STATE OF NEW JERSEY

N.J. DEPARTMENT OF INSTITUTIONS AND AGENCIES. Division of Mental Health and Hospitals. Environmental Sanitation Committee.

STANDARD OPERATING PROCEDURES FOR INSTITUTIONS AND AGENCIES:

WATER

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STANDARD OPERATING PROCEDURE FOR INSTITUTIONS AND AGENCIES

WATER

I. INTRODUCTION

A hygienically safe and continuously dependable water supply is one of the necessities of life. Water is procured in its raw state and, as such, may have been subjected to contamination by organisms pathogenic to man, or by chemicals which are toxic or which produce unsatisfactory conditions of color, taste, odor or hardness. Therefore, some degree of purification or treatment may be required prior to its distribution to the consumer.

II. SOURCES OF WATER USED AT INSTITUTIONS

Water for institutions may be obtained from three different sources:

A. Municipal supplies

B. Deep wells

C. Surface waters (including springs)

D. Combinations of the above for the purpose of providing a continuous, adequate supply, for example:

1. Municipal supply plus deep wells (approved connections)
2. Surface waters plus deep wells

III. CHARACTERISTICS OF WATER, POSSIBLE SOURCES OF CONTAMINATION AND METHODS USED FOR PURIFICATION

A. Municipal Supplies

Under ordinary conditions it may be assumed that water from a municipal source is safe and requires no further treatment. However, under certain conditions (institutions located at the end of the system, etc.) chlorination may be used to maintain a residual in the distribution lines of the institution. At some institutions fluoridation of a non-fluoridated municipal supply may also be practiced.

B. Deep Wells

1. *Nature of the Well*

Deep wells are usually drilled cores that pass through an impervious layer of rock or heavy clay to reach the aquifer. The core is then lined with iron casing down into the impervious layer. At its top, the casing extends above the ground level and is sealed to prevent the entrance of surface waters. At the bottom, the casing is sealed into the impervious layer to prevent any high subsurface water from using the pipe area as a channel to the aquifer. Thus, a watertight channel extends from the top of the casing down into the impervious layer and constitutes a barrier to the penetration of contaminating surface waters to the aquifer. In unconsolidated materials such as sand, gravel, silt, clay, or combinations thereof the casing shall extend at least 10 feet below the lowest seasonal level of the water table plus the distance equal to the drawdown. In highly-fractured, fissured, or limestone formations the casing may have to be considerably longer.

When overhead deep well pumps are employed, the pump is set on a pedestal directly over the casing with the drop line passing down through the casing. A suitable seal must be provided between the pump base and the pedestal. When other types of pumps are used, the top of the casing is sealed with a screw cap or a cap set in a well seal. The drop line may pass through the tip of the cap or be taken off on the side of the casing. In either case, the opening into the casing around the drop line is sealed by a solid weld or by means of a fitting.

The air vent on the pump is fitted with a down facing elbow and is screened to prevent the entrance of insects, moisture, or particulate matter.

2. *Hardness of the Water*

Because the waters in the aquifer may have travelled considerable distances through subsurface soils, they have had the opportunity to dissolve salts that are present. Consequently, well waters are frequently hard waters and the extent and type of hardness will be dependent upon the mineral contents of the soils through which they have passed. Waters below 100 ppm of hardness are usually considered to be soft waters. Waters above 100 ppm are considered to be hard waters.

3. *Causes and Sources of Contamination*

The most frequent causes associated with well contamination are broken seals at the top of the casing, casing of insufficient depth, casings improperly sealed into the impervious layer, and, in old wells, perforation of the casing.

Regulations relative to safe distances that wells may be sunk from major sources of pollution have been promulgated by some state and local health departments. Because of the differences in soil and underground formations, no specific regulations can be established that cover all situations. The U. S. Public Health Service and the New Jersey State Department of Health have generalized the following distances but are definite in stating that each installation should be inspected by a person with sufficient training and experience to evaluate all of the factors involved. The minimum distances given are: 50 feet from pit privies, septic tanks, sewers and subsurface pits; 100 feet from seepage pits, subsurface sewage disposal fields and barnyards; and 150 feet from a cesspool.

In areas underlain with limestone, shale, or certain sandstones, fissures may be present and extend for considerable distances. Such fissures may constitute a means for the contamination of water sources. Abandoned, unsealed deep wells that are subject to flooding constitute a channel for contamination of the aquifer.

