DATE: Friday, June 06, 2003

TO: Office of Water Programs Engineers

THROUGH: Eric H. Bartsch, P.E., Director
Office of Water Programs

Allen R. Hammer, P.E., Director
Division of Water Supply Engineering

Robert Taylor, P.E., Technical Services Administrator
Division of Water Supply Engineering

FROM Monte Waugh, Technical Services Assistant
Division of Water Supply Engineering

SUBJECT: Water - Design - Equipment - Pitless Adapters and Watertight Well Caps

Delete: WM666

Attached is a copy of "Certified Pipless Adapters and Pitless Units Certified Watertight Well Caps," a list of "Certified Pipless Adapters and Pitless Units Certified Watertight Well Caps" dated April 1991, a copy of "Pitless Adapter Standard -- 1997 (PAS-97), and Recommended Installation Procedures For Sanitary Water Well Pitless Adapters, Pitless Units and Watertight Well Caps" dated October, 1997, and a list of "List of Pitless Adapters, Pitless Units and Watertight Well Caps Currently Manufactured, Tested and Certified by Third Parties to Meet PAS Standards" dated March, 1998, from the Water Systems Council. These listings in conjunction with pitless adapters and watertight well caps that are certified by NSF or other bona fide independent testing organizations are acceptable products for use by a waterworks.

Please be aware of the facts regarding our requirements for well installations and the difficulties of using pitless adapters for waterworks are as follows:

1. Our regulations require metering, pressure gauges, sample taps, provisions for discharging the well water to waste, and in instances, pressure relief valves and other appurtenances. Most often these "plumbing" items are installed at the well itself and the pitless adapter unit may not be a practical fixture at the wellhead.
2. During an emergency or if continuous disinfection (chlorination) is required, the pitless adapter arrangement would not be practical in that a well house for chlorination facilities, etc. would still be necessary.
3. In all instances a 6 foot by 6 foot minimum size floor slab would have to be provided. The casing must extend at least 12 inches above the floor slat and a vent and sanitary seal provided. The floor slab must be above grade.
4. Grouting of the well must include placing of cement around the pitless adapter.

5. We feel that a minimum number of fittings is desirable to reduce the adverse effects from corrosion. Where added fittings are provided in the casing, there is an increased chance of leakage of upper ground waters into the well casings.
6. The installation of drawdown gauges is complicated by pitless adapters. A drawdown gauge of some type is likely to be required in the near future.
7. We do not feel that motor control boxes and pressure switches should normally be installed in the upper portion of well casings.
8. A protected air vent from the well seal to the casing below the adapter is necessary and this feature is not apparent in the brochure examined (Monitor-Modern Water Systems Equipment - Baker Manufacturing Company)."

In summary, the use of a pitless adapter must be considered on a case-by-case basis, using our usual well installation requirements, with the additional provision that the pitless adapter must have been evaluated by a recognized independent laboratory.

CERTIFIED PITLESS ADAPTERS AND PITLESS UNITS
CERTIFIED WATERTIGHT WELL CAPS

Pitless Adapter Division
Water Systems Council
600 S. Federal Street, Suite 400
Chicago, IL 60605
Phone: 312/922-6222 FAX: 312/922-2734

In 1966, a group of the manufactures of pitless adapters and complete pitless units joined together to form the Pitless Adapter Division of the Water Systems Council (PAD). The Division's first objective was to define and promote, under **written standards,** sound principles of pitless equipment construction and installation that would protect the public health by:

1. Incorporating manufacturer, installer and sanitary agency experience in the design and installation of pitless equipment.

2. Providing minimum design and manufacturing standards for use by manufacturers in producing sanitary equipment to meet reasonable and practical tests.

3. Providing regulatory agencies, specifiers and installers with a uniform description and definition of pitless products -- products which may vary in appearance yet have their own unique and unusual features.

4. Providing a single standard for equipment evaluation by regulatory agencies.

5. Providing installers with modern equipment which is practical to install and maintain.

6. Providing consumers with adequate and economical equipment as part of the water system.

Division members felt strongly that any such Recommended Standards should be reasonable, workable, and clearly understood; that all terms be precisely defined; and that the Standards avoid the use of coined or misleading terms and phrases which might produce ambiguous meaning or arbitrary interpretation.

