PART 5 CHEMICAL APPLICATION

5.0 GENERAL

Chemicals applied to treat potable drinking water shall meet NSF 60 requirements as verified by an ANSI accredited testing agency.

5.0.1 Plans and specifications

Plans and specifications shall be submitted for review and approval, as provided for in Part 2, and shall include:

a. descriptions of feed equipment, including maximum and minimum feed ranges;

b. location of feeders, piping layout and points of application;

c. storage and handling facilities;

d. operating and control procedures including proposed application rates;

e. descriptions of testing equipment, and;

f. system including all tanks with capacities, (with drains, overflows, and vents), feeders, transfer pumps, connecting piping, valves, points of application, backflow prevention devices, air gaps, secondary containment, and safety eye washes and showers.

5.0.2 Chemical application

Chemicals shall be applied to the water at such points and by such means as to:

a. assure maximum efficiency of treatment;

b. assure maximum safety to consumer;

c. provide maximum safety to operators;

d. assure satisfactory mixing of the chemicals with the water;

e. provide maximum flexibility of operation through various points of application, when appropriate, and;

f. prevent backflow or back-siphonage between multiple points of feed through common manifolds.

5.0.3 General equipment design

General equipment design shall be such that:

a. feeders will be able to supply, at all times, the necessary amounts of chemicals at an accurate rate, throughout the range of feed;

b. chemical-contact materials and surfaces are resistant to the aggressiveness of the chemical solution;

c. corrosive chemicals are introduced in such a manner as to minimize potential for corrosion;

d. chemicals that are incompatible are not stored or handled together;

e. all chemicals are conducted from the feeder to the point of application in separate conduits;

f. chemical feeders are as near as practical to the feed point;

g. chemical feeders and pumps shall operate at no lower than 20 per cent of the feed range unless two fully independent adjustment mechanisms such as pump pulse rate and stroke length are fitted then the pump shall operate at no lower than 10 percent of the rated maximum, and;

h. gravity may be used where practical.

5.0.4 Chemical Information

For each chemical the information submitted shall include:

a. documentation that the chemical is NSF/ANSI Standard 60 approved;

b. specifications for the chemical to be used;

c. purpose of the chemical;

d. proposed minimum non-zero, average and maximum dosages, solution strength or purity (as applicable), and specific gravity or bulk density, and;

e. method for independent calculation of amount fed daily.

f. Material Safety Data Sheet (MSDS)

5.1 FEED EQUIPMENT

5.1.1 Feeder redundancy

a. Where a chemical feed and booster pump is necessary for the protection of the supply, such as chlorination, coagulation or other essential processes, a standby unit or a combination of units of sufficient size to meet capacity shall be provided to replace the largest unit when out of service.

b. A separate feeder shall be used for each chemical applied.

c. Spare parts shall be available on site for each type of feeder and chemical booster pump to replace parts which are subject to wear and damage.

5.1.2 Control

a. Feeders may be manually or automatically controlled. Automatic controls shall be designed so as to allow override by manual controls.

b. Chemical feed rates shall be proportional to the flow stream being dosed.

c. A means to measure the flow stream being dosed shall be provided in order to determine chemical feed rates.

d. Provisions shall be made for measuring the quantities of chemicals used.

e. Weighing scales:

1. shall be provided for weighing cylinders at all plants utilizing chlorine gas;

2. shall be required for fluoride solution fed from supply drums or carboys;

3. should be provided for volumetric dry chemical feeders;

4. shall be capable of providing reasonable precision in relation to average daily dose; and

5. shall not be required for chlorine gas cylinders when used as a backup or standby source of chlorine gas.

f. Where conditions warrant, for example with rapidly fluctuating intake turbidity, coagulant and coagulant aid addition may be made according to turbidity, streaming current or other sensed parameter.

5.1.3 Dry chemical feeders

Dry chemical feeders shall:

a. measure chemicals volumetrically (see 5.1.2.e.3) or gravimetrically;

b. provide adequate solution/slurry water and agitation of the chemical at the point of placing in solution/slurry;

c. completely enclose chemicals to reduce emission of dust to the operating room.

5.1.4 Positive displacement solution feed pumps

a. Positive displacement type solution feed pumps should be used to feed liquid chemicals.

b. Pumps must be capable of operating at the required maximum rate against the maximum head conditions found at the point of injection.

c. Devices utilized to readily measure feed rates in the pumped liquid shall be designed to handle the liquid being measured and shall be provided.

d. A pressure relief valve should be provided on the pump discharge line.