4. *Purification and Treatment*

Deep well water is usually a safe water. However, with any water there is always the possibility of contamination either at the source or in the distribution system. As a precautionary measure well water is frequently chlorinated. This is especially so when there is an extensive distribution system and/or where there is a considerable number of people involved. Chlorination is accomplished by use of hypochlorite or gas.

C. Surface Waters

1. *Nature of Surface Waters*

Surface water supplies may consist of rivers, lakes, impoundments or springs.

The origin of surface waters is the rain that falls to earth. As it passes over the earth's surface it picks up many contaminants, both mineral and organic.

Contaminants may consist of silt, minerals, and industrial and human wastes that are washed or emptied into the river or impoundment.

Lakes and impoundments are the result of natural or artificial dams that back up and store water. The holding of water in such impoundments provides time for the death of organisms not indigenous to water reservoirs and oxidation of organic matter that causes color and taste. It also provides for the oxidation of certain minerals such as iron and manganese compounds. Both iron, in the form of ferrous salts, and manganese, in the form of manganous bicarbonate, are soluble in water. Upon oxidation the resultant ferric salts and manganese oxides are not soluble in water and therefore precipitate out.

In the watershed of any impoundment area, caution should be exercised that no sewage or industrial wastes gain access to the intake of the impounded water. Recreational activities in water edge areas should be carefully controlled. Intake areas should be well removed from possible sources of contamination and away from public access.

2. *Hardness of Surface Waters*

Inasmuch as surface waters originate as precipitation of water vapors they are free of mineral salts upon their return to earth. Usually the speed with which they accumulate and the volume with which they traverse the brook and river beds afford them relatively little time of contact with soils to dissolve minerals. Consequently, they consist, for the most part, of soft waters with hardness values of less than 100 ppm.

3. *Purification and Treatment*

The type and degree of purification required for surface waters is governed by the characteristics and pollutional load of the raw water. In some instances sedimentation and oxidation achieved by impoundment and followed by chlorination are sufficient to provide a safe supply. In other instances coagulation, sedimentation, and filtration may be additional requirements. In some areas a specific type of treatment may be required to rid the water of an objectionable element.

There are five basic processes in the treatment of a surface supply: oxidation, coagulation, sedimentation, filtration, and chlorination.

a. Oxidation is commonly accomplished by holding the water in an impoundment where the oxygen in the water acts to oxidize and thus reduce the volume of organic and mineral matter in suspension or solution. Under specific conditions peculiar to a location or source e.g., high iron content, the oxidation process may need to be extended by one of the following methods: spray nozzles, diffusion injectors, cascade aerators, or tray and splash pan aerators.

b. Coagulation involves the formation of numerous minute gelatinous particles that attract and hold bacteria and the finely divided colloidal particles that cause turbidity and color. The mass of minute particles is referred to as the "floc". There are several chemicals that are used to produce such flocs but alum, or aluminum sulphate, is the most commonly used. When aluminum sulphate is added to the water it reacts to form aluminum hydroxide. The particles of $Al(OH)_3$ tend to have a positive charge and, having such, attract colloidal silt and other particles which tend to have a negative charge.

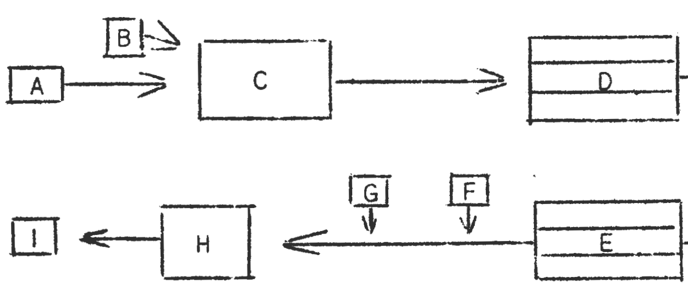
The production of an adequate floc and its distribution throughout the water is important. An efficient mixing chamber provides for a high velocity of the water mixing with the alum. Baffles or agitators are arranged to provide gradually decreasing speeds throughout the remaining portions of the chamber. In the floc basin a definite time of mixing at a minimum velocity must be attained to form a compact floc with adequate distribution. The outer parts of the radial paddles in the floc basin should move at a speed not in excess of 2 feet per second. Faster speeds tend to break up the floc and reduce its effectiveness.

