

**WSC Performance Standards
and Recommended Installation
Procedures for Sanitary Water Well**

Pitless Adapters, Pitless Units, And Well Caps



History of the WSC PAS Standard

The **Water Systems Council (WSC)** has long represented the manufacturing and engineering skill and water well knowledge of the nation's water pump, accessory and well supply manufacturers. Founded in 1932, WSC is dedicated to protecting the public health and our ground water resources, through product excellence and informational services. It has always endeavored to work closely with industry and public health groups.

In 1966, a group of WSC members comprising the majority of the U.S. manufacturers of Pitless Adapters and complete Pitless Units met to define and promote, through voluntary written standards, sound principles of pitless equipment performance that would better protect the public health by:

1. Incorporating manufacturer, installer and sanitary agency experience in the performance and installation of pitless equipment.
2. Providing minimum performance standards for use by manufacturers in producing pitless equipment that will meet practical tests for field applications.
3. Providing regulatory agencies, specifiers and installers with a means to consistently describe and define pitless products.
4. Providing a single performance standard for pitless equipment evaluation by regulatory agencies.
5. Providing installers with modern equipment that is practical to install and maintain.
6. Providing the consumer with pitless equipment for their water systems that meets the requirements of this standard.

These members felt strongly that such recommended standards should be reasonable, workable, and easily understood. It was essential that all terms be precisely defined and that the resulting standards avoid the use of coined or misleading terms and phrases that might produce ambiguous meaning or arbitrary interpretation.

Several drafts of the proposed standards were prepared and submitted to state health officials for their comment and review. First, Recommended Standards and Installation Procedures for Sanitary Water Well Pitless Adapters and Units (PAS-1) were approved. A companion standard, PAS-2 Standard for Watertight Well Caps, covering the inspection and approval of vermin-proof vented sanitary well caps, was also adopted in March 1988.

Reviews and/or Revisions to Original Standard

In 1997, the current edition of the standards was created when both the PAS-1 and PAS-2 standards were re-evaluated by the WSC Pitless Adapter Manufacturers Committee and combined to create the PAS-97 Standard.

Since 1997, the PAS-97 Standard has been used by many state and local government agencies when developing their code for pitless adapters and well caps.

The Pitless Adapter Manufacturers Committee reviewed and revised PAS-97 Standard in 2004. The amended standard was designated PAS-97(04).

The Pitless Adapter Manufacturers Committee reviewed the PAS-97(04) Standard in February 2008 and again in November 2010. There were no changes to the Standard at those times.

2012 Revision of Standard in Acknowledgement of Passage of “Reduction of Lead in Drinking Water Act.”

In January 2011, Public Law 111-380 the “Reduction of Lead in Drinking Water Act” was enacted. This law amended Section 1417 of the Safe Drinking Water Act (42 U.S.C. 300g-6) to require plumbing and water system components for systems providing water for “human consumption” be “lead free.” The law defines “lead free” as “(A) not containing more than 0.2 percent lead when used with respect to solder and flux; and (B) not more than a weighted average of 0.25 percent lead when used with respect to the wetted surfaces of pipes, pipe fittings, plumbing fittings, and fixtures.” These new provisions apply “beginning on the day that is 36 months after the date of enactment” or January 2014.

In the interim between 2012 and January 2014, WSC has revised the PAS standard to address material changes to products currently listed as PAS-97(04) compliant. The revised standard was designated PAS-97(2012)

The Pitless Adapter Manufacturers Committee reviewed and revised PAS-97 (2012) Standard in May 2017. The revised standard is PAS-97(2017).

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Introduction

The well pit, for many years a common method of providing convenient access to underground lateral pipe connections below the frost line on individual water systems, is generally unsanitary. The pit literally invites drainage into the well from possibly contaminated surface and near-surface sources. Pitless well construction sharply reduces the possibility of contaminated water entering the well and system, and avoids well pit construction costs as well as the need to inspect and regulate well pits.

Pitless Adapters and Pitless Units are devices designed to attach to openings in the water well casing. When properly installed, they provide sanitary connections by preventing the entrance of contaminants from surface or near-surface sources through such openings into the well or potable water supply, and permit the termination of the well above the ground surface. Pitless Adapters and Pitless Units, also sometimes known as diverting devices, sanitary underground discharges, attachments and connectors, also conduct water from the well, protect the water from temperature extremes, and permit access to the well and to water systems parts within the well without the exterior excavation or disruption of the earth. Pitless Adapters and Pitless Units are the modern way to maintain a sanitary water well supply when water is conducted to a location remote from the well.

