This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.

Designation: F2387 – 21

Standard Specification for Manufactured Safety Vacuum Release Systems (SVRS) for Swimming Pools, Spas and Hot Tubs[1]

This standard is issued under the fixed designation F2387; the number immediately following the designation indicates the year of original adoption or, in the case of revision, the year of last revision. A number in parentheses indicates the year of last reapproval. A superscript epsilon (ε) indicates an editorial change since the last revision or reapproval.

INTRODUCTION

The U.S. Consumer Product Safety Commission is aware of 44 swimming pool and spa suction entrapments between 2009 and 2018. Over this time period, two limb entrapment deaths were reported.

If a cover or grate is unfastened, missing, or broken, exposure to the suction outlet force could produce evisceration or limb entrapment. Even though it may be perceived that safety vacuum release devices may help in reducing cases of evisceration or limb entrapment, the devices are not designed for nor intended to do so. More direct efforts are related to the use of certified suction outlet covers, 12 in. by 12 in. or larger suction outlet covers, pool covers, dual suction outlets, and so forth. "Layered protection" should be used as outlined in CPSC's "Guidelines for Addressing Potential Entrapment Hazards Associated with Swimming Pools and Spas."

This specification is not intended to and does not address hair entrapment, evisceration, or limb entrapment.

Field fabricated vent pipes are excluded from this specification and are addressed in a separate standard, Safety Performance Specification F2707.

iTeh Standards (https://standards.iteh.ai) Document Preview

1. Scope

1.1 This specification covers requirements for safety vacuum release systems (SVRS) for use on both residential and commercial swimming pools, spas, hot tubs, and wading pools.

1.2 This specification is intended to reduce the risk of entrapment by providing a rapid detection and rapid release of vacuum or preventing a high vacuum altogether when a person becomes entrapped at the suction outlet serving a pumping system.

1.3 This specification only applies to systems equipped with pumps of similar horsepower and flow rating to those actually tested.

1.4 SVRS units manufactured, previously sold and installed, prior to the publication of this specification, which were compliant to the previous version of this specification, are to be considered compliant with this specification.

1.5 The values stated in inch-pound units are to be regarded as standard. The values given in parentheses are mathematical conversions to SI units that are provided for information only and are not considered standard.

1.6 The following safety hazards caveat pertains only to the test methods section, Section 5, of this specification. *This standard does not purport to address all of the safety concerns, if any, associated with its use. It is the responsibility of the user of this standard to establish appropriate safety, health, and environmental practices and determine the applicability of regulatory limitations prior to use.*

1.7 *This international standard was developed in accordance with internationally recognized principles on standardization established in the Decision on Principles for the Development of International Standards, Guides and Recommendations issued by the World Trade Organization Technical Barriers to Trade (TBT) Committee.*

2. Referenced Documents

2.1 *ASTM Standards:*[2]

D2466 Specification for Poly(Vinyl Chloride) (PVC) Plastic Pipe Fittings, Schedule 40

[1] This specification is under the jurisdiction of ASTM Committee F15 on Consumer Products and is the direct responsibility of Subcommittee F15.51 on Safety Vacuum Release Systems for Swimming Pools, Spas and Hot Tubs.

Current edition approved May 1, 2021. Published May 2021. Originally approved in 2003. Last previous edition approved in 2012 as F2387 – 04 (2012). DOI: 10.1520/F2387-21.

[2] For referenced ASTM standards, visit the ASTM website, www.astm.org, or contact ASTM Customer Service at service@astm.org. For *Annual Book of ASTM Standards* volume information, refer to the standard's Document Summary page on the ASTM website.

Copyright © ASTM International, 100 Barr Harbor Drive, PO Box C700, West Conshohocken, PA 19428-2959. United States

D2468 Specification for Acrylonitrile-Butadiene-Styrene (ABS) Plastic Pipe Fittings, Schedule 40 (Withdrawn 2003)[3]

D2855 Practice for the Two-Step (Primer and Solvent Cement) Method of Joining Poly (Vinyl Chloride) (PVC) or Chlorinated Poly (Vinyl Chloride) (CPVC) Pipe and Piping Components with Tapered Sockets

F402 Practice for Safe Handling of Solvent Cements, Primers, and Cleaners Used for Joining Thermoplastic Pipe and Fittings

F2707 Safety Performance Specification for Safe Design and Installation of Field Fabricated Suction-Limiting Vent Systems for Suction Entrapment Prevention in Swimming Pools, Spas, Hot Tubs, and Wading Pools

2.2 *ASME Standard:*[4]

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

2.3 *Federal Document:*[5]

CPSC Document Guidelines for Addressing Potential Entrapment Hazards Associated with Swimming Pools and Spas

2.4 *NSF Document:*[6]

NSF 50 Equipment and Chemicals for Swimming Pools, Spas, Hot Tubs and Other Recreational Water Facilities

2.5 *UL Standards:*[7]

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

UL 746C Standard for Safety Polymeric Material – Use in Electrical Equipment Evaluation

3. Terminology

3.1 *Definitions of Terms Specific to This Standard:*

3.1.1 *high-vacuum occurrence*—event where the operating vacuum normally present within a pool circulation system suddenly increases due to a suction outlet blockage.

