

41-00443

CITY OF KLAMATH FALLS
WATER DEPARTMENT STANDARD GUIDELINES
FOR THE INSTALLATION, TESTING
& INSPECTION OF BACKFLOW PREVENTION
DEVICES

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JUNE 1990

UPDATED 8/93

SECTION I

GENERAL RULES

I. GENERAL STATEMENT

The purpose of these rules is to protect the public water system against actual or potential cross-connections by isolating within premises, contamination or pollution that may occur because of undiscovered or unauthorized cross-connections on premises; 2) to eliminate existing cross-connections between the public water system and other sources of water that are not approved as safe or potable for human consumption; 3) to prevent the making of cross-connections in the future; and 4) to encourage the exclusive use of the public water system as source of water supply.

It is the intent of these rules is to recognize that there are varying degrees of hazard and to apply the principle that the degree of protection should be commensurate with the degree of hazard that exists on the customer's system.

These standards set forth minimum requirements for safe practice in the delivery and safe usage of domestic water. They are to be interpreted as meeting only minimum requirements.

II. DEFINITIONS - The meanings of terms used in this Chapter are as follows:

A) "Air Gap Separation" shall mean a physical separation between the discharge end of a potable water supply line and an open or non-pressure receiving vessel. An approved "Air Gap Separation" shall be at least two times the diameter of the supply pipe measured vertically above the overflow rim of the receiving vessel, but in no case shall be less than one inch.

B) "Approved", as herein used in reference to backflow prevention assemblies, shall mean meeting approval by the Oregon Health Division.

C) "Atmospheric Vacuum Breaker" shall mean a backflow prevention device containing a shut-off valve followed by a valve body containing a float-check, a check seat and an air inlet port.

D) "Auxiliary Water System" shall mean any water supply on or available to a customer's system other than the approved public water system.

E) "Backflow" shall mean the reversal of the flow of water or any mixture of water and other liquids, gas, or other substance into the distribution pipes of the public water system from any source.

F) "Certified Backflow Prevention Assembly Tester" shall mean a person who has been certified by the Oregon Health Division as having the necessary training and competence to test backflow prevention assemblies.

G) "Cross-Connection shall mean any actual or potential connection or structural arrangement between any part of the water system used or intended to supply water for human consumption, and any source or system containing used water, industrial fluid, gas or other substance that is not or cannot be approved as safe for human consumption.

H) "Customer" shall mean any person or entity to whom water is furnished or sold from the public water system.

I) "Customer System" shall mean any and all piping, fixtures or other parts of the premise which convey domestic water to points of use beyond the service connection.

J) "Double Check Valve Assembly" shall mean a backflow prevention device incorporating two, single, independently acting check valves, a shut-off valve at each end of the device, and necessary appurtenances for testing as required.

K) "Pressure Vacuum Breaker Assembly" shall mean a backflow prevention device incorporating one or two independently operating, loaded check valve(s), an independently operating loaded air inlet valve, a shut-off valve at each end of the device and necessary appurtenances for testing as required.

L) "Public Water System" shall mean the facilities of the distribution system under control of the City of Klamath Falls intended for the supply of potable water up to the point where the customer system begins - generally at the service connection.

M) "Reduced Pressure Principal Assembly" shall mean a backflow prevention device incorporating two independently acting check valves, a hydraulically operating, mechanically independent pressure relief valve, a shut-off valve at each end of the device, and necessary appurtenances for testing as required.

N) "Service Connection" shall mean the point at which the public water system piping ends and the water system piping of the customer begins, generally at the downstream end of the meter connection, or in a case of unmetered fire services, at the utility control valve or detector check.

O) "The Water System" shall mean the makeup of two parts: the public system and the customer system.

III. INSPECTION OF PREMISES

A) The customer's premises shall be available for inspection at all reasonable times to authorized representatives of the City of Klamath Falls Water Department to determine whether cross-connections or other structural or sanitary hazards, including violations of these regulations exist. When such a condition becomes known, the utility shall deny or immediately discontinue the water supply at the premises by a physical break in the service connection until condition has been corrected, provided that opportunity to be heard upon request shall be allowed thereafter as soon as practicable.

B) Customer is to furnish and install in a manner approved by the City of Klamath Falls Water Department, and keep in good working order and safe condition, any and all backflow prevention assemblies.

C) Customer to provide that any backflow prevention assembly be tested by a certified backflow prevention assembly tester at the time of installation and annually thereafter, or more often as may be required by the City of Klamath Falls Water Department.

D) Reports of tests of backflow prevention assemblies shall be filed with the City of Klamath Falls Water Department within twenty (20) days after said report is conducted. The department shall accept said reports from those persons who possess a valid certificate as issued by the Oregon Health Division.

E) All tests of backflow prevention assemblies shall be performed at the customer's expense. Records of such tests, repairs and overhauls will be maintained by the City Water Department, and it is the responsibility of the City's representatives to see that these tests are performed.

IV. WHERE PROTECTION OF THE PUBLIC WATER SYSTEM IS REQUIRED

A) Protection shall be required at each service connection from the public water system that supplies water to premises having an auxiliary water system.

B) Protection shall be required at each service connection from the public water system that supplies water to any premises having more than one service connection to the public water system.

C) Protection shall be required at each service connection from the public water system that supplies water to premises on which any substance is or may be handled in such a manner as to permit entry into the public water system, including water originating from the public water system which is or may be subjected to deterioration in sanitary quality.

D) Protection shall be required at each service connection to any premises that has cross-connections unless such cross-connections are abated to the satisfaction of the Klamath Falls City Water Department.

V. TYPE OF PROTECTION

A) The type of protection required shall be commensurate with the degree of hazard. In determining the degree of hazard and the type of protection required, the following criteria shall be used.

B) At each service connection to any premises where there exists an auxiliary water system with no known cross-connections, the public water system shall be protected by an approved double check valve assembly or an approved reduced pressure principle assembly.

C) At each service connection to any premises on which there is an auxiliary water system where cross-connections are known to exist, the public water system shall be protected by an approved reduced pressure principle assembly.

D) At each service connection to any premises on which an objectionable, but non-toxic substance is or may be handled in such a manner as to permit entry into the public water system, the public water system shall be protected by an approved double check valve assembly or an approved reduced pressure principle assembly.

E) At each service connection to any premises on which any toxic substance is, or may be handled in such a manner as to permit entry into the public water system, the public water system shall be protected by an approved air-gap separation. The air-gap separation shall be located as close as practicable to the service connection, and all piping between the service connection and any receiving vessel shall be visible. If these conditions cannot be reasonably met, the public water system shall be protected by an approved reduced pressure principle assembly.

VI. CONDITIONS OF SERVICE

As a condition of water service, customers shall install, maintain and operate their piping and plumbing systems in accordance with the Oregon Health Division Administrative Rules, the Oregon State Plumbing Code, and if applicable, in accordance with the City of Klamath Falls Rules and Regulations.

VII. REQUIRED SERVICE CONNECTION PROTECTION AT PLANTS AND FACILITIES

The type of protection that shall be provided to prevent backflow into the public water system shall be commensurate with the degree of hazard that exists on the customer's premises.

In addition to those plants and facilities named in the Oregon Health Division Administrative Rules, the following plants and facilities shall have the appropriate backflow prevention assembly.

Plants, facilities, and/or situations which are not listed in this section shall be evaluated on a case by case basis and the appropriate type of backflow protection shall be as determined by the City of Klamath Falls Water Department.

