ASME A112.19.17-2010

(Revision of ASME A112.19.17-2002)

REAFFIRMED 2023

Manufactured Safety Vacuum Release Systems (SVRS) for Residential and Commercial Swimming Pool, Spa, Hot Tub, and Wading Pool Suction Systems

AN AMERICAN NATIONAL STANDARD

ASME
SETTING THE STANDARD

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Date of Issuance: June 30, 2010

This Standard will be revised when the Society approves the issuance of a new edition. There will be no addenda issued to this edition.

ASME issues written replies to inquiries concerning interpretations of technical aspects of this Standard. Periodically certain actions of the ASME A112 Committee may be published as Cases. Cases and interpretations are published on the ASME Web site under the Committee Pages at http://cstools.asme.org as they are issued.

The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990

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FOREWORD

This Standard establishes requirements for manufactured Safety Vacuum Release System (SVRS) devices, for installation in residential and commercial swimming pool, spa, hot tub, and/or wading pool suction systems. It is intended to serve as a guide for producers, distributors, architects, code officials, contractors, installers, and end users; to promote understanding regarding materials, manufacture, installation and performance, and to provide a means for identifying devices complying with this Standard.

The U.S. Consumer Product Safety Commission (CPSC) is aware of 138 cases of swimming pool and spa suction outlet entrapments, including 35 confirmed deaths, between January 1985 and 2001. CPSC reports that some of the deaths were the result of drowning after the body, or a limb, was held against the suction outlet by the suction of the circulation pump. Of the 35 deaths, CPSC reports that 15 deaths were due to hair entrapment, 15 due to body entrapment, and five deaths due to entrapment of an unknown type.

These incidents typically involved older children (8 yr to 16 yr of age) with an average age of about 10 yr. In some cases, it appeared that the child was playing with the open suction outlet, inserted a hand or foot into the pipe, and then became trapped by the resulting suction. There are potentially many different circumstances of design and maintenance that can produce the conditions for this hazard. Body entrapment cases can occur in either pools or spas. Experience suggests that any open suction outlet, or any flat grating that a body or limb can cover completely, coupled with a plumbing layout that allows sufficient buildup of suction if the suction outlet is blocked, can produce the conditions that result in body entrapment.

The products covered under this Standard may generally be divided into three types of products.

(a) Nonelectric SVRS Devices. Available data suggests that a (SVRS) Nonelectric Device may effectively eliminate body entrapments. A child playing in the immediate vicinity of an SVRS Nonelectric Device-protected suction outlet will cause the device to activate upon sealing off the suction outlet fitting. The device is intended to eliminate the high vacuum forces at the protected suction outlet, by venting air into the suction system and breaking the circulating pump suction, thereby avoiding body entrapment.

(b) Electrical Intervention SVRS Devices. An SVRS electrical device typically includes a monitor or switch that responds to a sudden rise in pump suction vacuum by turning off the pump, and/or opening an electrically operated atmospheric vent valve.

(c) Vent Tube SVRS Devices. A vent tube is connected to the main suction outlet line between the suction outlet and the pump and would be open to atmosphere. The laws of physics require the vent tube to fill with water to a level equal to that of the pool at a static condition. Should the suction outlet become clogged or obstructed, the pump would then draw the water from the vent until air is introduced into the system and the suction is thereby broken.

Some States require and others are considering emergency pump cut-off switches located in view of the pool or spa. At the present time these switches are generally located in the electric equipment room, and are in the line of sight of the apparatus as opposed to the line of sight of the pool or spa. This form of manual entrapment avoidance does not provide protection for persons swimming alone and it is not covered by this Standard.

This Standard establishes a safe “reaction time limit” for these devices as well as set forth material and performance requirements that provide reasonable safety measures against bather entrapment when these devices are installed as a component of a pool circulation system.

The responsibility for verification of the device’s performance on any circulation system is the responsibility of the registered design professional.

