CERTIFICATE

By Authority Of
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: ASSE 1001: Performance Requirements for Pipe Applied Atmospheric Type Vacuum Breakers

CFR Section(s): 24 CFR 3280.604(b)(2)

Standards Body: American Society of Sanitary Engineering

APPROVED

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

A.S.S.E. Standard No. 1001
Issued: May, 1966
Revised: Oct., 1970
ANSI No. A112.1.1-1971
Revised: July, 1980
ANSI Approved 1990

Performance Requirements for

PIPE APPLIED ATMOSPHERIC TYPE VACUUM BREAKERS

· Sponsored by: American Society of Sanitary Engineering

AMERICAN SOCIETY OF SANITARY ENGINEERING
P.O. Box 40362 - Bay Village, OH 44140
Phone: 216-835-3040 - FAX: 216-835-3488

General Information

Neither this standard, nor any portion thereof, may be reproduced without the written consent of the American Society of Sanitary Engineering.

Although this standard may be used as a benchmark for in-house product evaluation, no product may be said to be A.S.S.E. approved unless the manufacturer has applied to the A.S.S.E., has had his product tested by an official A.S.S.E. recognized independent laboratory, according to the applicable A.S.S.E. Standard, and when the product has passed the test, displays the A.S.S.E. Seal on the product. Instructions for receiving the authorization to display the Seal are available from the A.S.S.E. Central Office.

It is recommended that all devices designed for plumbing systems, especially those which pertain to public health and safety, should be installed consistant with local codes by qualified and trained professionals.

Foreword

Standards for the components of Plumbing Systems are considered by the American Society of Sanitary Engineering (A.S.S.E.) to be of prime importance in the development of improved plumbing systems and for the increased protection of public health and safety.

To accomplish this the A.S.S.E. is encouraging manufacturers to cooperate with its Standards Committee to develop and revise standards for performance and testing procedures for their products that will have the endorsement of the manufacturers and still be acceptable by the Society.

Realizing the need for a uniform Standard and Test Procedure that manufacturers and laboratory personnel could follow to test and evaluate the performance of anti-siphon vacuum breakers, the A.S.S.E in 1958 formed a committee consisting of the Directors and personnel of the plumbing testing laboratories of Chicago, Detroit and Los Angeles, as well as a representative of the Bureau of Water Register of the New York City Department of Water Supply, to develop such a standard. Through the Standards Committee, with the cooperation of interested manufacturers, there was developed the following Standard of Performance Requirements and Test Methods for Pipe-Applied, Atmospheric Type, Anti-Syphon Devices (hereinafter referred to as vacuum breakers) for installation in potable water supply systems.

At the 1962 Annual Meeting of the Society held in Little Rock, Arkansas, the work of the committee culminated in the acceptance of this standard and assigned the official number 1001. Since that time, Standard 1001 has been revised in 1970, 1980, and 1988.

Although many of the material specifications are detailed within Section 1.4 of this Standard, it is the responsibility of the manufacturer to comply with the requirements of the Safe Drinking Water Act, United States Public Law 93-523.

If there are comments or suggestions regarding Standard 1001, please submit them to Dr. Stuart F. Asay, P.E.,Ph.D., A.S.S.E. Standards Coordinator, 11166 N. Huron, Unit 29, Northglenn, CO 80234. (303) 451-0978, FAX (303) 452-9776.

1988 - A.S.S.E. Standards Committee Members

Stuart F. Asay, P.E., Ph.D.
A.S.S.E. Standards Coordinator
Northglenn, Colorado

Robert C. Smith, P.E.
Standards Committee Chairman
Tulsa, Oklahoma

Joe Adam
Washington, DC

Julius Ballanco, P.E.
Country Club Hills, Illinois

Sid Cavanaugh
Alta Loma, California

William Gallagher
Pittsburgh, Pennsylvania

Patrick J. Higgins
Frederick, Maryland

Sterling Neblett
Houston, Texas

Morris Weinberg, P.E.
Atlantic City, New Jersey

Working group members for the revision of the ASSE backflow prevention device standards.

Stuart F. Asay, P.E., Ph.D.,Chair
A.S.S.E. Standards Coordinator
Northglenn, Colorado

Rand H. Ackroyd
Watts Regulator Company
North Andover, Massachusetts

Ted Beyke
Honeywell
Scarborough, Ontario, Canada

Dick Breneman
Woodford Mfg. Co.
Colorado Springs, Colorado

Bernie Clarke
Backflow Prevention Device Tester
Valencia, California

William Dunmire
FEBCO
Fresno, California

Les Engelmann
Ames Company, Inc.
Woodland Park, California

Leo Fleury
Grinnell Corporation
Cranston, Rhode Island

Tom Konen, P.E.
Stevens Institute of Technology
Hoboken, New Jersey

Richard G. Myers
Ford Meter Box Co.
Wabash, Indiana

Brad L. Noll
Wilkins Regulator Co.
Paso Robles, California

Bob Purzycki
Backflow Apparatus & Valve Co.
Gardena, California

Robert E. Sands
Mueller Company
Decatur, Illinois

George H. Swenson
Conbraco Industries, Inc.
Matthews, North Carolina

PIPE APPLIED ATMOSPHERIC TYPE VACUUM BREAKERS

INDEX

SECTION I

SECTION II

SECTION III

LIST OF TABLES AND ILLUSTRATIONS

PIPE APPLIED ATMOSPHERIC TYPE VACUUM BREAKERS

SECTION I

1.1 GENERAL - CONSTRUCTION

1.1.1 Class of Devices

Vacuum breakers, other than air gaps, may be classified into two general types:

(1) Atmospheric type
(2) Pressure type (See A.S.S.E. Standard 1020.)