The required minimum level of service connection protection at specific plants and facilities shall include the following:

ABBREVIATIONS:

AG - Approved Air Gap
RP - Reduced Pressure Principle Type Backflow Preventer
DC - Double Check Valve Assembly
PVB - Pressure Vacuum Breaker
AVB - Atmospheric Vacuum Breaker

- 1) Autopsy Facilities - RP
- 2) a. Auxiliary water systems with no known cross-connections - DC
b. Auxiliary water systems where cross-connections are known to exist - RP
- 3) Beverage Bottling Plants - RP
- 4) Breweries - RP

- 5) Buildings
 - a. Hotels, apartment buildings, public and private buildings, or other structures where sewage pumps and/or sewage ejectors have been installed - RP
 - b. Any commercial building in which the specific business activity cannot be ascertained - RP
 - c. Multistoried buildings that use booster pumps or elevated storage tanks to distribute potable water within the premises - DC
 - d. Any building that exceeds thirty (30) feet in height as measured from the service main to the highest piping - DC
- 6) Canneries, packing houses, and/or reduction plants - RP
- 7) Chemically contaminated water systems - any premises served from the public water system, where chemicals are used as additives to the water supply or where the water supply or where the water supply is used for transmission or distribution of chemicals, or where chemicals are used with water in the compounding or processing of chemical products - RP
- 8) Cold storage plants - RP
- 9) Convalescent Homes - RP
- 10) Dairy Processing Plants - RP
- 11) Dental Clinics - RP
- 12) Dry Cleaning Facilities - RP
- 13) Dye Works - RP
- 14) Film Processing Facilities or Film Manufacturing Plants - RP
- 15) Ice Manufacturing Plants - RP
- 16) Irrigation Systems:
 - With chemical additives - RP
 - With auxiliary supply - RP
 - Multi-zone system - DC or PVB
 - Single zone system - AVB
- 17) Laboratories, including, but not limited to teaching institutions, biological and analytical facilities - RP
- 18) Laundries (commercial) - DC

- 19) Medical buildings and clinics - RP
- 20) Metal manufacturing, cleaning, processing, or fabricating plants - RP
- 21) Mills and lumber processing plants - RP
- 22) Multistoried buildings - SEE BUILDINGS
- 23) Multi-service connections: Two or more interconnected services provided by the public water system to a single consumer complex - DC at each service connection
- 24) Nursing Homes - RP
- 25) Oil/Gas production, storage of transmission facilities - RP
- 26) Paper and paper products manufacturing plants - RP
- 27) Plastic manufacturing, extruding and injection molding facilities - RP
- 28) Portable spray, cleaning or flushing equipment which can be connected to the public water system - AG or RP
- 29) Radio active materials or substances - plants or facilities that process, handle, or store radioactive materials or substances - RP
- 30) Reclaimed Water Distribution Systems:
 - a. Premises where the public water system is used to supplement the reclaimed water - AG or RP
 - b. Premises where reclaimed water is used and there is no interconnection with the potable water system - DC or RP
- 31) Radiator flushing and repair shops - RP
- 32) Restricted, classified, or other closed facilities - RP
- 33) Rubber manufacturing plants - RP
- 34) Sand and gravel plants - RP
- 35) Sanitariums - RP
- 36) Schools, colleges, universities, DC or RP, if actual or potential health hazard exists on the premises

- 37) Solar heating systems:
 - a. Solar collector system which contains any hazardous substance and where there is a direct makeup connection to the public water system - RP
- 38) Tank trucks - AG or RP (see portable spray, cleaning and flushing equipment).
- 39) Veterinary Clinics - RP
- 40) Water front facilities and industries - including, but not limited to, docks, fisheries, fish hatcheries and marinas - RP
- 41) Any premises with the following situations:
 - a. Cooling towers
 - b. Swimming pools, spas, and/or fountains
 - c. Pressure generating equipment (e.g., boilers, steam generators, pressure tanks - RP

VIII. BACKFLOW PROTECTION ON FIRE LINE SERVICES

The following are common fire system configurations and their backflow device requirements. A detector meter is required on every fire service line, at or near the property line. The detector meter may be included as part of an Oregon Health Division approved backflow prevention assembly if installed at or near the property line.

TYPE OF SYSTEM

- 1) Any system with provisions for adding formite or toxic fire retardants whether directly connected or not - RP
- 2) Any system connected to or with provisions for connecting to an unapproved auxiliary supply - RP
- 3) Any system that utilizes toxic antifreeze - RP
- 4) Any system that utilizes U.S.P. grade or F.D.A. approved antifreeze - DC
- 5) Any system installed in non-potable materials (e.g., black iron pipe) - DC
- 6) Any system with private hydrants (backflow prevention assembly required at property line) - DC
- 7) Any system with a fire department pumper connection (backflow prevention assembly required upstream of pumper connection) - DC

- 8) Any system that extends piping beyond thirty (30) feet above the service main - DC

In all cases, the system is considered potable to the backflow prevention assembly. A customer may install the backflow prevention assembly as part of the fire system riser if the following criteria are met:

a. The distance between the property line and the backflow prevention assembly does not exceed 100 feet.

b. The piping between the service connection is an approved potable material.

BACKFLOW PREVENTION DEVICES

INSTALLATION GUIDELINES

I. AIR GAP SEPARATION

- A. Definition: A physical separation between a potable water supply pipeline and a receiving vessel.
- B. Air gap separations provide maximum protection from backflow hazards and are required at premises where a substance is handled which would be hazardous to health if introduced into the potable water system.
- C. An approved air gap separation shall be at least two times the diameter of the supply pipeline measured vertically above the top rim of the receiving vessel - in no case less than one (1) inch.
- D. Air gap separations must not be altered in any way without prior approval from the City of Klamath Falls Water Department.

II. PRESSURE VACUUM BREAKER (PVB)

- A. Definition: A device containing one or two independently operating loaded check valve(s) and an independently operating loaded air inlet valve located on the discharge side of the check(s). Device must be equipped with properly located all brass test cocks and tightly closing shut off valves located at each end of the assembly.
- B. PVB's required at premises where a substance is handled which would be objectionable, but not hazardous to health if introduced into the potable water system. The device must be a model approved for use at the premises by the City of Klamath Falls Water Department.
- C. PVB's protect against back siphonage only and shall not be installed where there is potential for back pressure.
- D. PVB's shall not be installed in an area subject to flooding and should be located where water damage would not occur when device discharges water.
- E. The device must be protected from freezing.
- F. The device shall be readily accessible for testing and maintenance, with a minimum clearance of 12" all around the device.
- G. PVB's shall be located between 12" and 48" above any downstream piping.

- H. All PVB's must be tested upon installation and at least once per year thereafter by a State certified tester. The City of Klamath Falls Water Department provides the initial test without charge to the owner. The owner must notify the City Water Department upon installation of any backflow prevention device.
- I. Variances from these specifications will be evaluated on a case by case basis. Any deviations must have prior written approval of the City of Klamath Falls Water Department.
- J. Although all approved devices are repairable in-line, the installation of union fittings on both ends of the device is recommended for vault installation due to the lack of space required for easy repairs and maintenance.
- K. Standard drawings are shown in Appendix.

III. ATMOSPHERIC VACUUM BREAKER (AVB) (NON-PRESSURE TYPE VACUUM BREAKER)

- A. Definition: A device containing a shut-off valve followed by a valve body containing a float check, a check seat and an air inlet port. When the shut-off valve is closed, the float falls and forms a check valve against back-siphonage and at the same time opens the air inlet port.
- B. AVB's are approved for extremely low hazard conditions only. These devices cannot be routinely tested, and their use is discouraged for most cross-connection control applications.
- C. AVB's are designed to protect against back-siphonage only, and shall not be installed where a back pressure may occur.
- D. The device must be installed a minimum of 6" above the highest downstream piping from the device.
- E. Shut-off valves downstream from the device are not permitted.
- F. AVB's are permitted for only those applications where there is less than 12 hours per day continuous use.

