



guardians of drinking water quality

**Code of Practice on
Technical Aspects of Fluoridation of
Water Supplies 2005**

**Drinking Water Inspectorate
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Code of Practice on Technical Aspects of Fluoridation of Water Supplies 2005

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1. Introduction

The purpose of this Code of Practice on Technical Aspects of Fluoridation of Water Supplies 2004, (the Code of Practice) is to outline the principles to be followed by water undertakers operating fluoridation schemes in England and Wales. The Code sets out the principles underpinning the safe design and operation of fluoridation installations which are intended to assist water suppliers in:

- ensuring that fluoride concentrations in water supplies that do not exceed the prescribed concentration specified in the Water Supply (Water Quality) Regulations 2000¹ of 1.5mgF/l;
- avoiding over-dosing of fluoridation chemicals; and
- maintaining, as far as is reasonably practicable, fluoride concentrations in drinking water within the operational criteria specified in the Company's agreement with the Strategic Health Authority.

The Drinking Water Inspectorate (DWI) expects water undertakers to meet the minimum requirements specified in the Code of Practice. However, it is anticipated that water undertakers' own policies and procedures may, where appropriate exceed these requirements.

The Code of Practice applies to all installations where fluoridation chemicals are dosed into public water supplies. Where reference is made in the Code of Practice to a "water undertaker" this shall equally apply to a licensed water supplier. Thus where a water undertaker or a licensed supplier supplies artificially fluoridated drinking water to an area, it will be expected to follow the Code of Practice requirements.

2. Legal framework

2.1 Summary of the legal framework surrounding the fluoridation of drinking water supplies.

The original provisions within sections 87 to 91 of the Water Industry Act 1991 (WIA 91) allowed health authorities to request water undertakers to fluoridate water supplies but placed no duty on water undertakers to accede to such requests.

Section 58 of the Water Act 2003 (WA03) amended sections 87 and 89 to 91 of the WIA91 as described below. The WA03 provides for the fluoridation of water supplies where Strategic Health Authorities (SHAs) in relation to England and the National Assembly for Wales (NAW) in relation to Wales make arrangements with water undertakers. Under the new section 87, water undertakers are under a statutory obligation to accede to requests from SHAs and/or the NAW to enter into arrangements to fluoridate water supplies. Water undertakers are not required to enter into arrangements unless an indemnity under the new section 90 has been given.

The SHA² must consult with the Water Services Regulation Authority in respect of the terms to be included in a fluoridation agreement, particularly those which affect the operation of the water undertaker's supply system. Where a water distribution system overlaps the boundaries of two adjoining SHAs, they must co-operate in making arrangements to fluoridate with a water undertaker. The SHA must also consult other potentially affected parties prior to introducing any new scheme.

¹ Water Supply (Water Quality) Regulations 2001 in Wales

² For the purposes of this document, references to SHA equally refer to the National Assembly for Wales (NAW) in relation to Wales.

The new section 87A sets a general target concentration of one milligram per litre as fluoride. However SHAs are permitted to make arrangements for a lower concentration where it is not technically practical to achieve one milligram per litre.

Section 87C confirms the two chemical compounds which are permitted to be used to fluoridate water supplies and allows water companies to temporarily supply fluoridated water to areas not covered by a fluoridation arrangement where it is necessary to do so due to meet operational constraints (such as dealing with a serious deficiency in supply).

Section 88A confers powers on the Secretary of State (and NAW) to make an order to set a target concentration of fluoride below one milligram per litre. This might be appropriate if, for example, it was established that consumers were consuming significant amounts of fluoride from sources other than drinking water.

Under new section 91, fluoridation schemes existing prior to 1985 are to be treated as if they had been established under the amended Act (except that the consultations required on proposals for new fluoridation schemes do not apply retrospectively). Similarly, the Code of Practice applies to both new fluoridation schemes (established under the WA03) and installations established under all other previous fluoridation arrangements.

2.2 Role of the Drinking Water Inspectorate in fluoridation schemes.

The Drinking Water Inspectorate (DWI) acts for and on behalf of the Secretary of State and the National Assembly for Wales in regulating the quality of public water supplies in England and Wales. DWI is responsible for assessing the quality of the water supplied, taking enforcement action if standards are not being met, and instituting proceedings when water unfit for human consumption is supplied.