The design consists of a check valve member and an air vent that is normally closed when the device is pressurized and open when the inlet pressure is atmospheric.

This standard applies only to those devices classified as "atmospheric-type" that are single pipe-applied and does not apply to tank ball cocks or similar devices that depend on float operated valves to control flow.

1.1.2 Sizes - Inlet and outlet pipe sizes one-quarter inch (1/4") to four inch (4").

1.1.3 Working Pressure - Devices shall be designed for a working pressure of at least 125 p.s.i. (862 kPa) but not less than 8 p.s.i. (55 kPa).

1.1.4 Temperature Range

(a) Cold Water Service: From 33 degrees Fahrenheit (0.55 degrees Celsius) up to 110 degrees Fahrenheit (43 degrees Celsius).

(b) Hot Water Service: From 33 degrees Fahrenheit (0.55 degrees Celsius) up to 180 degrees Fahrenheit (82.2 degrees Celsius) minimum.

1.2 Purpose - To prevent backflow or back-siphonage into a potable water distribution system when installed with the Critical Level point (as described later herein) at least 6 inches above the flood level rim of the receptacle served or greatest elevation of use, and when installed on the discharge side of the last control valve, and the backflow source is subject to no more than normal atmospheric pressure. This device shall not be subjected to more than twelve (12) hours of continuous water pressure.

1.3 Limitations on Design

1.3.1 Flow Capacity

1.3.1.1 The water passageway through the device shall be of sufficient size to deliver the required volume rate of water to any fixture or receptacle served.

1.3.1.3 Flowways shall be designed to reduce cavitation and to meet the pressure loss requirements of this standard.

1.3.1.4 Interior Finish - The interior of the device shall be reasonably smooth and free of burrs.

1.3.2 Air Port Shields - Air ports of vacuum breakers shall be shielded so as to minimize the probability of port fouling. Air port shields shall extend down the body of the device, over the air ports, to the lowest portion, of the air ports, and shall maintain a minimum 3/16" (4.8 mm) clearance between the inner lower edge of the shield and the lowest surface plane of the air ports.

1.3.3 Air Port Opening Area - The size and positioning of the air ports shall be effective in admitting a volume rate of air flow through the air ports into the discharge outlet of the device equal to or greater than the volume rate of air flow obtainable through the inlet water passageway of the device into the discharge outlet under conditions of equal vacuum applications.

1.3.4 Structural strength

1.3.4.1 All parts of the device shall be designed to withstand without permanent distortion, the stresses developed by the specified hydrostatic test pressure, as well as the stresses resulting from a specified water working pressure coincident with operation under a specified unbalanced pressure condition.

1.3.4.2 Design and construction shall be such that in normal handling in transit and during installation, the device will not be damaged in any way which will prevent it from functioning as required.

1.3.5 Mechanical Function

The air vent must be in the fully open position when the valve is at atmospheric pressure.

1.3.5.1 Durability

(a) It is essential that devices be as trouble free as sound engineering design can achieve.

(b) A reasonable planned life expectancy of the vacuum breaker and its parts shall be incorporated in the design.

1.3.5.2 All moving parts shall be designed to operate up to the rated flow without objectionable chatter or vibration.

1.3.5.3 The operation of the device shall not cause water hammer.

1.3.5.4 The design shall be such that the performance of the device will not be adversely affected by normal line pressure surges.

1.3.5.5 The air vent must not permit water leakage when the device is pressurized from atmospheric pressure beyond the amount of leakage which can be contained by design in the vent area without being visible as an external leak.

1.3.5.6 Moving part clearances shall be such as to minimize the probability of immobilization in ordinary field use.

1.3.5.7 The device shall not permit a water rise of more than 3 inches (76 mm) in a tube connected to the outlet end of the vacuum breaker even when the check member is held off its seat (as required in Section 2.7) during varied vacuum applications ranging from 0 to 25 inches (0-84.5 kPa) of mercury (corrected for sea level pressure).

1.3.5.8 Leakage. All joints shall be watertight where subject to water pressure.

1.3.5.9 Misassembling. The design shall be such that the parts cannot be easily misassembled.

1.3.5.10 Female pipe threaded connections shall be so constructed that it will not be possible to run a pipe into them far enough to restrict the flow through the device or interfere with working parts.

1.4 Materials

1.4.1 Reference to ANSI[1] and ASTM[2] Standards mean the latest edition.

1 American National Standards Institute, 1430 Broadway, New York, NY 10018. (212) 354-3300
2 American Society for Testing and Materials, 1916 Race Street, Philadelphia, PA 19103. (215) 229-5400

1.4.2 Toxic Materials

1.4.2.1 Materials which could contaminate the water and make it injurious to persons consuming it shall not be used in the device where the material would be in contact with the water.

1.4.2.2 All elastomers and polymers coming in contact with the water shall have characteristics that shall comply with the United States Code of Federal Regulations (CFR), Title 21, 177.2600, or shall be certified as non-toxic by an approved independent laboratory.

