CERTIFICATE

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THE UNITED STATES OF AMERICA
Legally Binding Document

By the Authority Vested By Part 5 of the United States Code § 552(a) and Part 1 of the Code of Regulations § 51 the attached document has been duly INCORPORATED BY REFERENCE and shall be considered legally binding upon all citizens and residents of the United States of America. *HEED THIS NOTICE*: Criminal penalties may apply for noncompliance.

Document Name: WQA S-300: Point-of-Use, Low Pressure Reverse Osmosis Drinking Water Systems

CFR Section(s): 24 CFR 200, Subpart S

Standards Body: Water Quality Association

APPROVED

Official Incorporator:
THE EXECUTIVE DIRECTOR
OFFICE OF THE FEDERAL REGISTER
WASHINGTON, D.C.

S-300-84

FOR POINT-OF-USE LOW PRESSURE REVERSE OSMOSIS DRINKING WATER SYSTEMS

A Voluntary Industry Standard

WATER QUALITY ASSOCIATION

A not-for-profit international trade association representing firms and individuals engaged in the design, manufacture, production, distribution and sale of equipment, products, supplies and services for providing quality water for specific uses in residential, commercial, industrial and institutional establishments. Membership is voluntary.

One of the basic purposes of WQA is to promote the acceptance and use of industry equipment, products, and services. Activities, programs and services are designed to enable the industry to perform with the greatest economy and efficiency and to provide the greatest service to the public. The benefits of this shared experience accrue to all, and might otherwise be unobtainable.

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DISCLAIMER

WQA does not guarantee or otherwise endorse any water treatment equipment as a result of its having been tested pursuant to this Standard, and bears no responsibility or liability as a result of any damage or injury caused by a product tested and/or validated pursuant to this Standard. Additionally, WQA is not responsible for any damage to water treatment equipment occurring during or as a result of the testing of such equipment.

TABLE OF CONTENTS

Voluntary Industry Standard S-300-84

S-300

VOLUNTARY STANDARD FOR POINT-OF-USE LOW PRESSURE REVERSE OSMOSIS DRINKING WATER SYSTEMS

SECTION 1. GENERAL

1.1 The point-of-use systems covered by this voluntary Standard use reverse osmosis as the principal method to enhance the quality of water obtained from public or private drinking water supplies considered to be microbiologically safe. It is recognized that these systems, which reduce the total dissolved solids concentration, may also include other types of treatment to reduce contaminants and thereby further enhance the quality of the final water. This Standard establishes the minimum requirements for low pressure (150 psig or less) Reverse Osmosis Systems. This Standard should not be interpreted to limit system or performance quality in any way.

1.2 This Standard relates to the physical integrity and performance of systems which improve the quality of potable water.

1.3 Electrical standards are not addressed in this Standard inasmuch as nationally recognized standards for electrical safety exist.

1.4 This Standard is intended to be used in the verification of contaminant removal claims.

1.5 This Standard is not intended to be used in the verification of claims for improvement of taste, odor, and color, although these properties are often improved by reverse osmosis systems.

1.6 Many on-site conditions that could affect service life are beyond control of the system manufacturer. Therefore, this Standard is not intended to be used to verify service life claims.

1.7 Many on-site conditions that could affect product performance also are beyond the control of the system manufacturer. Therefore, the performance claims verifiable under this Standard are minimum performance claims that may be used only as a basis for comparison of contaminant removal capabilities of similar products under identical conditions.

SECTION 2. DEFINITIONS

ACCESSIBLE: Exposable for proper and thorough cleaning and inspection with the use of only simple tools, such as a screwdriver, pliers, or open-end wrench.

READILY ACCESSIBLE: Exposed or easily exposed without the use of tools for proper and thorough cleaning and visual inspection.

BYPASS: A channel or flow path which allows water or contaminants to flow around a water treatment unit or its media. A bypass may be deliberate, as when a system of valves is installed to permit servicing of a unit, or may be accidental, as when a flaw exists in the unit or the media.

CHALLENGE WATER: Water specially prepared for Standard tests.

CONTAMINANT: Any undesirable physical, chemical, or microbiological substance or matter in water.

CORROSION RESISTANT MATERIAL: A material which maintains its original surface characteristics under prolonged exposure to the intended use environment and does not contribute unacceptable amounts of substances into the water.

DISPOSABLE COMPONENT: A component that requires periodic replacement as defined by the manufacturer.

DRINKING WATER: Water which is intended for human consumption. (Terms used synonymously: product water, effluent.)

EFFLUENT: The stream emerging from a unit, system, or process. (Terms used synonymously: drinking water, product water.)

FEED WATER: The solution that enters the system. (Term used synonymously: influent.)

INFLUENT: The stream entering a unit, system, or process. (Term used synonymously: feed water.)

MCL: Abbreviation for Maximum Contaminant Level: the maximum allowable concentration of a contaminant in water as established in the U.S. EPA Drinking Water Regulations.

POINT-OF-USE: Reverse Osmosis Drinking Water Systems used on the user's premises.

PRODUCT WATER: Water delivered from the system to user. (Terms used synonymously: drinking water, effluent.)