The result was the development of **Recommended Standards (PAS-I) and Installation Procedures for Sanitary Water Well Pitless Adapters and Units.** First adopted in 1966, PAS-1 was re-evaluated by the Division's Board of Examiners in 1971, 1974, 1977, 1980, 1983 and 1986. The sixth edition of PAS-1 was published in 1987.

In addition to PAS-1, Division members felt a need to develop a companion standard, **Pitless Adapter Standard No. 2 (PAS-2), Standard for Watertight Well Caps.** Development of that Standard began in

1985 and included input and comments from state health officials. The first edition of PAS-2 was approved and adopted in March, 1988.

PAS-1 defines criteria and testing procedures for pitless well adapters. Over the years, it has become widely accepted that wells must be vented to the atmosphere in order to prevent a vacuum from being drawn on the casing and attachments to the casing, including well caps, electrical conduit and pitless adapter.

Most watertight well caps have provision for either a factory or field installed vent device; however, there had been no nationwide standard setting forth criteria for such a watertight cap until PAS-2 was adopted. PAS-2 was developed to set a minimum standard for the design, inspection and approval of watertight caps.

The Division publishes a listing (updated semi-annually) of products that have been tested under the provisions of its Recommended Standards.

Under PAS-1, adapters and units are tested for internal and external watertightness. Under PAS-2, caps that passed five inspection points are then tested for tamper resistance, vermin resistance and external watertightness.

These tests are conducted by an independent, private testing laboratory under the supervision of the Division's Board of Examiners which is composed of both industry and non-industry personnel. Based on the results of these tests, the products included on the Division's published listing meet or exceed the requirements of the above listed standards and, accordingly, have been so certified by the Division.

Full information on these standards, as well as information on the testing and certification program, are available through the Division Office. Copies of both
PAS-1 and PAS-2 are available upon request.

CERTIFIED PITLESS ADAPTERS AND PITLESS UNITS
CERTIFIED WATERTIGHT CAPS

APRIL 1991

The following products have been tested and certified by the Pitless Adapter Division of the Water Systems Council to meet or exceed the provisions of **Recommended Standards (PAS-1) and Installation Procedures for Sanitary Water Well Pitless Adapters and Units** and/or **PAS-2, Standard for Watertight Caps.**

The Certified List is presented alphabetically, by company name and shows which products manufactured by each company have been certified to meet the provisions of PAS-1 only, PAS-2 only and BOTH Standards.

ADVANCE-MORRISON

Certified under BOTH PAS-1 and PAS-2

AMA-1
AMA-1P
AMWTC Caps
D-8001-DWC 008 A Series
ADVANCE-MORRISON Weld-on Adapter Series

AMERICAN GRANBY, INC.

PAS-1 Certified Products

HARVARD: PT600, PT700, PT725, PT800, PT825, PT900 Pitless Adapters
HARVARD: SA Series Jiffy Clamp-on Pitless Adapters

PAS-2 Certified Products

HARVARD: WC Series watertight well caps
HARVARD: WTC Series watertight well caps

BAKER MANUFACTURING COMPANY

PAS-1 Certified Products

PS Units -- 3 to 20-in. Well Sizes

PJ Units -- Single Pipe Jets, Shallow Well 2-Pipe Jet, Packer Jet
PR Units -- 2 to 8-ft. Buried Depth
PL Clamp-on & Weld-on Adapters
BA -- Adapters Sub
SA Series Adapters, Harvard
Bulldog Adapters

PAS-2 Certified Products

WTC Series Cap
C4 Watertight Cap
WE Series Watertight Cap

CAMPBELL MANUFACTURING, INC.

PAS-1 Certified Products

"B" Series Adapters
"J" Series Adapters
"LP" Series Well Caps
"LSW-614 PVC Casing Cap
"LX" Series Well Caps
"S" Series Adapters
"WT" Series Well Caps

PAS-2 Certified Products

WT Series Caps -- WT4, WT5
WTC Series Caps
LP, LX (SC4, SC4 1/2, SC5) LSW Series Caps
T Series Adapters -- T4X1, T4x 1/4, T4 1/2x1, T4 1/2X1 1/4, T5X1, T5X1 1/4

DAYTON PRECISION MANUFACTURING COMPANY, INC.