1.4.3 Dissimilar Metals - Diversity of metals in the construction of devices used in water pipe lines is conducive to galvanic corrosion. Where different materials are used, this action can be substantially reduced by selecting materials which are close to each other in the electromotive scale. The use of insulation may also be employed. Both expedients shall be employed to the fullest practical extent.

1.4.5 Bodies and internal parts shall be of material having a corrosion resistance at least equal to a non-ferrous alloy of not less than fifty-eight per cent (58%) copper.

1.4.6 Valve discs, seat facings or other non-metallic parts shall be designed for continuous exposure to water at the maximum rated operating temperature of the device without change in physical characteristics which would prevent full compliance with all requirements of the standard.

1.4.7 Metal to metal seating of relief means venting to atmosphere is not acceptable. Either seat, valve disc or both shall be of non-metallic materials which will assure pressure tight seating and reseating.

1.4.8 Pipe Threads

1.4.8.1 Taper pipe threads except dryseal shall be in compliance with Standard ANSI /ASME3 B1.20.1.

1.4.8.2 Dryseal shall comply with the Standard ANSI ASME B1.20.3.

1.4.8.2 Dryseal shall comply with Standard ANSI B2.2.

1.4.8.3 Other types of connections shall conform to appropriate standards.

1.5 Instructions for Marking and Installation

1.5.1 Marking of Devices

1.5.1.1 Each device shall have the following information marked on it where it will be visible after the device has been installed.

(a) Name of manufacturer or trademark
(b) Model number of the device
*(c) Maximum rated working pressure
*(d) Maximum water temperature for which device is designed
(e) Nominal valve size
(f) The direction of water flow through the device

* May be omitted on 1/4" and 3/8" sizes.

1.5.1.2 The markings shall be either cast, etched, stamped or engraved on the body of the device or on a brass or stainless steel plate securely attached to the device with a corrosion resistant material.

3 American Society of Mechanical Engineers, United Engineering Center, 345 E. 47th Street, New York, NY 10017. (212) 705-7722

1.5.2 Installation Instructions

1.5.2.1 Complete instructions for installation of the device must be packaged with the device. Drawings or schematic sketches which would be useful to the installer shall be part of these instructions. These instructions must provide all information necessary to enable correct installation. The instructions shall describe or show by drawings the correct installed position.

1.5.2.2 Where the device is a separate unit, in the absence of a Critical Installation Level (CIL) mark, the extreme bottom of the body casting shall be used to determine its installed position. Where the device is incorporated in an outlet tube furnished by the manufacturer, the extreme bottom of the internal unit shall be noted on the outside of the tube by a CIL line, for use in determining its installed position.

1.5.2.3 For all devices capable of being maintained or repaired in the field, complete detailed instructions shall be furnished.

1.5.2.4 Devices shall not be subjected to continuous pressure for more than twelve (12) hours. This requirement shall be included in the installation instructions.

1.5.3 Installation Recommendations

1.5.3.1 The device shall not be installed in a concealed or inaccessible location, nor where the venting water from the device during its normal functioning may be deemed objectionable.

SECTION II

2.0 CRITERIA AND PROCEDURES FOR EVALUATION

2.1 Drawings - Assembly drawings and other data which are needed to enable a testing agency to determine compliance with this standard, together with installation drawings, shall accompany devices when submitted for examination and performance tests under this standard.

2.2 Laboratory Testing

2.2.1 Three (3) units shall be submitted by the manufacturer of each size and model. All tests shall be run in order listed on one (1) device.

2.2.2 The testing agency shall select one of each type or model and size for full test. If the first valve should fail any test, a second valve shall be tested. Failure of both devices shall be cause for rejection of that type or model and size until the manufacturer has corrected the fault and submitted new devices for testing.

2.3 Noise - The device shall not produce and objectionable noises when subjected to any flow rate up to its maximum capacity, at any pressure up to its rated maximum, maintained at the inlet of the device.

2.3.1 Conditions of noise shall be observed during the tests prescribed in the standard and shall be reported.

2.4 Hydrostatic and Air Inlet Test of Complete Device

2.4.2 The device to be tested shall be mounted in its normal working position. A control valve shall be mounted in the outlet end of the device and a pressure tap shall be provided in the inlet opening. The inlet supply pipe shall be connected to a water supply line whose pressure can be raised to 125 p.s.i. (862 kPa) from the minimum working pressure. The pressure shall be raised to the rated pressure in 25 p.s.i. (172 kPA) increments and maintained for a period of not less than five (5) minutes.

2.4.3 Water shall be allowed to flow freely through the device. Then the control valve at the outlet end of the device shall be closed and the water pressure in the test assembly allowed to rise to twice the rated working pressure. This pressure shall be maintained for five minutes during which time the device shall be examined for evidence of any leaks or structural deformation.

2.4.4 Any leaks or indications of damage shall be cause for rejection of the device.

2.5 Deterioration at Extremes of Manufacturer's Temperature Range

2.5.1 When exposed to water at extremes of manufacturer's temperature range, any material, whose memory is essential to the continued functioning of the device, shall not be adversely affected.

2.5.2 Cold water devices shall be tested at 40 degrees Fahrenheit (4 degrees Celsius) and 110 degrees Fahrenheit (43.3 degrees Celsius). Hot water devices shall be tested at 180 degrees Fahrenheit (82 degrees Celsius) minimum or the manufacturer's maximum rated temperature, and 40 degrees Fahrenheit (4 degrees Celsius).