Regardless of whether or not the concentration of fluoride in public drinking water supplies has been raised via an authorised fluoridation scheme, the concentration of fluoride in drinking water must not exceed the maximum concentration of 1.5mgF/l specified in the Water Supply (Water Quality) Regulations 2000¹.

Where the concentration of fluoride in public drinking water supplies is raised via an authorised fluoridation scheme, DWI will also:

- expect water undertakers to comply with the requirements of this Code of Practice; and
- audit water undertaker's arrangements for the fluoridation of water supplies as part of its on-going programme of technical audits.

3. Fluoridation chemicals

3.1 Chemical standards

Section 87C(2) of the Water Act 2003 permits the use of two chemical compounds to increase the fluoride content of water within an area subject to a fluoridation arrangement. These compounds are:

- Disodium hexafluorosilicate (Na_2SiF_6); and
- Hexafluorosilicic acid (H_2SiF_6).

European standards for disodium hexafluorosilicate (Na_2SiF_6) and hexafluorosilicic acid (H_2SiF_6) have been published. The BS EN Standards specify the physical properties and purity criteria required of the compounds, together with test methods for sampling and analysis of the compounds, and labelling, transportation and storage instructions.

In order to be used in drinking water, these compounds must conform with either BS EN 12174:2001 Sodium hexafluorosilicate or BS EN 12175:2001 Hexafluorosilicic acid. Copies of these standards can be obtained from BSi Customer Services, BSi, 389 Chiswick High Road, London, W4 4AL (Tel: 020 8996 9001, Fax: 020 8996 7001), or ordered from the BSi website: www.bsi-global.com.

Water treatment chemicals which conform to a European Standard may only be used where the national conditions of use are observed. National conditions of use, where applicable, are detailed in the List of Approved Products and Processes published annually by DWI on behalf of the Secretary of State for Environment, Food and Rural Affairs. Water undertakers in England and Wales should refer to the most recent version of the Secretary of State's List which is available on the DWI website: <http://www.dwi.gov.uk/cpp/> for current information on national conditions of use.

Water undertakers are expected to be aware of the contents of the relevant BS EN standard for any fluoridation chemical used and should also ensure that adequate account has been taken of any additional guidance provided by the DWI.

Section 88 of the WIA91 confers powers on the Secretary of State to make an order to add, or to remove, a compound to the list of permitted fluoridation chemicals.

3.2 Health & Safety considerations

The use of chemicals in the water treatment process, including fluoridation chemicals must be adequately controlled to safeguard the health and safety of employees and the public. The safe use of these chemicals is covered by a range of significant legislation including:

The Health and Safety at Work etc Act 1974 (HSWA) which places general duties on an employer to conduct their work in such a way that their employees will not be exposed to health and safety risks, and to provide information to other persons about their work place which might affect their health and safety. The legislation also extends these duties on employers to people other than their own employees.

The Management of Health and Safety at Work Regulations 1999 require employers to make an assessment of the risks to the health and safety of themselves, employees, and persons not in their employment arising out of, or in connection with, the conduct of their business - and to make appropriate arrangements for protecting those people's health and safety.

The Control of Substances Hazardous to Health Regulations 2002 (COSHH) impose duties on employers to assess the risks to health arising from exposure to hazardous substances, and to ensure that exposure to these substances is prevented or, where this is not reasonably practicable, adequately controlled.

Other relevant Regulations, Codes of Practice and Guidance (including Material Safety Data Sheets) should be considered by water undertakers when developing written risk assessments, safe working policies, procedures and other suitable precautions. These precautions must be monitored and reviewed regularly. The provision of suitable instruction and training for staff should be included.

4. Principles of fluoride dosing installations

Depending on the target area to receive fluoridated water, fluoridation chemicals may be dosed within the treatment process of a water treatment works (WTW), on the outlet of a WTW, or (where practical and reasonable) at the outlet of a treated water storage point or at a fixed point within the distribution system.

The target fluoride concentration for a fluoridation dosing scheme will normally be 1.0mgF/l . However, in each case the written agreement between the SHA and the water undertaker will specify the actual target concentration and the agreed operational criteria.

It is expected that water undertakers will have their own policies and procedures in place to support the implementation of this Code of Practice, which may, where appropriate, exceed the requirements of the Code of Practice. Site specific requirements will need to be agreed with the relevant SHA when establishing the fluoridation agreement. However, in all cases, fluoride dosing installations should follow the principles described below in order to ensure suitable controls are in place to safeguard drinking water quality.