WARNING: Due to the lack of physiological data, it cannot be concluded that a device of this type referred to hereafter as a Safety Vacuum Release System (SVRS) will eliminate the potential for disembowelment.

This revision is intended to allow more uniform testing results and provide more realistic testing requirements.

Suggestions for improvement of this Standard are welcome. They should be sent to

The American Society of Mechanical Engineers
Standardization and Testing Department
Secretary, A112 Standards Committee
Three Park Avenue
New York, NY 10016-5990

This revision was approved as an American National Standard on April 13, 2010.

ASME A112 COMMITTEE
Standardization of Plumbing Materials and Equipment

(The following is the roster of the Committee at the time of approval of this Standard.)

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General. ASME Standards are developed and maintained with the intent to represent the consensus of concerned interests. As such, users of this Standard may interact with the Committee by requesting interpretations, proposing revisions, and attending Committee meetings. Correspondence should be addressed to:

Secretary, A112 Standards Committee
The American Society of Mechanical Engineers
Three Park Avenue
New York, NY 10016-5990
http://go.asme.org/Inquiry

Proposing Revisions. Revisions are made periodically to the Standard to incorporate changes that appear necessary or desirable, as demonstrated by the experience gained from the application of the Standard. Approved revisions will be published periodically.

The Committee welcomes proposals for revisions to this Standard. Such proposals should be as specific as possible, citing the edition, the paragraph number(s), the proposed wording, and a detailed description of the reasons for the proposal, including any pertinent documentation. When appropriate, proposals should be submitted using the A112 Project Initiation Request Form.

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Requests for Cases shall provide a Statement of Need and Background Information. The request should identify the standard, the paragraph, figure or table number(s), and be written as a Question and Reply in the same format as existing Cases. Requests for Cases should also indicate the applicable edition(s) of the standard to which the proposed Case applies.

Interpretations. Upon request, the A112 Committee will render an interpretation of any requirement of the Standard. Interpretations can only be rendered in response to a written request sent to the Secretary of the A112 Standards Committee.

The request for interpretation should be clear and unambiguous. It is further recommended that the inquirer submit his/her request in the following format:

Subject: Cite the applicable paragraph number(s) and the topic of the inquiry.

Edition: Cite the applicable edition of the Standard for which the interpretation is being requested.

Question: Phrase the question as a request for an interpretation of a specific requirement suitable for general understanding and use, not as a request for an approval of a proprietary design or situation. The inquirer may also include any plans or drawings that are necessary to explain the question; however, they should not contain proprietary names or information.

Requests that are not in this format will be rewritten in the appropriate format by the Committee prior to being answered, which may inadvertently change the intent of the original request.

ASME procedures provide for reconsideration of any interpretation when or if additional information that might affect an interpretation is available. Further, persons aggrieved by an interpretation may appeal to the cognizant ASME Committee or Subcommittee. ASME does not "approve," "certify," "rate," or "endorse" any item, construction, proprietary device, or activity.

Attending Committee Meetings. The A112 Standards Committee schedules meetings as needed, which are open to the public. Persons wishing to attend any meeting should contact the Secretary of the A112 Standards Committee. The A112 home page contains information on future meeting dates and locations.

1 GENERAL

1.1 Scope

This Standard establishes general requirements, dimensions and tolerances, materials, installation instructions, testing requirements, and markings and identification for SVRS devices. SVRS devices are intended to be utilized on pool, spa, hot tub, and/or therapy unit suction systems. SVRS devices covered under this Standard are designed to relieve high vacuum occurrences that cause human body or body part suction entrapment.

Demonstration of compliance with this Standard is merely an indication that the product meets the performance requirements and specifications contained in this Standard.

The provisions of this Standard are not intended to prevent the use of any alternative material or method of construction, provided any such alternative meets the intent and requirements of this Standard.

1.2 Units of Measurement

Values are stated in U.S. Customary units and in the International System of Units (SI). The U.S. Customary units shall be considered as the standard.