5.1.5 Liquid chemical feeders - siphon control

Liquid chemical feeders shall be such that chemical solutions cannot be siphoned or overfed into the water supply, by:

a. assuring discharge at a point of positive pressure, or;

b. providing vacuum relief, or;

c. providing a suitable air gap, or anti-siphon device, or;

d. providing other suitable means or combinations as necessary.

5.1.6 Cross-connection control

Cross-connection control shall be provided to assure that:

a. the service water lines discharging to liquid storage tanks shall be properly protected from backflow as required by the reviewing authority;

b. chemical solutions or slurries cannot be siphoned through liquid chemical feeders into the water supply as required in Section 5.1.5;

c. no direct connection exists between any sewer and a drain or overflow from the liquid chemical feeder, liquid storage chamber or tank by providing that all drains terminate at least six inches or two pipe diameters, whichever is greater, above the overflow rim of a receiving sump, conduit or waste receptacle, and ;

d. in the absence of other cross connection control measures, separate feeders shall be provided for chemical feed systems that have feed points at both unfiltered and filtered water locations such that all

unfiltered water feed points are fed from one feeder, and that all filtered water feed points are fed from another feeder.

5.1.7 Chemical feed equipment location

Chemical feed equipment:

a. shall be readily accessible for servicing, repair, and observation of operation;

b. should be located in a separate room where hazards and dust problems may exist, and;

c. should be conveniently located near points of application to minimize length of feed lines.

5.1.8 In-plant water supply

In-plant water supply shall be:

a. ample in quantity and adequate in pressure;

b. provided with means for measurement when preparing specific solution concentrations by dilution;

c. properly treated for hardness, when necessary;

d. properly protected against backflow;

e. obtained from the finished water supply, or from a location sufficiently downstream of any chemical feed point to assure adequate mixing.

5.1.9 Supply and Storage of chemicals

a. A minimum of 10 days of chemical supply shall be on site at all times that will allow the facility to satisfy a maximum average day demand for all seven days. Additional supply of chemicals that will not degrade is recommended.

b. Storage space shall:

1. be convenient and provide for efficient handling of chemicals;

2. have dry storage conditions; and

3. provide a minimum storage volume of 1.5 truck loads where purchase can only be made by truck load lots.

c. Storage tanks and pipelines for liquid chemicals shall be specified for use with individual chemicals and not used for different chemicals. Offloading areas shall be clearly labeled to prevent accidental cross-contamination.

d. Chemicals shall be stored in covered or unopened shipping containers, unless the chemical is transferred into an approved storage unit.

e. Liquid chemical storage tanks shall:

1. have a means to readily determine the volume of liquid retained in the storage tank; and,

2. have an overflow and a receiving basin capable of receiving accidental spills or overflows without uncontrolled discharge; a common receiving basin may be provided for each group of compatible chemicals, which provides sufficient containment volume to prevent accidental discharge in the event of failure of the largest tank.

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5.1.10 Bulk liquid storage tanks

a. A means which is consistent with the nature of the chemical stored shall be provided in a liquid storage tank to maintain a uniform chemical strength. Continuous agitation shall be provided to maintain slurries in suspension.

b. A means to assure continuity of chemicals to treat the water to comply with federal primary drinking water standards and state drinking water regulations shall be provided while servicing a liquid storage tank.

c. A means shall be provided to readily measure the liquid level in the liquid storage tank.

d. Liquid storage tanks shall be kept covered. Large liquid storage tanks with access openings shall have such openings curbed and fitted with overhanging covers or, bolted and gasketed manways.

e. Subsurface locations for liquid storage tanks shall:

1. be free from sources of possible contamination, and;

2. assure positive drainage away from the area for ground waters, accumulated water, chemical spills and overflows.

f. Overflow pipes, when provided, shall:

1. be turned downward, with the end screened;

2. have a free fall discharge, and;

3. be located where noticeable.

g. Liquid storage tanks must be vented, but not through vents in common with other chemicals or day tanks. Acid storage tanks shall be vented to the outside atmosphere.

h. Each liquid storage tank shall be provided with a valved drain.

i. Each liquid storage tank shall be protected against contamination by cross-connections.

j. Liquid storage tanks shall be located and secondary containment provided so that chemicals from equipment failure, spillage or accidental drainage shall not enter the water in conduits, treatment or storage basins. Secondary containment volumes shall be able to hold the volume of the largest storage tank. Piping shall be designed to minimize or contain chemical spills in the event of pipe ruptures.