The Pitless Adapter Division Recommended Standard (PAS-1) and Installation Procedures for Sanitary Water Well Pitless Adapters and Units have been in effect since 1966. They define product performance criteria and testing procedures, and provide recommended installation procedures for pitless well adapters. Over the years it has become widely accepted that wells must be vented to the atmosphere to prevent a vacuum from being drawn on the casing and on attachments to the casing, including well caps, electrical conduit and pitless adapters. Most sanitary well caps have provision for either a factory or field installed vermin-proof vent device; PAS-2 was adopted to set a minimum standard for performance inspection and approval of vented sanitary well caps. Note: The factory or field installation of a vent and/or open electrical conduit connection can result in the cap's being watertight only at the point of attachment between the standard well casing and well cap. The culmination of years of field experience and manufacturing using the PAS-1 and PAS-2 led to the combined standard PAS-97(04).

The passage of the “Reduction of Lead in Drinking Water Act” in January 2011 has resulted in many manufacturers making material changes (not design changes) to their products to comply with the “lead free” requirements. The 2012 revisions to PAS-97 (04) clarify the changes to listing requirements for the manufacturers of these products. The revised standard was called WSC PAS-97(2012).

The 2017 revisions to WSC PAS-97 (2012) clarified Pitless Adapter and Pitless Unit definitions, revised the Pitless Adapter and Pitless Unit testing, and revised the Sanitary Well Cap Watertight capability testing. A separate set of tests 6.1.1 – Surface Water Contamination Test and 6.1.2 – Internal Pressure Test were developed for Pitless Adapters. Similarly, a separate set of tests 6.2.1 – Surface Water Contamination Test, 6.2.2 – External Housing Pressure Test less than 8” and 6.2.3 Internal Housing Pressure Test 8” and Larger were developed for Pitless Units. Sanitary Well Cap Tests are now section 6.3 and Lead Free Test is section 6.4. The 2012 Standard required users to perform a submersed watertight leak test. Sanitary Well Caps are installed with vents to allow circulation of air through the well. These vents will allow floodwater to enter the well in the event the Sanitary Well Cap becomes submerged in flood water. Therefore, the requirement of a submerged leak test does not represent an actual capability of the Sanitary Watertight well cap. The 2017 standard clarifies the actual watertight capability of the Sanitary Well Cap to only protect a well against falling rain, sleet, snow or the external formation of ice.

Performance Standards for Sanitary Water Well Pitless Adapters, Pitless Units, and Well Caps

1.0 GENERAL PROVISIONS

1.1 PURPOSE – The purpose of this standard is to establish worldwide recognized performance standards for sanitary water well Pitless Adapters, Pitless Units, and Sanitary Well Caps. It is also the purpose of this standard to provide government agencies, specifiers, engineers, installers, and other interested parties, including the general public, with a single definition of Pitless Adapter, Pitless Unit, and Sanitary Well Cap; to provide a single standard for the evaluation of pitless products and sanitary well caps by governmental regulatory agencies; to provide a means for listing products which are certified to comply with the standards; and to promote better understanding between the manufacturer and the user.

1.2 SCOPE – This standard covers Pitless Adapters, Pitless Units, and Sanitary Well Caps as defined in the standard.

1.3 REVIEW AND REVISION – This standard will be reviewed on a periodic basis, but not less frequently than every three years, by the Pitless Adapter Manufacturers Committee of the Water Systems Council.

2.0 DEFINITIONS

2.1 PITLESS ADAPTER – A device designed to attach to one or more openings through a well casing. It shall be constructed so as to prevent the entrance of contaminants into the well or potable water supply through such opening(s), to conduct water from the well, to protect the water from freezing or extremes of temperature, and to provide access to water system parts within the well.

2.2 PITLESS UNIT – An assembly that extends the upper end of the well casing from below frost level to a minimum of 12 inches above grade. It shall be constructed so as to prevent the entrance of contaminants into the well or potable water supply, to conduct water from the well, to protect the water from freezing or extremes of temperature, and to provide full access to the well and to water system parts within the well. It shall provide a Sanitary Well Cap for the top terminal of the well.

2.3 CONTAMINANT – Any regulated substance that is present outside a well.

2.4 DISCHARGE OR PRESSURE LINE – A pipe connected to the outlet side of a pump.

2.5 DROP PIPE – A pipe or pipes within a well casing which conducts water from the well to the Pitless Adapter or Pitless Unit.

2.6 FROSTLINE – The underground level above which water may freeze due to ambient temperatures.

2.7 NEAR-SURFACE – The area from the ground level down to the point of attachment of the Pitless Adapter or Pitless Unit.