PAS-1 Certified Products

Model 002.5B Unit
Model DPM-001B Unit, DPM-002B Unit, DPM-003B Unit, DPM-004B Unit,DPM-005B Unit, DPM-004C Unit, DPM-005C Unit, DPM-006C Unit

MAASS MANUFACTURING, INC.

PAS-1 Certified Products

Model B Weld-on Adapter
Model J Weld-on Adapter

Model JJ Weld-on Adapter
Model HC Pitless Adapter
Model JD Pitless Adapter
Model DX Pitless Unit
Model JX Pitless Unit
Model JC Clamp-on Adapter

PAS-2 Certified Products

Model WT Watertight Well Cap

MERRILL MANUFACTURING COMPANY, INC.

PAS-1 Certified Products

CO Series Pitless Adapters
MB100 Series Pitless Adapters
MB200 Series Pitless Adapters
MHB Series Pitless Adapters
(Made by Dayton Precision)
MCK Series Pitless kiTS
(Made by Dayton Precision)
SP Series Pitless Units
SPK Series Pitless Kits
SPP Series Pitless Units
V and VC Series Vent Caps
WC Series Watertight Caps

PAS-2 Certified Products

MERRILL WC Series Watertight Caps
MERRILL WCB Series Watertight Caps
MERRILL WCI and WCM Series Watertight Caps

Certified under BOTH PAS-1 and PAS-2

MCK Series Pitless Kits with WC Series Cap
MCK Series Pitless Kits with WCI and WCM Series Cap
MCK Series Pitless Kits with WCB Series Cap
SP Series Pitless Kits with WCB Series Cap
SP Series Pitless Kits with WC Series Cap
SPK Series Pitless Kits with WC Series Cap
SPK Series Pitless Kits with WCB Series Cap

SPP Series Pitless Kits with WC Series Cap
SPP Series Pitless Kits with WCB Series Cap

MIDWEST DICKEN MANUFACTURING, DIVISION OF MAASS MFG., INC.

PAS-1 Certified Products

Model CW-Series Adapters (CW-4-10, CW-5-10, CW-6-10, CW-4-10WA, CW-4-1/2-10WA, CW-5-10WA)
Model LD-S Series Adapters (LD-S-10, LD-S-10P, LD-S-12, LD-S-12-P, LD-S-10-CO, LD-S-12-CO)
Model S. Series Adapters (S-10, S-12, S-20, S-20-CO, LD-2X)
Model WTCC Series Caps (WTCC-56, WTCC-66, WTCC-8)
JR-S-10, JR-S-10P
KK410, KK510, KK5610, KK412, KK512, KK612
Compression Coupling: SA 4"-5" Eccentric Standpipe Adapter

PAS-2 Certified Products

MDWEST DICKEN WTCC-6, WTCC-5, WTCC-4

SIMMONS MANUFACTURING COMPANY

PAS-1 Certified Products

Models 1820, 1281 -- 1" Unit
Models 1822, 1823 -- 1-1/4" Unit
Models 1840, 1841
Model 1850 -- 1" Unit
Model 1860 -- 1-1/4" Unit

WHITEWATER MANUFACTURING COMPANY

PAS-1 Certified Products

Series 1742 Calmp On
Series 1742 Compak
Series 1742-W Ace Try-Me
Series 1J (Wis. Code)
Series SS (wis. Code)
Series SU (Model 52)
Series W1J
Weld On Model WB 1742 Adapter

Duplex

1060 PJ-C
2000 PJ2

1060 PJ-P	2015 SUB
1060 SUB	2015 SUB CA
1060 SUB CA	2049 SUB 4
1060 SW	2050 SUB 4
2000 PJ2-P	2070 SUB
2000 SW2	2175 SUB CA

PAS-2 Certified Products

Watertight Seal
Series 300 Watertight Seal
150350
150351 Model 200
105352 Model 300