5.1.11 Day tanks

a. Day tanks shall be provided where bulk storage of liquid chemical is provided, however the reviewing authority may allow chemicals to be fed directly from shipping containers no larger than 55 gallons.

1. An exception to this requirement can be made for new and existing systems under the following condition except in the case of fluoride:

A. When an approved alternative means to provide chemical overfeed protection that provides at least the same level of protection as a day tank in addition to the requirements of Section 5.1.5 (siphon control), or where chemicals are fed directly from shipping containers no larger than 55 gallons.

b. Day tanks shall meet all the requirements of Section 5.1.10, except that shipping containers do not require f. (overflow pipes) and h. (drains).

c. Day tanks should hold no more than a 30 hour supply.

d. Day tanks shall be scale-mounted, or have a calibrated gauge painted or mounted on the side if liquid level can be observed in a gauge tube or through translucent sidewalls of the tank. In opaque tanks, a gauge rod may be used.

e. Except for fluorosilicic acid, hand pumps may be provided for transfer from a shipping container. A tip rack may be used to permit withdrawal into a bucket from a spigot. Where motor-driven transfer pumps are provided, an automated means to prevent an overflow shall be provided.

f. A means which is consistent with the nature of the chemical solution shall be provided to maintain uniform chemical strength in a day tank. Continuous agitation shall be provided to maintain chemical slurries in suspension.

g. Tanks and tank refilling line entry points shall be clearly labeled with the name of the chemical contained.

h. Filling of day tanks shall not be automated, unless redundancy of controls is provided.

5.1.12 Feed lines

a. should be as short as possible, and:

1. of durable, corrosion-resistant material;

2. easily accessible throughout the entire length, and;

3. readily cleanable.

b. shall be protected from freezing;

c. should slope upward from the chemical source to the feeder when conveying gases;

d. shall be designed consistent with scale-forming or solids depositing properties of the water, chemical, solution or mixtures conveyed, and;

e. should be color coded and labeled.

5.1.13 Handling

a. Carts, elevators and other appropriate means shall be provided for lifting chemical containers to minimize excessive lifting by operators.

b. Provisions shall be made for disposing of empty bags, drums, carboys, or barrels by an approved procedure which will minimize exposure to dusts.

c. Provisions shall be made for the proper transfer of dry chemicals from shipping containers to storage bins or hoppers, in such a way as to minimize the quantity of dust which may enter the room in which the equipment is installed. Control should be provided by use of:

1. vacuum pneumatic equipment or closed conveyor systems;

2. facilities for emptying shipping containers in special enclosures, and/or;

3. exhaust fans and dust filters.

d. Provision shall be made for measuring quantities of chemicals used to prepare feed solutions.

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5.1.14 Housing

a. Floor surfaces shall be smooth and impervious, slip-proof and well drained.

b. Vents from feeders, storage facilities and equipment exhaust shall discharge to the outside atmosphere above grade and remote from air intakes.

5.2 CHEMICALS

5.2.1 Shipping containers

Chemical shipping containers shall be fully labeled to include:

a. chemical name, purity and concentration, and;

b. supplier name and address.

5.2.2 Specifications

Chemicals shall meet the appropriate ANSI/AWWA standards and/or ANSI/NSF Standard 60.

5.2.3 Assay

Provisions may be required for assay of chemicals delivered.

5.3 OPERATOR SAFETY

5.3.1 Ventilation

Special provisions shall be made for ventilation of chlorine feed and storage rooms when such rooms are provided.

5.3.2 Respiratory protection equipment

Respiratory protection equipment, meeting the requirements of the National Institute for Occupational Safety and Health (NIOSH) shall be available where chlorine gas is handled, and shall be stored at a convenient heated location, but not inside any room where chlorine is used or stored. The units shall use compressed air, have at least a 30 minute capacity.

5.3.3 Chlorine gas leak detection

A bottle of concentrated ammonium hydroxide (56 per cent ammonia solution) shall be available for chlorine leak detection; where ton containers are used, a leak repair kit approved by the Chlorine Institute shall be provided. Where pressurized chlorine gas is present, continuous chlorine leak detection equipment is required and shall be equipped with both an audible alarm and a warning light.

5.3.4 Other protective equipment

a. At least one pair of rubber gloves, a dust respirator of a type certified by NIOSH for toxic dusts, an apron or other protective clothing and goggles or face mask shall be provided for each operator on duty.

b. An appropriate deluge shower and eye washing device shall be installed where strong acids and alkalis are used or stored.

c. Other protective equipment should be provided as necessary.