2.8 PITLESS CASE – The extension of the well casing between the lateral connection and the Sanitary Well Cap.

2.9 SUCTION LINE – A pipe connected to the inlet side of a pump or a pipe not supplied with system pressure when evacuated.

2.10 VENT – An opening at the upper terminal of a well to provide for equalization of air pressure in the well and to resist entrance of vermin or contaminants.

2.11 WATER SUPPLY – The source of the water that is conducted through the well.

2.12 WATER SYSTEM – A pump, Pitless Adapter or Pitless Unit, pressure vessel, automatic controls, piping, and valves.

2.13 WATERTIGHT – Defined and measured by tests as specified in Section 4.3 and Section 6.3.4.

2.14 SANITARY WELL CAP – A device that covers and encloses the upper termination of a Pitless Unit or the well casing and provides protection to the top, exposed portion of the well casing by being tamper resistant, forming a protective cover from the elements, and being resistant to the entry of vermin or contaminants.

2.15 WELL CASING – A pipe which protects and supports the wall of the well and maintains access to the water supply.

3.0 PHYSICAL REQUIREMENTS

3.1 TEMPERATURE PROTECTION – A Pitless Adapter or Pitless Unit shall permit the passage of water from the well in such a manner as to protect the water from freezing or extremes of temperature.

3.2 INTERNAL CLEARANCE

3.2.1 PITLESS ADAPTERS – A Pitless Adapter shall provide adequate clearance within the internal diameter of the well to permit withdrawal or insertion of water system components from within the well through the upper terminal of the well casing.

3.2.2 PITLESS UNITS – A Pitless Unit shall provide full well diameter opening and permit unrestricted access from the top for the withdrawal or insertion of water system components.

3.3 ATTACHMENT

3.3.1 BELOW-GROUND ATTACHMENT, PITLESS ADAPTER – Below-ground lateral connections to the well casing may be made by bolt-through, by clamp and-gasket, or by welding, and shall be watertight (see Sections 4.3).

3.3.2 BELOW-GROUND ATTACHMENT, PITLESS UNIT – Below-ground lateral connections to the well casing shall be watertight (see Sections 4.3).

3.3.3 PITLESS ADAPTERS – May be attached to extend the well casing by a threaded, welded or compression-gasketed connection, which shall be watertight (see Sections 4.3).

3.3.4 PITLESS UNITS – When factory-assembled on a Pitless Case, Pitless Units may be attached to extend the well casing by a threaded, welded, flanged or compression-gasketed connection, which shall be watertight (see Sections 4.3).

3.4 SANITARY WELL CAP – A Sanitary Well Cap shall enclose the upper terminal of a Pitless Unit or a Pitless Adapter complete with Pitless Case. All openings in a Sanitary Well Cap projecting upward shall be threaded or gasketed to provide for attachment or closure. A Sanitary Well Cap may incorporate openings or discharge attachments or other appurtenances thereto. If a Sanitary Well Cap is gasketed and if a vermin-proof well vent is not otherwise provided, the Cap shall provide a secured method for attachment of a vermin-proof vent.

3.4.1 The cap shall cover the top of the well casing to provide resistance to the entrance of vermin or contaminants. Provision shall be made for securing the cap to the well casing so that it will be tamper resistant and yet can be removed from the well casing for system service. Provisions shall be made for a downward facing, shielded (from weather) corrosion resistant vent or vents with total vent area of at least a nominal one-half inch diameter (not less than 40% open area). No single opening shall allow an object larger than 1/32 of an inch to pass.

3.5 MATERIAL – Pitless Adapters and Pitless Units shall be constructed of materials suitable to withstand normal handling, shipment, and installation practices. All Sanitary Well Caps shall be constructed of durable and weather resistant materials.

3.6 WATERTIGHT, EXTERIOR – Pitless Adapters and Pitless Units shall be constructed and installed so that all exterior surfaces that may be wetted by surface or near-surface water following installation shall be watertight (see Sections 4.3.1 and 4.3.3).

3.7 WATERTIGHT, INTERIOR – Pitless Adapters and Pitless Units shall be constructed and installed so that interior sealing methods and parts which are exposed to the water system pressure shall be watertight (see Sections 4.3.2).

3.8 IDENTIFICATION – Pitless Adapters and Pitless Units shall provide a durable means of identifying the manufacturer. Pitless Adapters and Pitless Units that are manufactured as “lead free” components per the definition of lead free in the “Reduction of Lead in Drinking Water Act” should be identified as such.

