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NATIONAL SANITATION FOUNDATION

STANDARD No. 43

FOR

CHEMICAL FEEDING AND PROCESSING EQUIPMENT

RELATING TO

SUPPLEMENTARY TREATMENT OF POTABLE WATER

As Prepared by

The NSF Joint Committee

for

Devices and Substances

for

Supplementary Treatment of Potable Water

and

Recommended for Adoption by

The NSF Council of Public Health Consultants

Adopted

by

The NSF Board of Trustees

November 11, 1971

The National Sanitation Foundation

P. O. Box 1468

Ann Arbor, Michigan 48106

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This is one of a series of nationally uniform sanitation Standards and Criteria established by the National Sanitation Foundation. ~~for community water supply~~

Current Standards and Criteria include:

- 1 Soda Fountain and Luncheonette Equipment
- 2 Food Service Equipment
- 3 Spray Type Dishwashing Machines
- 4 Commercial Cooking and Warming Equipment
- 5 Commercial Hot Water Generating Equipment
- 6 Dispensing Freezers
- 7 Commercial Refrigerators and Storage Freezers
- 8 Commercial Powered Food Preparation Equipment
- 9 Diatomite Type Filters for Swimming Pools
- 10 Sand Type Filters for Swimming Pools
- 11 Recessed Automatic Surface Skimmers
- 12 Automatic Ice Making Equipment
- 14 Thermoplastic Materials, Pipe, Fittings, Valves, Traps and Joining Materials
- 15 Thermoset Plastic Pipe, Fittings, Valves, Tanks, Appurtenances, Joining Materials and Thermoset Plastic Coatings for Use in Potable Water Supply Systems
- 16 Film Badge Services
- 17 Centrifugal Pumps for Swimming Pools
- 18 Manual Food and Beverage Dispensing Equipment
- 19 Adjustable Output Rate Chemical Feeding Equipment for Swimming Pools
- 20 Bulk Milk Dispensing Equipment
- 21 Thermoplastic Refuse Containers
- 22 Swimming Pool Water Treatment Chemicals and/or Processes
- 23 Watercraft Sewage Disposal Devices
- 24 Plumbing System Components for Mobile Homes and Recreational Vehicles
- 25 Vending Machines for Food and Beverages
- 26 Pot, Pan and Utensil Commercial Spray Type Washing Machines
- 27 Multiport Valves for Swimming Pools
- 28 Cartridge Type Filters for Swimming Pools
- 29 Detergent and Chemical Feeders for Commercial Spray Type Dishwashing Machines
- 30 Cabinetry and Laboratory Furniture for Hospitals
- 31 Polyethylene Refuse Bags
- 32 Paper Refuse Sacks
- 33 Commercial Cooking Equipment Exhaust Systems
- 34 Laundering of Cloth Toweling
- 35 Laminated Plastics for Surfacing Food Service Equipment
- 36 Dinnerware
- 37 Air Curtains for Entranceways in Food Establishments
- 38 Test Kits for Swimming Pool Water
- 39 Resilient Artificial Recreational Surfaces

- 40 Individual Aerobic Wastewater Treatment Plants
- 42 Filtration Devices Relating to Supplementary Treatment of Potable Water
- 43 Chemical Feeding and Processing Equipment Relating to Supplementary Treatment of Potable Water
- 44 Cation Exchange Water Softeners Relating to Supplementary Treatment of Potable Water
- 46 Microbial Control Coatings
- C-2 Special Equipment and Devices
- C-6 Cloth Towel Dispensers
- C-7 Plastic Lined Pipe
- C-8 Pitless Well Adapters
- C-9 Evaluation of Special Processes or Devices Used in Treating Wastewater

THE NATIONAL SANITATION FOUNDATION
Purpose and Organization

The Foundation, popularly referred to as NSF, is a nonofficial and noncommercial agency. It is incorporated under the laws of Michigan as a not-for-profit organization devoted to research, education and service. It seeks to solve problems involving man and his environment. It wishes to promote man's health and enrich the quality of life through conserving and improving that environment. Its fundamental principle of operation is to serve as a neutral medium in which business and industry, official regulatory agencies, and the public come together to deal with problems involving products, equipment, procedures, and services related to health and the environment.

The Foundation is perhaps best known for its role in the developing of standards and criteria for equipment, products and services that bear upon health. The NSF Seal is widely recognized as a sign that the article to which it is affixed complies with public health requirements. The Foundation early in its existence established its own testing laboratory as a subsidiary corporation. This laboratory conducts research; tests and evaluates equipment, products, and services for compliance with NSF Standards and Criteria; and grants and controls the use of the NSF Seal.