IV. DOUBLE CHECK VALVE ASSEMBLY (DCV) INSTALLATION REQUIREMENTS

- A. Definition: An Assembly composed of two single, independently acting, approved check valves, including tightly closing shut-off valves located at each end of the assembly and fitted with four properly located all brass test cocks.
- B. Double check valve assemblies are required at premises where a substance is handled which would be objectionable, but not hazardous to health if introduced into the potable water system. The device installed must be a model which is approved for use by the Oregon Health Division.
- C. DCV's must be sized to provide an adequate supply of water and pressure for the premises being served. Flow characteristics are not standard. Consult manufacturer's specifications for specific performance data.
- D. Premises where interruption of water supply is critical should be provided with two devices installed in parallel. They should be sized in such a manner that either device will provide the minimum water requirements while the two together will provide the maximum flow required.
- E. Bypass lines are not permitted. Pipe fittings which could be used for connecting a bypass line must not be installed.
- F. Backflow prevention assemblies which are installed to isolate premises from the public potable water system must be installed on the downstream side of the meter at or near the property line or immediately inside the building being served, but in any case, must be installed before the first branch line.
- G. Installation Inside Building

The device shall be readily accessible with adequate room for testing and maintenance. Minimum clearances shall be as follows:

- 1. All Devices:
 - a. Headroom of 6' 0" minimum
 - b. Device shall be located between 6" and 48" above the floor.

2. Devices 2" and smaller:
 - a. At least 6" clearance all around device and at least 12" on test cock side.
3. Devices Larger than 2":
 - a. At least 12" all around device.

H. Installations in Vaults :

DCV's may be installed below grade, providing all test cocks are fitted with brass pipe plugs. All vaults shall be constructed of concrete, plastic, or other suitable materials, sized to make the valve readily accessible for testing and maintenance and allow for the minimum clearances established below. Vault sides and bottom shall be solid to prevent collapse or rodent intrusions and shall be well drained.

Minimum clearances shall be as follows:

1. All devices:
 - a. Headroom of 6" 0" is required in vaults without a full opening top.
 - b. The device shall be located between 4" and 24" from the bottom of vault.
 - c. For reach-in type vaults, all test cocks shall be within 12" of vault opening.
 2. Devices 2" and smaller:
 - a. At least 4" clearance all around device with at least 6" on test cock side.
 3. Devices larger than 2":
 - a. At least 6" clearance all around device with at least 12" on test cock side
- I. The device must be protected from freezing and other severe weather conditions.
- J. Vertical installation is restricted to those DCV's specifically approved for vertical installation by the manufacturer.
- K. The property owner assumes all responsibility for foundation or basement wall penetration, leaks and damage, the owner shall also see that the vault is kept reasonably free of silt and debris.

- L. All DCV's must be tested upon installation and at least once per year thereafter by a State certified tester. The City of Klamath Falls Water Department provides the initial test without charge to the owner. The owner must notify the City Water Department upon installation of any backflow prevention device.
 - M. Variances from these specifications will be evaluated on a case by case basis. Any deviations must have prior written approval of the City of Klamath Falls Water Department.
 - N. Although all approved devices are repairable in-line, the installation of union fittings on both ends of the device is recommended for vault installation due to the lack of space required for easy repairs and maintenance.
 - O. Standard drawings are shown in Appendix.
- V. REDUCED PRESSURE PRINCIPLE ASSEMBLY (RP)
- A. Definition: A device containing two independently acting approved check valves, together with a hydraulically operating, mechanically independent pressure relief valve located between the check valves. The unit shall include properly located all brass test cocks and tightly closing shut-off valves at each end of the assembly.
 - B. RP assemblies are required in the main water line at premises where a substance is handled which would be hazardous to health if introduced into the potable water system.
 - C. RP assemblies must be sized to provide an adequate supply of water and pressure for the premises being served. Flow characteristics are not standard. Consult manufacturer's specifications for specific performance data.
 - D. Premises where interruption of water supply is critical should be provided with two assemblies installed in parallel. They should be sized in such a manner that either device will provide the minimum water requirements while the two together will provide the maximum flow required.
 - E. Bypass lines are not permitted. Pipe fittings which could be used for connecting a bypass line must not be installed.

F. Backflow prevention assemblies which are installed to isolate premises from the public potable water system must be installed on the downstream side of the meter at or near the property line or immediately inside the building being served, but in any case, must be installed before the first branch line.

G. Installations Inside Buildings:

The assembly must be readily accessible for testing and maintenance, and must be located in an area where water damage to buildings or furnishings would not occur when the relief valve is flowing. If the relief valve is piped to discharge water outside the building, an approved air gap of at least 6" is required at both ends of the drain line. The drain line must be sized to accommodate full relief valve discharge and must be installed level or down slope.

Installation without drains must be located in well drained areas where the highest possible level of standing water is below the bottom of the device.

Minimum clearances shall be as follows:

1. Headroom of 6' 0" minimum
2. At least 12" all around the device
3. Device located between 12" and 48" from floor
4. Relief valve opening must be at least 12" plus nominal size of device from floor or highest possible floor level.

H. Installation in Vaults or Other Enclosures:

- RP assemblies may be installed below grade providing that an adequate drain is provided.
- Drains must be bore sighted to daylight.
- RP assemblies are typically installed above grade, with drainage openings located at bottom of enclosure (at grade surface).
- The vault or enclosure must be sized to make the device readily accessible for testing and maintenance and allow for the minimum clearances established below. Sides and bottom of enclosure must be solid to prevent collapse or rodent intrusion. All enclosures must drain to daylight. Drain ports should be sized to accommodate full pressure discharge from the device.

Minimum clearances shall be as follows:

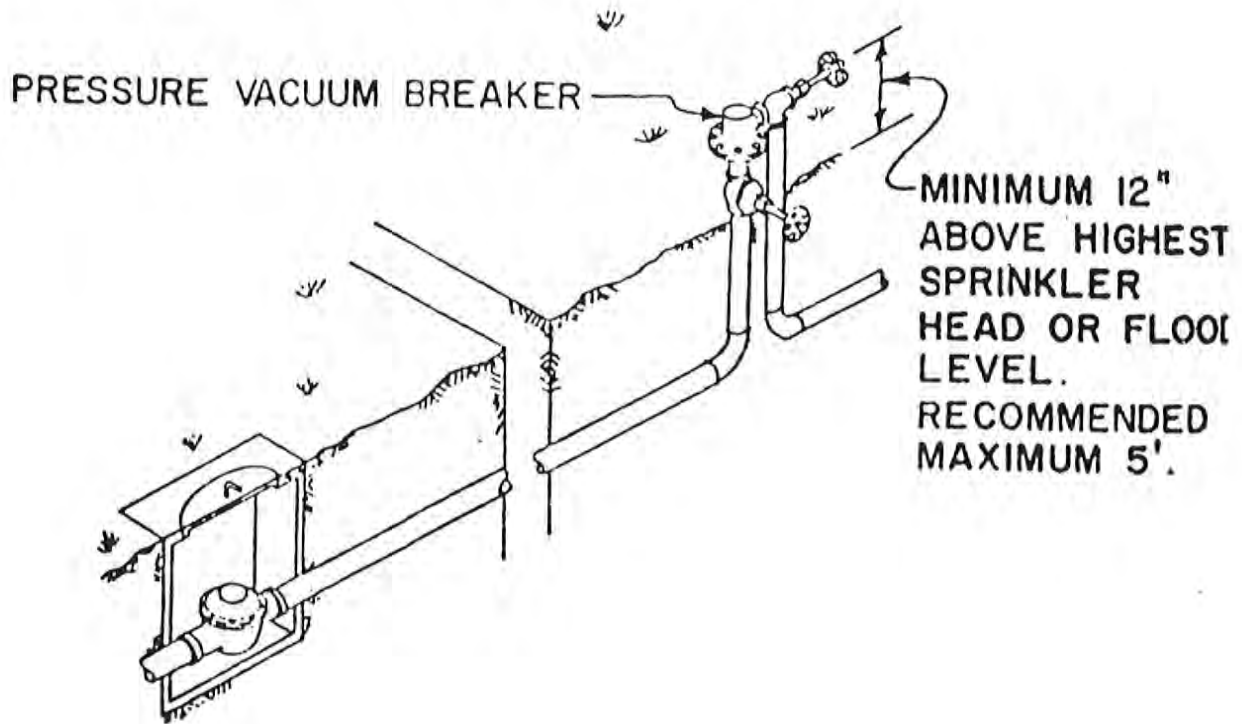
1. Headroom of 6' 0" required for vaults without a full opening top.
 2. The assembly shall be located between 6" and 24" from the floor.
 3. For assemblies 2" and smaller:
 - At least 6" clearance all around the assembly.
 - Relief valve opening shall be at least 6" from highest possible floor level in enclosure.
 4. For assemblies larger than 2":
 - At least 6" clearance all around assembly with at least 12" on test cock side.
 - Relief valve opening shall be at least 12" plus nominal size of assembly above the highest possible flood level in enclosure.
- I. Assembly must be protected from freezing and other severe weather conditions.
- J. Vertical installation is restricted to those RP assemblies specifically approved for vertical installation by the manufacturer.
- K. The property owner assumes all responsibility for foundation or basement wall penetration, leaks and damage. The owner shall also see that the vault is kept reasonably free of silt and debris.
- L. All RP assemblies must be tested upon installation and at least once per year thereafter by a State certified tester. The City of Klamath Falls Water Department provides the initial test without charge to the owner. The owner must notify the City Water Department upon installation of any backflow prevention device.
- M. Variances from these specifications will be evaluated on a case by case basis. Any deviations must have prior written approval of the City of Klamath Falls Water Department.
- N. Although all approved assemblies are repairable in-line, the installation of union fittings on both ends of the assembly is recommended for vault installations due to the lack of space required for easy repairs and maintenance.
- O. Standard drawings are shown in Appendix.