PITLESS ADAPTER STANDARD -- 1997
(PAS-97)
PERFORMANCE STANDARDS

And Recommended Installation Procedures For Sanitary Water Well PITLESS ADAPTERS, PITLESS UNITS AND WATERTIGHT WELL CAPS

Pitless Adapter Manufacturers Committee of the
Water Systems Council
800 Roosevelt Road
Building C, Suite 20
Glen Ellyn, Illinois 60137

October, 1997

HISTORY OF THE PAS-1 AND PAS-2'

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, the Council 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 comprising the majority of the U.S. manufacturers of Pitless Adapters and complete Pitless Units joined together as the Pitless Adapter Division (changed in 1994 to the Pitless Adapter Manufacturers Committee) of the Water Systems Council {WSC}).

The new Division's first objective was 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 which is practical to install and maintain.

6. Providing the consumer with pitless equipment for their water systems which meets the requirements of this standard.

The members of the Division felt strongly that any such Recommended Standards should be reasonable, workable, and clearly understood. It was thought to be essential that all terms be precisely defined and that the Standards avoid the use of coined or misleading terms and phrases which might produce ambiguous meaning or arbitrary interpretation. Recommended Standards (PAS-1) and Installation Procedures for Sanitary Water Well Pitless Adapters and Units was re-evaluated by the Division's Board of Examiners in 1971, 1974, 1977, 1980, 1983 and 1986.

In addition to PAS-1, Division members developed a companion standard, PAS-2 Standard for Watertight Well Caps, covering the inspection and approval of vented watertight well caps. Development of that Standard began in 1985. Division members prepared and reviewed several drafts of the proposed new standard and solicited input and comments during each step of the development process from state health officials. The first edition of PAS-2, approved and adopted in March, 1988, was the result of those efforts. This 1997 edition of the Standards was re-evaluated by the Pitless Adapter Manufacturers Committee, and both Standards were merged to create the 1997 edition.

For additional information about the Pitless Adapter Manufacturers Committee and its Standards, contact:

Pitless Adapter Manufacturers Committe
Water Systems Council
800 Roosevelt Road
Building C, Suite 20
Glen Ellyn, Illinois 60137
Phone: 630/545-1762
FAX: 630/790-3095

PITLESS ADAPTER STANDARD 1997 [PAS-97]
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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 frostline 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 for attachment 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. Adapters and 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 in order 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 watertight well caps have provision for either a factory or field installed vent device; PAS-2 was adopted to set a minimum standard for performance inspection and approval of vented watertight well caps. Note: the factory or field installation of a vent and/or open electrical conduit connection can result in the cap 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 has led to this combined standard PAS-97.

PERFORMANCE STANDARDS FOR SANITARY WATER WELL PITLESS ADAPTERS, PITLESS UNITS AND WATERTIGHT 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 Watertight 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, of Pitless Unit, and of Watertight Well Cap; to provide a single standard for the evaluation of pitless products and watertight 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, Watertight 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 PITILESS ADAPTER - A device designed for attachment 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 PITILESS UNIT - An assembly which extends the upper end of the well casing to 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 Watertight 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 Pitless 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.

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.

2.14 WATERTIGHT 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 UNIT - 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 or compression-gasketed connection, which shall be watertight (see Sections 4.3).

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

3.4.1 The cap shall cover the top of the well casing to provide resistance to the entrance of vermin or contaminantes. 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 $\frac{1}{32}$ 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 Watertight 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).

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).

3.8 IDENTIFICATION - Pitless Adapters, Pitless Units, and Watertight Well Caps shall provide a durable means of identifying the manufacturer

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 and 4.3.2 immediately below. (see Annex A):

4.3.1 WATERTIGHT EXTERNAL BURIED SURFACES - 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 - 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.

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.

6.0 TESTING PROCEDURES

6.1 PITLESS ADAPTERS AND PITLESS UNIT TESTS

6.1.1 EXTERNAL PRESSURE 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, or a Pitless Unit, 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. Connect the inlet water, pressure and meter lines as indicated on page 13.