2.5.3 Install the device as in Figure 6 with a heater capable of maintaining required temperature, a reservoir located above the heater, and a pump capable of circulating water listed in Table 1, through device continuously. The reservoir shall be vented to atmosphere. A recirculated system may be used instead of the vented reservoir at the option of the Testing Laboratory. Water at the manufacturer's maximum rated temperature and pressure shall be circulated through the device for 8 hours per day for a total of 10 days (Total of 80 hours). Adequately insulate device and piping as required to maintain required temperature through the device. After each eight (8) hour test period, verify that the air vent returns to its fully opened position when the system pressure is reduced to atmosphere.

2.5.4 Run water maintained at 40 degrees Fahrenheit (4 degrees Celsius) through the device for at least one hour.

2.5.5 Any indication of change in physical characteristics of the materials which would prevent full compliance with all requirements of this Standard shall be cause for rejection of the device.

Table 1

Size of Device inches	Min. Hot Water Flow gpm	(l/s)
1/4	1	(0.06)
3/8	2	(0.13)
1/2	5	(0.32)
3/4	7	(0.44)
1	8	(0.50)
1 1/4	9	(0.57)
1 1/2	10	(0.63)
2	15	(0.95)
2 1/2	25	(1.58)
3	30	(1.89)
4	35	(2.20)

2.6 Allowable Pressure Loss at Rated Flow

2.6.1 The required rated water flow shall be obtained at or below maximum allowable pressure loss shown in Table 2.

2.6.2 The test system shall be equipped with means for accurately measuring the rate of flow through the device and indicating or recording pressures. Pressure gauges shall be located approximately 5 pipe diameters upstream and 10 downstream of the device. The supply system shall be capable of supplying a volume of cold water adequate to meet the maximum flow requirements of the device on test while sustaining a steady inlet pressure of not less than 25 p.s.i.. Repeat at the rated working pressure of the device.

2.6.3 Purge the air from the system and then close the discharge valve. Open the supply valve fully and gradually open the discharge valve until the minimum required rate of flow is reached or the maximum allowable pressure loss is obtained and record the data observed. Adjust for pressure loss in the piping between the gauges and the device on test.

2.6.4 Failure to achieve the minimum allowable pressure loss shall be cause for rejection of the device.

Table 2

Maximum Allowable Pressure Loss Across the Device at Required Rated Water Flow

Size of Device inches	Rated Flow gpm	(l/s)	Maximum Allowable Pressure Loss p.s.i.	(kPa)
1/4	3	(0.19)	10	(69)
3/8	6	(0.38)	10	(69)
1/2	10	(0.63)	10	(69)
3/4	17	(1.07)	10	(69)
1	28	(1.77)	10	(69)
1 1/4	45	(2.84)	10	(69)
1 1/2	65	(4.10)	10	(69)
2	100	(6.31)	10	(69)
2 1/2	160	(10.10)	10	(69)
3	240	(15.14)	10	(69)
4	400	(25.24)	10	(69)

2.7 Air Port Shields

2.7.1 Air port shields shall be examined to determine if they extend down to the bottom of the lowest air port opening.

2.7.2 Clearances between the shield and the body of the device shall be measured to determine if an unobstructed 3/16" (4.8 mm) air passageway is maintained.

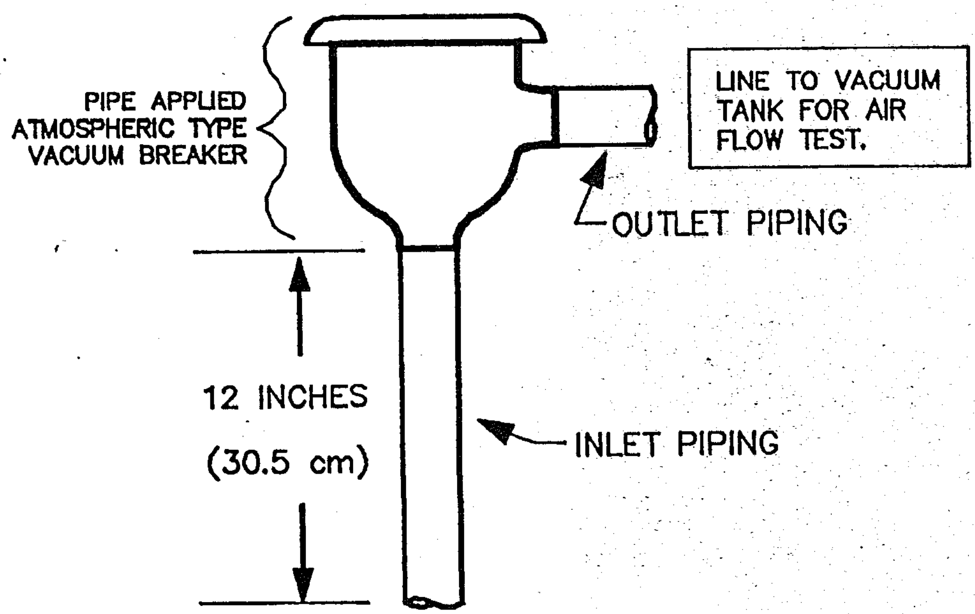
2.7.3 Failure to meet either of these criteria shall be cause for rejection of the device.