4.0 INSTALLATION

4.1 PITLESS ADAPTER – Pitless Adapters should be constructed and installed so as to prevent the entrance of contaminants into the well or water supply through openings in the well casings to which the Adapters are attached, and should be constructed so as to conduct water from the well, protect the water from freezing or extremes of temperature, and provide service access to the well and water system parts within the well.

4.2 PITLESS UNIT – Pitless Units should be constructed and installed so as to prevent the entrance of contaminants into the well or the water supply through openings in the well casing to which Units are attached, and should be constructed so as to conduct water from the well, protect the water from freezing or extremes of temperatures, and provide full access to the well and water system parts within the well.

4.3 WATERTIGHT – All surfaces and connections specified watertight shall meet the requirements defined in Sections 4.3.1, 4.3.2 and 4.3.3 immediately below. (see Appendix A):

4.3.1 WATERTIGHT EXTERNAL BURIED SURFACES (PITLESS UNIT) – An external buried surface shall withstand a gradual increase in external pressure to a minimum of 75 psi (pounds per square inch) pressure exerted against it at any point during a one-hour period, without leakage of water.

4.3.2 WATERTIGHT INTERNAL SURFACES (PITLESS UNIT) – All internal surfaces of Pitless Adapters and Pitless Units which are exposed to water system pressure shall withstand a gradual increase in pressure to a minimum of 150 psi internal pressure exerted against them during a one-hour period, without leakage of water.

4.3.3 WATERTIGHT EXTERNAL SURFACES (WELL CAPS) – All external surfaces of Well Caps which are exposed to falling rain, sleet, snow or the external formation of ice on the surface shall be free from any leakage of precipitation. Watertight Well Caps do not provide leakage protection in the event that the Well Cap is submersed due to flood conditions.

5.0 TESTING

In testing Pitless Adapters and Pitless Units under this Standard, the test procedures and test equipment shall be as prescribed by this standard. The tests in Section 6.1 are applicable to Pitless Adapters that are installed by altering the structure or integrity of the well casing. The tests in Section 6.2 are applicable to Pitless Units that are installed without altering the structure or integrity of the well casing.

6.0 TESTING PROCEDURES

6.1 PITLESS ADAPTER TESTS

6.1.1 SURFACE WATER CONTAMINATION TEST – Attach the Pitless Adapter, in accordance with the instructions of the Pitless Adapter manufacturer, to a short length of standard schedule 40 well casing, or other casing as specified by the manufacturer. One end of the casing shall have been capped. A 2-foot length of casing is usually convenient for this purpose. Do not insert any internal components of the Adapter assembly.

Screw the lower end of the casing with its Adapter, less any removable internal components, into the bottom head of the test tank. Plug the top of the casing and any external ports. Assemble the test tank (see Diagram 1). Connect the inlet water, pressure and meter lines.

Open the tank vents and fill the tank with water. From the bottom of the tank, inspect the interior of the casing or unit for evidence of leaks through the various joints.

Close the tank vents and increase the pressure to 15 psi for 10 minutes. Reinspect the interior for evidence of leaks as above during this period. Each 10 minutes, increase the pressure an additional 15 psi, and reinspect the interior for evidence of leaks, until a minimum of 75 psi is reached. Maintain the pressure at a minimum of 75 psi for 20 minutes, reinspect the interior, and relieve the pressure. The Adapter must not show any evidence of leaking from 0 to 75 psi.

Drain the test tank, remove the Adapter assembly, and reinspect for evidence of leakage. Evidence of any water in the interior of the Adapter assembly at any time shall constitute a failure of the Adapter seals.

6.1.2 INTERNAL PRESSURE TEST – Attach the Pitless Adapter, in accordance with the manufacturer's instructions, to a short length of standard schedule 40 well casing or as specified by the manufacturer. The same assembly used in the External Pressure Test shall be used for this purpose.

Insert the internal Adapter assembly into the casing, and attach 60 pounds of weight to the drop pipe. Fill the Adapter with water and attach the pressure line to the Adapter. Attach the pressure inlet line.

Increase the pressure to 10-20 psi for approximately 5 minutes, and then reduce pressure to zero, to seat properly each Adapter. Increase the pressure to 40 psi and inspect the assembly for evidence of leaks. Increase the pressure to 60 psi and reinspect for leaks. Increase the pressure to a minimum of 150 psi and hold at that pressure for a minimum of 60 minutes, with periodic inspections for leaks. Relieve the pressure and disassemble. The unit must not show any evidence of leakage from 0 to 150 psi after initial seating.