3.1.2 *interrupter element (IE)*—pad or mat used to simulate an entrapment event by blocking the suction outlet completely.

3.1.3 *non-mechanical SVRS*—SVRS with no moving parts.

3.1.4 *readily affixed*—to be easily retrofitted to existing systems where an entrapment hazard is possible using approved pipe fittings or approved adapters, or both.

3.1.5 *return inlet*—appurtenance for conveying water returned to the pool.

3.1.6 *safety vacuum release system (SVRS)*—system or device capable of providing vacuum release at a suction outlet caused by a high-vacuum occurrence due to a suction outlet blockage. SVRS devices must allow for the vacuum release with or without suction outlet cover(s) in place, and shall operate in such a way as to not defeat or disengage other layers of protection installed to protect against suction entrapment.

3.1.7 *suction outlet*—appurtenance for conveying water out of a pool, spa, hot tub, whirlpool, therapy unit or similar fixture.

3.1.8 *test actuator (TA)*—device used to lower the interrupter element (IE) in a uniform manner and rate.

3.1.9 *tripped position*—the condition after a high-vacuum event where the SVRS is protecting the suction outlet such that no further high-vacuum event can take place without resetting the SVRS.

3.1.10 *variable speed pump*—includes multi-speed or two-speed pumps as well as devices external to the pump that vary the speed of the pump.

4. Requirements

4.1 *General:*

4.1.1 Exposed surfaces shall be free from rough or sharp edges.

4.1.2 An SVRS shall not be made dysfunctional without the use of tools.

4.1.3 Manufacturers shall evaluate all materials for exposure and environmental conditions (chemicals, etc.) expected to be encountered in the use condition over a period of time to insure long term durability and operation. NSF 50 and UL 1081 may be used as guidelines.

4.1.4 Materials exposed to outdoor elements shall be UV resistant and capable of withstanding ambient temperatures between –40 °F and 140 °F (in accordance with 4.1.15 and 4.2.2).

4.1.5 Under normal system operating conditions, the SVRS shall not adversely affect pump suction, system pressure, system flow, or other equipment performance.

4.1.5.1 An SVRS must provide the means to protect the pump against consequential damage by a pump running dry due to a loss of prime.

4.1.6 An SVRS shall latch or lock out in the tripped position following a high-vacuum occurrence until reset after a minimum of 15 s. See Note 1.

NOTE 1—The selection of a minimum of 15 s before reset is the result of a desire to ensure the system does not vapor lock the blocking element to the sump.

4.1.7 SVRSs, following a high-vacuum occurrence, shall be manually reset or automatically reset to its ready position without requiring special tools.

4.1.8 In the event of a spring or loading mechanism failure, an SVRS shall fail in the tripped position.

4.1.9 Any air inlet ports for SVRSs shall be designed and installed in such a manner that the air inlet port(s) cannot be defeated by reasonably anticipated conditions or in any manner, environmental or human, that would prevent the device from functioning as intended. This includes, but is not limited to, infestation, debris buildup, or microbiological contamination.

[3] The last approved version of this historical standard is referenced on www.astm.org.

[4] Available from American Society of Mechanical Engineers (ASME), ASME International Headquarters, Two Park Ave., New York, NY 10016-5990, http://www.asme.org.

[5] Available from U.S. Consumer Product Safety Commission (CPSC), 4330 East West Hwy., Bethesda, MD 20814, http://www.cpsc.gov.

[6] Available from NSF International, P.O. Box 130140, 789 N. Dixboro Rd., Ann Arbor, MI 48105, http://www.nsf.org.