In the passing from the floc basin to the sedimentation tanks the floc bearing water passes through openings between baffles rather than over a weir. Falling over a weir might cause excessive agitation and tend to break up the floc.

c. Sedimentation in conjunction with coagulation removes silt and some of the bacteria, color, taste and odors from the water. Conventional sedimentation basins are designed to have the water flow through the basin at a velocity too slow to support coagulated particles. Such speed should be less than one foot per minute. Approximately 80 per cent of the floc entering a basin plus its adherents settles to the bottom.

The removal of this material creates a problem inasmuch as any agitation would tend to throw the highly suspendible particles back into suspension. Consequently the removal of deposits is accomplished by closing down one settling basin at a time, draining it to waste, and hosing down the sides and floor. Semi-annual cleanings of sedimentation basins are usually adequate to maintain them in satisfactory condition.

Diagram of Flow Through a Filtration Plant



A. Raw water pumping station
B. Alum mixing chamber
C. Floc chamber
D. Settling tanks
E. Rapid sand filters
F. Lime dispenser
G. Chlorinator
H. Clear well
I. Pumps to storage tank

d. Filtration may be accomplished by any of several types of filters. The rapid sand filter is the type most commonly used and normally filters at the rate of 2 gallons per square foot per minute or 125 million gallons per acre per day.

Formerly it was thought that filtration was the primary defense against diseases. This is now known not to be so. Rather filtration provides the clarification required by the public. Chlorination is now considered as the primary defense and is required for all surface supplies.

A plant is seldom constructed with the entire plant capacity represented by a single filter unit. Two or more units are essential to enable one to be taken out of service for repairs or cleaning, and to give flexibility in output necessary to meet varying water consumption rates.

Filter beds are usually three to four feet deep, depending upon the type of filter. In the bottom of each filter is an underdrain system which may be of several designs including perforated tile, half tile, half spheres, or perforated plates. The underdrain collects the water and discharges it to the distribution system during normal filter operation. Also, it acts as the wash-water distribution system for the rapid type filter. Above the underdrain is placed a bed of gravel that supports the filtering sand and breaks up the incoming wash-water to prevent channelling. The depth of the gravel is usually 12 to 18 inches and consists of three to five layers of different sized stones varying from 2 inches in diameter at the bottom to 0.1 of an inch at the top.

The filtering medium consists of sand, anthracite, or combinations of both, is placed directly on the gravel, and is 18 to 24 inches in depth. The medium is carefully selected as to "effective size" and to "uniformity coefficient". Effective size is that size of grains whereby 90 per cent is courser than the stated size, and 10 per cent is finer than the stated size. Uniformity coefficient is a term used to express the relationship or uniformity of the grain sizes making up the lot of the medium. The Rules and Regulations of the New Jersey State Department of Health require that filter media shall have an effective size between 0.45 and 0.6 millimeters, with the uniformity coefficient not over 1.6. If the particles of the filtering medium are too fine, the filter will clog too rapidly. If the particles are too course, the medium will not provide proper filtration.

Up to 20 per cent of the floc in the sedimentation chambers is carried over into the filters. The deposition of floc particles on the medium soon fills the voids between the particles on the surface, and forms a mat in the upper few inches. The resistance of the mat to the flow or water, plus the friction resistance of the filter bed, is known as the "loss of head". When the resistance becomes too great to permit an adequate velocity through the bed, the filter is considered to be "dirty". Rapid filters are cleaned by "backwashing" with processed water.

Constant filtration rates are important and, in rapid filters, are maintained by mechanical controllers which automatically open the effluent valve as the loss of head increases. Rapid filters should also be provided with pressure gauges, ahead of and after the filters, to record the head-loss and to enable the operator to determine when the filter requires backwashing.

Backwashing is accomplished by passing safe water back through the filter. Such water enters the bottom of the filter, passes up through the filtering medium, and is discharged to waste by a trough near the top of the filter. The velocity of the wash water should be sufficient to cause a 30 to 40 per cent expansion of the bed during washing, such expansion having been demonstrated to scour the bed by the particles striking each other. The desired velocity depends upon the depth of medium in the filter, but usually varies between 18 to 30 inches upward rise per minute.

Often the backwash water is supplied by gravity from a small auxiliary elevated tank generally holding from two to three times the water necessary to wash one filter. It is more economical to fill the elevated storage tank with a separate pump connected to the clear well than to use water from the hign pressure service lines. In some cases filters are washed by direct pump pressure taking clear water out of the clear well. The height of the bottom of the wash-water tank above the top of the medium on the filters is usually from 30 to 35 feet, producing pressures of approximately 15 p.s.i. The water requirements are approximately 10 gallons per minute per square foot of filter area, and the time of wash-water application varies from 3 to 10 minutes depending upon the amount of soil in the filter.