4.1 Hexafluorosilicic acid dosing installations

4.1.1 Chemical delivery, storage & transfer arrangements

Water undertakers must have in place suitable arrangements for the delivery and storage of fluoridation chemicals to prevent accidental spillage. These arrangements should meet the following basic principles:

Chemical delivery

- Chemical delivery points should allow appropriate safe access for the mechanism of delivery to the site (e.g. by tanker for hexafluorosilicic acid);
- Delivery locations should be sited such that any spillage of fluoridation chemical is restricted to drainage facilities which allow spill containment and subsequent removal;
- Where the spill containment measures consist of an interceptor or containment tank, this tank should be fitted with an audio-visual high level alarm;
- Arrangements should be in place to contain and dispose of any spillage of fluoridation chemical (in line with advice provided by the supplier);
- Chemical delivery points should be appropriately labelled, and permanently locked (except when a delivery is taking place) with a suitable key control regime in place;
- All chemical deliveries should be supervised by a competent member of the water undertaker's staff for the duration of the chemical transfer process; and
- Where undertakers transfer chemicals from bulk storage to remote sites, they should ensure they comply with the relevant legal requirements applicable to the chemical concerned and the method of transportation e.g. the Road Traffic (Carriage of Dangerous Substances in Road Tankers and Tank Containers) Regulations for tanker transfers, or the Chemicals (Hazard Information and Packaging) Regulations for drums or other containers.

Bulk Chemical storage

- All tanks should be of an appropriate chemically resistant material³ and located within a bunded area of not less than 110% of the tank volume;
- Chemical storage areas should be secure and access restricted to authorised personnel only;
- Chemical transfer pipework should be arranged such that any spillage of fluoridation chemical during transfer is adequately and safely contained;
- Ventilation should be provided as appropriate to the chemical stored;
- Any external vent to a storage tank should be secure and suitably protected against the weather;
- Indoor overflows from acid storage tanks should incorporate a fume trap (incorporating suitable frost protection where necessary) located within the storage tank bund;
- All storage tanks should be equipped with a calibrated level monitoring instrument. The instrument(s) should include local visual display of tank contents and operate alarms on the detection of a high tank level;
- High tank level and bund flood alarms should initiate a local audio-visual alarm in addition to any remote alarm signals; and
- All isolation valves should remain operable in the event of a bund flood (by the use of extension spindles or other appropriate provision).

Chemical transfer arrangements (bulk tank to day tank)

Where dosing is practised, the installation shall include the provision of a day tank to maintain dosing within acceptable limits. Arrangements for the transfer of fluoridation chemicals from the bulk tank to the day tank should meet the following basic principles:

- Transfers of chemical from the bulk storage tank to the day tank should be by pumping not gravity transfer;
- Transfer pump(s) should be located within a bunded area;
- Any risk of gravity flow through the pump from the bulk storage tank should be prevented by appropriate hydraulic design.
- Chemical transfer should be initiated and stopped in response to level indicators in the day tank;
- The day tank must not be filled more than once in any 24 hour period. Where a “day tank” holds less than 24 hours supply of acid, it must not be filled more than once in an appropriate shorter period;
- Arrangements should be in place to determine the number of times that the day tank fills within a given time period;

³ Advice on the suitability of construction materials should be sought from the chemical supplier.

- A local emergency stop button should be provided to enable immediate cessation of chemical transfer in the event of a problem occurring; and
- The use of a filter immediately upstream of the chemical transfer pumps is recommended.

Day tank

- A day tank must meet the requirements of section Bulk Chemical storage above; and
- A day tank must be sized such that it can contain no more than 24 hours supply of fluoridation chemical, when dosed at the maximum usage rate (i.e. the volume required to attain the target concentration at the maximum flow rate of the site);
- The recommended minimum size is a “half-day tank” i.e. containing 12 hours supply of acid.

4.1.2 Dosing arrangements

Injection point

- Hexafluorosilicic acid should normally be dosed at a point where all water to be treated passes. However, where the acid is dosed at a point where not all water passes (e.g. into a motive water stream), the monitoring point controlling the automatic shutdown facility must be located downstream of any blending point;
- Where possible the injection point should be a point that is under constant positive pressure; where this is not possible particular attention should be paid to the provision of anti-siphon protection on the dosing pipework;
- Water undertakers should be mindful of any possible interaction between the fluoridation chemical used and other processes or chemicals dosed during the treatment process. The injection point should be located accordingly; and
- The design of the injection point should ensure that adequate mixing occurs.