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 unit must not show any evidence of leaking from 0 to 75 psi.

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

6.1.2 INTERNAL HYDROSTATIC LEAK 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 component assembly into the casing or Unit, and attach 60 pounds of weight to the drop pipe. Fill the unit with water and attach the pressure line 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 or Unit. 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 Unit or Adapter joints during any portion of the test shall constitute a failure of the Unit or Adapter.

Note: Where the Pitless Unit or 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 WATERTIGHT WELL CAP TEST

6.2.1 TEST INSPECTION POINTS - After proper installation, if the Watertight Well Cap can be removed without the aid of tools it shall not be deemed tamper resistant. The Watertight Well Cap shall be removed and reinstalled two times in succession. Failure of the sealing component will result in failure of the pressure 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 ½ inch diameter of a total vent area. No opening in the installed Watertight Well Cap shall 1/32 exceed inch in diameter.

6.2.2 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 watertight 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.

6.2.3 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 1/32 and diameter inch 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 1/32 the inch diameter balls in the collection container shall constitute a failure of the vermin and contaminant resistance test.

6.2.4 WATERTIGHT CAPABILITY - Attach the watertight cap, in accordance with the instructions of the manufacturer, with conduit and vent plugged, 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.

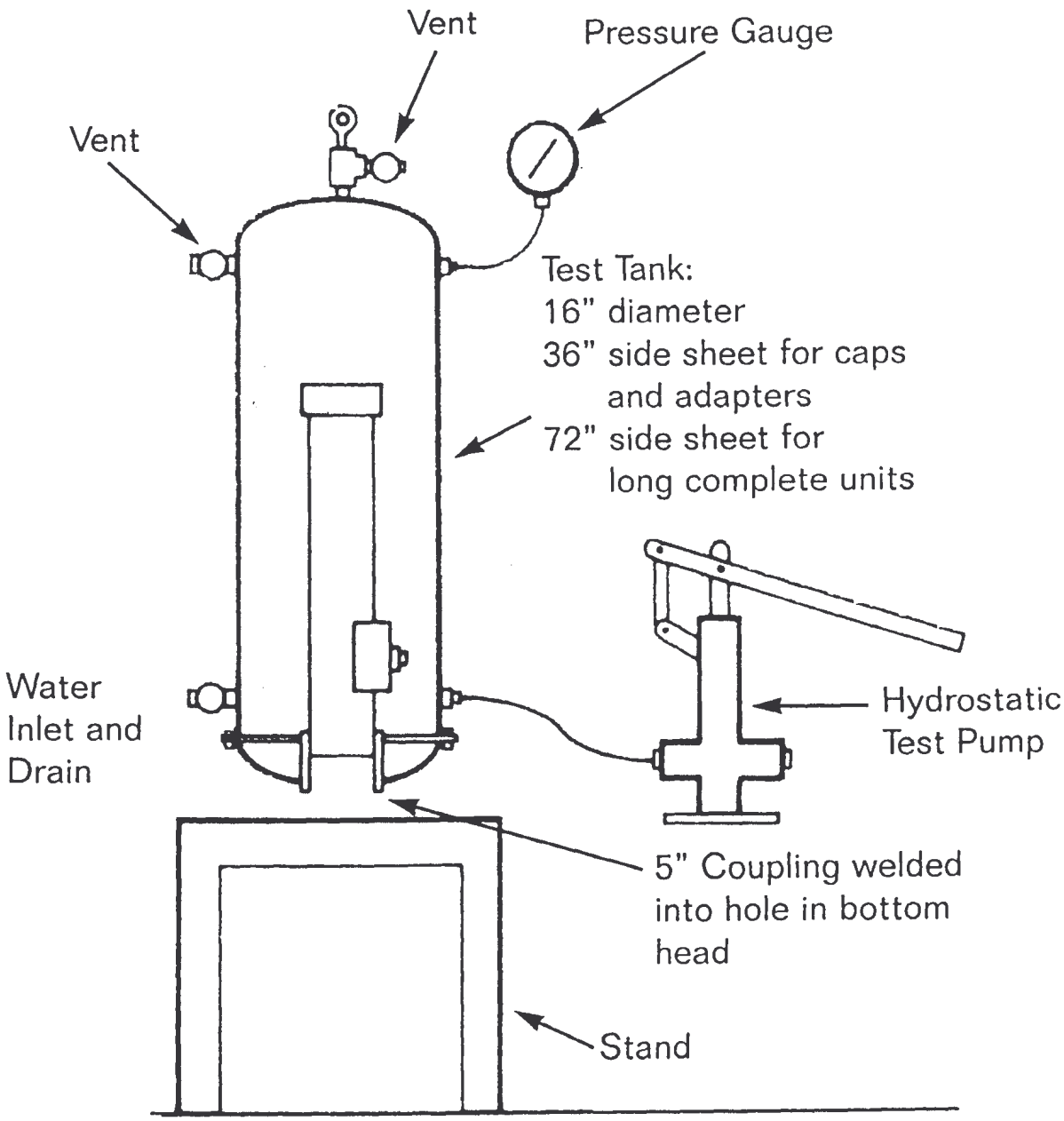
Attach the lower end of the well casing, with its attached watertight cap, into the test tank. The test tank should have provisions to evacuate the air in the tank when filled with water and apply pressurized water to the entire outer surface of the cap. Connect the inlet water, pressure and meter lines as indicated in Figure 1, on page 13.