In this Standard, gallons (U.S. liquid) per minute is abbreviated as “gpm” and liters (metric liquid) per minute is abbreviated as “L/min”.

1.3 References

The following documents form a part of this Standard to the extent specified herein. Unless otherwise specified, the latest edition shall apply.

ASME A112.19.8b–2009, Suction Fittings for Use in Swimming Pools, Spas, Hot Tubs, and Whirlpool Bath Appliances.

ASME B1.20.1, Pipe Threads, General Purpose, Inch

Publisher: The American Society of Mechanical Engineers (ASME) Three Park Avenue, New York, NY 10016-5990; Order Department: 22 Law Drive, P.O. Box 2900 Fairfield, NJ 07007–2900, (www.asme.org)

ASTM D 2466, Poly (Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

ASTM D 2468, Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40

Publisher: American Society for Testing and Materials (ASTM International), 100 Barr Harbor Drive, P.O. Box C700, West Conshohocken, PA 19428-2959 (www.astm.org)

NSF-50, Suction System Components For Swimming Pools, Spas, Tubs, And Whirlpools

Publisher: National Science Foundation (NSF International), 789 North Dixboro Road, Ann Arbor, MI 48105 (www.nsf.gov)

UL 1081, Standard For Safety For Swimming Pool Pumps, Filters, and Chlorinators

Publisher: Underwriters Laboratories, Inc. (UL), 333 Pfingsten Road, Northbrook, IL 60062-2096 (www.ul.com)

1.4 Definitions

blocking element: the part used to simulate an entrapped victim constructed of a 12 in. (305 mm) × 12 in. (305 mm) (tolerance = ± 0.25 in.) maximum 5 in. (127 mm) thick closed cell foam block with a covering of Buna-N rubber sheet having a minimum of $\frac{1}{8}$ in. (3 mm) thickness and Shore A durometer 60 ± 5 or equivalent whose combined buoyancy force is between 14.0 lbf (62.2 N) and 15.0 lbf (66.7 N).

cycle: a sequence where the SVRS activates, latches, or locks out in the vented or safe position following a high vacuum occurrence and then is automatically or manually reset.

flooded suction: a pool, spa, hot tub, wading pool, or similar appliance whose circulation system pump suction inlet or inlets are located below the static water level in the appliance (flooded suction).

high vacuum occurrence: an event where the operating vacuum normally present within a pool circulation system increases due to a full suction outlet blockage.

Safety Vacuum Release System (SVRS): a system or device capable of automatically providing vacuum release at a suction outlet caused by a high vacuum occurrence due to a suction outlet flow blockage. The device or system provides vacuum release with or without suction fitting cover(s) in place.

suction lift: a pool, spa, hot tub, wading pool, or similar appliance whose circulation system pump suction inlet or inlets are located above the static water level in the appliance (nonflooded suction).

suction outlet: an appurtenance within a pool, spa, hot tub, wading pool, or similar appliance for conveying water into a circulating system; i.e., a pump suction.

suction system: that portion of the circulation piping located between the pool suction outlet and the inlet side of the pump and usually includes the following: main suction outlet piping, skimmer piping, and/or vacuum piping.

2 REQUIREMENTS

2.1 General

2.1.1 Field-adjustable SVRS devices when provided with a vacuum gauge shall have a maximum graduation of $\frac{1}{2}$ in. (13 mm) Hg increments to aid in calibration and trouble shooting.

2.1.2 Where SVRS devices are capable of field adjustment to site-specific hydraulic conditions, the means for effecting adjustments shall be tamper resistant, so that nonqualified personnel cannot make adjustments inadvertently.

2.1.3 SVRS devices shall be designed for on-site testing.

2.1.4 SVRS devices shall activate, latch, or lock out in the vented, or safe position following a high vacuum occurrence until manually or automatically reset to its original condition without the use of special tools.

2.2 Dimensions and Tolerances for Device End Connections

2.2.1 Where the SVRS device is provided with a PVC end connection, the end connection shall conform to Tables 1 and 2 of ASTM D 2466.