PRODUCT WATER DISPENSING RATE: That amount of water available from the fully open dispensing outlet for a time of 30 seconds $\pm$ 1 second or until the reservoir is empty.

PRODUCTION RATE: The quantity of water produced per unit of time.

QUALIFICATION TEST: Tests and verifications performed to validate conformance to this Standard.

REMOVABLE: Capable of being taken away from the unit with the use of only simple tools, such as a screwdriver, pliers, or open-end wrench.

READILY (OR EASILY) REMOVABLE: Capable of being taken away from the unit without the use of tools.

REJECT WATER: That portion of the feedwater that is not converted to product water.

REJECTION: Reduction of specified contaminants in product water as related to feed water, expressed as percentage.

REPLACEMENT ELEMENTS: Those elements whose performance deteriorates with system use and are intended to be replaced.

REVERSE OSMOSIS: A process that reverses, by the application of pressure, the flow of water in a natural process of osmosis so that water passes from the more concentrated to the more dilute solution through a semipermeable membrane.

STORAGE CAPACITY: The maximum volume available for use from the storage tank as tested in accordance with procedures outlined in Appendix C.11.

SYSTEM: A complete, integrated unit which may consist of various components which will be tested as a singular unit of equipment.

TDS: Abbreviation for "Total Dissolved Solids."

USER: The product water consumer.

SECTION 3. MATERIALS, DESIGN AND CONSTRUCTION

3.1 General

The system shall be so designed and constructed that its intended purpose will be accomplished when installed and operated in accordance with the manufacturer's instructions. System materials in contact with water shall be selected for their strength and resistance to corrosion by water; shall be free of objectionable taste and odor; and shall not impart toxic substances to the water.

Systems shall be capable of withstanding exposure to the intended use environment as specified by the manufacturer, and shall be durable and capable of withstanding normal mechanical and thermal stresses incident to shipping, installation, operation, and maintenance.

Systems shall be designed and constructed so that when installed in accordance with the manufacturer's instructions they will meet established public health and safety requirements. Suitable evidence must be submitted to the Water Quality Association Laboratory to support compliance.

All non-metallic interior coatings or linings shall meet the requirements for plastic materials as specified in NSF Standard 14. All non-metallic components shall be constructed for a working temperature of at least 100°F. Unless exposed non-metallic components are capable of resisting deterioration due to

sunlight, the manufacturer shall warn the installer and user against exposed installations, by use of a label or tag attached to the unit.

All parts and components shall be free of rough or sharp edges or other hazards which could cause injuries to persons adjusting, servicing, or using the unit.

3.2 Minimum Quality Assurance Provisions
A label with the following information shall be permanently affixed to every system: that it is the user's responsibility to, and that the manufacturer strongly recommends that the user, periodically test the unit in order to determine whether it maintains the performance levels claimed by the manufacturer.

3.3 Flow Control
If performance of the system is dependent on flow rate, a flow rate control shall be provided as an integral part. The manufacturer shall clearly identify controls requiring adjustments. The adjustment procedures shall be explained in the instructions.

3.4 Waste Connections
Waste connections, if provided as part of the system, shall be capable of conforming to applicable national, local municipal and county codes.

3.5 Dispensing Outlet
Faucet spouts (except for drinking fountain orifices), if provided with the system, shall be constructed and located so the discharge orifice is directed downward. The lower edge of the outlet shall be at an elevation not less than one inch above the flood rim of the sink.

3.6 Drinking Fountain Outlet
Orifices designed as drinking fountain outlets, if provided with the system, shall meet the following provisions:

3.6.1 The discharge orifice shall be protected by a guard designed in conjunction with the orifice to prevent persons from directly contacting the orifice while drinking from the unit, and to prevent foreign matter from dropping vertically into the orifice. The guard shall be of such width, height, and design that the user's mouth or lips cannot readily touch the orifice. Spaces between the nozzle and guard shall be proportioned to allow for convenient cleaning of these parts.

3.6.2 The discharge orifice and guard shall be designed so as to discourage hose connections or other improper uses.

3.6.3 The water stream shall issue from the end of the orifice set at an angle from the vertical so as to prevent water in a jet from returning into the orifice or orifices from which it issues. The jet of the water issuing from the orifice shall not touch the guard.

3.6.4 Drinking fountain nozzles shall be placed so that the lower edge of the nozzle orifice is at an elevation not less than one inch above the flood rim of the receptacle.

SECTION 4. PERFORMANCE

4.1 Chemical Performance Requirements

4.1.1 All chemical performance tests shall be conducted in accordance with Appendix C.

4.1.2 Systems must demonstrate 75% minimum TDS rejection of the General Test Water when tested in accordance with Appendix C.

Optional. Where the levels of a substance regulated by the EPA's Primary and Secondary Drinking Water Regulations are to be tested, the concentration of the substance in the product water shall be not more than the MCL specified in those regulations. When the contaminating substance is asbestos, the level of contamination shall be reduced by at least 99% when tested in accordance with Appendix C. A minimum of 50% rejection of other contaminants whose reduction is claimed is required.