[7] Available from Underwriters Laboratories (UL), UL Headquarters, 333 Pfingsten Road, Northbrook, IL, 60062, http://www.ul.com.

iTeh Standards (https://standards.iteh.ai) Document Preview ASTM F2387-21

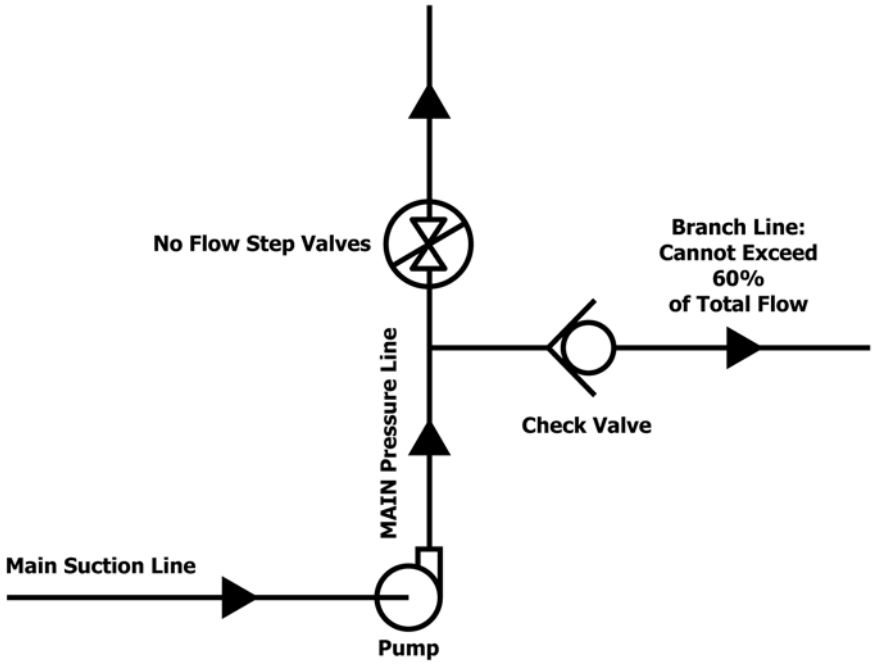

FIG. 1 Acceptable Check Valve Installation

4.1.10 An SVRS that provides for field calibration and adjustment shall contain clearly defined permanent instructions. The means for effecting adjustments and calibration shall be tamper resistant, so that non-qualified personnel cannot make adjustments.

4.1.11 An SVRS shall be designed for on-site servicing and testing.

4.1.12 PVC end connections of the device shall conform to Specification D2466. ABS end connections of the device shall conform to Specification D2468. Solvent weld connections shall be made in accordance with Practices D2855 and F402.

4.1.13 Threaded pipe connections shall conform to ANSI/ASME B1.20.1.

4.1.14 Non-mechanical SVRSs must have built into them design specific tamper-proof features that will limit the transmission of suction at the suction outlet within the parameters specified by the manufacturer, such as pump horsepower, pipe sizes, pump elevation, and so forth.

4.1.15 An SVRS exposed to outdoors conditions shall meet environmental exposure testing for UV as described in UL 746C.

4.2 *Specific Requirements:*

4.2.1 *Test Criteria*—The SVRS shall actuate without failure at each of two elevations of the pump (a minimum of 3 ft below and 3 ft above the water surface level), releasing the blocking element within 4.5 s or less when tested by the manufacturer in accordance with 5.1 and 5.2.

4.2.2 The SVRS used to test in 4.2.1 shall be exposed to ten cycles of heat/cold in accordance with 5.2.2 prior to testing.

4.2.3 An SVRS selected by the manufacturer's sampling plan (see Section 9), shall be tested 25 times against criteria in 4.2.1 without failure.

4.3 *Installation Instructions:*

4.3.1 Installation instructions, use and maintenance instructions, proper calibration and adjustment instructions, proper start-up, and periodic testing procedures shall be provided with each unit.

4.3.2 Installation instructions provided with the unit shall contain the following statements or equivalent:

4.3.2.1 This device shall be installed by an individual that meets the qualifications established by the SVRS manufacturer.

4.3.2.2 Check valves shall not be used to carry the water flow within circulation systems protected by an SVRS. (**Warning—**Check valves in the circulation system must follow the SVRS manufacturer's requirements.) The presence of a check valve used to carry the water flow within the circulation system has been shown to prolong the high vacuum present at the drain, even though the drain was protected by an SVRS.

NOTE 2—Exception to 4.3.2.2—If permitted by the SVRS manufacturer's installation instructions, check valves may be used to carry a portion of the water flow within circulation lines protected by an SVRS provided they are used only on pressure side lines (downstream from the circulation pump) which branch off the main pressure circulation line, and the circulation system cannot be valved to direct more than 60 % water flow of the circulation system through the check valve (see Fig. 1).

4.3.2.3 An SVRS that provides a means for field adjustment shall be adjusted to site-specific hydraulic conditions. Once calibrated, the system shall be tested by simulating an entrapment event.

4.3.2.4 Following the SVRS manufacturer's instructions, there shall be three simulated entrapment tests conducted in the field to verify proper installation, calibration, and operation of the device.

4.3.2.5 The maximum and minimum horsepower of the pump or pumps used to test the SVRS as well as the maximum horsepower recommended for the SVRS.