A recent innovation has been the use of a "surface wash" to supplement the wash-water rising from tne underdrains. It has proved useful in preventing mud balls. There are two methods of surface washing, the fixed nozzle and the rotating nozzle. In the fixed nozzle system the surface wash-water is applied by means of 1 inch pipes on 2 foot centers terminating 4 inches above the bed. Each pipe has a brass cap on the end with 4 holes each $\frac{1}{4}$ inch in diameter bored so that water jets are directed downward on the filtering medium.

Water is applied through the surface wash pipes at 10 to 15 p.s.i. at about 5 gallons per square foot per minutes, while at the same time backwashing is going on.

In the rotating or Palmer surface wash system, two balanced pipes on opposite sides of a swivel head sweep over the top of the bed parallel to the surface. The pipes are equipped with nozzles set at a slight angle just above the bed. When water is applied under pressure the entire mechanism is driven around by the reactance or back pressure, and the surface of the bed is scoured by the water from the nozzles. The water requirements are approximately 0.5 gallon per minute per square foot of filter area at pressures ranging from 40 to 150 p.s.i. In this system the surface wash is usually applied before tne regular sub-surface wash-water is applied.

The sequence of valve openings and closing during the back-washing process is specific for each type of filter. The following procedure is an example:

Closing filter:

1. The valve to the clear well is closed.
2. Water flow from settling tanks to filter is closed.
3. Rotary jets are opened to break up mat.
4. Water to waste valve is opened.
5. Rotary jet valve closed.
6. Valve admitting clean backwash water is opened.

Reopening filter:

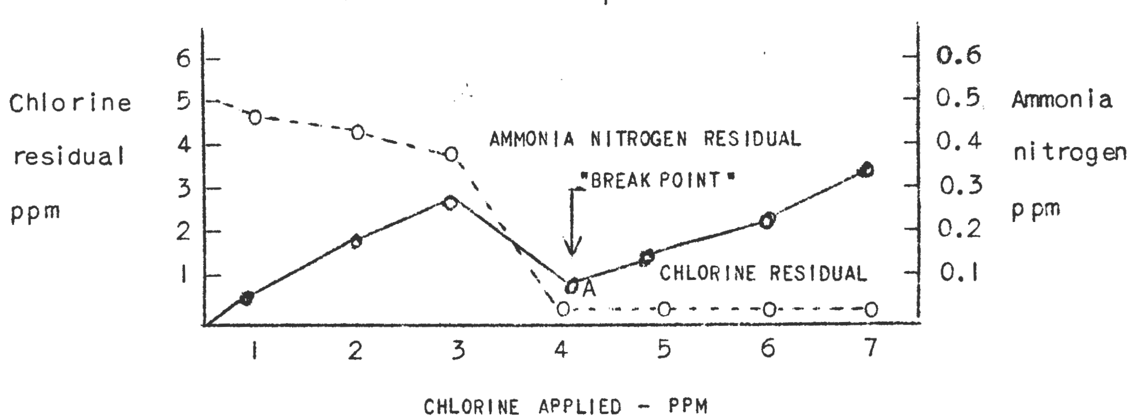
1. Backwash valve is closed.
2. Water to waste (sewer) valve is closed.
3. Valve from settling tanks to filter opened.
4. Rinse valve to waste opened until bed has settled.
5. Rinse valve closed after bed has settled.
6. Valve to clear well opened.

Proper backwashing of a filter is important. When a filter continues to be incompletely washed, some of the particles of the medium retain mud. They stick together and gradually enlarge to form a mud ball. The density of the mud ball is greater than the surrounding medium, resists the flow of water through it, and thus increases the flow through the surrounding medium. When the formation of mud balls occurs, the only remedy is to break up the balls with rakes or other tools and to adopt a higher rate of flow of the backwash waters.

e. Chlorination constitutes the primary defense against disease and in doubtful waters its application in an adequate dosage is essential. Chlorine is a strong oxidizing agent which reacts with the organic matter and ammonia in the water. The requirement of the water for chlorine is known as the "chlorine demand". The demand is defined as the amount consumed in a 30 minute period subsequent to initial contact.