Evidence of any water at any of the Adapter joints during any portion of the test shall constitute a failure of the Adapter.

Note: Where the Pitless Adapter has two or more internal chambers or passages, as in the case of a design for a jet pump installation, the pressure shall be applied simultaneously to all chambers or passages.

6.2 PITLESS UNIT TESTS

6.2.1 SURFACE WATER CONTAMINATION TEST – Attach both the top and bottom connections of a Pitless Unit, in accordance with the instructions of the Pitless Unit manufacturer, to a short length of standard schedule 40 well casing, or other casing as specified by the manufacturer. Both ends of the casing shall be capped. A 2-foot length of casing is usually convenient for this purpose. Do not insert any internal components of the Adapter assembly. Attached a short length of pipe to the discharge connection on the Pitless Unit, in accordance with the manufacturer's instructions (reference Diagram 2).

Connect the inlet water, pressure and meter lines to the discharge pipe opening on the Pitless Unit.

Fill the Pitless Unit with water and purge the air through the plug hole in the cap on the upper barrel casing. When all the air is purged from the unit, plug the cap. Ensure the assembly is dry before proceeding with testing.

Increase the pressure to 15 psi for 10 minutes. Inspect the exterior for evidence of leaks during this period. Each 10 minutes, increase the pressure an additional 15 psi, and reinspect the exterior for evidence of leaks, until a minimum of 75 psi is reached. Maintain the pressure at a minimum of 75 psi for 20 minutes, reinspect the exterior, and relieve the pressure. The Unit must not show any evidence of leaking from 0 to 75 psi. Evidence of any water on the exterior of the Unit assembly at any time shall constitute a failure of the Unit.

6.2.2 EXTERNAL HOUSING PRESSURE TEST LESS THAN 8” – Attach a short length of pipe to the discharge connection on the Pitless Unit, in accordance with the manufacturer's instructions.

Insert the internal component assembly into the Pitless Unit.

Connect the inlet water, pressure and meter lines to the discharge pipe on the Pitless Unit.

Fill the Pitless Unit with water and purge the air through the pressure zone tapplings. When all the air is purged from the unit, plug the pressure zone tapplings. Ensure the assembly is dry before proceeding with testing.

Plug the pressure zone tapplings in the internal component assembly.

Increase the pressure to 15 psi for 10 minutes. Inspect the internal component assembly at the upper barrel connection and the well casing connection for evidence of leaks during this period. Each 10 minutes, increase the pressure an additional 15 psi, and reinspect for evidence of leaks, until a minimum of 150 psi is reached. Maintain the pressure at a minimum of 150 psi for 20 minutes, reinspect, and then relieve the pressure. The unit must not show any evidence of leaking from 0 to 150 psi. Evidence of any water on the internal component assembly at the upper barrel connection and the well casing connection of the Pitless Unit assembly at any time shall constitute a failure.

6.2.3 INTERNAL HOUSING PRESSURE TEST 8” AND LARGER – Attach a short length of pipe to the discharge connection on the Pitless Unit, in accordance with the manufacturer's instructions. Insert the internal component assembly into the Pitless Unit.

Connect the inlet water, pressure and meter lines to the discharge pipe on the Pitless Unit.

Fill the Pitless Unit with water and purge the air through the pressure zone tapplings. When all the air is purged from the unit, plug the pressure zone tapplings. Ensure the assembly is dry before proceeding with testing.

Plug the pressure zone tapplings in the top plate of the internal component assembly.

Increase the pressure to 15 psi for 10 minutes. Inspect the internal component assembly at the upper barrel connection and the well casing connection for evidence of leaks during this period. Each 10 minutes, increase the pressure an additional 15 psi, and reinspect for evidence of leaks, until a minimum of 300 psi is reached. Maintain the pressure at a minimum of 300 psi for 20 minutes, reinspect, and then relieve the pressure. The unit must not show any evidence of leaking from 0 to 300 psi. Evidence of any water on the internal component assembly at the upper barrel connection and the well casing connection of the Pitless Unit assembly at any time shall constitute a failure.

Reference the addendum located on page 18.

6.3 SANITARY WELL CAP TEST

6.3.1 TEST INSPECTION POINTS – After proper installation, if the Sanitary Well Cap can be removed without the aid of tools, it shall not be deemed tamper-resistant. The Sanitary Well Cap shall be removed and reinstalled two times in succession. Failure of the sealing component will result in failure of the vermin test. The screen or other method used to resist the entrance of vermin or contaminants shall be attached in such a manner that it shall not be dislodged without intentional effort or easily damaged. The open vent area shall be determined by examination and/or computation and shall not be less than 40% of at least a nominal 1/2 inch diameter of a total vent area. No opening in the installed Sanitary Well Cap shall exceed 1/32 inch in diameter.