Open the tank vents and fill the tank with water. From the bottom of the test tank, inspect the interior of the cap and well casing for evidence of leaks through the cap joints.

Close the tank vents and increase the pressure to 2 psi. Reinspect the interior for evidence of leaks as above. Each 10 minutes, increase the pressure an additional 2 psi, and reinspect the interior for evidence of leaks, until 10 psi is reached. Maintain the pressure at a minimum of 10 psi for 20 minutes, reinspect, and relieve the pressure.

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

EQUIPMENT - FIGURE 1



ANNEX A
(Normative)
INSTALLATION RECOMMENDATIONS

INSTALLERS - Pitless Adapters, Pitless Units and Watertight 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 Watertight Cap manufactured, including but not limited to, instructions relating to attachment.

WELL CASING - Pitless Adapters, Pitless Units and Watertight 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.

WATERTIGHT WELL CAP - Pitless Adapters and Pitless Units should be installed with a Watertight 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 Watertight 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).

ANNEX 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 Watertight Caps must be certified as meeting PAS-97 (or, previously, to the predecessor standard PAS-1 and/or PAS-2) by an independent laboratory such as Allied Labs of Villa Park, Illinois. Applicants for such listing must identify the original equipment manufacturer of the product in their certification applications. At least one size of the same model series of these products must be tested and certified as meeting PAS-97 in order for the entire model series to be listed.

1.2 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.

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

1.4 ANNUAL RENEWAL OF PRODUCT LISTING - A list of products certified by independent testing laboratories to PAS-1, PAS-2 and/or PAS-97 shall be published once a year by the Water Systems Council. 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.

NOTES:

LIST OF PITLESS ADAPTERS, PITLESS UNITS AND
WATERTIGHT WELL CAPS CURRENTLY MANUFACTURED9 TESTED
AND CERTIFIED BY THIRD PARTIES TO MEET PAS STANDARDS
March, 1998

The following listee companies have provided the Water Systems Council with either written reports from independent laboratories stating that their listed products meet PAS-1, PAS-2 and/or PAS-97 or notarized statements affirming that such reports have been issued for each of their listed products.

CAMPBELL MANUFACTURING9 INC.

Products meeting the above Standards

"B" Series Pitless Adapters
"S" Series Pitless Adapters
"J" Series Pitless Adapters
"T" Series Pitless Adapters
"LP" Series Well Caps
"LSW" Series Well Caps
"LX" Series Well Caps
"LW" Series Well Caps
"SC" Series Well Caps
"WT" Series Well Caps
"WTC" Series Well Caps

MAASS-MIDWEST MANUFACTURING CO., INC.

Products meeting the above Standards

Model B Weld-on Adapter
Model J Weld-on Adapter
Model JJ Weld-on Adapter
Model BX Pitless Unit
Model JX Pitless Unit
Model JC Clamp-on Adapter
Model WT Watertight Well Cap

MIDWEST DICKEN MANUFACTURING, DIVISION OF MAASS MFG., INC.