A brochure is available discussing in some detail the origin, philosophy, and growth of the Foundation. It describes the way in which distinguished leaders from business, industry, public health, and related professions give generously of their time and talent in helping achieve NSF objectives. It reviews current programs, lists current Standards and Criteria, and outlines the procedures and requirements of the NSF Seal program. The brochure is entitled, "In Quest of Environmental Quality." A copy will be supplied upon request.

PREFACE

What is the measure of quality? Does quality reside in the basic material of an article or in the way in which the article is fabricated? Or is quality measured, perhaps, by the excellence with which a thing serves, or by the pride with which it is regarded by its possessor. The issue has endured the centuries, and it will continue to fling a challenge for tomorrow.

Man cares about the quality of his environment. He is aware of the influences exerted by food, water, air, land and shelter upon his well-being--influences which bear upon health, economic livelihood, and general enjoyment. He expects of society a form of protection which is dependable, yet imposes minimal restraints upon his freedom to achieve his own wants. Quality, therefore, derives from values which may be highly subjective and, from a materials standpoint, extremely complex.

The National Sanitation Foundation assumes that where there is a will there is a way. Quality can be attained. Cost of attainment can be reasonable. Multiple needs can be reconciled and satisfied. Hence, the employment by NSF of an operational methodology to bring together all parties at interest--business and industry, regulatory agencies at all levels of government, professional and technical organizations, and consumer representatives--to achieve understanding with each other of the requirements necessary to assure agreed upon quality objectives. From such understanding a definition of appropriate standards emerge. As the process creates mutual confidence between the parties at interest, such confidence is secondarily communicated to associates at home in business, industry and government. Acceptance of the new Standard is attained. Progress is extended in achieving uniformity of requirements for equipment construction, maintenance, and operating practice.

But some may contend that standardization is detrimental, restrictive, and inhibiting to free enterprise; that it stifles innovative use of materials and methods. Again, however, a basic tenet of NSF philosophy governs. Standards and criteria against which equipment or processes are to be evaluated must be couched in terms of performance. Alternative materials and methods of fabrication are permissible so long as the specifications are utilized as may be necessary to achieve performance objectives. Testing and evaluation, then, are carried out under conditions which reflect actual use situations. Final acceptance requires unequivocal answer to the question, "Does it perform as specified under the applicable Standard?" The pronouncement can only be "pass" or "fail." Equipment or materials which bear the NSF Seal assures that they conform with the applicable Standards as determined by a testing program rigorously and objectively administered.

The National Sanitation Foundation continues to be in debt to those who represent the multiple interests that join in developing the Standards, promoting support of the program, and sharing in the surveillance of compliance in the field. Special thanks are extended to the NSF Joint Committee for Devices and Substances Relating to Supplementary Treatment of Potable Water for the generous contribution of time and knowledge devoted to this Standard No. 44.

A quality environment is our objective. Such quality can be measured. We can attain it.

Robert M. Brown, President
National Sanitation Foundation

NATIONAL SANITATION FOUNDATION STANDARD
FOR
CHEMICAL FEEDING AND PROCESSING EQUIPMENT
RELATING TO
SUPPLEMENTARY TREATMENT OF POTABLE WATER

SECTION 1. GENERAL

- 1.00 SCOPE: This Standard covers the requirements for chemical feeders and processing equipment, including ozonation, used for the supplementary treatment of potable water supplied primarily by private water systems or by service connection from a public supply, including small commercial or institutional supplies such as schools and restaurants.
- 1.01 MINIMUM REQUIREMENTS: This Standard is established as a basis for the evaluation of equipment covered herein and is considered to contain basic and minimum requirements. Variations are permissible when they tend to make the equipment more resistant to corrosion, wear, and physical damage, or if they improve the general operation and performance of the device. Equipment which has components or parts which are covered under existing National Sanitation Foundation Standards or Criteria shall comply with the applicable requirements therein.
- 1.02 ALTERNATE MATERIALS: Where specific materials are mentioned it is understood that the use of other materials proved to be equally satisfactory for the intended use will be acceptable.
- 1.03 REVIEWS AND REVISIONS: Following adoption of the Standard and prior to its printed publication, a

general review is carried out by the National Sanitation Foundation Joint Committee for Devices and Substances for Supplementary Treatment of Potable Water to determine the adequacy and appropriateness of the requirements; and to ascertain if additional requirements are indicated. Subsequent to the printed publication of this Standard, complete review of the Standard shall be conducted at intervals of not more than 3 years to determine what changes, deletions or additions, if any, are necessary to maintain current and effective requirements consistent with new technology and progress. These reviews shall be conducted by appropriate representatives from the public health, industry and user groups. Revisions shall be in accordance with the procedures established by the NSF Joint Committee for Devices and Substances for Supplementary Treatment of Potable Water.