2.2.2 Where the SVRS device is provided with an ABS end connection, the end connection shall conform to Tables 1 and 2 of ASTM D 2468.

2.2.3 Where the SVRS device is provided with a threaded end connection, the threaded end connection shall conform to ASME B1.20.1.

2.3 Materials

2.3.1 The materials used for constructing the device shall be in conformance with NSF-50 (for components in contact with water or the environment) and UL 1081 (for electrical components).

2.3.2 When plastic materials are used, UV inhibitors shall be added to the polymer mixture in accordance with para. 38 of UL 1081.

2.4 Installation, Use and Maintenance, Adjustment Instructions, and Field-Testing Procedures

2.4.1 Installation, use and maintenance, adjustment instructions, and field-testing procedures shall be provided with each unit.

2.4.2 Installation instructions provided with the unit shall contain the statements specified in paras. 2.4.2.1 through 2.4.2.5.

2.4.2.1 SVRS devices shall only be installed in conjunction with an ASME A112.19.8 suction outlet fitting.

2.4.2.2 A check valve shall only be used in accordance with the manufacturer's instructions.

WARNING: The presence of a check valve used to carry the water flow within the circulation system can prolong the high vacuum present at the suction outlet. The proper use of a check valve shall be clearly described in the manufacturer's installation instructions.

2.4.2.3 All SVRS devices shall be factory set or field adjusted to site-specific hydraulic conditions. After installation and before bather use, the system shall be tested by simulating an entrapment event.

2.4.2.4 A ball, butterfly, or sliding gate valve shall be installed within 2 ft (0.6 m) upstream from the SVRS (between the SVRS and the protected suction outlet), or a test mat shall be used to cover the suction outlet to simulate an entrapment event. There shall be three simulated entrapment tests conducted to verify proper adjustment and operation of the device.

2.4.2.5 Where an SVRS is used, one SVRS device shall be installed for each circulating pump piped directly to the suction outlet(s) without the use of valves that could isolate the SVRS device from the suction system.

2.5 Owner's Manual

The Owner's Manual shall include at a minimum

(a) model designation and manufacturer.

(b) a description of device operation, including diagrams illustrating basic design.

(c) a statement confirming that the device meets the requirements of ASME A112.19.17-2010.

(d) a statement that the SVRS is designed to release body entrapment. It may mitigate evisceration (prolapse) or limb entrapment. It does not prevent hair or mechanical entrapment.

(e) SVRS devices are tested with a single functioning suction outlet.

(f) name and telephone number of an appropriate service location.

(g) methods and criteria to be used to identify malfunctions or problems.

(h) operating instructions that clearly describe proper function of the device and the operating and maintenance responsibilities of the owner and authorized service personnel.

(i) an overview of the function of each component and the expected function of the entire device when all components are properly assembled and connected.

2.6 Installation/Operation/Troubleshooting Manuals

The device shall be installed and tested in accordance with manufacturer's instructions. The instructions in the installation/operation/troubleshooting manuals shall include

(a) list of device components, illustration, or photograph

(b) unpacking instructions including safety considerations, identification of fragile components, and measures to avoid damage to the device