Free residual chlorination of water containing no ammonia requires the addition of sufficient chlorine to satisfy the chlorine demand of reducing agents present, plus enough to establish the desired free available chlorine residual.

Free residual chlorine in the presence of ammonia involves the "break point" process which is defined as the application of chlorine to water containing ammonia to produce free residual chlorination. The process was developed from experimental observations that increasing doses of chlorine to water containing ammonia first produced increasing combined chlorine residuals, than a suddenly decreased residual. The term "break point" is derived from the shape of the chlorine curve produced by plotting graphically chlorine residuals obtained from increasing doses of chlorine added to a series of samples of water containing ammonia, as illustrated below. The point just prior to the rapid rise in residual has been called the "break point".



In the above illustration, the point A is the break point at which chlorine has been utilized in satisfying the ammonia demand. Subsequent chlorine dosage results in a free chlorine residual. Sufficient chlorine should be added to satisfy the initial chlorine demand, any demand in the distribution system, and result in a free chlorine residual of 0.2 ppm in the terminal areas of the distribution system. Tests for chlorine residual should be made at the ends of the distribution lines rather than at a location near the point of application.

Effective chlorination may require a contact period of at least 30 minutes, so whenever possible chlorine should be added to a water supply ahead of the storage tank.

A test to determine the amount of free chlorine is the orthotolidine test. The test is based on the production of a yellow color. The intensity of the color, matched with standards, indicates the ppm of chlorine present in the water.

Orthotolidine is not specific for free chlorine. Unstable oxides, reducing agents, and combined chlorine, if present, will produce false readings.

4. *Other Control Measures*

a. pH Control

In areas where water is soft and has a near neutral or slightly acid pH, lime or caustic soda is added to bring the pH up to 7.3. Lime is added through means of a slurry pot in the base of an automatic dispenser. The carbonate formed helps to provide a thin coating on the interior of the distribution system and seals off the oxidation process that pits and rusts the pipes.

b. Algae Control

Algae, diatoms, crustacea, and other microorganisms are found in larger populations in all reservoirs when the temperature of the water rises above 50°F. The life cycle of these plant and animal organisms is about 2 weeks under optimum conditions.

As they die and decompose they give off minute traces of obnoxious oils that may produce disagreeable tastes and odors in the water. Depending upon the species, 500 to 1000 units per ml. will produce the taste in drinking water (a unit is 400 sq. microns). Inasmuch as the life cycle is about 2 weeks any taste factor caused by decomposing plankton is the result of their presence in mass during the previous two weeks. Sampling points located in various areas of the reservoir are necessary for plankton control.

The most common chemical used for control is copper sulphate. Inasmuch as different organisms require different amounts of copper sulphate to control them, a knowledge of organisms present should be had. Also, the toxicity of copper sulphate to fish must be taken into consideration unless extreme measures are required.

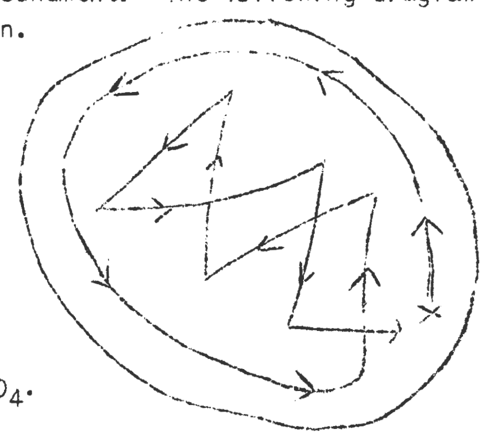
The following table shows safe dosages of $CuSO_4$ for common fish.

FISH	PPM	LBS./MILLION GALLONS	FISH	PPM	LBS./MILLION GALLONS
Trout	0.14	1.2	Goldfish	0.50	4.2
Carp	0.33	2.8	Perch	0.67	5.5
Suckers	0.33	2.8	Sunfish	1.35	11.1
Pickerel	0.40	3.5	Black Bass	2.00	16.6
Catfish	0.40	3.5			

Inasmuch as most species of plankton (plant and animal) are controlled by dosages of 0.30 ppm $CuSO_4$; this, or a slightly lower dosage, is usually used to keep plankton under control.

Application of a required dosage must be made in a single treatment for effective control. Very heavy growths should not be permitted to develop for if such growths are killed, the dead organisms will clog the gills of fish and kill them by suffocation. Large numbers of dead plankton will also produce a strong odor which will require 5 or 6 days to clear from the water.