- 1.04 VARIATIONS IN DESIGN AND OPERATION: Equipment varying in principle of design and/or operation from that set forth herein may qualify under the provisions of this Standard provided appropriate tests and investigations indicate that said equipment produces control, accuracy, performance, operation and service at least equivalent to that produced by equipment complying with this Standard. Such equipment shall meet the requirements for materials, finishes and construction contained in this Standard.

SECTION 2. DEFINITIONS

- 2.00 APPROVED: Found acceptable for the specific intended use, as determined by the National Sanitation Foundation Testing Laboratory when related to the use of the NSF Seal.
- 2.01 TOXIC: Adverse physiological effect on man.

- 2.02 RESISTANT: The properties of a material which permit it to withstand chemical reaction, mechanical erosion and electrolytic action.
- 2.03 OUTPUT RATE: Quantity of a chemical delivered by a feeder into a potable water system per 24 hours. This will be expressed as volume (US gallons) per 24 hours of solutions or slurries, or weight (avoirdupois ounces or pounds) per 24 hours of solid or gaseous chemicals.
- 2.04 FEED RATE INDICATOR: A mechanism, calibrated directly or with reference to a chart, to provide points of reference to permit reproducible setting of output rate.

SECTION 3. MATERIALS

- 3.00 GENERAL: Any suitable material may be employed that will meet the requirements of resistance, pressure, normal handling and shipping as outlined herein and that will not produce any toxic effect or impart undesirable taste, odor or color to the potable water into which the material is introduced.

SECTION 4. DESIGN AND CONSTRUCTION

- 4.00 GENERAL: For purposes of cleaning and maintenance, the equipment shall be designed for easy dismantling and reassembly. The design and construction shall tend to minimize stoppage from chemicals or from foreign materials. The equipment shall be designed so that when properly installed it will prevent siphonage or discharge of chemicals directly into the water supply system.
 - 4.001 To minimize tampering with any rate adjustment controls, the equipment shall be designed or equipped with optional locking accessories, or shall be installed in a locked or protected place.

- 4.01 SAFETY: The equipment shall be designed to prevent accidental injury to an operator or attendant.
- 4.02 PROVISION FOR MOUNTING: The equipment shall be designed and constructed to facilitate secure installation.
- 4.03 MOTORS: All motors shall be constructed electrically and mechanically so that they will perform satisfactorily and safely under the conditions of load and environment normally encountered in potable water treatment installations. They shall be of the continuous duty type and where NEMA Standards exist, shall conform thereto. Standard voltages and cycles shall be used and full service factors as provided for by NEMA for each size motor shall be maintained.

SECTION 5. CHEMICAL FEEDING EQUIPMENT

- 5.00 CHEMICAL RESISTANCE: Feeders shall be corrosion resistant to the chemicals which are specified by the manufacturer as capable of being handled by the device under the test conditions specified in Item 5.001.
 - 5.001 Normally wetted parts of the feeder shall be exposed to the above solutions for a period of 100 days at $73 \pm 2^{\circ}\text{F}$. The feeder shall then be operated for a period of 24 hours at maximum specified rate, and meet the standard specified in Item 5.011.
- 5.01 EROSION RESISTANCE: Feeders designed for feeding dry chemicals, or slurries, shall be resistant to the specified chemicals in their dry form under the test conditions specified in Item 5.011.
 - 5.011 The feeder shall operate continuously at maximum setting for a period of 2,500 hours delivering specified dry chemicals or slurries,

and during this period shall deliver not less than 80 percent of its net rated output. It must also feed 80 percent or more of its rated output during the last hour of this test. Upon disassembly, none of the parts of the feeder normally contacted by the chemical or slurries being fed shall show marked erosion. Maintenance according to the manufacturer's standard instructions, with the exception of parts replacement, shall be carried out during the test period.

5.02 MATERIALS: In addition to Item 3.00, no material used in the portion of the feeder which is exposed to the chemical being fed shall contribute toxic, obnoxious or deleterious substances to such chemicals, or to the water being treated. All plastic materials in contact with the chemical being fed shall meet the applicable standards of the National Sanitation Foundation.

5.03 FEEDER OUTPUT RATE: Feeders shall deliver chemicals in slurries, solutions or in solid form into the water at the output rates, pressures and suction lift conditions specified by the manufacturer. The equipment shall have a sufficiently large, externally adjustable output range to feed chemicals proportional to normally encountered flow rates of the water into which the chemical is being fed.