c5:backflow

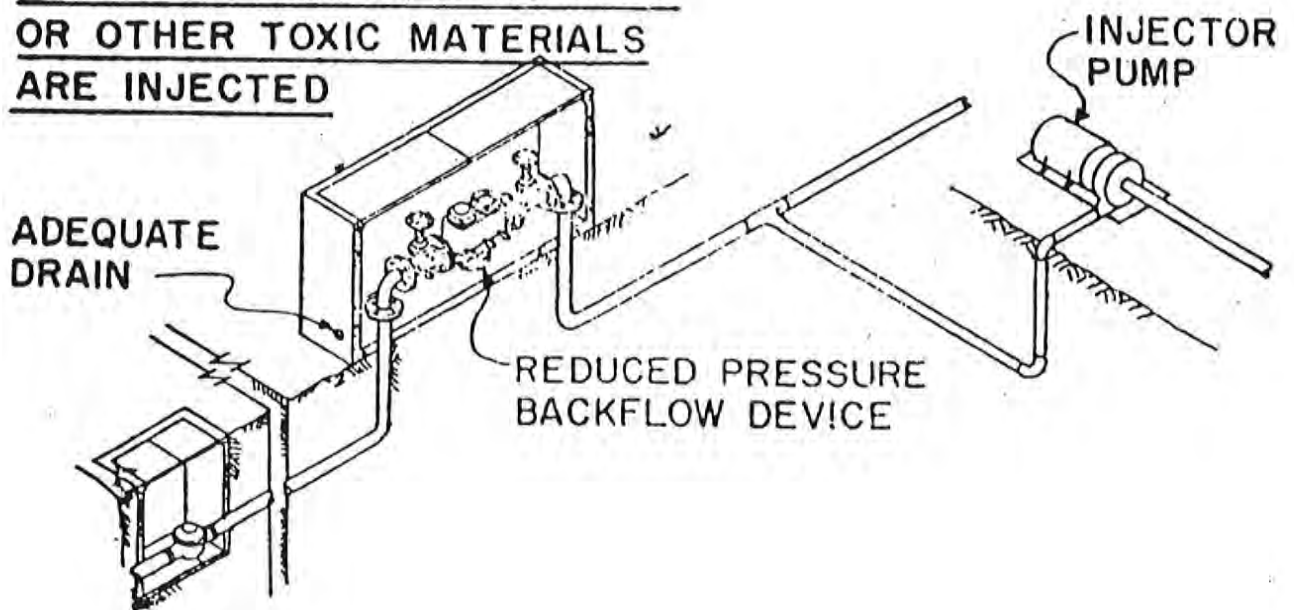
APPENDIX

IRRIGATION SYSTEMS

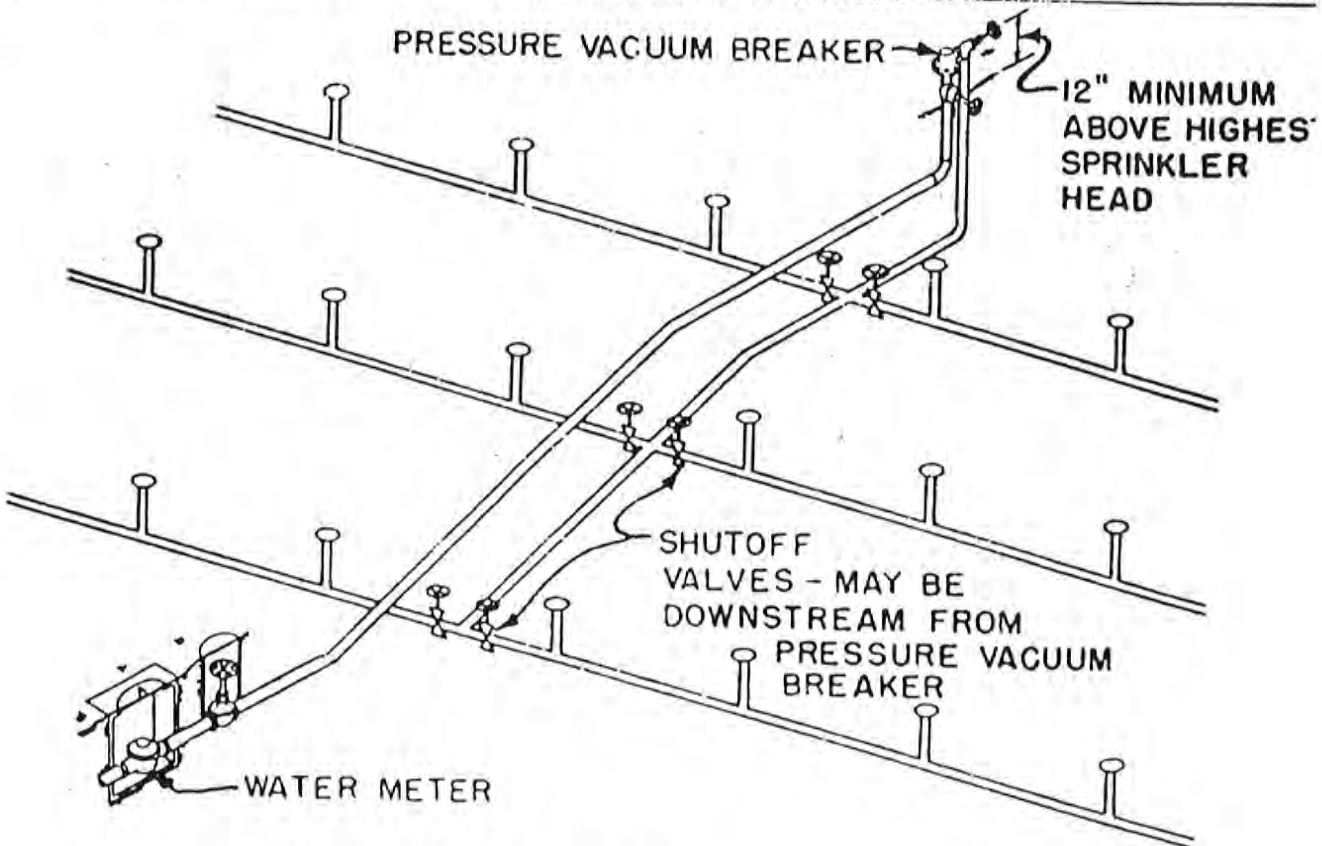
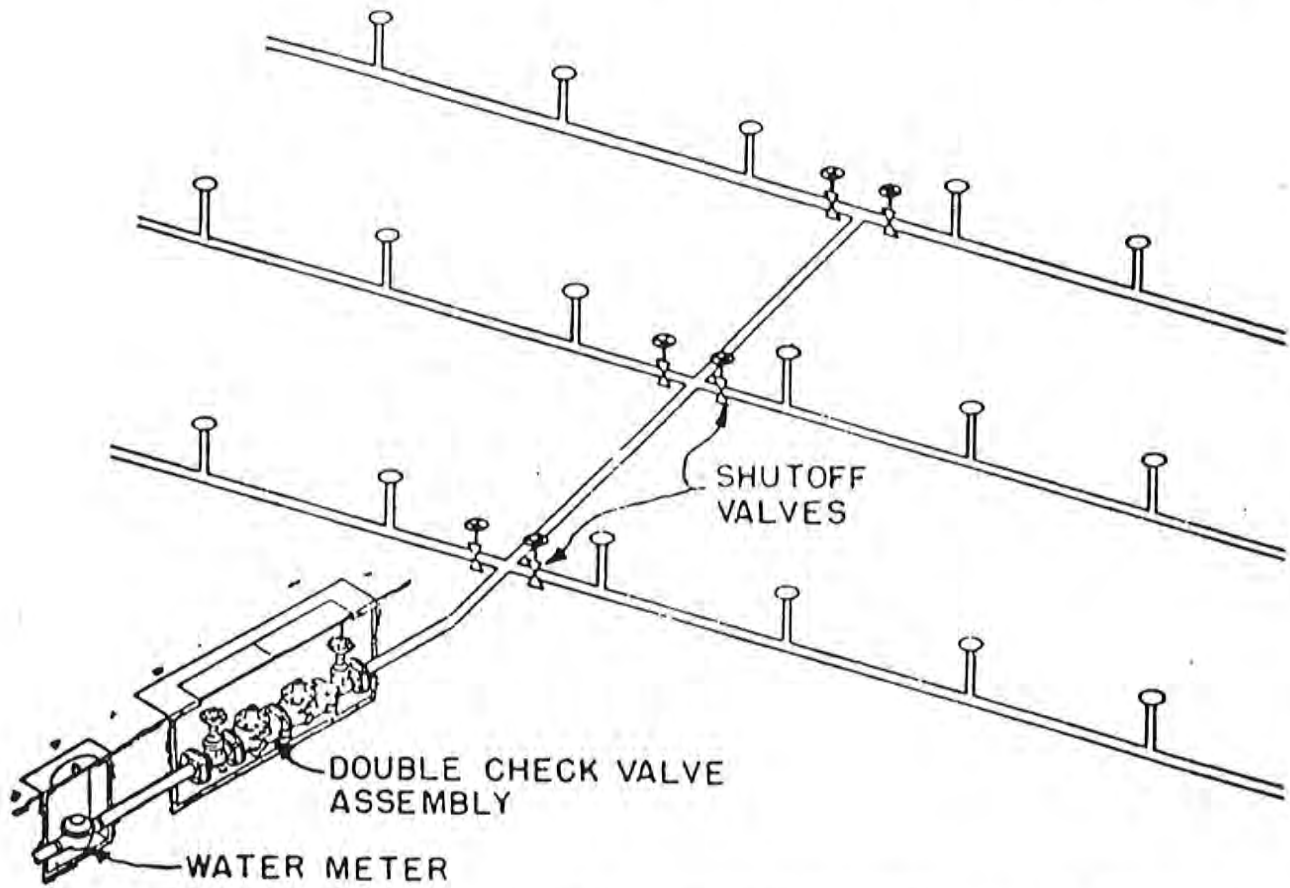
(WHERE THERE IS NO INJECTION)