Dosing

- Dosing should be flow proportional⁴. This will typically be achieved using a suitably placed flowmeter and variable speed dosing pumps;
- Water undertakers may wish to trim the chemical dose based on a feedback signal from an on-line instrument indicating fluoride residual (typically by automatically adjusting pump stroke);
- Flow meters and variable speed/stroke pumps used to control chemical dose should be regularly maintained and calibrated (as per manufacturers’ recommendations); and

⁴ Where the output of a site varies by less than $\pm 10\%$ then fixed speed dosing may be considered. However, undertakers should consider trim-dosing based on residual fluoride concentrations and remain mindful of the need to monitor raw and treated water fluoride levels and to cease dosing on high residual alarm.

- When considering dosing arrangements water undertakers should be mindful of the need to maintain fluoride concentrations within the operational criteria specified by the SHA and not exceed the regulatory maximum concentration of 1.5mgF/l.

Dosing pumps

- Dosing pumps should be specified such that they are able to accurately deliver the required volume of fluoridation chemical for the quantity of water being treated;
- Positive displacement piston-diaphragm metering pumps are typically used, however water undertakers may use any appropriate pump;
- Any risk of gravity flow or siphoning of acid through the dosing pump must be prevented;
- Dosing pumps should be sized such that they operate at their maximum output at the maximum flow of the site;
- Where duty & auxiliary dosing pumps are used, the combined maximum output must not exceed the maximum dose required at the maximum flow of the site; and
- The performance of a dosing pump should be calibrated at least monthly by measuring the volume of solution pumped during a measured time interval. This can be adequately tested by performing a drop test.

Provision of anti-siphon devices (in dosing lines)

- Any risk of gravity flow or siphoning of acid from the dosing lines into the water supply must be prevented;
- Where fitted, anti-siphon devices should be inspected for wear annually and replaced as directed by the manufacturer; and
- Manually (or remote automatically) operated valves should be located at the injection end of the dosing line. These valves should be closed, thereby physically isolating the dosing system, whenever a planned shutdown of the fluoridation plant is carried out.

Backflow protection

- Suitable backflow protection must be provided for all water supplies feeding the fluoridation chemical storage and dosing equipment. This should be in the form of either an air gap or a vacuum breaker.

Water undertakers should consider the provision of pressure monitors for burst indication and/or chemical flow meters within the dosing lines. Where present, chemical flow meters should be fitted with high flow alarms appropriate to the sizing of the installation.

Where site flows are such that the operational requirements for dosing agreed with the SHA cannot be met by directly injecting acid, water undertakers may need to consider the use of acid dilution systems.

Water undertakers should also consider manually calculating fluoridation chemical usage and the consequent calculated fluoride dose as a non-routine additional check.

4.2 Disodium Hexafluorosilicate dosing installations

4.2.1 Chemical delivery storage and transfer arrangements

Water undertakers must have in place suitable arrangements for the delivery and storage of fluoridation chemicals to prevent accidental spillage. These arrangements should meet the following basic principles:

Chemical Delivery

- Chemical delivery points should allow appropriate safe access for the mechanism of delivery to the site;
- Delivery locations should be sited such that any spill of fluoridation chemical is restricted to drainage facilities which allow spill containment and subsequent removal;
- Water undertakers must ensure that they have the necessary equipment to collect and remove any powder spillages;
- Arrangements should be in place to contain and dispose of any spillage of fluoridation chemical (in line with advice provided by supplier); and
- All chemical deliveries should be supervised by a competent member of the water undertaker's staff for the duration of the chemical transfer process.

Chemical storage

- Chemical storage areas should be secure and access restricted to authorised personnel only;
- Ventilation should be provided as appropriate to the chemical stored. Free circulation of air around bags is required to prevent caking; and
- Any external vent to a storage building should be secure and suitably protected against the weather.

Chemical storage buildings

- Chemical storage buildings for powder plants should be regularly cleaned and any collected powder should be disposed of (in line with advice provided by supplier); and
- Packaging should be handled and disposed of safely (in line with advice provided by supplier).

Chemical transfer (bags to hoppers)

- The transfer of chemical from storage to dosing area should be completed in a controlled environment to avoid spillages, for example using a bag handling unit.