4.1.3 Claims for contaminant concentration reduction must specify the nature of the contaminant and specifically describe those instances when all forms of the contaminant will not be removed. For example, a claim of mercury reduction must specifically describe those instances when there will not be a reduction of each of the three common mercury forms: Mercury I, Mercury II, Organic Mercury.

4.1.4 The arithmetic mean of the percent TDS rejection measured on the last test day (the seventh day, as set out in Appendix C) shall be at least 90% of the arithmetic mean of the percent rejection measured on the second test day.

4.1.5 The mean of the production rate measured on the last test day (the seventh day, as set out in Appendix C) shall be at least 90% of the arithmetic mean of the product flow rates measured on the first test day and shall be at least the claimed product flow.

4.1.6 Product water storage capacity, if provided, shall be at least equal to the manufacturer's claimed volume.

4.2 Hydrostatic Performance Requirements

4.2.1 All hydrostatic performance tests shall be performed in accordance with Appendix D. The system need not meet the performance requirements of this Standard after the hydrostatic burst pressure testing or pressure cycle testing.

4.2.2 A system shall withstand an inlet hydrostatic proof pressure test of 150 psig or 1.5 times working pressure, whichever is greater, for a period of 15 minutes without leakage of water from the system. Permanent distortion of the system components is allowed.

4.2.3 A system will be tested by subjecting it to an inlet hydrostatic burst pressure of at least three times the working pressure or 400 psig, whichever is greater, for a period of three seconds. Permanent distortion is allowed; no leakage is permitted.

4.2.4 After being exposed to a minimum of 100,000 pressure cycles of 0 to 150 psig, the system shall be watertight at 150 psig, or 1.5 times the working pressure, whichever is greater.

APPENDIX A.

TESTING SEQUENCE

1. The testing sequence shall be as follows:

   1.1 Data compliance and visual verification shall be considered pursuant to Appendix B.

   1.2 At least two test systems shall be subjected to the chemical performance tests found in Appendix C.

   1.3 At least two test systems shall be tested according to the hydrostatic proof pressure test procedure found in Appendix D.

   1.4 One test system which successfully passed tests 1.1 through 1.3 shall be subjected to the applicable pressure cycle test requirements found in Appendix D.

   1.5 The second test system which successfully passed tests 1.1 through 1.3 shall be subjected to the applicable hydrostatic burst pressure test requirements found in Appendix D.

How about testing whether the units can still pass chemical performance of 1.2 after going through the pressure cycle & hydrostatic burst stress of 1.4 & 1.5 i.e., should know that not only the units don't leak after hydraulic use, but that they also continue to perform.

Failures

Upon encountering a failure during qualification procedure, the procedure shall be stopped, the submitting party so notified of the failure, and all data and test articles may be returned. Upon resubmission, the procedure shall start at Step 1.1 unless the submitting organization can provide an acceptable rationale with supporting documentation. The submission will be reviewed by an appropriate independent technical review body for interpretation and acceptability.

→ ?

Testing by Similarity

Testing by similarity may be permitted if the submitting organization can substantiate areas of similarity and can provide an acceptable rationale for abbreviation of the procedures set out in paragraph 1. The submission will be reviewed by the Water Quality Association Technical Director for interpretation and acceptability.

APPENDIX B.

DATA COMPLIANCE AND VISUAL VERIFICATION PROCEDURES

Prior to initiating performance tests pursuant to Appendix C, or hydrostatic tests pursuant to Appendix D, compliance with the requirements of Appendix B shall be satisfied.

1. Data

Data package shall include a letter certifying that any and all systems submitted for testing are representative of production articles, and that only non-toxic materials are used in construction of the system (see, paragraph 3.1 of the Standard). Special considerations (see, paragraphs 4.1 and 4.2 of the Standard) shall be noted in this document.

2. Visual Inspection

2.1 If a wastewater connection is provided, the method to prevent wastewater cross connections must be substantiated.

2.2 If a product water outlet is provided, this outlet should be examined and, if necessary, operated to verify compliance with the requirements of paragraph 3.5 and 3.6 of the Standard.

↳ = faucet or drinking fountain

APPENDIX C.

CHEMICAL TEST PROCEDURES

1. General

   1.1 At least two systems will be tested in parallel using the loop as illustrated in Figure C-1.

   1.2 All systems shall meet the data requirements of Appendix B and shall have passed applicable tests required by the Hydrostatic Proof Pressures Procedure found in Appendix D.

2. Equipment

   2.1 A circulation pump must deliver the challenge water to the test units at the specified operating pressure.

      2.1.1 The operating challenge water will be at 60 psig $\pm$ 5.0 psi, and the temperature will be maintained at 77°F $\pm$ 5°F.

   2.2 A pressure regulator will be included to maintain the desired operating pressure within $\pm$ 5.0 psig.

   2.3 Valves shall be provided to regulate challenge water and product streams as desired.

   2.4 Withdrawal of product water, other than samples, from each unit shall be accomplished by means of a solenoid valve controlled by a timer. An impulse counter will also be installed to record the number of draws.