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5.4 SPECIFIC CHEMICALS

5.4.1 Chlorine gas

a. Chlorinators should be housed in a room separate from but adjacent to the chlorine storage room.

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b. Both the chlorine gas feed and storage rooms should be located in a corner of the building on the prevailing downwind side of the building and be away from entrances, windows, louvers, walkways, etc.

c. Chlorinator rooms should be heated to 60oF, and be protected from excessive heat. Cylinders and gas lines should be protected from temperatures above that of the feed equipment.

d. Chlorine gas feed and storage shall be enclosed and separated from other operating areas. Both the feed and storage rooms shall be constructed so as to meet the following requirements:

1. a shatter resistant inspection window shall be installed in an interior wall;

2. all openings between the rooms and the remainder of the plant shall be sealed;

3. doors shall be equipped with panic hardware, assuring ready means of exit and opening outward only to the building exterior;

4. a ventilating fan with a capacity to complete one air change per minute when the room is occupied; where this is not appropriate due to the size of the room, a lesser rate may be considered;

5. the ventilating fan shall take suction near the floor and as great a distance as is practical from the door and air inlet, with the point of discharge located so as not to contaminate air inlets to any rooms or structures;

6. air inlets with corrosion resistant louvers shall be installed near the ceiling;

7. air intake and exhaust louvers shall facilitate airtight closure;

8. separate switches for the ventilating fan and for the lights shall be located outside and at the inspection window. Outside switches must be protected from vandalism. A signal light indicating ventilating fan operation shall be provided at each entrance when the fan can be controlled from more than one point;

9. vents from chlorinator and storage areas must be screened and discharge to the outside atmosphere, above grade;

10. floor drains are discouraged. Where provided, the floor drains must discharge to the outside of the building and not be connected to other internal or external drainage systems, and;

11. provisions should be made to chemically neutralize chlorine gas where feed and/or storage is located near residential or developed areas in the event of any measured chlorine release. The equipment must be sized to treat the entire contents of the largest storage container on site.

e. Chlorine gas feed systems shall be of the vacuum type and include the following:

1. vacuum regulators on all individual cylinders in service;

2. service water to injectors/eductors shall be of adequate supply and pressure to operate feed equipment within the needed chlorine dosage range for the proposed system.

f. Pressurized chlorine feed lines shall not carry chlorine gas beyond the chlorinator room.

g. Full and empty cylinders of chlorine gas shall meet the following requirements:

1. housed only in the chlorine storage room;

2. isolated from operating areas;

3. restrained in position;

4. stored in locked and secure rooms separate from ammonia storage, and;

5. protected from direct sunlight or exposure to excessive heat.

5.4.2 Acids and caustics

a. Acids and caustics shall be kept in closed corrosion-resistant shipping containers or bulk liquid storage tanks.

b. Acids and caustics shall not be handled in open vessels, but should be pumped in undiluted form to and from bulk liquid storage tanks and covered day tanks or from shipping containers through suitable hoses, to the point of treatment.

5.4.3 Sodium chlorite for chlorine dioxide generation

Proposals for the storage and use of sodium chlorite must be approved by the reviewing authority prior to the preparation of final plans and specifications. Provisions shall be made for proper storage and handling of sodium chlorite to eliminate any danger of fire or explosion associated with its powerful oxidizing nature.

a. Storage

1. Sodium chlorite shall be stored by itself in a separate room and preferably shall be stored in an outside building detached from the water treatment facility. It shall be stored away from organic materials because many materials will catch fire and burn violently when in contact with sodium chlorite.

2. The storage structures shall be constructed of noncombustible materials.

3. If the storage structure must be located in an area where a fire may occur, water must be available to keep the sodium chlorite area cool enough to prevent heat induced explosive decomposition of the sodium chlorite.

b. Handling

1. Care should be taken to prevent spillage.

2. An emergency plan of operation should be available for the clean-up of any spillage.

3. Storage drums must be thoroughly flushed to an acceptable drain prior to recycling or disposal.

c. Feeders

1. Positive displacement feeders shall be provided.

2. Tubing for conveying sodium chlorite or chlorine dioxide solutions shall be Type 1 PVC, polyethylene or materials recommended by the manufacturer.

3. Chemical feeders may be installed in chlorine rooms if sufficient space is provided or in separate rooms meeting the requirements of subsection 5.4.1.

4. Feed lines shall be installed in a manner to prevent formation of gas pockets and shall terminate at a point of positive pressure.