4.2.2 Dosing arrangements

Injection Points

- The fluoridation chemical should normally be dosed at a point where all water to be treated passes. However, where the acid is dosed at a point where not all water passes (e.g. into a motive water stream), the monitoring point controlling the automatic shutdown facility must be located downstream of any blending point;
- Where possible the injection point should be a point that is under constant positive pressure. Where this is not possible particular attention should be paid to the provision of anti siphon protection on the dosing pipe work;
- The design of the injection point should ensure that adequate mixing occurs; and
- Water undertakers should be mindful of any possible interaction between the fluoridation chemical used and other processes or chemicals dosed during the treatment process. The injection point should be located accordingly.

Dosing

- Dosing should be flow proportional;
- Water undertakers may wish to trim the chemical dose based on a feedback signal from an online instrument indicating the fluoride residual;
- Flow meters and variable dry-feeder systems used to control chemical dose should be regularly maintained and calibrated (as per manufacturers recommendations);
- Disodium hexafluorosilicate in coarse powdered or granular form should be used in saturators as very fine disodium hexafluorosilicate can cause clogging in the saturator;
- Saturator make-up water should be softened when the total hardness of the water supply (as CaCO₃) exceeds 75mg/l; and
- Saturator reliability may be compromised if operated to its design capacity limit for any length of time. When a saturator's capacity is approached, then an alternative method of fluoridation (i.e. acid dosing) should be considered.

Dry feeder systems

- Dry feeder systems should be specified such that they accurately deliver the required volume of fluoridation chemical for the quantity of water being treated;
- Dry feeder systems should be sized such that they operate at their maximum output at the maximum flow of the site; and
- The performance of the dry feeder system should be calibrated at least monthly by measuring the volume of powder delivered during a measured time interval. Where this is not possible water undertakers should manually calculate the fluoridation chemical usage and consequent calculated fluoride dose.

4.3 Monitoring of fluoride in drinking water

4.3.1 Monitoring of fluoride concentration in the raw water

Water undertakers should take sufficient numbers of samples of the raw water 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.

Where variations in raw water fluoride concentration are not compensated for by trimming the dose on fluoride residual readings, regular sampling of the raw water is recommended. This should be at an appropriate frequency for the expected variations in raw water fluoride level.

4.3.2 On-line monitoring at the fluoridation plant

Continuous fluoride monitoring, linked to an appropriate alarm monitoring system and automatic plant shut down, is required for all dosing installations. The instrument must meet the following criteria:

- i. The sample point supplying the instrument should be located such that adequate mixing has taken place before the sampling point. The sampling point must be before the first draw off for a consumer is reached. The time taken for the sample to travel from the sampling point to the instrument should be kept to a minimum;
- ii. The performance of the on-line instrument as installed, maintained and operated should meet the following criteria:
 - a. **accuracy** or **trueness** not exceeding 10% of the result or 0.15mgF/l (whichever is the greater), at the 95% confidence level;
 - b. **precision** or **total standard deviation** (under repeatability conditions) not exceeding 10% of the result or 0.15mgF/l (whichever is the greater);
 - c. **limit of detection**⁵ not greater than 0.20mgF/l;
- iii. The instrument should be subject to an automatic standardisation at least once in every 24 hour period. Standardisation must be at two concentrations spanning the target dose (normally 1.0 mgF/l) and within the range 0.5 to 1.5mgF/l. Where the instrument is used to control (or trim) the amount of chemical dosed, the lower concentration of the standardisation should be close to the target dose;
- iv. Where standardisation results in the adjustment of the instrument's response slope, any adjustment outside of the manufacturers' recommended response range should result in appropriate remedial action being taken. Where monitors do not record such adjustments, the response slope should be checked in line with the manufacturers recommendations;
- v. The instrument should allow the manual initiation of a standardisation;
- vi. The instrument should be calibrated, at a frequency in accordance with the manufacturers' instructions, including the verification of the value and alarms displayed in the manned control room;
- vii. The instrument should register a low level alarm at 80% of the target concentration and a high level alarm at 120% of the target concentration, provided that this higher value does not exceed 1.4mgF/l;
- viii. The instrument should register a high-high alarm at 1.4mgF/l;

⁵ Where 'limit of detection' is defined as the smallest amount reliably detected as giving a response greater than a blank at the 95% confidence level.