   2.5 The reservoir shall be of sufficient size to contain the challenge water. It shall not impart any contaminants to the challenge water. Suitable mixing means shall be provided.

   2.6 A chart recording conductivity instrument shall be provided to monitor conductivity of challenge water in-line after the pump.

   2.7 Microbiological protection of all challenge waters shall be provided by a properly sized operating ultraviolet (UV) water treating device. The UV device shall immediately precede the inlet to test units.

3. Challenge Water Preparation

   3.1 In all tests, a batch of challenge water shall be of sufficient volume to provide eight days operation. Every nine days the reservoir contents are to be discarded and replaced with a new batch. At this time, all product water and wastewater in the system will also be manually drained.

3.2 Wherever possible, a single challenge water batch is to be used for verifying all contaminant removal claims. Where incompatability prevents this, additional challenge waters shall be prepared for additional testing. The additional contaminants shall be added at concentrations equal to three times the MCL or product performance claims.

3.2.1 General Challenge Water is used to verify reduction of TDS. The challenge water shall be 1,000 mg/l of sodium chloride in deionized, or equivalent, water of at least 100,000 ohm-cm resistivity, with a turbidity of less than 1.0 NTU and a pH of 5.0 to 8.5. The General Challenge Water is to be chlorine-free.

3.2.2 Special Challenge Water is used as a challenge in verifying other contaminant reduction claims. It shall be prepared by adding all appropriate contaminants, where compatible to the General Challenge Water.

3.2.3 Unique Challenge Water is used when contaminant incompatibility precludes the use of one Special Challenge Water. It shall be prepared by adding appropriate contaminants to the above qualified deionized water.

3.2.4 Asbestos Challenge Water
The challenge water shall be prepared from General Challenge Water by the addition of a 50-50 blend of chrysotile and anthophyllite to produce a fiber concentration of $10^7 - 10^8$ fibers per liter. Concentration of the fibers shall be reduced at least 99% throughout the test period.

Note: Asbestos for testing may be obtained from:

Particle Information Service, Inc.
22 Granet Hill Road
Grants Pass, OR 97526

or

Duke Standards Company
455 Sherman Avenue
Palo Alto, CA 94306

3.3 Appropriate mixing shall be provided.

4. Sampling and Analyses

certified laboratory?

4.1 All sampling and analyses will be conducted by approved methods of ASTM, EPA, or AWWA in a laboratory approved by WQA. Analysis for asbestos fibers will be by transmission electron microscope (TEM), or alternatively by x-ray diffraction, according to the procedures of Anderson and Long and Ontario Ministry of the Environment.[1]

4.2 TDS estimates shall be made from conductivity measurements.

4.3 All samples must be analyzed for conductivity plus the constituents of 3.2.1, 3.2.2, 3.2.3, or 3.2.4.

5. Sampling Schedule

5.1 Test duration shall not exceed one week. When individual determinations of three consecutive TDS readings do not vary by more than 5% from their average, the system shall be considered in a steady state condition. Such TDS readings shall be made on product water samples collected at least three hours apart. A maximum of one day shall be allowed to reach steady state condition: during this period, a continuous service draw shall be made, except as needed to measure reservoir capacity (if applicable), production rate, and flow rate as specified in this Appendix.

5.2 Each batch of challenge water must be sampled and analyzed to assure proper composition.

5.3 Samples of challenge water and product water shall be taken at the same time and appropriately analyzed. The sample frequency shall be at the mid use of each reservoir batch, and at the end of the last test day.

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1. Anderson, C.H. and Long, J.M. "Preliminary Interim Procedure for Fibrous Asbestos," Analytical Chemical Branch, U.S. Environmental Protection Agency, Environmental Research Lab, College Station Road, Athens, Georgia 30601.

   Ontario Ministry of The Environment 1977 "An Interim Method for the Determination of Asbestos Fibre Concentration in Water by the Transmission Electron Microscopy," 36 pp.

6. Data

Collect several samples daily and record the following:

Date;
Time;
Operating Pressure;
Challenge Water Temperature;
Challenge Water Conductivity; and
Product Water Conductivity.

7. Operating Sequence

7.1 Systems shall operate continuously except when batch replenishment is necessary. Batch replacement time shall not exceed eight hours.

7.2 A timer shall energize the solenoid valve every six hours to dispense 5% of the manufacturer's estimated daily system production rate.