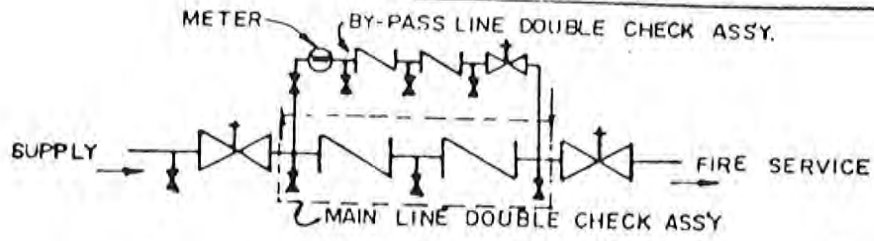


REQUIRED ON ALL SYSTEMS
WHEN FERTILIZER, HERBICIDES
OR OTHER TOXIC MATERIALS
ARE INJECTED

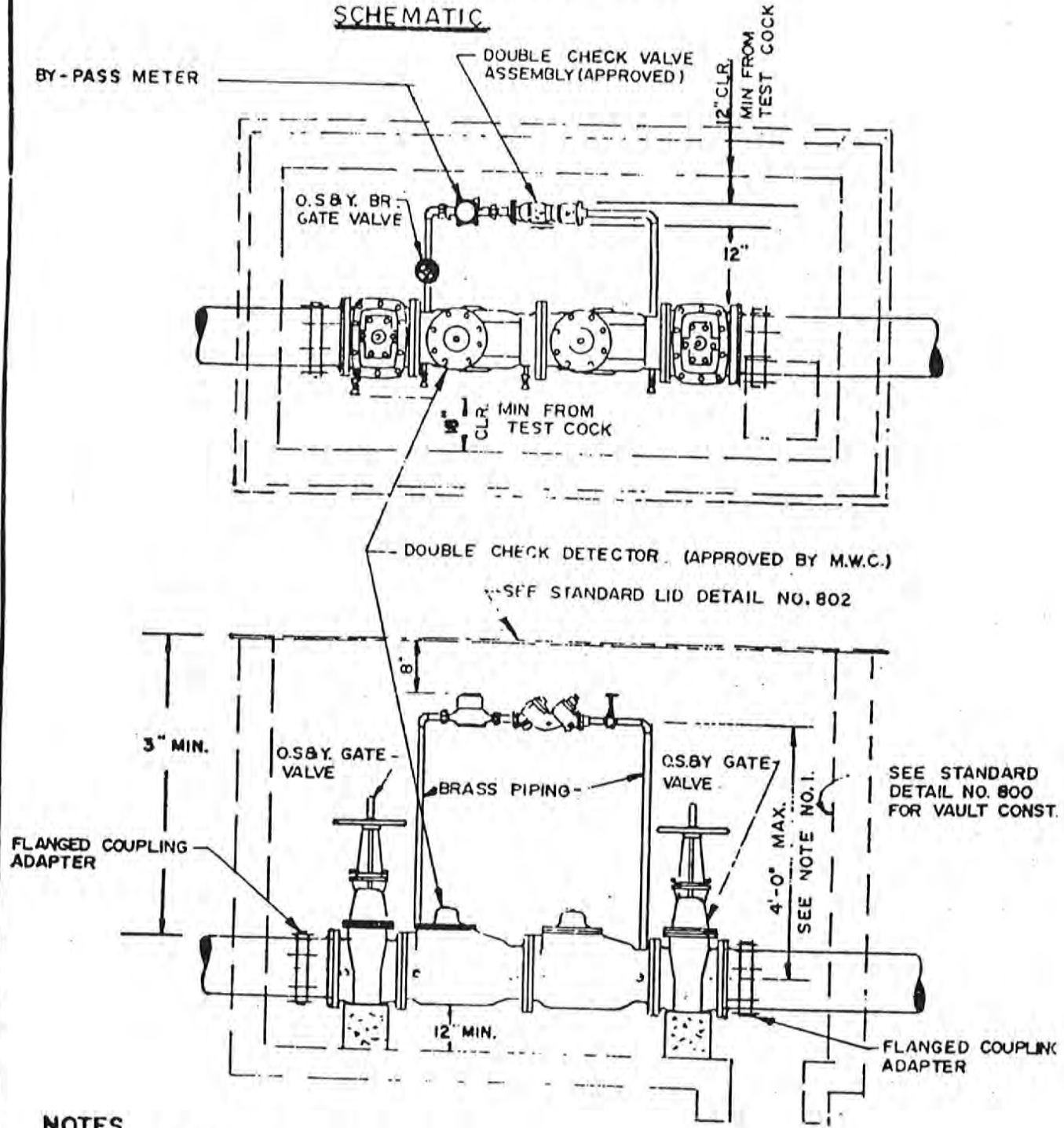


HILLSIDE IRRIGATION SYSTEMS



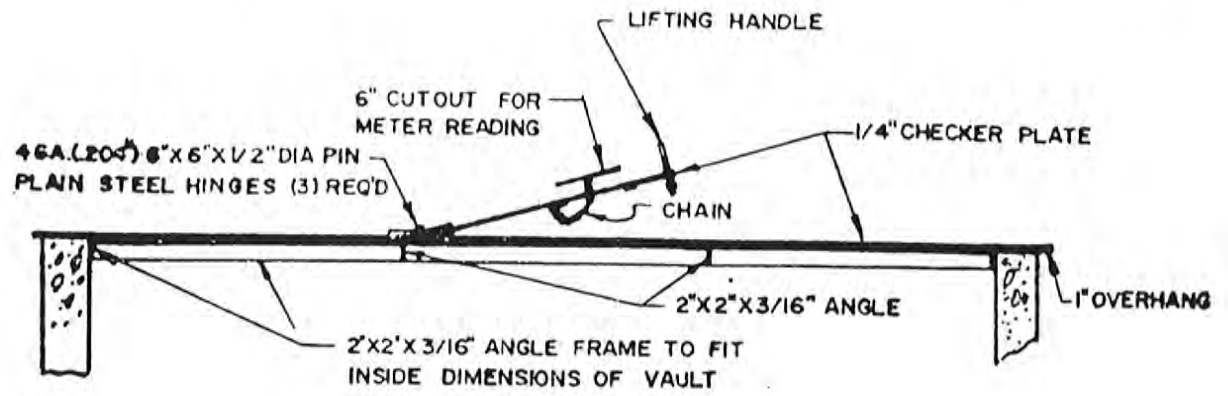