6.3.2 TAMPER RESISTANCE – Attach the cap, using the manufacturer's assembly instructions, to a length of well casing, meeting applicable standards, (ASTM # A53 Grade A Specification for steel, ASTM F-480 & ASTM 2241 for plastic) or as specified by the manufacturer. Secure the bottom of the casing and apply 100 pounds of tension to the sanitary cap in an attempt to remove the cap from the casing. Maintain this tension for a minimum of five minutes. If after five minutes the test cap is still attached to the well casing, the cap is considered tamper resistant.

6.3.3 VERMIN AND CONTAMINANT RESISTANCE – Attach the cap, according to the manufacturer's instructions, to a length of well casing meeting applicable standards (ASTM # A53 Grade A Specification for steel, ASTM F-480 & ASTM 2241 for plastic) or as specified by the manufacturer.

Invert the assembly and pour into the casing, one gallon of the standard test suspension of water and 1/32 diameter inch maximum 1.3 minimum specific gravity balls.

Allow the casing, cap and standard test suspension to stand for a period of 15 minutes with agitation at five minute intervals.

At the end of 15 minutes inspect the cap at the point of its vent provision and/or casing juncture; also inspect the collection container. Any evidence of one or more of the 1/32 inch diameter balls in the collection container shall constitute a failure of the vermin proof test.

6.3.4 WATERTIGHT CAPABILITY – Attach the well cap with standard vents installed to a length of well casing conforming to ASTM # A53 Grade A Specification for steel, ASTM F-480 & ASTM 2241 for plastic or such casing as specified by the manufacturer.

Cap the blind end of the well casing to seal the interior of the well assembly.

Place well cap and casing assembly upright and fasten to a stand (reference Diagram 3).

Simulate a falling precipitation event by spraying the top of the well cap assembly with a soaking nozzle for 10 minutes (the nozzle should pointed downward at a 45 degree angle towards the top of the well cap and moved to ensure equal distribution of water over the entire surface of the well cap).

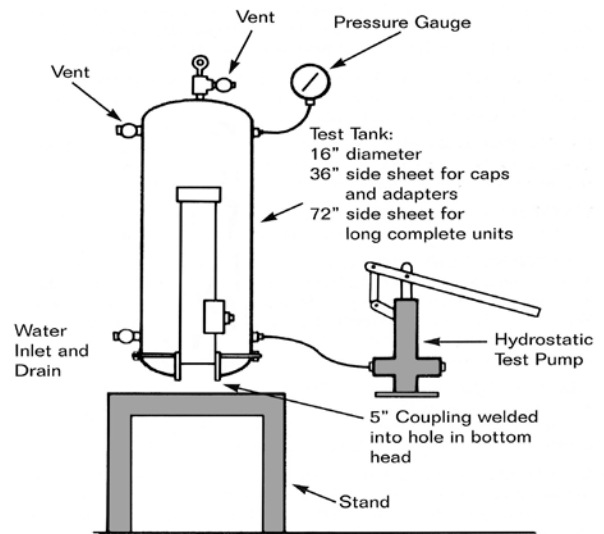
After 10 minutes, shut off the water and dry off the outside surfaces of the well cap assembly.

Remove the well cap assembly from the well casing and inspect the inside surfaces of both the well cap and well casing for evidence of water. Evidence of any water in the interior of the assembly shall constitute a failure of the watertight well cap.