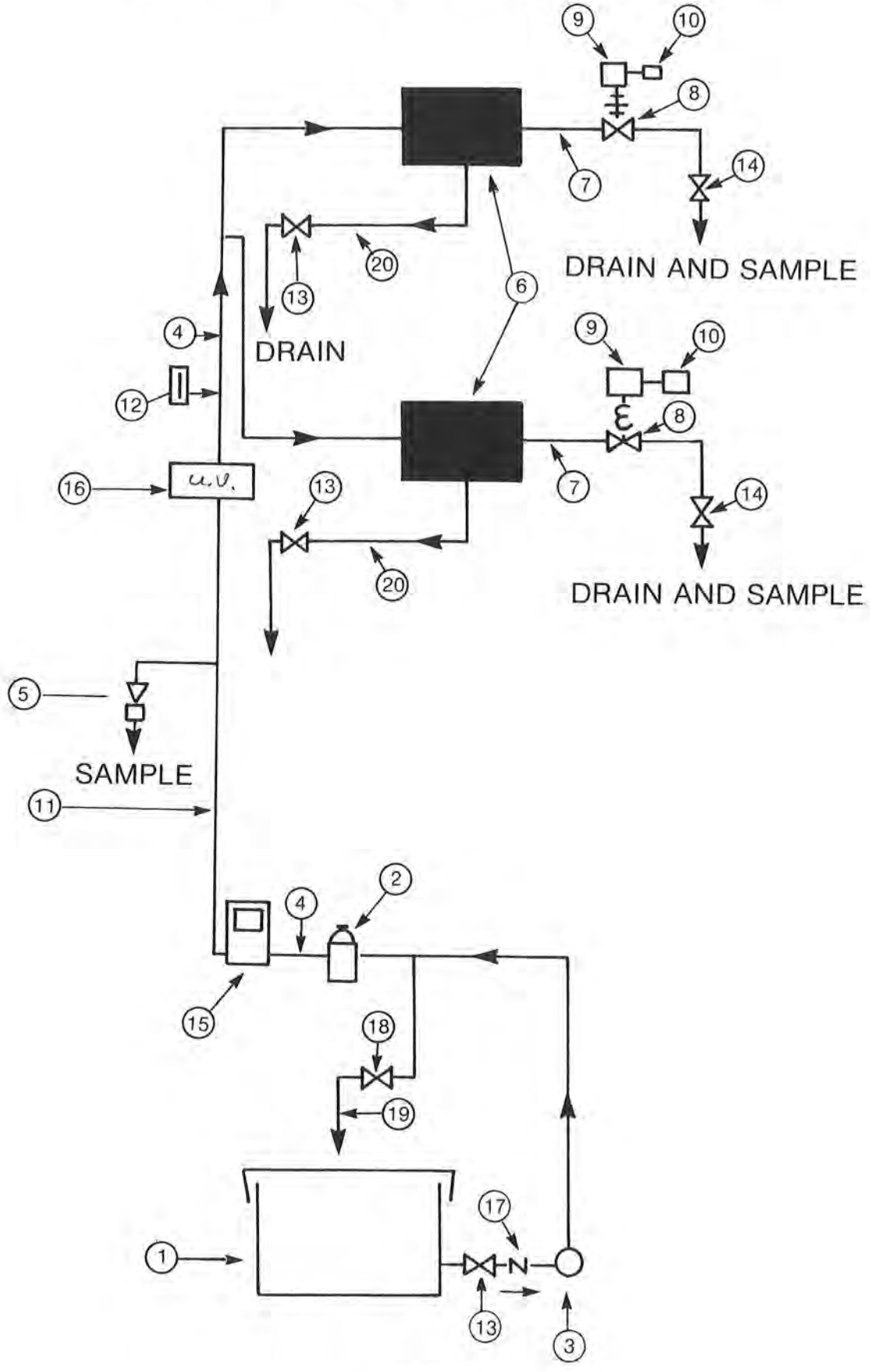
7.3 Test duration after equilibrium shall not exceed one week's operation.

PARTS LIST OF TEST LOOP

(Reference Figure C-1)

1. Reservoir, capacity at least equal to eight days total requirements
2. Pressure regulator
3. Corrosion resistant circulation centrifugal pump
4. Pressure gauge (Pressure recorder)
5. Sample valve, inlet
6. Test systems
7. R/O product line
8. Solenoid valve
9. Timer with impulse counter
10. Timer, electrical disconnect switch
11. Feed water to test systems
12. Thermometer (Temperature recorder)
13. Valve, stream isolation
14. Valve, system faucet (open at all times during tests)
15. Chart recorder, recording conductivity monitor
16. Ultraviolet water purifier
17. Check valve
18. Bypass flow throttling valve
19. Bypass return
20. Wastewater

FIGURE C-1
ACHEMATICS OF PRESSURE TEST LOOP



8. Performance Monitoring or Indicating Device
Systems provided with a performance monitoring device shall be subjected to the following additional tests.

8.1 The system device shall have satisfactorily passed the proof pressure tests of paragraph 3.1 of Appendix D.

8.2 Install the system in the chemical performance test loop of Figure C-1. When performance has first stabilized, operate the performance monitoring device. Its indication must correspond to the acceptance established under Section 4.

8.3 At the conclusion of the test herein, operate the performance monitoring device. Its indication must correspond to the acceptance criteria established under Section 4.

8.4 In the event that no appropriate test procedure is available to validate the device, a practical test is to be developed by the Water Quality Association Technical Committee.

9. Product Water Dispensing Rate
Verification is required only when manufacturer makes claims concerning product water dispensing rate. During the stabilizing phase of the chemical performance test in this Appendix, when the system is operating at rated pressures and is fully charged, determine the dispensing rate by opening the dispensing outlet and collect the entire discharge for 30 seconds ± 1 second or until the reservoir is empty. A flow rate less than that claimed by the manufacturer will constitute a failure. This verification shall also be made at the end of the one week test.