5. Check valves shall be provided to prevent the backflow of chlorine into the sodium chlorite line.

5.4.4 Sodium hypochlorite

Sodium hypochlorite storage and handling procedures should be arranged to minimize the slow natural decomposition process of sodium hypochlorite either by contamination or by exposure to more extreme storage conditions. In addition, feed rates should be regularly adjusted to compensate for this progressive loss in chlorine content.

a. Storage

1. Sodium hypochlorite shall be stored in the original shipping containers or in sodium hypochlorite compatible bulk liquid storage tanks.

2. Storage containers or tanks shall be located out of the sunlight in a cool area and shall be vented to the outside of the building when enclosed.

3. Wherever reasonably feasible, stored sodium hypochlorite shall be pumped undiluted to the point of addition. Where dilution is utilized, deionized or softened water should be used.

4. Storage areas, tanks, and pipe work shall be designed to avoid the possibility of uncontrolled discharges.

5. Reusable sodium hypochlorite storage containers shall be reserved for use with sodium hypochlorite only and shall not be exposed to contamination.

b. Feeders

1. Positive displacement pumps with sodium hypochlorite compatible materials for wetted surfaces shall be used.

2. To avoid air locking in smaller installations, small diameter suction lines shall be used with foot valves and degassing pump heads.

3. In larger installations flooded suction shall be used with pipe work arranged to ease escape of gas bubbles.

4. Calibration tubes or mass flow monitors which allow for direct physical checking of actual feed rates shall be provided.

5. Injectors shall be made removable for regular cleaning where hard water is to be treated.

5.4.5 Ammonia

Ammonia for chloramine formation may be added to water either as a water solution of ammonium sulfate, or as aqua ammonia, or as anhydrous ammonia (purified 100% ammonia in liquid or gaseous form). Special provisions required for each form of ammonia are listed below.

5.4.5.1 Ammonium sulfate

A water solution is made by addition of ammonium sulfate solid to water with agitation. The tank and dosing equipment contact surfaces should be made of corrosion resistant non-metallic materials. Provision should be made for removal of the agitator after dissolving the solid. The tank should be fitted with an air-tight lid

and vented outdoors. The application point should be at the center of treated water flow at a location where there is high velocity movement.

5.4.5.2 Aqua ammonia (ammonium hydroxide)

Aqua ammonia feed pumps and storage shall be enclosed and separated from other operating areas. The aqua ammonia room shall be equipped as in Section 5.4.1 with the following changes:

a. Corrosion resistant, closed, pressurized tank shall be used for bulk liquid storage and day tanks, vented through inert liquid traps to a high point outside.

b. An incompatible connector or lockout provisions shall be provided to prevent accidental addition of other chemicals to the bulk liquid storage tank(s).

c. The bulk liquid storage tank(s) shall be designed to avoid conditions where temperature increases cause the ammonia vapor pressure over the aqua ammonia to exceed atmospheric pressure. Such provisions shall include either:

1. refrigeration or other means of external cooling, and/or;

2. dilution and mixing of the contents with water without opening the bulk liquid storage tank.

d. An exhaust fan shall be installed to withdraw air from high points in the room and makeup air shall be allowed to enter at a low point.

e. The aqua ammonia feed pump, regulators, and lines shall be fitted with pressure relief vents discharging outside the building away from any air intake and with water purge lines leading back to the headspace of the bulk storage tank.

f. The aqua ammonia shall be conveyed direct from a day tank to the treated water stream injector without the use of a carrier water stream unless the carrier stream is softened.

g. The application point should be placed in a region of rapid, preferably turbulent, water flow.

h. Provisions should be made for easy access for removal of calcium scale deposits from the injector.

i. Provision of a modestly-sized scrubber capable of handling occasional minor emissions should be considered.

5.4.5.3 Anhydrous ammonia

Anhydrous ammonia is readily available as a pure liquefied gas under moderate pressure in cylinders or as a cryogenic liquid boiling at -15° Celsius at atmospheric pressure. The liquid causes severe burns on skin contact.

a. Anhydrous ammonia and storage feed systems (including heaters where required) shall be enclosed and separated from other works areas and constructed of corrosion resistant materials.

b. An emergency air exhaust system, as in Section 5.4.1 d4 but with an elevated intake, shall be provided in the ammonia storage room.

c. Leak detection systems shall be provided in all areas through which ammonia is piped.

d. Special vacuum breaker/regulator provisions must be made to avoid potentially violent results of backflow of water into cylinders or storage tanks.