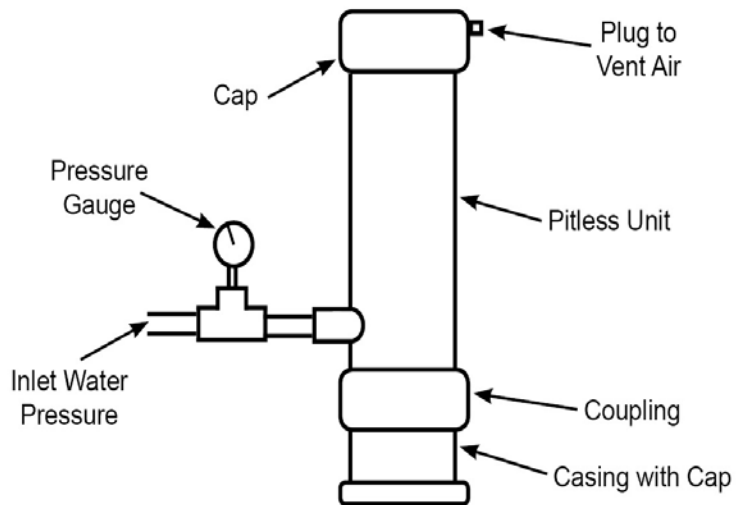
6.4 LEAD FREE TEST

The weighted average lead content shall be calculated by using the following formula: For each wetted component, the percentage of lead in the component shall be multiplied by the ratio of the wetted surface area of that component to the total wetted surface area of the entire product to arrive at the weighted percentage of lead of the component. The weighted percentage of lead of each wetted component shall be added together, and the sum of these weighted percentages shall constitute the weighted average lead content of the product. For lead content of materials that are provided as a range, the maximum content of the range will be used; 0.25 percent or less.

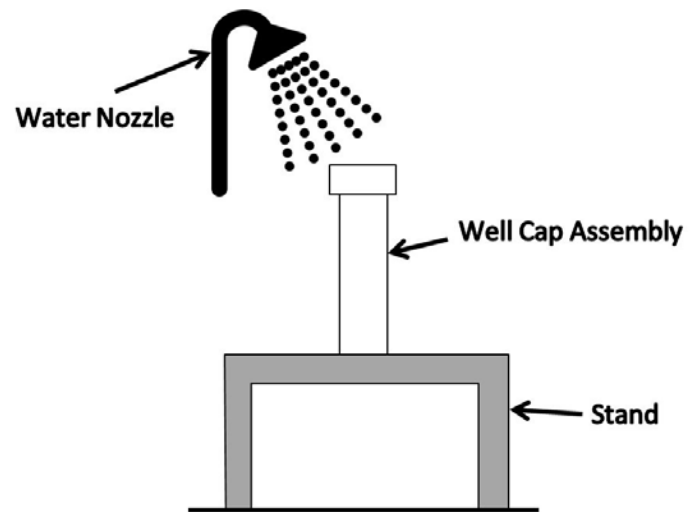
**Diagram 1:
Pitless Adapter/Unit Test Equipment**



**Diagram 2:
Pitless Unit**



**Diagram 3:
Sanitary Well Cap Test**



APPENDIX A (Normative)

INSTALLATION RECOMMENDATIONS

INSTALLERS – Pitless Adapters, Pitless Units, and Sanitary Well Caps should be installed by installers who are licensed by applicable regulatory agencies where required.

INSTRUCTION – Manufacturers should provide clearly understandable and detailed installation and service instructions for each Pitless Adapter, Pitless Unit, or Sanitary Well Caps manufactured, including but not limited to, instructions relating to attachment.

WELL CASING – Pitless Adapters, Pitless Units, and Sanitary Well Caps should be attached only to well casing meeting the requirements of applicable regulatory agencies where required.

DISCHARGE AND SUCTION LINES – Pitless Adapters and Pitless Units should be connected only to suction and pressure piping meeting the requirements of applicable regulatory agencies where required.

SANITARY WELL CAP – Pitless Adapters and Pitless Units should be installed with a Sanitary Well Cap for the top terminal of the well.

TOP TERMINAL HEIGHT – The top of the well casing or Pitless Case should extend a minimum of 12 inches, or as specified by the applicable local code, above surrounding grade, and be covered by a Sanitary Well Cap. The ground immediately surrounding the top of the well casing or Pitless Case should be graded so as to sufficiently drain surface water away from the well.

FIELD TESTING – An installed Pitless Adapter or Pitless Unit should be pressure-tested with the system pump in the field to detect and thereby permit the prevention of leakage, before grouting and backfilling of the Adapter or Unit installation.

GROUTING – The space between the side of the well hole and the well casing with an attached Pitless Adapter or Pitless Unit should be filled with cement grout, bentonite, or other grouting material as required by applicable regulatory agencies.

AREA SUBJECT TO FLOODING – Any Pitless Adapter or Pitless Unit installed in such an area should extend a minimum of 24 inches above known flood level. The well casing or Pitless Case should be sealed at the upper terminal by a watertight closure (see Sections 4.3).

APPENDIX B (Informative)

WATER SYSTEMS COUNCIL LISTING PROGRAM

1.0 LISTING

1.1 ELIGIBILITY – In order to be eligible for listing by the Water Systems Council, Pitless Adapters, Pitless Units, and Sanitary Well Caps must be certified as meeting WSC PAS-97 (2016), WSC PAS-97(2012), PAS-97(04) (or, previously, to the predecessor standard PAS-1 and/or PAS-2) by an third-party testing laboratory. Applicants for such listing must identify the original equipment manufacturer of the product in their certification applications. At least one size of the same design and model series of these products must be tested and certified as meeting PAS-97(2016) in order for the entire model series to be listed. The tested sample must be forwarded to WSC to retain for future comparison.