SCHMATIC

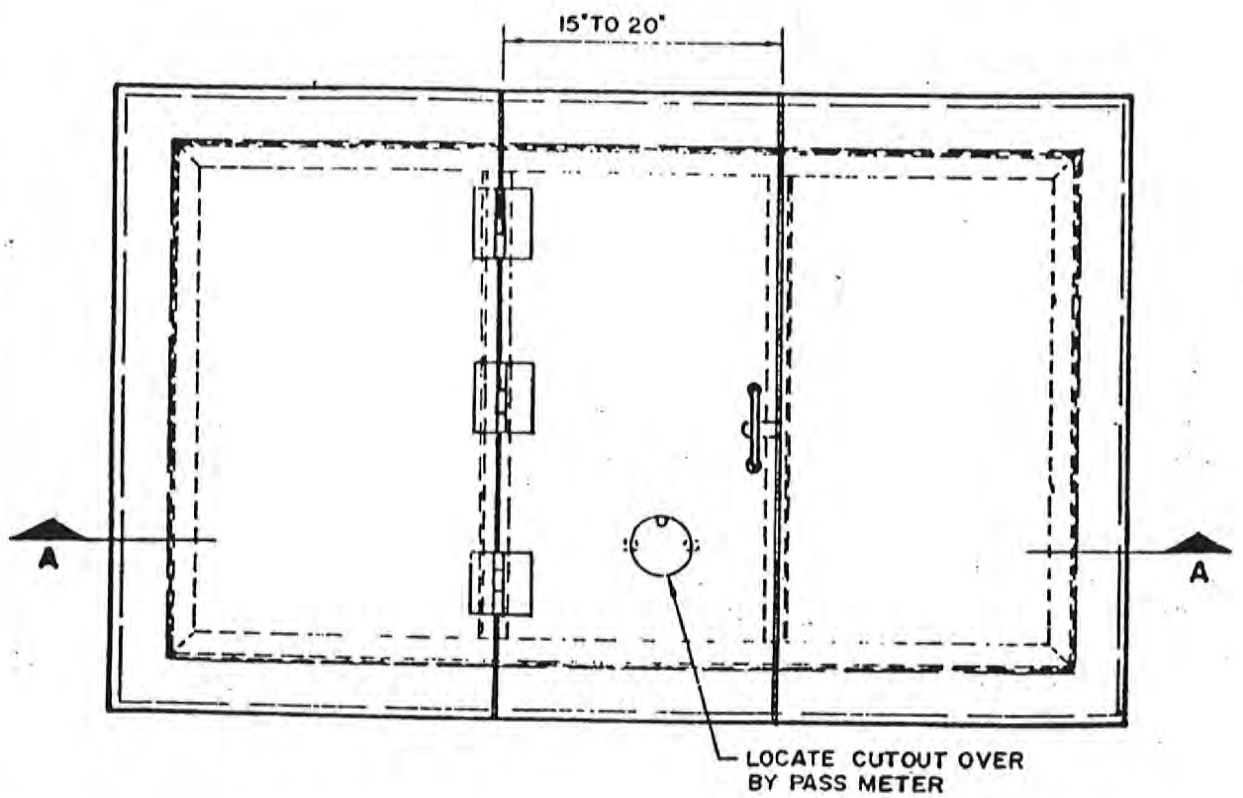


NOTES

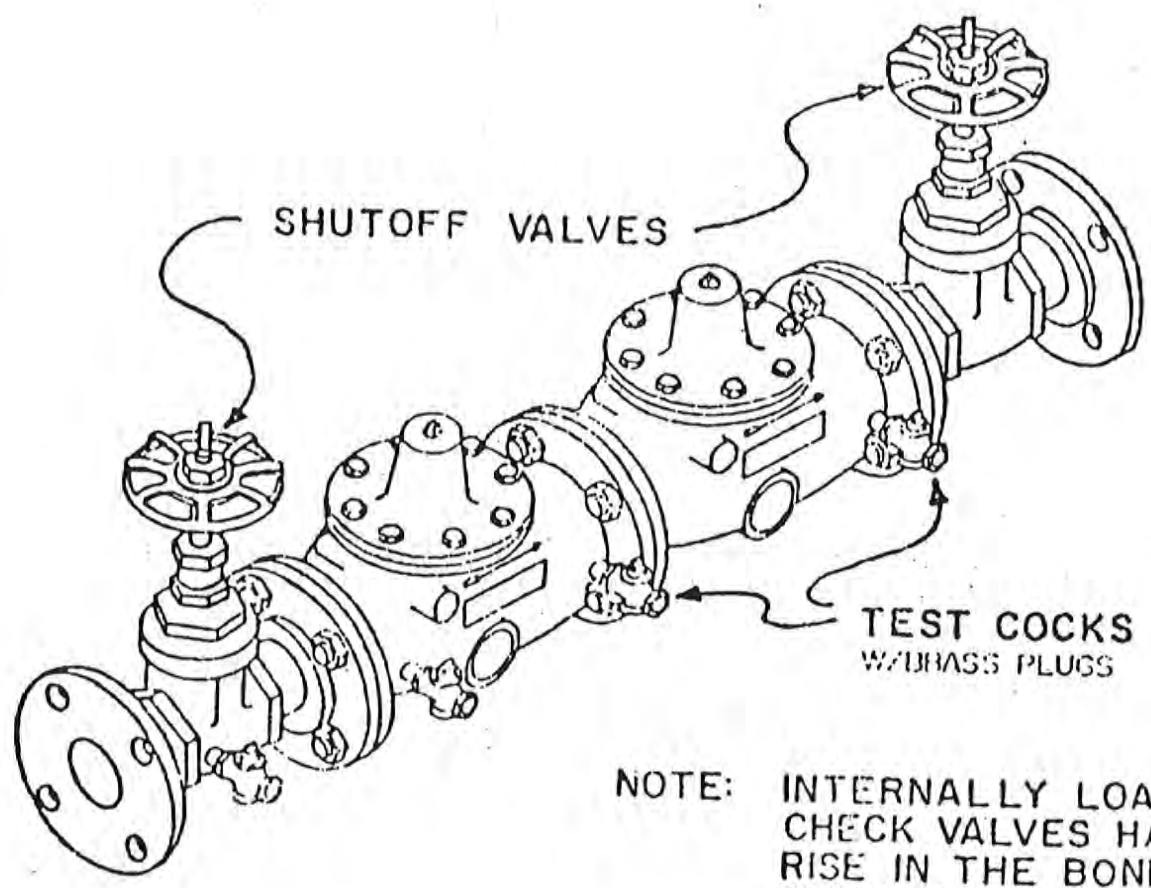
1. WHEN RISE IS OVER 4'-0" USE REMOTE REGISTER
2. BRASS PLUGS TO BE INSTALL IN ALL TEST COCK



SECTION "A-A"