Application of the copper sulphate is most easily made by placing small crystals in a burlap bag, hanging the bag over the back of a boat into the water and criss-crossing the impoundment. The following diagram shows the common method of application.



Distances are about 20 feet from shore and swaths averaging 100 feet apart.

Copper sulphate as used is not harmful to man. Those quantities that do not precipitate out as salts in the impoundment are taken out by the coagulants in the treatment plant so that the treated water will be free of $CuSO_4$.

If consideration is given to the use of other chemicals for the control of algae, weeds, etc., an effort should be made to determine possible toxicities and deleterious tastes that they may produce.

IV. DISTRIBUTION SYSTEM

The distribution system should have sufficient size and be properly balanced and interconnected to produce satisfactory volumes for domestic, industrial, and fire purposes at all points in the system. It should be free of dead ends, direct connections with other supplies, or openings through which non-potable water might be pumped, sucked, diverted, or flooded into the potable system. The design should be of such to insure a pressure of 35 to 50 pounds throughout the system.

Disinfection: - Upon the installation of a new line or section, disinfection should be accomplished by filling the line or section for a contact period of 4 hours or more with a solution containing at least 50 ppm of chlorine.

Recent studies have, however, shown that chlorine solutions containing more than 10 ppm and held for many hours in the line will tend to damage coal tar linings. Unless gross contamination is involved, future recommendations will probably call for lower concentrations of chlorine solutions.

V. DUTIES OF THE SANITARIAN

Although the duty of producing a safe water is not that of the Sanitarian, it is his duty to ascertain that such a water is produced. This may be accomplished by making periodic checks of those points listed in Appendix B. In addition, monthly samples should be taken for bacteriological examination and periodic checks should be made of water throughout the distribution system for residual chlorine.

At institutions presently or formerly employing wells, it is advisable for the Sanitarian to investigate the history of wells on the grounds and to determine that all unused wells are properly sealed by capping and/or filling.

APPENDIX A

INSTITUTIONAL WATER FACILITY INFORMATION SHEET

1. NAME OF INSTITUTION ....

2. SOURCE OF WATER
   a. Municipal ....
   b. Surface ....
   c. Wells ....

3. EMPLOYEES
   a. Name of licensed operator ....
   b. Class license held .... License No. ....
   c. Name of trainee for licensing ....

4. METHODS OF TREATMENT
   a. Municipal
      Chlorination .... If yes, Gas .... Hypo ....
   b. Surface
      Impoundment .... Filtration ....
      Coagulation .... Chlorination.......... Gas .... Hypo ....
      Sedimentation .... pH Control ....
   c. Wells
      Chlorination........ Gas .... Hypo.......... Iron & Manganese Removal ....
      pH Control ....

5. WATER CONSUMPTION (Gallons per day)
   a. Total services ....
   b. Avg. per patient (inmate) ....

6. WATER STORAGE FACILITIES
   a. Type ....
   b. Capacity ....
   c. Covered ....
   d. Status re. cleaning & repair ....
   e. Eaves, opening overflow screened ....
   f. Pressure produced ....psi

7. RECENT REPAIRS OR NEW CONSTRUCTION ON PLANT OR SYSTEM: — ....

....

....

8. CHEMICAL DATA
   a. Date of last analysis ....
   b. Report filed with ....
      (Name of person)

9. BACTERIOLOGICAL DATA (Required at least every 3 months)

a. Date of last sampling ....

b. Tests performed at:- State Lab............ ; Own lab........... ; Other lab. ....
(Name)

c. Reports filed with ....
(Name of person)

10. WATER PRESSURE IN HYDRANTS AT THE FOLLOWING LOCATIONS:

Location	Pressure PSI
a.	....
b.	....
c.	....
d.	....
e.	....
f.	....
g.	....
h.	....
i.	....
j.	....

11. OTHER INFORMATION:

APPENDIX B

CHECK POINTS

WELLS

1. LOCATION
    a. Distance from
        1. Septic tank 50 ft. min.
        2. Pit privy 50 ft. min.
        3. Barnyard 100 ft. min.
        4. Tile field 100 ft. min.
        5. Cesspool 150 ft. min.
    b. Structures not subject to flooding
    c. Industrial wastes not discharging into underground strata so as to cause contamination of ground water supplies.
2. PROPERLY SEALED AND OTHERWISE CONSTRUCTED SO AS TO PREVENT ENTRANCE OF SURFACE WATER.
3. PRESENCE OF ABANDONED WELLS, CAVES, SINK HOLES.
4. AVAILABILITY OF SAMPLING TAPS.
5. PRESENCE OF EQUIPMENT TO REPORT RATE, QUANTITY USED, AND RESIDUAL CHLORINE.
6. PRESENCE OF COMPETENT SUPERVISION AND MAINTENANCE.
7. ADEQUATE LABORATORY CHECK OF TESTS AND CONTROLS.