1.2 LISTING FORMAT – Beginning in 2012, manufacturers listing their products by “series” must provide WSC with a complete list of individual products included in the series listing and indicate which products are “lead free.” Or, companies can submit an individual product-by-product list with the “lead free” designation where appropriate.

1.3 SYMBOL AUTHORIZATION – Manufacturers or redistributors of products eligible for listing may be licensed or authorized by the Water Systems Council to use its symbol of compliance with this Standard. Listed manufacturers and listed redistributors shall be eligible to utilize the WSC symbol of testing compliance with the PAS standard for their products that are listed.

1.4 FEES FOR LISTING – Fees for listing will be set from time to time by the Water Systems Council.

1.5 ANNUAL RENEWAL OF PRODUCT LISTING – A list of products certified by third-party testing laboratories to the PAS standard shall be published once a year by the Water Systems Council. This list will be available on the WSC website. Listed manufacturers and redistributors shall have the annual opportunity to add newly certified products to the list and incur the obligation to inform the certifying laboratory of any changes in their listed products' design or function that could necessitate a retest and recertification.

1.6 ENFORCEMENT – WSC reserves the right to require a retest of any product on the PAS list.

Any challenge by a member or non-member to the veracity of a product’s compliance with PAS requirements must be submitted to WSC in writing. The letter must include the basis for the challenge as well as the name of the person and/or company submitting the information. The WSC Board of Directors is responsible for determining what actions, if any, will be taken.

If the retesting is required in answer to a challenge to a product listing and the retested product meets the PAS standard requirements, challenger will reimburse the manufacturer for the cost of the retesting. If product fails, the manufacturer of the failed product shall pay the cost of retesting. Proper notification must be made to WSC PAS Committee and the manufacturer being challenged.

APPENDIX C

PROCESS FOR PAS LISTING

WSC maintains and updates the PAS listing annually. WSC publishes the annual update of the PAS List in June each year. This list is available on the WSC website. To be included on the updated PAS list, all the below-mentioned materials and payment of all fees (if applicable) must be submitted to WSC before May 31 each year.

Each year, manufacturers with products on the current list are sent letters requesting a notarized letter signed by an officer of the company that lists all products (individually under any series) to be listed. The manufacturer's published literature that includes a photo and description for each listed product must be included with the notarized letter returned to WSC for reference to the specific product. This notarized letter must certify that there were no design, materials or function changes made to any of these products since the inclusion and approval for prior listing. If any changes in the listed product were made, a detailed description of all changes for any product must be included. If the change is ONLY a "materials" change (e.g., change from material with lead to a "lead free" material), a company must certify that there were no other changes to the product design or function. WSC reserves the right to require that the revised product be re-tested and approved separately prior to approval for listing.

To obtain approval for listing for any products made by you that have never been tested or that are not currently listed, you will need to have those products tested and certified by a third-party testing laboratory for compliance with the standard before they can be approved for listing.

All revised and new products to be added to the PAS list not only have to be tested by a third-party testing laboratory, but the third-party testing laboratory will be required to forward the tested sample product to WSC to retain for future comparison with off the shelf product, should a question arise by any manufacturer with a listed product. WSC reserves the right to retest products on the PAS list from time to time.

For any products that are manufactured by someone else for you and that are currently listed, you need to obtain a letter from the manufacturer certifying that the product model (include product number) that you want PAS-listed is a product manufactured by that manufacturer for you and is a product currently listed by that manufacturer. This letter should include all product numbers for both your product and the manufacturers and clearly show the relationship between each.

ADDENDUM 1

6.2.3 INTERNAL HOUSING PRESSURE TEST 8" AND LARGER

Products tested under section 6.2.3, Internal Housing Pressure Test 8" and Larger, outlined in PAS-97 (2017) will be tested by an accredited A2LA certified independent mechanical laboratory. The laboratory will photograph the testing process and product, and shall submit the photographs to WSC for storage. The laboratory will also supply a letter stating the product meets the PAS-97 (2017) standard. The company shall provide drawings with nominal dimensions of the tested product to WSC. The maker of the tested product will store the sample at their own facility until the product is obsolete. The stored product will include the model number, date code and report number noted on the letter from the laboratory. Products tested under section 6.2.3 will be identified on the product listings for each company on the WSC website.

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