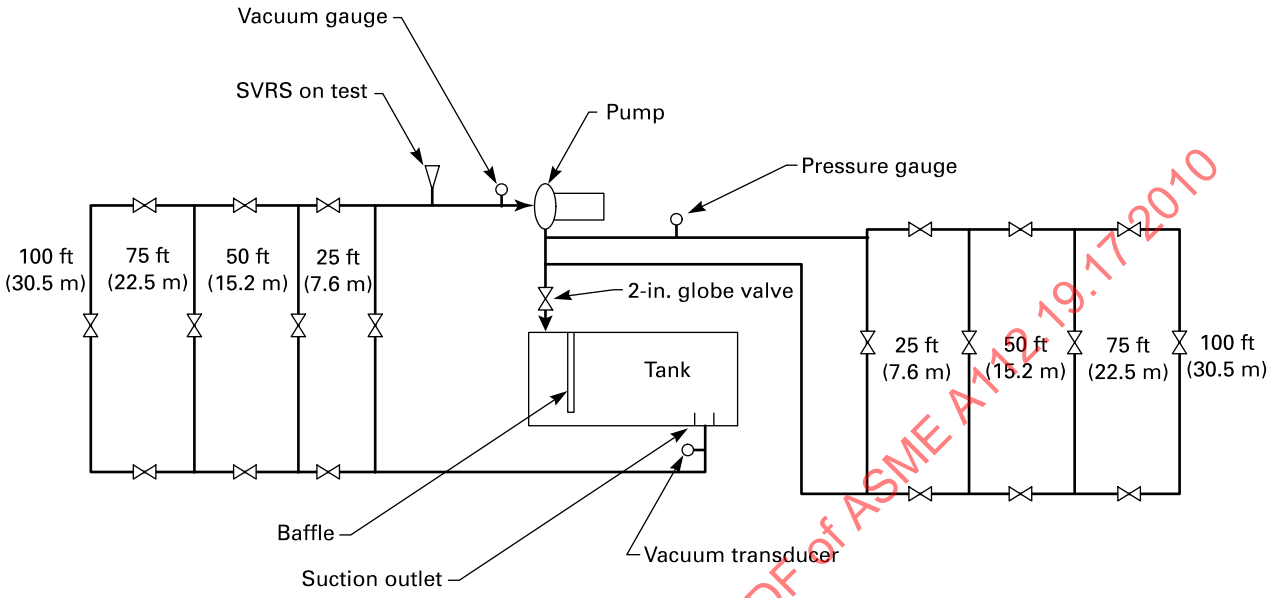
(c) sequential installation procedure

(d) definition of installation requirements including applicable plumbing and electrical power requirements

(e) a clear statement describing any limitations of pool and spa/hot tub circulation systems or usage including the maximum pipe size and flow rate the device is designed and tested to protect

(f) field testing criteria to verify the release of a potentially entrapped bather shall be provided

Figure 1
Vacuum Response Versus Time Test Set-Up



GENERAL NOTE: This figure is for illustrative purposes only.

(g) repair or replacement instructions

(h) instructions and/or warnings relating to the use and installation of a check valve

3 TESTING

3.1 General

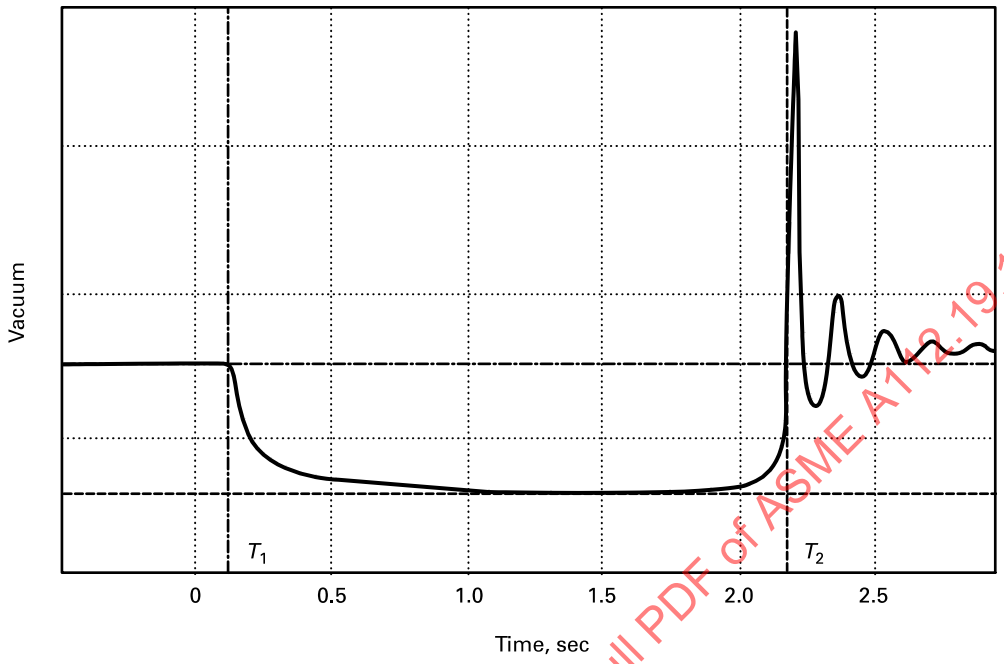
3.1.1 Purpose. The purpose of these tests is to establish proper device application criteria, i.e., flooded suction and/or suction lift applications, for full rated pumps ranging from ½ HP to 3 HP. These tests will measure device performance relative to criteria established below. The vacuum transducer shall be capable of reading a minimum of 50 vacuum readings per second (see Fig. 1 for a general schematic of the test set-up). SVRS devices shall cause the release of the vacuum at the suction outlet within 4.5 sec after onset of the high vacuum event, as detailed below. The vacuum level shall be measured at the suction outlet protected by the SVRS device. The vacuum shall decay to a level equal to or less than the level present at the suction outlet prior to the suction outlet blockage and the blocking element shall be released within an elapsed time of less than 4.5 sec per para. 3.2.1. Record the vacuum response in inches of Hg (y-scale) and plot the time in minimum 0.1 sec intervals (x-scale) as a wave-form graph (see Fig. 2 for illustrative example). An SVRS selected by the manufacturer's sampling plan shall be tested a minimum of 10 times at each test configuration against criteria in this section without failure.