SURFACE SUPPLY

1. PRESENCE OF ANY CESSPOOLS, SEPTIC TANKS, INDUSTRIAL WASTES ON WATERSHED THAT MIGHT CONTAMINATE WATER.
2. IMPROPER LOCATION OF INTAKE IN RELATION TO POSSIBLE CONTAMINATION, ENTRANCE OF WATER TO THE IMPOUNDMENT, AND ACCESSIBILITY TO TRESPASSERS.
3. RESTRICTIONS ON USE OF RESERVOIR.
4. EXTENT OF POLLUTION OF RAW WATER IN RELATION TO TREATMENT.
5. LACK OF RESERVE CAPACITY - CAPACITY OF PLANT COMPARED TO VOLUME OF WATER REQUIRED.
6. SUPPLEMENTAL SOURCES OF WATER AND POWER.
7. PROPER OPERATION OF VARIOUS PROCESSES IN TREATMENT PLANT.
8. PRESENCE OF ADEQUATE DEVICE FOR RECORDING FLOW.
9. PRESENCE OF EQUIPMENT TO MEASURE THE DISPENSING OF ALUM AND LIME.
10. FREQUENCY AND ADEQUACY OF BACKWASHING.
11. PRESENCE OF EQUIPMENT TO RECORD RATE USED; QUANTITY USED, AND RESIDUAL OF CHLORINE.
12. PROTECTION OF TREATMENT PLANT AND FINISHED WATER FROM FLOODING OR OTHER CONTAMINATION.
13. PRESENCE OF COMPETENT SUPERVISION AND MAINTENANCE.
14. ADEQUATE LABORATORY CHECK OF TESTS AND CONTROLS.

DISTRIBUTION SYSTEM CHECKS

1. EXISTENCE OF CROSS CONNECTIONS.
2. RETURN TO THE SYSTEM OF WATERS OF COOLING SYSTEMS OR HYDRAULIC SYSTEMS WHICH SHOULD BE ENTIRELY ENCLOSED AND NOT SUBJECT TO RE-ENTRY INTO REGULAR WATER SYSTEM.
3. ADEQUATE RESERVE AND PRESSURE TO PREVENT LOW PRESSURES OR NEGATIVE PRESSURES IN LINE.
4. CONNECTION OF SPRINKLER SYSTEMS.
5. REPUMPING AT ANY FACILITY THAT MIGHT CREATE NEGATIVE PRESSURE ON THE LINES.
6. SUMPS ASSOCIATED WITH FIRE HYDRANTS OR OTHER SUBMERGED CONNECTIONS THAT MIGHT ESTABLISH POTENTIAL CROSS CONNECTIONS.
7. PROPER STERILIZATION OF NEW PIPES ADDED TO DISTRIBUTION SYSTEM.
8. VALVE STEMS TIGHT AND PROTECTED.
9. WATER STORAGE TANKS WITH WORKING TELL-TALE, SCREENED AND OF ADEQUATE CAPACITY.
10. WERE RESTRICTIONS ON WATER USE IMPOSED. VOLUNTARY OR COMPULSORY.
11. WAS IT NECESSARY TO RESORT TO THE USE OF AN EMERGENCY SOURCE. IF SO DESCRIBE BRIEFLY.
12. PRINCIPAL REASON(s) FOR WATER SHORTAGE OR PRESSURE PROBLEMS.
13. HAVE PLANS BEEN MADE TO ELIMINATE WATER SHORTAGES OR PRESSURE PROBLEMS. IF SO, DESCRIBE.
14. IF THE ANSWER TO THE FOREGOING QUESTION IS "NO" FOR WHAT PERIOD OF TIME IS THE EXISTING WATER WORKS CONSIDERED TO BE ADEQUATE.
15. OVERALL IMPRESSION OF SUPPLY (Operation, maintenance, appearance)

    Excellent............ Good............ Fair........... Poor.....................

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