10. Product Water Production Rate

10.1 During the first day of the chemical performance test herein, when each system is operating at rated pressures, empty the system of product water through the dispensing faucet. This faucet shall remain open for a sufficient time to dispense twice the rated storage capacity at the rated dispenser faucet flow rate. Close the dispenser faucet.

10.2 Four hours after the faucet is closed or when the reservoir is full, whichever occurs first, a timed sample shall be drawn from the dispensing faucet for the same time period as described above.

10.3 The measured volume, multiplied by 6, is the maximum daily production rate.

10.4 Repeat this test at the completion of the one week testing period.

10.5 The maximum daily production rate which may be claimed by the manufacturer shall not be greater than the lesser of the volumes determined herein.

11. Product Water Storage Capacity

11.1 During the week of the chemical performance test herein, and with each system operating at rated pressures, interrupt discharge from the system in such a manner to allow the system storage tank to fill. Continue this process for a time period sufficient to fill storage tank (minimum time to be 24 hours). When the storage tank is filled, shut off the influent water supply.

11.2 Open dispensing faucet and collect discharge from storage tank.

11.3 Measure and record collected volume. This volume shall be the claimed storage capacity for the system.

12. Wastewater flow rate and/or volume ratios of wastewater to product water produced will be verified by suitable means and procedures when product claims include such statements.

APPENDIX D.

PROOF PRESSURE, HYDROSTATIC BURST AND CYCLE PRESSURE TEST PROCEDURES

1. General

1.1 Prior to testing under this section, all systems must first meet the requirements of Appendix B.

1.2 At least two systems shall be subjected to the proof pressure tests of paragraph 3.1 of this Appendix D.

1.3 At least one system of the two having passed the criteria in 1.2 and Appendix C performance requirements shall then be subjected to the hydrostatic burst tests of paragraph 3.2 of this Appendix D.

1.4 At least one system of the two having passed criteria in 1.2 and 1.3 above and Appendix C performance requirements shall then be subjected to the pressure cycle test, paragraph 3.3 of this Appendix D.

2. Test Apparatus and Arrangements
The following components shall be used:

2.1 Pump, complete with check valves, capable of producing 400 psig pressure or minimum pressure needed for burst test.

2.2 Bourdon tube pressure gauge, graduated in increments of not more than 5 psig, with $\pm$ 2% accuracy or equivalent accuracy recorder.

2.3 Shutoff valves and plugs.

3. System Test

3.1 Proof Pressure Test

3.1.1 Close system outlets, including waste line, with a suitable valve and connect the test unit inlet to the pump outlet.

3.1.2 Fill test system and test apparatus with water in the temperature range of 77 $\pm$ 5°F and flush to remove the air following the manufacturer's recommended procedure.

3.1.3 Close the outlet valve and gradually raise the hydrostatic pressure at the rate of 80 to 100 psig per second until 150 psig or 1.5 times working pressure, whichever is greater, is reached.

3.1.4 Maintain the test pressure for 15 minutes. Any leakage of water from the test unit constitutes a failure.

3.1.5 Relieve the pump pressure by slowly opening the bleed valve provided. Open the product water faucet and other isolating valves to relieve the test unit and test system of all pressure. A small distortion is allowed, as determined by the testing laboratory, providing that the distortion will not affect the operation of the system.

3.1.6 Disconnect the test system from the test apparatus. Systems passing this test shall be subjected to the Chemical Test Procedures of Appendix C. Note: Certain other tests are to be performed in conjunction with the procedures in Appendix C.

3.2 Burst Pressure Test

3.2.1 The system to be tested shall be a complete system assembled if necessary to conform to its normal state of use. Suitable protection should be provided for the operator's safety.

3.2.2 Close system outlets, including waste line, with a suitable valve and connect the test unit inlet to the pump system incorporating a Bourdon tube pressure gauge or equivalent accuracy pressure recorder, a check valve, a shut-off valve, and a drain valve.

3.2.3 Fill test system and test apparatus with water in the temperature range of 77°F ± 5°F and flush to avoid pockets of air. Suitable protection should be provided for the operator's safety.

3.2.4 Close the outlet valve, and the hydrostatic pressure shall be steadily raised at the rate of 80 to 100 psig per second until 400 psig or four times working pressure, whichever is greater is reached. Maintain the maximum pressure for three seconds.

3.2.5 Permanent distortion is allowed. However, leakage of water shall constitute a failure.

3.2.6 Open the product water faucet and then slowly open the outlet valve, then the pump bleed valve (if so provided) to relieve the test unit and test system of pressure. Permanent distortion is allowed.