- ix. An alarm should be generated on failure of the instrument;
- x. An alarm should be generated on loss of water sample to the instrument;
- xi. Failure of the instrument or loss of water sample to the instrument should result in the cessation of fluoride dosing;
- xii. Where instrument alarms can be manually overridden (for maintenance purposes) any override events should be logged and the facility configured such the operator is aware that the override is activated;
- xiii. Fluoride concentration alarms from the instrument should be transmitted to a permanently manned control room;
- xiv. Instrument performance should be compared to the results from the laboratory analysis of samples at a frequency not less than monthly; and
- xv. Instrument readings should be logged and kept for a minimum period of five years.

4.3.3 Manual checks of fluoride residual at dosing sites

Water undertakers may also manually test (using a portable test kit) the fluoride concentration in the dosed water as an additional check. Where such tests are carried out, undertakers should have in place guidance to staff 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 exceedances of this permitted variance.

4.3.4 Monitoring at customer taps / authorised supply points

Water supplies must be sampled and analysed for fluoride content at the frequencies specified in Tables 2 and 3 of Schedule 3 to the Water Supply (Water Quality) Regulations 2000¹ (as amended).

Water undertakers are referred to the current guidance on the Regulations available on the DWI website for further information.

4.4 Automatic shutdown systems

As a minimum requirement, fluoride dosing at a site should cease on activation of any one of the following alarms:

Storage alarms	- bulk tank high level alarm - bund flood alarm - day tank high level alarm - day tank overflow - day tank failed to fill
Dosing system alarms	- dosing pump failure - bund flood alarm - delivery pressure low
Instrument alarms	- high fluoride residual (target concentration +20%, delay not to exceed 15 minutes) - high-high fluoride residual (1.4mgF/l, delay not to exceed 1 minute) - instrument failure alarm - loss of instrument sample alarm

All dosing systems should be configured so as to 'fail safe', i.e. failure of a critical component leads to the cessation of dosing.

Where dosing is stopped during automatic operation which is outside of the normal operating parameters of the site (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 should 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 should be fully tested at least once every six months, and the outcome of these tests recorded.

4.5 Commissioning (and re-commissioning) of fluoride dosing plants

Water undertakers should agree acceptability criteria for the acceptance of new or refurbished fluoride dosing plants with the relevant SHA (or NAW). This will typically entail a test using undosed water (for new plants) followed by a surveillance period of at least 30 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 water undertaker should prepare an appropriate re-commissioning plan.

4.6 Decommissioning of fluoride dosing plants and equipment

The decommissioning and removal of fluoride dosing plant and equipment should take into consideration all relevant legal requirements, including those relating to Health & Safety, construction / demolition and waste disposal.

Any decommissioning activity should include the preparation of a site specific assessment of the activities to be undertaken. This should be documented and agreed by both the water undertaker and relevant SHA (or NAW).

4.6.1 Removal & disposal of fluoridation chemicals

Prior to any removal of the fluoridation chemical off-site (except via existing bulk transfer arrangements that may be employed as part of normal fluoridation operations), water undertakers must ensure that the fluoridation chemical storage and dosing equipment is physically isolated from the treatment process / water supply.

Prior to decommissioning, the volume of fluoridation chemical present at the installation should be reduced to a minimum. The arrangements for the reduction in stored volumes of chemicals should form part of the documented site specific assessment, and but should consider the following options:

i. Volume reduction via existing dosing arrangements

An assessment should be made of the viability of minimising the amount of bulk storage chemical to be disposed of off-site by continuing existing dosing in a controlled manner.

Particular attention should be paid to the age, safety and reliability of equipment to be used and appropriate additional safeguards employed.

ii. Transfer of chemicals to alternative sites

Where the reduction in stored chemical via controlled dosing is not possible, a reduction in the stored volume, may be possible via transfer to an alternative fluoride dosing installation.

This is only likely to be possible where undertakers routinely utilise specialist equipment to transport fluoridation chemicals between sites. Careful consideration should be given to the health and safety implications of any non-routine chemical handling operations.

iii. Disposal via an appropriate waste contractor

Where it is not possible to minimise the volume of fluoridation chemical by the above means, or where a residual amount remains after partial storage reduction, the fluoridation chemical should be disposed of via an appropriate licensed waste contractor.

The potential long term effects of environmental exposure to the fluoridation chemical should be evaluated as part of the waste disposal options considered. Careful consideration of the waste classification will be required to ensure appropriate disposal control measures are employed.