3.1.2 Cold Temperature and Hot Temperature Preconditioning. Prior to testing, subject the complete SVRS to a temperature of −40°F (−40°C) for a period of 12 hr. Allow the unit to return to room temperature. Subject the complete device to a temperature of 140°F (60°C) for a period of 12 hr. Allow the unit to return to room temperature.

3.2 Time Versus Vacuum Response Test

3.2.1 SVRS devices shall be preconditioned as described in para. 3.1.2 prior to being subjected to vacuum response versus time tests, with the device placed at distances of 25 ft (7.6 m) to 100 ft (30.5 m), in 25 ft (7.6 m) increments, from a circulating pump suction and 25 ft (7.6 m) to 100 ft (30.5 m), in 25 ft (7.6 m) increments, of piping return distances. Suction and return piping shall be set to equal lengths. All incremental piping shall be located below the static water level in the test tank, except the suction lift piping necessary to plumb the suction lift pumps. These tests are to be performed at ambient room temperature in accordance with manufacturer's specifications at 60 gpm (227 L/min), or at the maximum flow rate produced by the pump, or at the flow rate that produces the maximum vacuum level recommended by the SVRS manufacturer. Perform the tests in para. 3.2.2 and/or para. 3.2.3 on a commercially

Figure 2
Wave Form Graph Plotting Example



GENERAL NOTES:
(a) This figure is for illustrative purposes only.
(b) The total elapsed time between T_1 and T_2 shall not exceed the limits in para. 3.1.

available 8.0 in. diameter suction outlet having no less than 33 in.^{2} of open inside area, without a cover or grate installed, piped with 2 in. diameter suction piping by blocking the suction outlet using the test actuator described. (With the pump running, measure the vacuum level prior to suction blockage, then lower the test actuator as detailed below.) When the use of a check valve is permitted by the manufacturer, such valve shall be installed within the test stand in accordance with the manufacturer's recommendations.

3.2.1.1 Test Actuator. A mechanical test actuator shall support a blocking element centered on the vertical axis of the suction outlet sump with a minimum of 6 in. (152 mm) between the top of the sump and the bottom of the blocking element. The test actuator shall lower the blocking element at a rate not to exceed 6 in./sec (152 mm/s) onto the top of the sump. The test actuator shall cease downward force at the point contact is made with the top of the suction outlet sump and allow the blocking element to move vertically free. (See Fig. 3 for a general schematic of the test actuator.)