2.8 Air Flow Test

2.8.1 The device shall be subjected to tests to compare the effective throughway area from its water inlet to outlet in relation to its available internal air relief area. Tests shall be conducted as follows:

2.8.2 Install the device in the normal operating position with the check or moving member held fully open and the air valve held closed. Connect the discharge outlet of the device by means of a 12" (30.5 cm) length of reamed corresponding size piping to an adequately sized vacuum tank capable of providing at least a 10 second air flow, and with the inlet open and a 12" (30.5 cm) reamed nipple of corresponding size threaded into the inlet (Figure 1) dissipate the vacuum in the tank from 25 inchesto 5 inches (84.5 to 17 kPa) of mercury through the check valve orifice by operating a quick opening valve, timing the operation. See Figure 1 and Figure 5.

FIGURE 1



2.8.3 With the discharge outlet still connected to the vacuum tank and the inlet check held in a closed position, hold the air valve open and dissipate the vacuum in the tank from 25 inchesto 5 inches (845 to 17 kPa) of mercury in the same manner through the air port or ports, timing the operation.

2.8.4 The time for Section 2.8.3 shall be equal to or less than Section 2.8.2 based on the average result of not less than three test runs, indicating that the opening(s) to atmosphere is (are) equal to or greater than the effective waterway through the device.

2.8.5 Failure to meet the requirements of Section 2.8.4 shall be cause for rejection of the device.

2.9 Water Rise Test

2.9.1 The device shall be subjected to tests to determine the internal reverse flow leakage should the check(s) or moving member(s) or its seat become scored or fouled with a foreign substance on the seating area. The test apparatus shall conform to that shown in Figure 5.

2.9.2 To foul the check(s) or moving member(s) of the device, a wire shall be applied to the seat. Wire sizes shall be a minimum of the size indicated in Table 3.

2.9.3 Test wires shall be furnished by the manufacturer, shaped or formed to fit the contour of the seat or tube. The shaped test wires submitted must be in conformance with Table 3. NOTE: Fouling wires may or may not cause leakage.

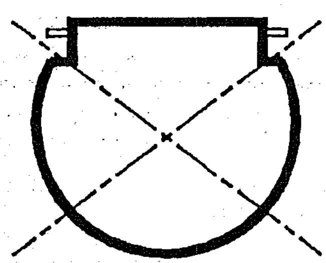
Table 3

Wire Sized for Fouling Check Member

Size of Vacuum Breaker	Test Wire Size Required	
inches	inches	(mm)
1/8	0.032	(0.81)
1/4	0.032	(0.81)
3/8	0.032	(0.81)
1/2	0.032	(0.81)
3/4	0.040	(1.00)
1	0.048	(1.22)
1-1/4	0.056	(1.42)
1-1/2	0.064	(1.63)
2	0.080	(2.03)
2-1/2	0.096	(2.44)
3	0.112	(2.85)
4	0.144	(3.66)

2.9.4 This wire shall be placed in the lower quadrant of a suspended check(s) opposite the hinge(s) or point(s) of suspension. (See Figure 2). When testing a device in which the check member(s) is (are) not hinged, but it moves vertically, the wire or spacer shall be placed a a single point of suspension on the seating area, on center line in the direction of the outlet port, as illustrated (See Figure 3 & Figure 4). Devices having other types of moving parts shall have said parts spaced or defaced to accomplish the intent of this section.

FIGURE 2



TEST WIRE TO BE PLACED
ACROSS THE SEAT AT THIS POINT

FIGURE 3

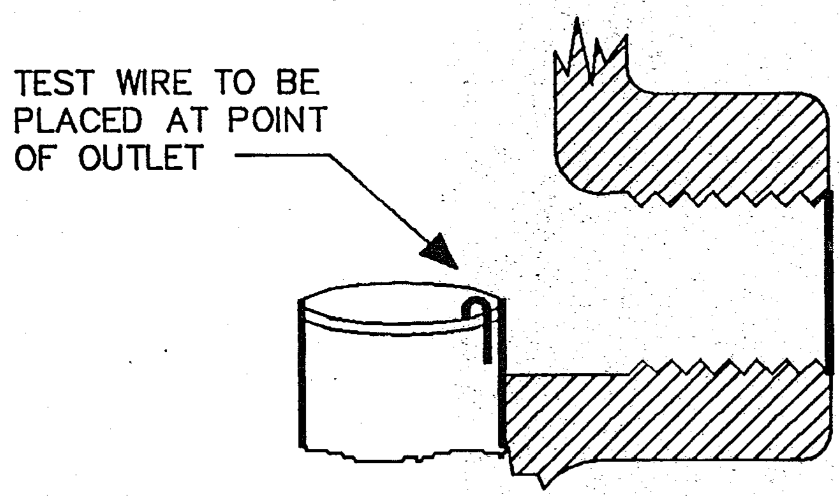
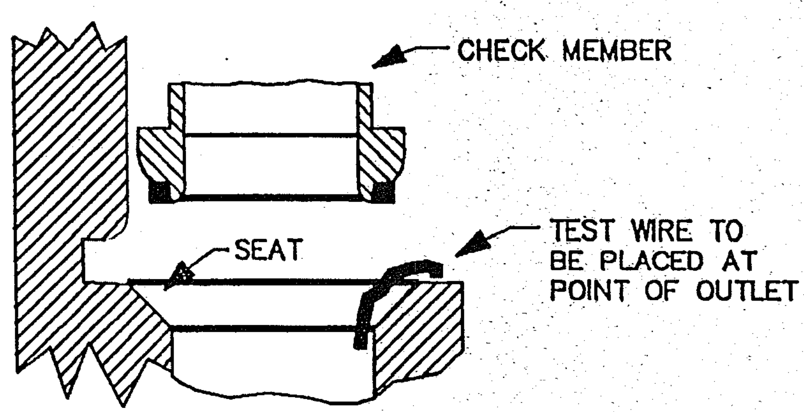