This may involve the classification of fluoridation chemicals and/or materials that have been in contact with the fluoridation chemicals being considered as a special waste.

4.6.2 Removal of plant and equipment (tanks, pipework, pumps, monitoring equipment, etc)

All redundant material and equipment which has been subject to long term exposure to the fluoridation chemical should be removed and disposed of in an appropriate manner.

Equipment to be disposed of is likely to include (but is not limited to) the following:

- Chemical delivery pipework and equipment;
- Storage and holding tanks and associated equipment (including saturators for powder installations);
- Chemical transfer equipment and pipework;
- Pumps;
- Dosing lines & dosing point installations;

- Electrical equipment exposed to fluoridation chemicals or residues (including cable trays, ducts);
- Monitoring and telemetry installations associated with the fluoride dosing plant.

The equipment to be removed and disposed of should be agreed on a site-by-site basis between the water undertaker and the Strategic Health Authority.

Consideration should also be given to the future use of any buildings and land areas specifically associated with the fluoridation installation.

As with disposal of the chemical itself, the disposal of plant and equipment should be subject to an assessment of the potential long term effects of environmental exposure and careful consideration of the waste classification will be required to ensure appropriate disposal control measures are employed.

This may involve the classification of materials that have been in contact with the fluoridation chemicals being considered as a special waste.

4.6.3 Interaction with existing treatment processes / operations on site

Any decommissioning of fluoridation plant and equipment should include a documented assessment of the likely impact on continuing operational activities at the site concerned. This assessment should also include detail of the actions to be taken to safeguard the quality of treated water leaving the site during and after the decommissioning process.

This assessment should consider (but not be limited to):

- The impact of the cessation (temporary or permanent) on water quality, e.g. a reduction in the amount of pH depression as a result of stopping acid dosing;
- The impact of the cessation (temporary or permanent) on treatment processes employed at / near to the site, e.g. variation of other treatment processes, such as coagulation, pH correction;
- The impact on control loops, in particular where flow measurements are also used in the control of other dosing or control systems;
- The impact of changing carrier water flows and/or characteristics;
- The impact of changes to telemetry, alarms and electrical systems resulting from the isolation and/or removal of the fluoridation equipment.

5. Training

Water undertakers' employees involved in the operation and maintenance of fluoride dosing installations should receive specific training in fluoridation issues.

As a minimum this should include instruction and the demonstration of competence in the following areas:

- maximum permitted level of fluoride in drinking water;
- permitted fluoridation chemicals and their safe handling;
- knowledge of the contents of this Code of Practice;
- operational checks on fluoridation chemical dosing installations;
- reporting requirements of dosing records; and
- actions to be taken in the event of an incident (e.g. spillage or overdose).

Water undertakers should maintain records of training and competence assessment of those employees operating fluoride dosing installations.

6. Consumer information

Under regulation 35 of the Water Supply (Water Quality) Regulations 2000¹ (as amended), water undertakers are required to make available to the public information relating to drinking water quality in their area of supply. Included in this are results from samples taken in accordance with the Regulations and will therefore include information on fluoride concentrations in drinking water.

Water undertakers should also prepare general information for consumers describing the extent of artificial fluoridation within their supply area.

7. Reporting requirements

The fluoridation agreement between the water undertaker and the SHA (or NAW) will normally specify the reporting requirements for a given fluoride dosing scheme.

8. Sources of additional information

Further information on aspects of this Code of Practice can be obtained from:

Drinking Water Inspectorate

Ashdown House
123 Victoria Street
London
SW1E 6DE
Tel: 020 7082 8024
Fax: 020 7028 8028
Email: dwi.enquiries@defra.gsi.gov.uk
Internet: www.dwi.gov.uk

Further advice on Health & Safety aspects of fluoridation chemicals and chemical handling can be obtained from the chemical suppliers and/or:

Health & Safety Executive

Caerphilly Business Park
Caerphilly
CF83 3GG
(or the HSE Chemical Hazards and Installations Division, based at Bootle, Merseyside).
Infoline: 08701 545500
Email: hseinformationservices@natbrit.com

Enquiries relating to current Government policy on the fluoridation of drinking water supplies or queries regarding the impact of fluoridation on health should be directed to:

Department of Health

Richmond House
79 Whitehall
London
SW1A 2NL
Tel: 020 7210 4850
Email: dhmail@dh.gsi.gov.uk