5.04 PRESSURE REQUIREMENTS: Pressure vessels (i.e., over 1 year estimated life or more) containing filter cartridges, elements, or media and all permanent components subjected to line pressure shall:

5.041 Meet the conditions stated in Item 5.00.

5.042 Be water tight to 125 psi, and show no evidence of failure after being subjected

to 100,000 low-high pressure cycles of
20 - 120 psi at $73.4 \pm 2.3^{\circ}\text{F}$. (1 cycle =
not less than 10 seconds.)

- 5.043 Feeders shall pass a 5 minute hydrostatic pressure test equal to 1 1/2 times the manufacturer's maximum pressure rating applied to all parts of the feeder which will be subject to discharge pressures when in operation.
- 5.05 LIFE TEST: Feeders shall be capable of operating 3000 continuous hours at 80 percent of maximum pressure and output rate as specified by the manufacturer. Tests shall be conducted on 3 sample feeders using clear soft water. At least 1 sample must complete 3000 hours and at least 8000 satisfactory operation hours must be accumulated by the 3 samples. All tests shall be carried out in a room where ambient temperature is $100 \pm 2^{\circ}\text{F}$. Maintenance according to the manufacturer's standard instructions with the exception of parts replacement shall be carried out during the test period.
- 5.06 FEEDER HOUSING: The feeder housing and other components shall have sufficient structural strength and durability to withstand normal stresses encountered in shipping, installation and operation.
- 5.07 OPERATION AND INSTALLATION INSTRUCTIONS: Drawings and parts lists for easy identification and ordering of replacement parts shall be furnished with each feeder. Also included shall be:
- 5.071 A statement of manufacturer's guarantee
 - 5.072 Instructions for proper size selection and installation
 - 5.073 Chemicals that can be used
 - 5.074 Operation and maintenance instructions

5.075 Reference to prevention of cross connections

5.08 DATA PLATE: A data plate shall be provided.

5.081 Data plates shall be of a permanent nature, so inscribed as to be easily read and understood, and securely attached, cast or stamped into the feeder at a location readily accessible after normal installation.

5.082 Data plates shall contain the following information:

5.0821 Manufacturer's or prime supplier's name and address

5.0822 Feeder model number and/or serial number

5.0823 Maximum operating pressure rating (psig)

5.0824 Maximum output rating

SECTION 6. OZONE UNITS

6.00 MINIMUM DOSAGE: For disinfection, clear ground waters require application of 0.5 - 1.5 ppm ozone at all points throughout the water disinfection chamber. Higher ozone concentrations are required for solving problems other than disinfection.

6.01 CONTACT TIME: Contact time in the mixing chamber shall be a minimum of 5 minutes.

6.02 OZONE GENERATOR: The ozone generator should be:

6.021 A cooled, self contained unit complete with air preparation unit

6.022 Protected by high voltage and high current overload shutoff devices

6.023 Constructed of ozone resistant materials such as glass, aluminum and stainless steel

- 6.03 START-STOP MECHANISM: A start-stop mechanism shall be provided that will control water flow and assure that such flow occurs only when the ozone generator is operating properly.
- 6.04 CLEANING: The unit shall be designed to permit cleaning of diffusers when necessary without disassembly of the unit.
- 6.05 FLOW CONTROL: An automatic flow control valve, accurate within the expected pressure range, shall be installed to limit flow to the maximum design flow of the treatment unit.
- 6.06 ALARM: An automatic audible alarm shall be installed to warn of malfunction or impending shutdown.
- 6.07 OPERATION AND INSTALLATION INSTRUCTIONS: Drawings and parts lists for easy identification and ordering of replacement parts shall be furnished with each unit. Also included shall be:
 - 6.071 A statement of manufacturer's guarantee
 - 6.072 Instructions for proper size selection and installation
 - 6.073 Operation and maintenance instructions
- 6.08 DATA PLATE: A data plate shall be provided.
 - 6.081 Data plates shall be of a permanent nature, so inscribed as to be easily read and understood, and securely attached, cast or stamped into the unit at a location readily accessible after normal installation.
 - 6.082 Data plates shall contain the following information:
 - 6.0821 Manufacturer's or prime supplier's name and address
 - 6.0822 Unit model number and/or serial number

6.0823 Maximum operation pressure rating
(psig)

6.0824 Maximum water flow

6.09 MATERIALS: The materials of construction shall not impart toxic substances into the water, either as a result of the presence of toxic constituents in construction materials or as a result of physical or chemical changes resulting from exposure to ozone.

6.10 SAFETY: The unit shall be designed to protect the operator against electrical shock. As with any potable water treatment process, due consideration must be given to reliability, economics and competent operation of the disinfection process and related equipment, including:

6.101 Design of system so no ozone is vented to atmosphere

6.102 Installation of the unit in a protected enclosure not subject to extremes of temperature which could cause malfunction

APPENDIX A

Participating Committees

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