3.2.7 Disconnect the test system from the test apparatus.

3.3 Pressure Cycle Test

3.3.1 Assemble the following components as shown in Figure D-1.

a. Open sump equipped with a low level alarm and switch to open the electrical circuit in the event of failure of the test unit.

b. Positive displacement or centrifugal pump capable of maintaining 150 psig in pressure system during the test.

c. Pressure relief valve for operation in 150 psig range.

d. Solenoid valves for operation at 150 psig.

e. Pressure gauges or recorders suitable for operation at 150 psig, with $\pm$ 2% accuracy.

f. Air cushion tank or column.

g. Electrical impulse counter with capacity of at least 100,000 cycles.

h. Continuous cycling cam timer adjustable to one revolution every five seconds.

i. Bleeder valves for adjustment of pressure increase rate.

3.3.2 Procedure

a. Fill the test system with tap water at room temperature and connect to the test apparatus as shown in Figure D-1.

b. Fill the sump with tap water at room temperature and operate the system at low pressure to bleed air from the test unit.

c. Set the counter at zero, or record initial reading. Adjust the cam cycle timer, pressure relief valve and bleed valves to produce a pressure cycle from 0 to 150 psig in 1.5 seconds, maintain maximum pressure for an instant, and then immediately release pressure. The pressure in the test system shall return to 0 psig before the initiation of another cycle.

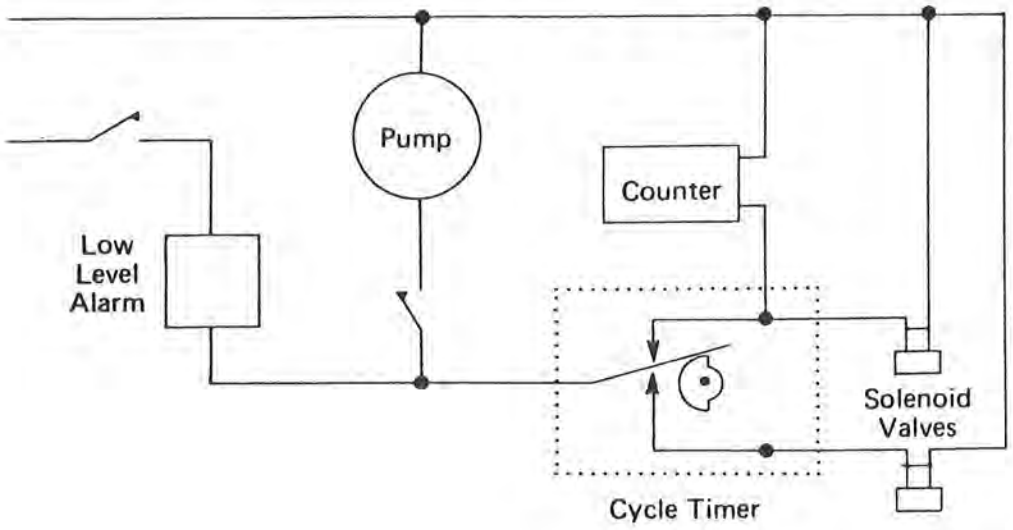
d. Continue the 0 to 150 psig cycling, with periodic inspections of the test system and cycle pressure, until 100,000 cycles have been completed.

e. Stop the cam cycle timer so that 150 psig pressure is on the test system and inspect the system for leaks. Any evidence of leakage during the cycle tests or in the final inspection shall constitute a failure of the system.