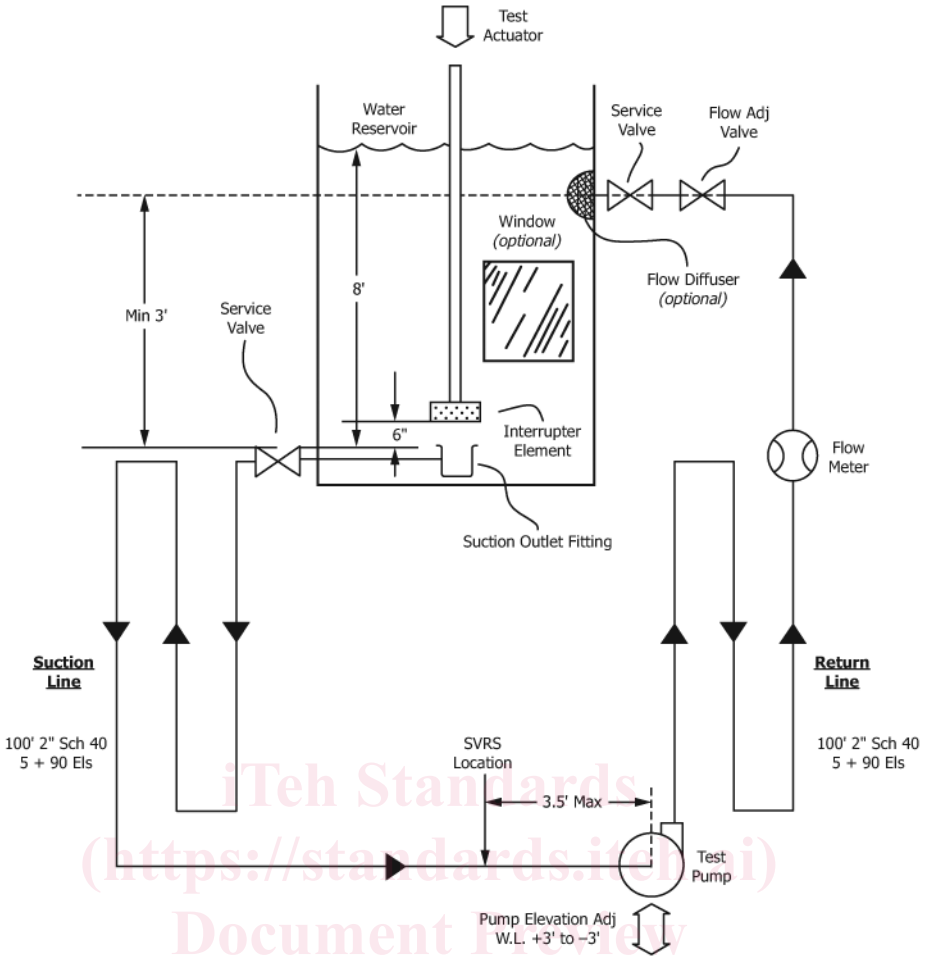

FIG. 2 Safety Vacuum Release System (SVRS)

iTeh Standards
(https://standards.iteh.ai)
Document Preview

4.3.2.6 "This SVRS was tested with a Variable Speed Pump" or "This SVRS has NOT been tested with, nor is intended to be used with a variable speed pump," whichever is applicable to the tested SVRS.

5. Test Methods

5.1 *Test Equipment*—See Figs. 2 and 3. Fig. 2 illustrates the layout for the test system for testing an SVRS which attaches to a circulation suction line which is directly plumbed to the pump. Fig. 3 illustrates the layout for a test system for testing an SVRS which incorporates a vacuum-induced, indirect circulation drain system.

5.1.1 *Water Tank*—A commercial, cylindrical, vertical storage tank produced from high density linear polyethylene (HDLPE) 48 in. in diameter, and of adequate height to maintain a water level 8 ft above the suction outlet fitting.

5.1.2 *Suction Outlet Fitting*—The bottom of the tank shall terminate in a prefabricated 8 in. ± 0.13 in. inside diameter uncovered outlet sump.

5.1.3 *Suction Line*—The suction outlet fitting shall be piped with 100 ft of 2 in. rigid schedule 40 PVC pipe from the suction outlet fitting to the test pump. The suction line shall include five or more (90°) elbows (see Fig. 2).

5.1.3.1 *SVRS Location*—The SVRS shall be installed not more than 3.5 ft from pump inlet for testing purposes.

5.1.4 *Return Line*—The pipe run length of the return line shall always match the pipe run, type, length and size (100 ft, 2 in.) of the suction line, including elbows (five or more), and will incorporate a straight section for the accurate measurement of flow.

5.1.5 *Test Actuator*—A mechanical test actuator shall support the interrupter element centered on the vertical axis of the