FIGURE 4

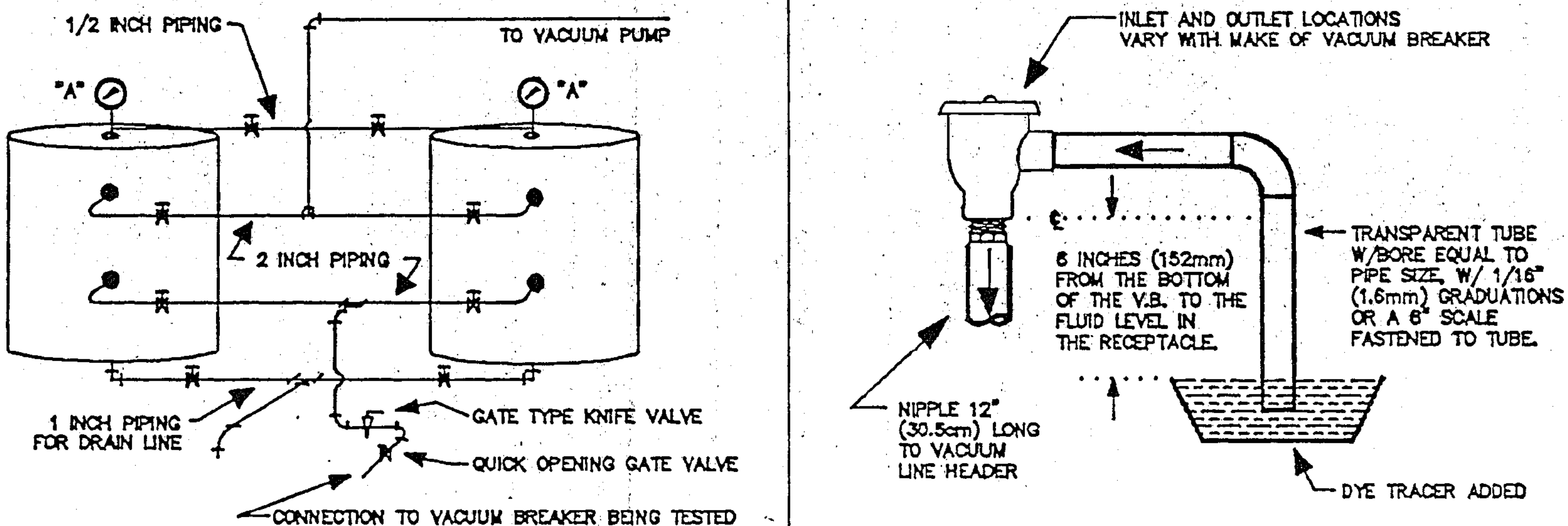


VACUUM TANK HOOK-UP TO TEST 1/4" TO 2" SIZE VACUUM BREAKERS

RELATED PIPING MUST BE ENLARGED AND AN ADDITIONAL TANK ADDED FOR LARGER SIZE VACUUM BREAKERS WHEN NECESSARY

TANKS ARE 500 GAL. (1893 l) CAPACITY EACH

"A" – VACUUM GAUGE AND MERCURY SWITCH CONTROL



12 INCH (30.5cm) NIPPLE AT VACUUM BREAKER CONNECTION MAY BE REDUCED IN SIZE TO CORRESPOND WITH THE VACUUM BREAKER UNIT BEING TESTED.

NOTE:
THE 2 INCH LINE CONNECTING THE TANK HEADER SHALL NOT EXCEED 10 FEET (3m) IN LENGTH TO THE 12 INCH (30.5cm) LONG NIPPLE TAKE-OFF TO THE VACUUM BREAKER BEING TESTED.

TANK CAPACITY SHOULD BE ADEQUATE TO PROVIDE AT LEAST A 10 SECOND FLOW THROUGH THE DEVICE DURING THE AIR FLOW TEST.

