed by the sampler.

B1.2 Sample Size

B1.2.1 The sample size must provide a gross sample that is representative of the material.

B1.2.2 The size of the gross sample and the samples for analysis shall be agreed by the purchaser and the supplier, giving consideration to obtaining representative samples and the requirements of the laboratory to undertake analyses.

B1.3 Sodium Fluoride and Sodium Silicofluoride

B1.3.1 If the sodium fluoride and sodium silicofluoride is packaged, a minimum of 2%, and preferably 5%, of the number of the packages shall be sampled. No sample shall be taken from a broken package. Samples from individual packages shall be combined to form a gross sample.

B1.3.2 Care shall be taken to include a proportional amount of lumps and fines, to obtain representative material.

B1.3.3 Sodium fluoride and sodium silicofluoride shall be sampled using a sampling tube or other effective device that measures at least 2 cm in diameter.

B1.3.4 The gross sample, of at least 8 kg or as agreed, shall be mixed thoroughly and quartered and quartered again to provide eight 0.5 kg samples. Six of these samples shall be sealed in air tight, moisture-proof, plastic or glass containers. Two samples shall be for use by the purchaser. The other four shall be retained to be used for retesting as provided for in Section B1.1.3.

To quarter the sample, tip it on to a clean surface so that it forms a conical or hemispherical pile. With a clean knife, cut the pile vertically, dividing the pile into four equal parts. Make up a new pile with these four parts, and repeat the quartering process.

B1.3.5 Each sample container shall be labelled to identify it, dated, and shall be signed by the sampler.

B 1.4 **Hydrofluosilicic Acid**

B1.4.1 A composite sample should be taken from the tank truck or taken at five equally spaced time intervals during the unloading of the tank truck. The total sample volume shall equal at least 2 litres or as agreed. Special sampling arrangements may be necessary at unmanned water treatment plants, particularly if a new load is pumped into a tank that still has some fluoride in it.

B1.4.2 The gross sample (2 litres) should be thoroughly mixed, and three 0.5 litres samples retained. They shall be sealed in air tight, moisture-proof, plastic or glass containers.

B 1.4.3 Each sample container shall be labelled to identify it and shall be signed by the sampler.

B2 Sample Preparation

B2.1 The preparation of subsamples for testing may affect the results obtained from identical samples so appropriate and consistent preparation procedures are most important.

B2.2 Appropriate preparation techniques and test procedures must be agreed by the purchaser and the supplier.

B2.3 Test procedures are detailed in the following ANSI/AWWA Standards:

ANSI/AWWA B703-89 Hydrofluosilicic Acid

ANSI/AWWA B701-89 Sodium Fluoride

ANSI/AWWA B702-79 Sodium Silicofluoride

Appendix C: Supply Contract

C1 Contract

The following provides an outline of acceptable conditions of supply of product, to be included in a contract between a purchaser and a supplier for the supply of hydrofluosilicic acid/sodium fluoride/sodium silicofluoride (*delete those not applicable*) in accordance with this Standard, or as agreed by the purchaser and the supplier.

C2 Contract Period

A nominated contract period shall be set as part of a supply contract and shall commence from the date of entering into contract.

C3 Annual Requirements

An approximate annual requirement of product shall be provided for the information of the supplier. However, no guarantee can be given to these amounts as they will vary with water treatment plant throughput and customer consumption.

C4 Delivery

C4.1 The reception point for the supply of hydrofluosilicic acid/sodium fluoride/sodium silicofluoride (*delete those not applicable*) shall be designated and agreed between the supplier and the purchaser.

C4.2 Delivery of an order to the purchaser's specified reception point shall be made within seven days of receipt of the order or at any other mutually agreed time.

C4.3 Delivery of hydrofluosilicic acid shall be in full tanker or compartment loads, unless a prior agreement between the supplier and the purchaser has been reached as to the load size.

C4.4 Delivery shall be made between the hours of 7.30 am and 4.00 pm Monday to Friday, excluding public holidays, unless a prior arrangement is made between the supplier and the purchaser, and discharged only with the authorisation of the purchaser's representative or operating personnel.

C4.5 Delivery dockets shall be provided giving the weight of the product and the proportion of fluoride ion. Bulk deliveries shall be weighed over certified weighbridges.

C4.6 The purchaser may check the solution proportion of available fluoride ion in the fluoride compound after delivery.

C5 Payment

C5.1 Payment will be made in full by the purchaser by the 20th of the month following that in which deliveries are made and correctly invoiced by the supplier, unless otherwise agreed.

C5.2 Invoices shall state the order number, docket number, weight of product supplied and the proportion of available fluoride ion or fluoride compound.

C5.3 Payment will be made on measured quantities unless otherwise agreed.

C6 Contract Sum

C6.1 Suppliers shall submit quotes in NZ\$/tonne for the product offered. The quoted price shall allow for delivery including off-loading to the nominated reception points unless otherwise agreed.

C6.2 The quote shall hold firm for the duration of the contract period.

C6.3 The quote shall be exclusive of GST, but inclusive of any applicable duties or charges.

C7 Insurance

The supplier shall make their own arrangements for insurance of the order while in transit to the reception point. Responsibility will pass to the purchaser once the delivery has been made to the purchaser's storage facility.

C8 Subletting

The supplier shall not assign or sublet the contract or any part of the contract without the written consent of the purchaser.

C9 Cancellation

The purchaser shall reserve the right to cancel the contract for non-compliance with the Standard or failure to deliver within the allotted time.

REFERENCES

- ANSI/AWWA Standard for Hydrofluosilicic Acid.* ANSI/AWWA B703-89, AWWA, 1989.
- ANSI/AWWA Standard for Sodium Fluoride.* ANSI/AWWA B701-89, AWWA, 1989.
- ANSI/AWWA Standard for Sodium Silicofluoride.* ANSI/AWWA B702-89, AWWA, 1989.
- Drinking-Water Standards for New Zealand* Ministry of Health, Wellington_ 1995.
- Guidance Note for Completion of a Material Safety Data Sheet.* National Occupational Health and Safety Commission, Australia NOHSC:3001 (1991).
- Health and Safety in the Employment Act.* 1992.
- National Guidelines for Health and Safety in the New Zealand Water Industry,* New Zealand Water and Wastes Association, Auckland, 1997.
- NZS 5433: 1988 Code of Practice for the Transport of Hazardous Substances on Land.* SANZ, Wellington.
- Resource Management Act.* 1991.
- Standard Methods for the Examination of Water and Wastewater.* 19th Ed. APHA, AWWA, WEF, 1995.
- Transport Act.* 1992.
- Toxic Substances Regulations.* 1983.