3.2.1.2 Actuator Validation. Prior to conducting each incremental distance test procedure, without the SVRS active, the blocking element shall be lowered against the sump, downward force released and shall remain entrapped until the pump is manually shut off. This procedure shall be repeated three times.

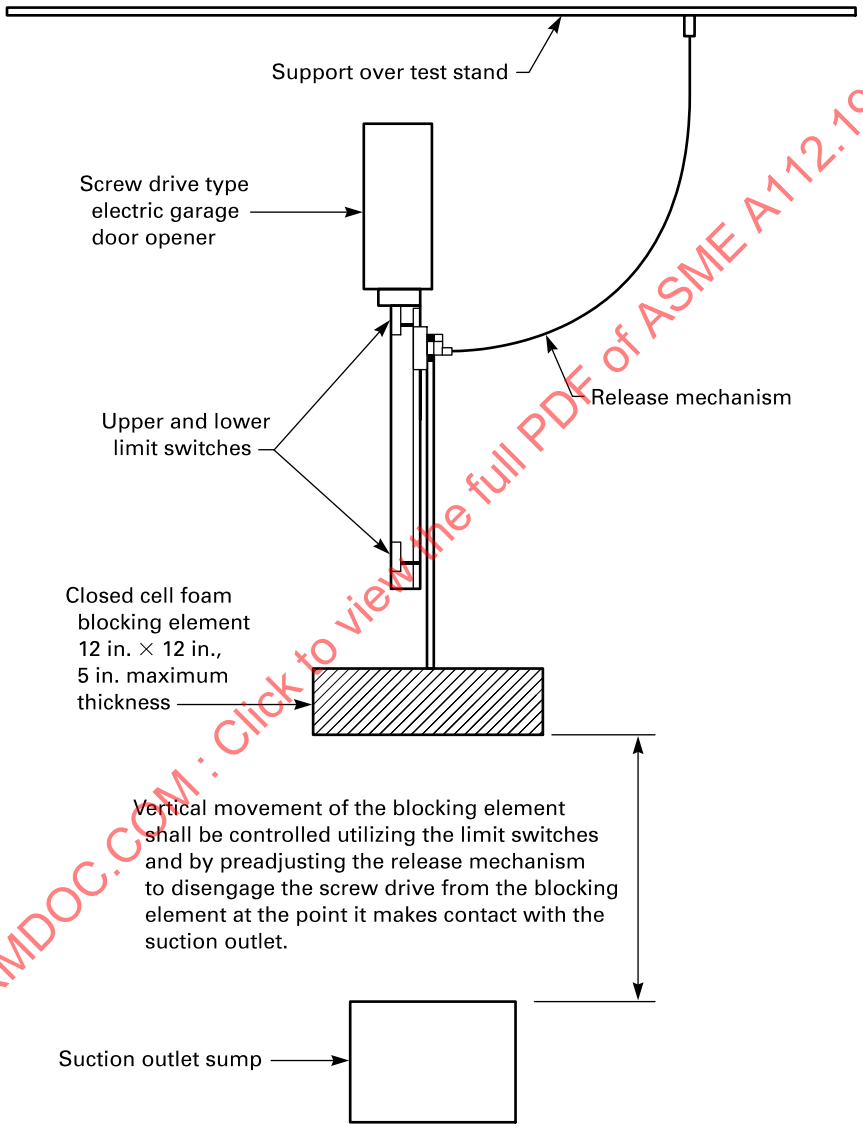
NOTE: In case of failure of the blocking element to remain entrapped, adjustments shall be required. Adjustments include: slowing the blocking element speed of approach; adjusting the blocking element release mechanism to ensure good contact with the suction outlet, etc.

3.2.2 Flooded Suction Test

3.2.2.1 Method. Perform tests utilizing a ½ HP circulating pump with the pump elevation at 3 ft (914 mm) below the static water level in the test tank by blocking the suction outlet utilizing the test actuator and recording vacuum response versus time as described in para. 3.2. Perform the tests again utilizing a 3 HP circulating pump.