Products meeting the above Standards

MODEL CW-Series Adapters (CW-4-10, CW-5-10, CW-6-10, CW-4-10WA, CW-4-1/2-

10WA, CW-5-10WA)
MODEL LD-S Series Adapters (LD-S-10, LD-S-10P, LD-S-12, LD-S-12P, LD-S-10-CO, LD- S- 12-CO)
MODEL S. Series Adapters (S-10, S-12, S-20, S-20-CO, LD-2X)
JR-S-10, JR-S-10P
KK410, KK510, KK610, KK412, KK512, KK612
Compression Coupling: SA 4"-5" Eccentric Standpipe Adapter
Model WTCC Series Caps (WTCC-56, WTCC-66, WTCC-8, WTCC-4, WTCC-5, WTCC-6)
Model WTCC 5CL, WTCC 6CL Chlorine Well Caps

MERRILL MANUFACTURING COMPANY, INC.

Products meeting the above Standards

Mini Pitless Adapter
CO Series Pitless Adapters
MB100 Series Pitless Adapters
MB200 Series Pitless Adapters
MHB Series Pitless Adapters
MCK Series Pitless Kits
SMCK Series Pitless Kits
SP Series Pitless Units
DSP Series Pitless Units
SPK Series Pitless Kits
SPP Series Pitless Units
Model MB60, MB100, MHB100, MHB125, MHB300, MHB400, MB50, MBI100, MB200,
MBI125, MB225, MB125, MBP100, MBP125 Pitless Adapters
MERRILL WC Series Watertight Caps
MERRILL WCB Series Watertight Caps
MERRILL WCI and WCM Series Watertight Caps
MERRILL WCO Series Watertight Caps
MERRILL WCOP Series Watertight Caps
MERRILL WCD Series Watertight Caps
MERRELL WCP Series Watertight Caps
MCK Series Pitless Kits with WCO Series Cap
MCK Series Pitless Kits with WCD Series Cap
MCK Series Pitless Kits with WCP Series Cap
MCK Series Pitless Kits with WC Series Cap
MCK Series Pitless Kits with WCI and WCM Series Cap
MCK Series Pitless Kits with WCB Series Cap
SP Series Pitless Units with WCB Series Cap
SP Series Pitless Units with WC Series Cap

SPK Series Pitless Kits with WC Series Cap
SPK Series Pitless Kits with WCB Series Cap
SPP Series Pitless Units,with WC Series Cap
SPP Series Pitless Units with WCB Series Cap

SIMMONS MANUFACTURING COMPANY

Products meeting the above Standards

Models 1820, 1821 -- 1" Unit
Models 1822, 1823 -- 1-1/4" Unit
Models 1840, 1841

WHITEWATER MANUFACTURING COMPANY

Products meeting the above Standards

Series 1742 Clamp On
Series 1742 Compak
Series 1J (Wis. Code) IE. Concentric Piping
Series SS (Wis. Code) IE. Concentric Piping
Series SU (Model 52)
Duplex
1060 PJ-C
1060 SUB
1060 SUB CA
1060 SW
2015 SUB
2015 SUB CA
2049 SUB 4
2050 SUB 4
Series 300 Watertight Seal
Series 200 Watertight Seal

WELLS, INC.

Products meeting the above Standards

A Series Pitless Adapter
T Series Pitless Adapter
B Series Pitless Adapter
J Series Pitless Adapter
SC Series Well Cap
WT Series Well Cap

WC Series Well Cap
Model ASC (Pitless & Well Cap Combination)
Model AWT (Pitless & Well Cap Combination)
Model AWC (Pitless & Well Cap Combination)
Model TSC (Pitless & Well Cap Combination)
Model TWT (Pitless & Well Cap Combination)
Model TWC (Pitless & Well Cap Combination)
Model BSC (Pitless & Well Cap Combination)
Model BWT (Pitless & Well Cap Combination)
Model BWC (Pitless & Well Cap Combination)