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e. Carrier water systems of soft or pre-softened water may be used to transport ammonia to the application point and to assist in mixing.

f. The ammonia injector should use a vacuum eductor or should consist of a perforated tube fitted with a closely fitting flexible rubber tubing seal punctured with a number of small slits to delay fouling by lime or other scale deposits.

g. Provision should be made for the periodic removal of lime or other scale deposits from injectors and carrier piping.

h. Consideration should be given to the provision of an emergency gas scrubber capable of absorbing the entire contents of the largest anhydrous ammonia storage unit whenever there is a risk to the public as a result of potential ammonia leaks.

5.4.6 Potassium permanganate

a. A source of heated water should be available for dissolving potassium permanganate, and

b. mechanical mixers shall be provided.

5.4.7 Fluoride

Sodium fluoride, sodium silicofluoride and fluorosilicic acid shall conform to the applicable AWWA Standards and ANSI/NSF Standard 60. Other fluoride compounds which may be available must be approved by the reviewing authority.

a. Storage

1. Fluoride chemicals should be isolated from other chemicals to prevent contamination.

2. Compounds shall be stored in covered or unopened shipping containers and should be stored inside a building.

3. Unsealed storage units for fluorosilicic acid should be vented to the atmosphere at a point outside any building. The vents to atmosphere shall be provided with a corrosion resistant 24 mesh screen.

4. Bags, fiber drums and steel drums should be stored on pallets.

b. Chemical feed equipment and methods

1. At least two diaphragm operated anti-siphon devices shall be provided on all fluoride saturator or fluorosilicic acid feed systems.

a. One diaphragm operated anti-siphon device shall be located on the discharge side of the feed pump, and;

b. A second diaphragm operated anti-siphon device shall be located at the point of application unless a suitable air gap is provided.

2. A physical break box may be required in high hazard situations where the application point is substantially lower than the metering pump. In this situation, either a dual head feed pump or two separate pumps are required and the anti-siphon device at the discharge side of the pump may be omitted.

3. Scales, loss-of-weight recorders or liquid level indicators, as appropriate, accurate to within five percent of the average daily change in reading shall be provided for chemical feeds.

4. Feeders shall be accurate to within five percent of any desired feed rate.

5. Fluoride compound shall not be added before lime-soda softening or ion exchange softening.

6. The point of application if into a horizontal pipe, shall be in the lower half of the pipe, preferably at a 45 degree angle from the bottom of the pipe and protrude into the pipe one third of the pipe diameter.

7. Except for constant flow systems, a device to measure the flow of water to be treated is required.

8. Water used for sodium fluoride dissolution shall be softened if hardness exceeds 75 mg/L as calcium carbonate.

9. Fluoride solutions shall be injected at a point of continuous positive pressure unless a suitable air gap is provided.

10. The electrical outlet used for the fluoride feed pump should have a nonstandard receptacle and shall be interconnected with the well or service pump, or have flow pacing as allowed by the reviewing authority,

11. Saturators should be of the upflow type and be provided with a meter and backflow protection on the makeup water line.

12. Consideration shall be given to providing a separate room for fluorosilicic acid storage and feed.

c. Secondary controls

Secondary control systems for fluoride chemical feed devices shall be provided as a means of reducing the possibility for overfeed; these may include flow or pressure switches, break boxes, or other devices.

d. Protective equipment

Personal protective equipment as outlined in Section 5.3.4 shall be provided for operators handling fluoride compounds. Deluge showers and eye wash devices shall be provided at all fluorosilicic acid installations.

e. Dust control

1. Provision must be made for the transfer of dry fluoride compounds from shipping containers to storage bins or hoppers in such a way as to minimize the quantity of fluoride dust which may enter the room in which the equipment is installed. The enclosure shall be provided with an exhaust fan and dust filter which places the hopper under a negative pressure. Air exhausted from fluoride handling equipment shall discharge through a dust filter to the outside atmosphere of the building.

2. Provision shall be made for disposing of empty bags, drums or barrels in a manner which will minimize exposure to fluoride dusts. A floor drain should be provided to facilitate the washing of floors.

f. Testing equipment

Equipment shall be provided for measuring the quantity of fluoride in the water. Such equipment shall be subject to the approval of the reviewing authority.

5.4.8 Activated Carbon

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Activated carbon is a potentially combustible material requiring isolated storage. Storage facilities should be fire proof and equipped with explosion-proof electrical outlets, lights and motors in areas of dry handling. Bags of powdered carbon should be stacked in rows with aisles between in such a manner that each bag is accessible for removal in case of fire.