FIGURE 5

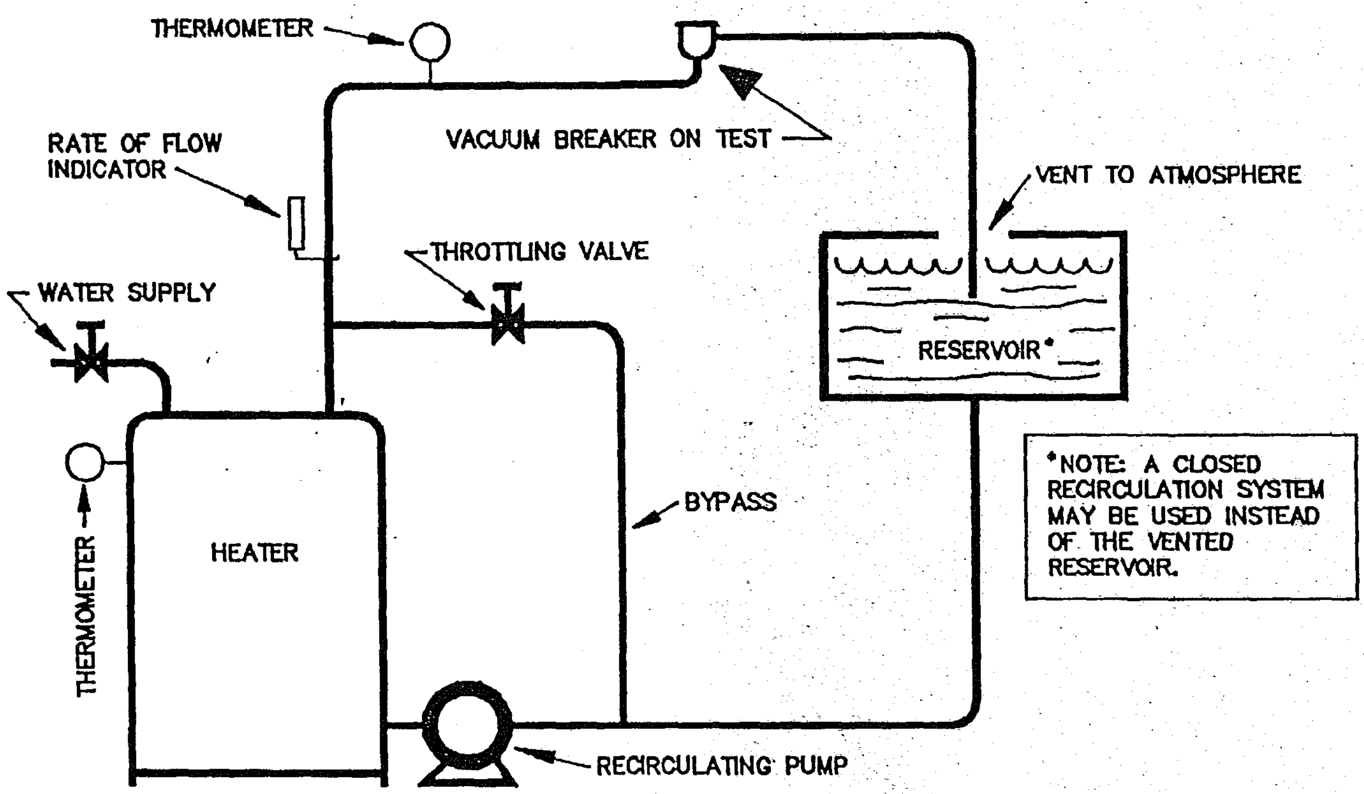


FIGURE 6

2.9.5 The device shall be installed in its normal position; The check(s) member(s) shall be fouled with the proper size wire or spacer in the proper position or by defacement depending on the type of check member(s) and the inlet of the device connected to a vacuum line. A transparent "sight" tube shall be connected to the outlet of the device and the lower end of such tube submerged in water to within 6 inches (152 mm) of the bottom or CIL point of the device.

2.9.6 The device shall then be subjected to tests, as described below involving (a) sustained vacuum, (b) intermittent vacuum, (c) effects of instantaneously applied vacuum, and (d) gradually increasing and decreasing vacuums to establish creep.

2.9.7 The following tests shall be repeated to obtain five successive measurements under each set of conditions:

(a) Instantly apply a constant vacuum of at least 25 inches (84.5 kPa) of mercury for a period of at least 30 seconds.

(b) Apply intermittent vacuums of 2, 5, 10, 15, and 25 inches of mercury (7, 17, 34, 51, and 84.5 kPa). Each application shall be for 5 seconds on and 5 seconds off.

(c) First, slowly apply a vacuum increasing at a uniform rate from 0 inches to 25 inches (0-84.5 kPa) of mercury. Second, slowly apply a vacuum decreasing at a uniform rate from 25 inches to 0 inches of mercury (84.5-0 kPa).

Note: In tests (a) through (c) vacuum levels are sea-level values; at high altitudes, appropriate corrections shall be made so as to produce the same vacuum in terms of fractional parts of an atmosphere at the higher altitude.

2.9.8 Observe the elevation to which the water surface rises in the transparent tube beneath the vacuum breaker in each test described in Section 2.9.7. If the water rise exceeds 3 inches (76 mm) in any one of the observations, it shall be cause for rejection of the device.

SECTION III

3.0 Definitions

Definitions not found in this Section may be located in the Plumbing Dictionary, Third Edition published by the A.S.S.E.

Air Gap - The air gap in a water supply system is the unobstructed vertical distance through the free atmosphere between the lowest opening from any pipe or faucet supplying water to a tank or plumbing fixture and the flood level rim of the receptacle.

Air Inlet - The air inlet of a vacuum breaker is an opening or series of openings through the body of the device from the free atmosphere to the liquid passageway of the device.

Atmospheric Vacuum Breaker - AVB - The term (also know as the non-pressure type vacuum breaker) shall mean an assembly containing a float-check, a check seat and an air inlet port. The flow of water into the body causes the float to close the air inlet port. When the flow of water stops the float falls and forms a check valve against backsiphonage and at the same time opens the air inlet port to allow air to enter and satisfy the vacuum. A shut-off valve immediately upstream may be an integral part of the assembly. An atmospheric vacuum breaker is designed to protect against a health hazard (i.e. contaminant) under a backsiphonage condition only. See A.S.S.E. Standard 1001.

Backflow - 1. A term which denotes the reversal of flow from that normally intended. 2. the flow of water or other liquids, mixtures, or substances into the distributing pipes of a potable supply of water from any source or sources other than its intended source. Back-Siphonage is one type of backflow.