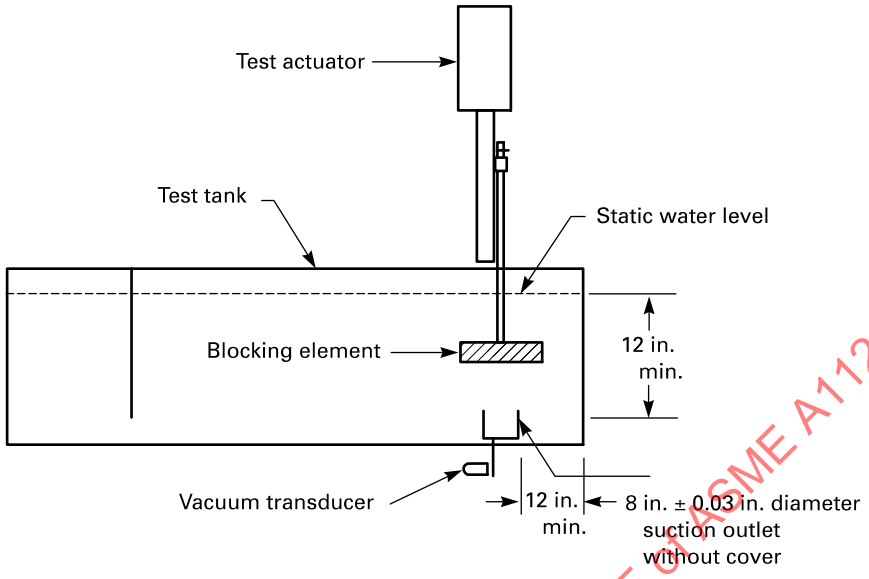
3.2.2.2 Performance Criteria. The failure of a device to respond within the required time, or failure to activate, latch out, or lock out in the vented or safe position and require resetting automatically or manually, or a vacuum condition remaining at the suction outlet exceeding the level present prior to the suction outlet blockage, shall be cause for rejection of the SVRS device for flooded suction applications.

Figure 3
Test Actuator Schematic



(a) Test Actuator
Side View — No Scale

Figure 3
Test Actuator Schematic (Cont'd)



(b) Tank and Blocking Element Detail
Side View — No Scale

GENERAL NOTE: This figure is for illustrative purposes only.

3.2.3 Suction Lift Test Method

3.2.3.1 Method. Perform tests utilizing a ½ HP circulating pump with the pump elevation at 3 ft (914 mm) above the static water level in the test tank by blocking the suction outlet utilizing the test actuator and recording and measuring the vacuum response over time event as described in para. 3.2. Perform the tests again utilizing a 3 HP circulating pump.

3.2.3.2 Performance Criteria. The failure of a device to respond within the required time, or failure to activate, latch out or lock out in the vented or safe position and require resetting automatically or manually, or a vacuum condition remaining at the suction outlet exceeding the level present at the suction outlet prior to the suction outlet blockage, shall be cause for rejection of the SVRS device for suction lift applications.

4 CLASSIFICATION OF DEVICES

SVRS devices tested in accordance with section 3 shall be permitted to be listed and labeled for suction lift applications, flooded suction applications, or both suction lift and flooded suction applications.

5 MARKING AND IDENTIFICATION

Each unit shall be permanently marked as follows:

(a) manufacturer's name or trademark

(b) model number, serial number, date coding and lot identification (this may be encoded within the serial number)

(c) one of the following application limits: "suction lift," "flooded suction," or "suction lift or flooded suction"

(d) SVRS devices shall be marked with operating temperature ranges in accordance with para. 3.2.1

(e) statement confirming that the device meets the requirements of ASME A112.19.17-2010

(f) clear statement describing any limitations of pool and spa/hot tub circulation systems or usage, including maximum and minimum GPM and ambient temperature conditions