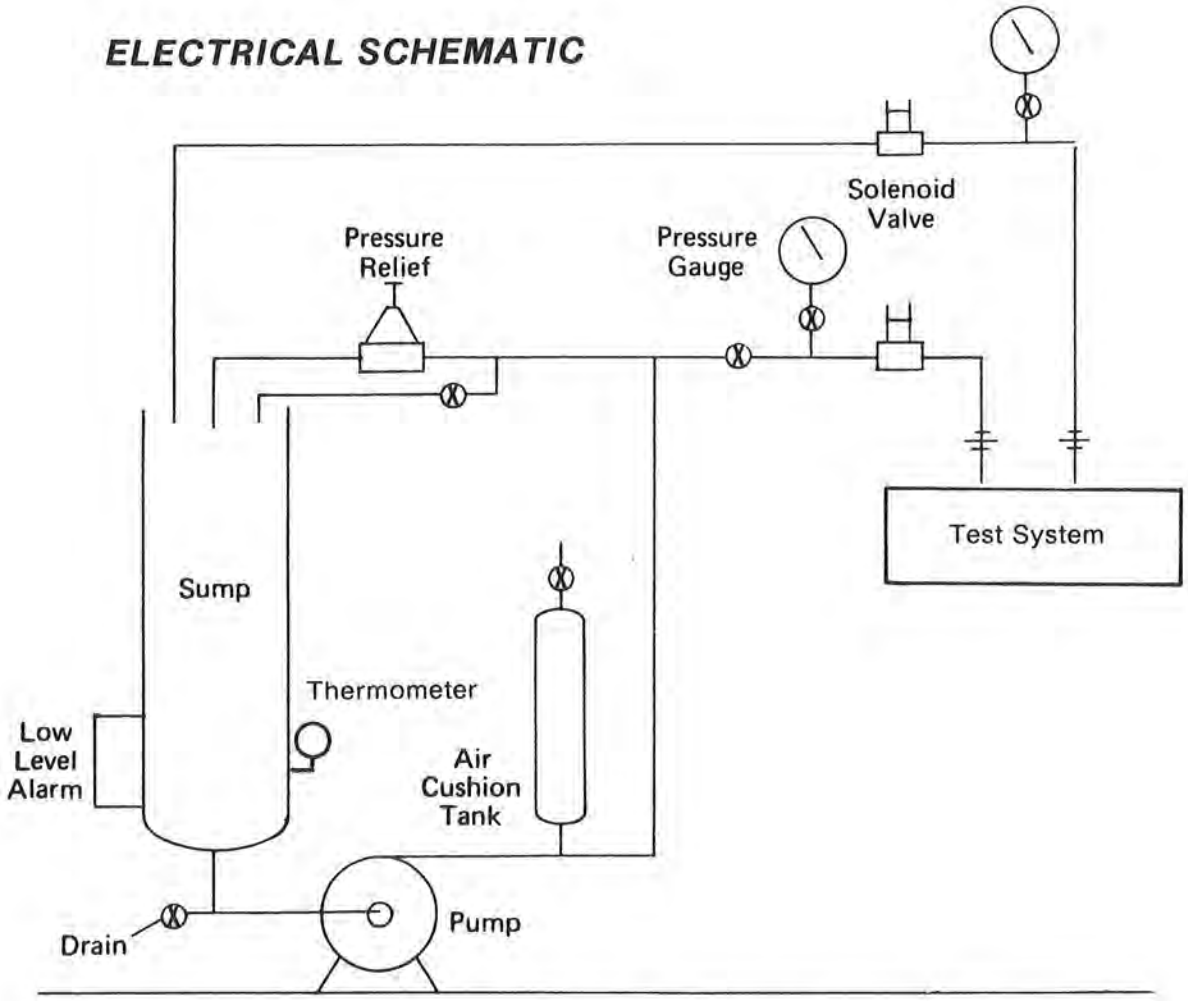
f. Slowly release pressure on the test system and test apparatus.

FIGURE D-1

SCHEMATIC OF SYSTEM TEST LOOP



ELECTRICAL SCHEMATIC



SCHEMATIC PIPING ARRANGEMENT

APPENDIX E

PUBLISHED DATA

1. **REFERENCES TO THESE STANDARDS IN SALES AND PROMOTIONAL MATERIALS**

To promote consumer safety and to avoid misleading installers or consumers, all sales or other promotional materials for a particular product, system, or unit stating or implying that the product, system, or unit meets this Standard, shall include at least the following data:

Conditions of use;

Description of water quality assurance program;

Model number of unit;

Name and address of manufacturer and/or servicing organization;

Minimum and maximum operating pressure;

Minimum and maximum operating temperature; and

Electrical characteristics (where applicable).

2. **OPERATION, MAINTENANCE, AND INSTALLATION INSTRUCTIONS**

At least the following information should be made available to the installer: detailed instructions for installation, operation, maintenance, and initiation of service. Specific instructions shall include arrangement of plumbing connections, electrical wiring where applicable, disinfection procedures and other requirements of this Standard, with details referring to the particular model. Installation instructions shall note the need for compliance with all applicable state and local laws and regulations. Representative sources of supply for expendable components and supplies for the unit or system shall be clearly stated.

The manufacturer should also furnish the following data with the system:

Model number;

Model number and replacement cartridge (if applicable);

Functional description of unit;

A statement of performance as established by tests. If the tests were conducted under this Standard:

1. Product water daily production rate, gpd at 60 psig and 77°F, as established by tests under this Standard;

2. Product water dispensing flow rate, gpm, as established by tests under this Standard;

3. Minimum and maximum operating pressure in psig as tested under this Standard; and

4. Capacity of product water storage, where applicable, as established by tests under this Standard;

Minimum and maximum operating temperature in degrees F and pressure ratings in psig;

Electrical characteristics (where applicable);

A statement that the product was tested in accordance with the Standard;

Conditions of use, including limits of feed water pressure, temperatures, chemistry, and where applicable electrical voltage; and

Description, and instructions for user, of means to verify system performance.

3. LABELING

A permanent plate or label should be affixed, by the manufacturer or servicing organization, in a conspicuous location on each unit and should contain the following:

Name and address of manufacturer and/or servicing organization;

Model number of unit;

Model number of replacement element (if applicable);

Minimum and maximum operating temperature in degrees F;

Minimum and maximum operating pressure in psig; and

Electrical characteristics (where applicable).

4. REPLACEMENT ELEMENTS

Data regarding replaceable elements shall be provided on elements including, but not limited to, disposable components and cartridges. The replaceable items shall be labeled on the medium or its packaging with:

Conditions of use;

Model number (if applicable);

Model number of unit or units in which used; and

Name and address of manufacturer and/or supplier.

Where applicable and appropriate, the following information shall also be included:

Functional description of unit;

Rated Capacity;

Installation Instructions; and

Operating Requirements.

The industry served by WQA and its members encompasses water quality improvement for homes, businesses, industry, and institutions in these broad areas; • drinking water
• working water

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