Backflow Preventer - Device or means to prevent backflow.

Back Pressure - 1. A reverse pressure greater than that in the intended normal direction and/or pressure of flow or thrust. 2. Air pressure in drainage pipes greater than atmospheric pressure.

Back Siphonage - 1. The application of a simple siphon to cause reverse flow of gravity. 2. an escape of liquid by virtue of the physics of a simple siphon. 3. Air pressure in plumbing pipes that is less than atmospheric pressure. 4. The flowing back of used, contaminated, or polluted water from a plumbing fixture or vessel or other source into a negative pressure in such pipe.

Contamination - The introduction into water of microorganisms, chemicals, wastes, or wastewater in a concentration that makes the water unfit for its intended use.

Contaminant - Any material (solid or liquid or gas) which if introduced into a potable water supply, would cause it to be unfit for human or animal consumption.

Control Valve - A discharge valve.

Critical Installation Level - (Critical Level) - Refers to a designated operational limitation prescribing a safe height for the installed vacuum breaker above the flood level rim of the fixture or receptacle served. In the absence of a physical mark on the device, indicating a height measurement reference point, the extreme bottom of the device shall be considered this height reference point.

Cross Connection - A physical connection or arrangement between two otherwise separate (piping) systems, one of which contains potable water and the other water of questionable or unknown safety: as, steam, gas, or chemicals. There may be a flow from one system to the other, the direction of flow depending on the pressure differential between the two systems.

Double Check Valve Assembly - DCVA - The term shall mean an assembly composed of two independently acting, approved check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with properly located test cocks. This assembly shall only be used to protect against a non-health hazard (i.e. pollutant). See A.S.S.E. Standard 1015

Dual Check Valve - These devices consist of two independently acting check valves, internally force loaded to a normally closed position, and designed and constructed to operate under intermittent or continuous pressure conditions. The purpose of this backflow preventer is to keep polluted water from flowing back into the potable water system when something in the system causes the pressure to be temporarily higher in the polluted part of the system than in the potable water piping. The Dual Check Valve is considered suitable for use only where there is no health hazard involved.

Flood Level Rim - The edge of the receptacle from which water overflows.

Hose Bibb Backflow Preventers - Are designed to be installed on the discharge side of the hose bibb or sill cock. The design embraces a check valve member force loaded, or biased, to a closed position, and an atmospheric vent valve, or means, force loaded, or biased, to an open position when the device is not under pressure. This device shall be used on systems where additional sources of pressure may not be introduced. For the protection of the potable water supply against pollution by contaminants which can otherwise be caused to enter the system by back-siphonage and low head back pressure backflow through the hose threaded outlets. See A.S.S.E. Standards 1011 and 1019.

Independently-Acting Check Valve - An independent check shall share no common parts except for body housing. There can be no contact between any moving components of either check valve through its normal operation. The total failure of either check valve in any mode can in no way effect the operation of the other check valve.

Memory - (As applied to non-metallic material) Ability to retain original physical characteristics despite being subjected to extremes of temperature.

Potable Water - 1. Water which is suitable for drinking, culinary, and personal purposes. 2. Water free from impurities present in amounts sufficient to cause disease or harmful physiological effects. Quality is normally controlled by public health regulations.

Pollution - 1. Specific impairment of water quality by agricultural, domestic, or industrial wastes (including thermal and atomic wastes), to a degree that has an adverse effect upon any beneficial use of water. 2. The addition to a natural body of water of any material which diminishes the optimal economical use of the water body by the population which it serves, and has an adverse effect on the surrounding environment.

Ports, Vent - Openings from the inside of the device/assembly to the outside for allowing air to enter the device/assembly under back-siphonage conditions, or water to drain from the device/assembly under back-pressure backflow conditions.

Pressure Vacuum Breaker Assembly - PVB - The term shall mean an assembly containing an independently operating loaded check valve and an independently operating loaded air inlet valve located on the discharge side of the check valve. The assembly is to be equipped with properly located test cocks and tightly closing shut-off valves located at each end of the assembly. This assembly is designed to protect against a health hazard (i.e. contaminant) under a backsiphonage condition only. See A.S.S.E. Standard 1020.

Pressure, Working - The pressure at which the water supply system nominally operates. It is a lower pressure than the setting of pressure relieving devices in the system in order to prevent their frequent openings. Such safety devices are set at the maximum allowable working pressure. In the same context, a hydrostatic test pressure for the system could be stated to be twice the working pressure whereas the destruction test pressure might be three to five times the working pressure, depending on design considerations.

Rate of Flow - The rate of flow of water, silt, or other mobile substance which emerges from an opening, pump, or turbine or passes along a conduit or channel, usually expressed as cubic feet per second, cubic meters per second, gallons per minute, or million gallons per day.

Reduced Pressure Principle Backflow Prevention Assembly - RP - There term shall mean an assembly containing two independently acting approved check valves together with a hydraulically operating, mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The unit shall include properly located testcocks and tightly closing shut-off valves at each end of the assembly. This assembly is designed to protect against a health hazard (i.e. contaminant). See A.S.S.E. Standard 1013.

Shall - The term, when used in a plumbing code, has mandatory meaning. Compare "May" which is permissive rather than mandatory.

Should - Where used, indicates a feature or requirement which is desirable but not mandatory.

Toxic - Not fit for human consumption. Associated with leaching. Poisonous.