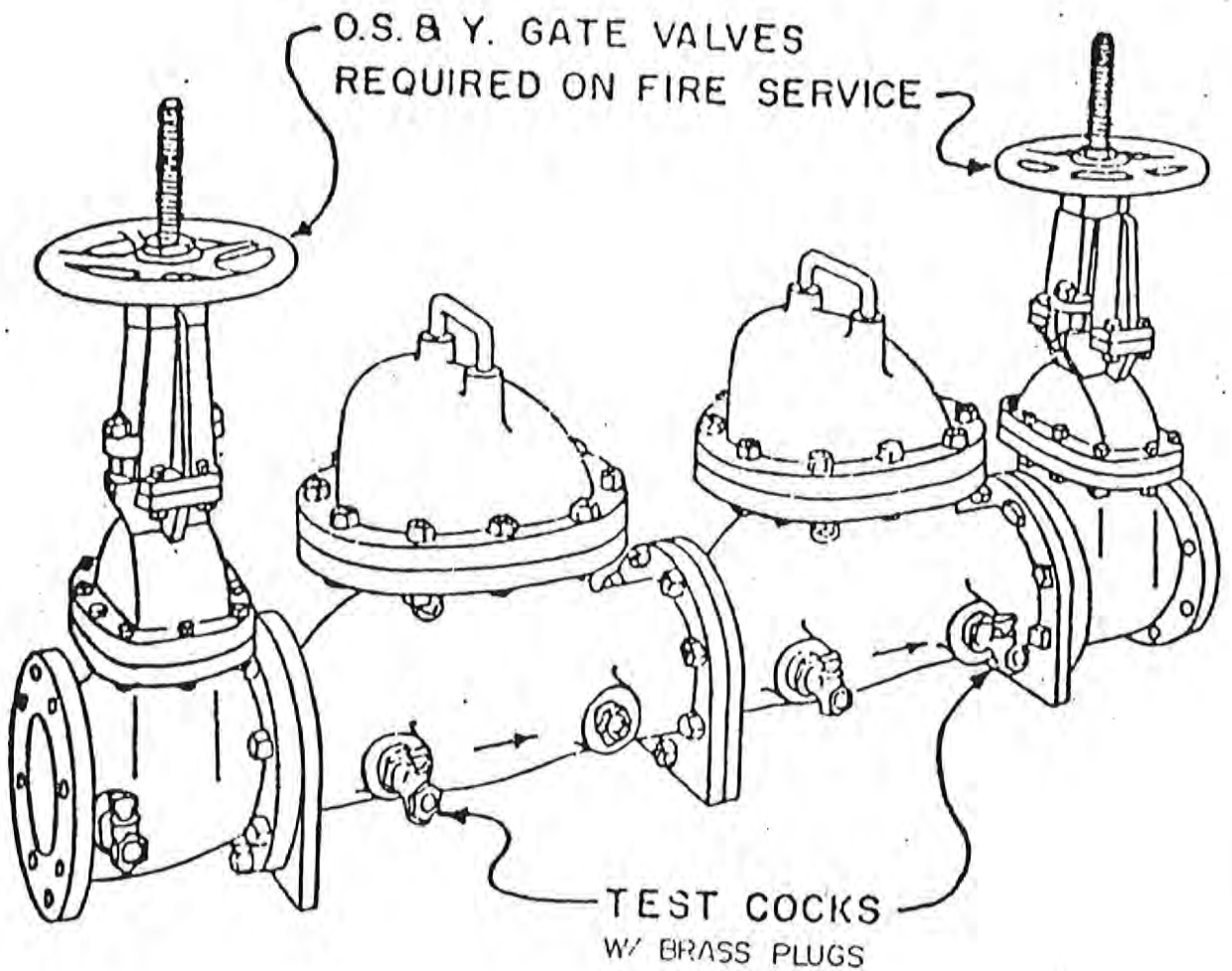


TYPICAL SPRING LOADED DOUBLE CHECK VALVE ASSEMBLY

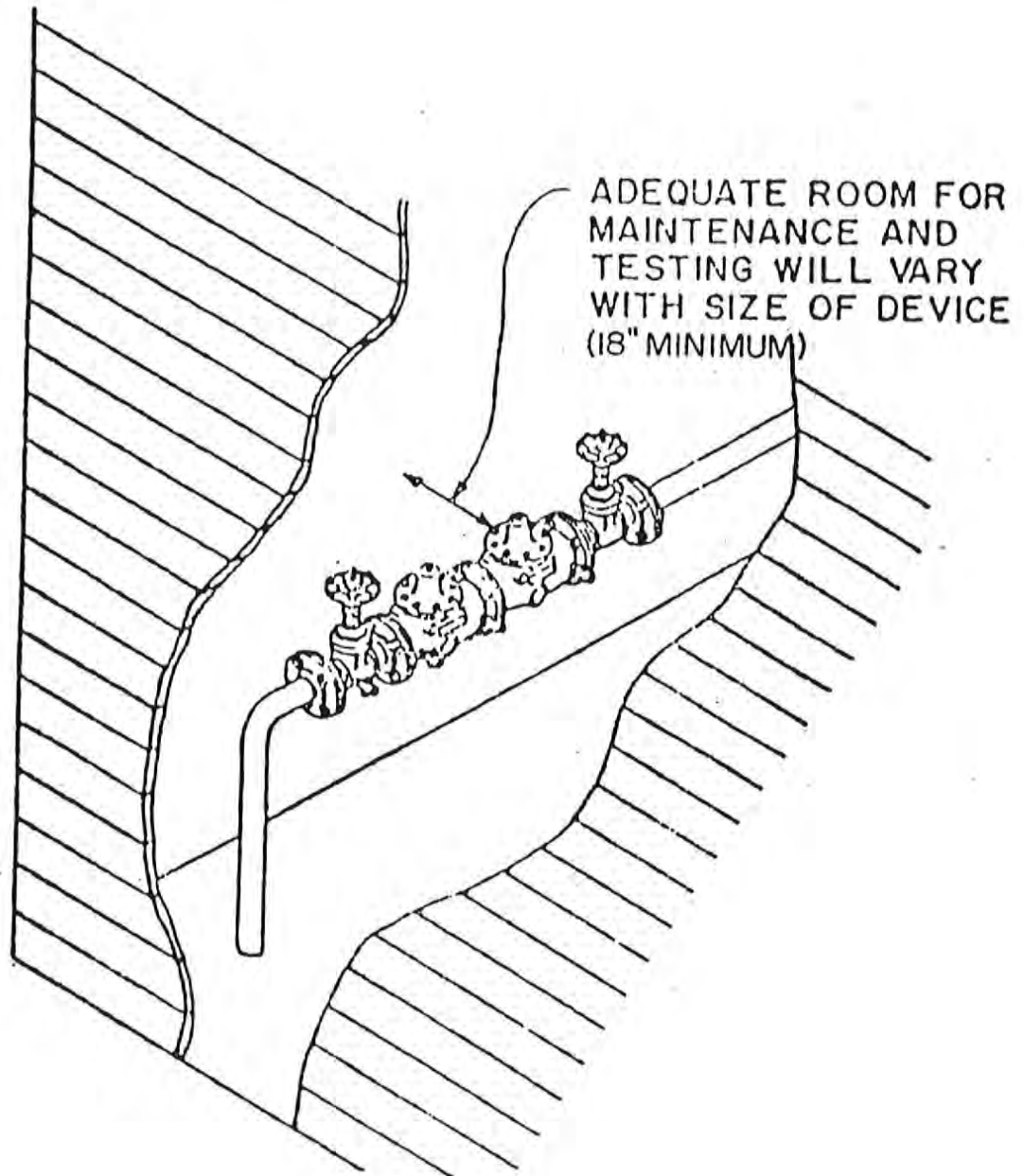


NOTE: INTERNALLY LOADED
CHECK VALVES HAVE A
RISE IN THE BONNET.
SWING CHECK VALVES
NORMALLY HAVE NO
RISE IN THE BONNET.

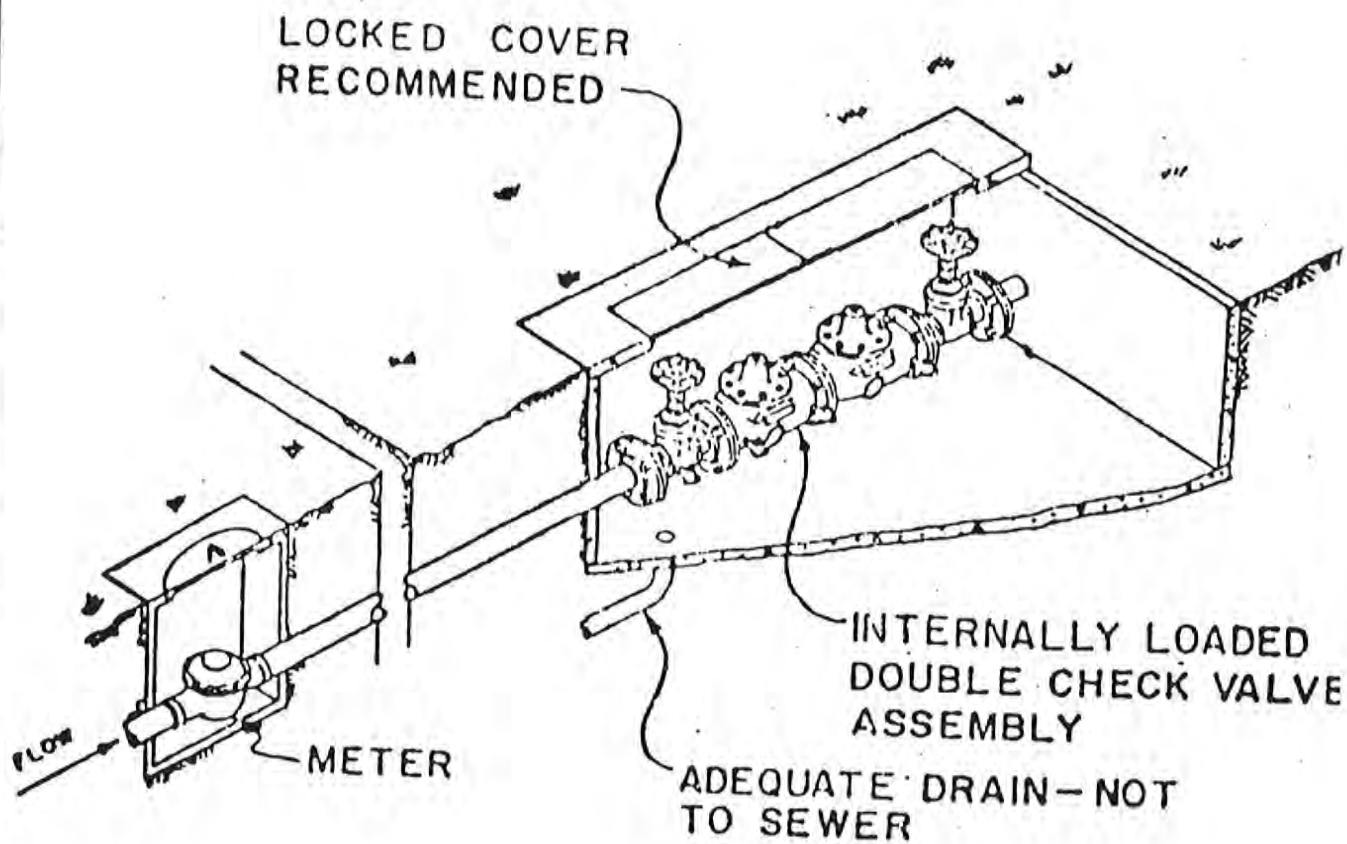
TYPICAL INTERNALLY WEIGHTED DOUBLE CHECK VALVE ASSEMBLY



TYPICAL INSTALLATION OF DOUBLE CHECK VALVE ASSEMBLY IN BUILDING



PIT INSTALLATION OF DOUBLE CHECK VALVE ASSEMBLY (NOT RECOMMENDED)

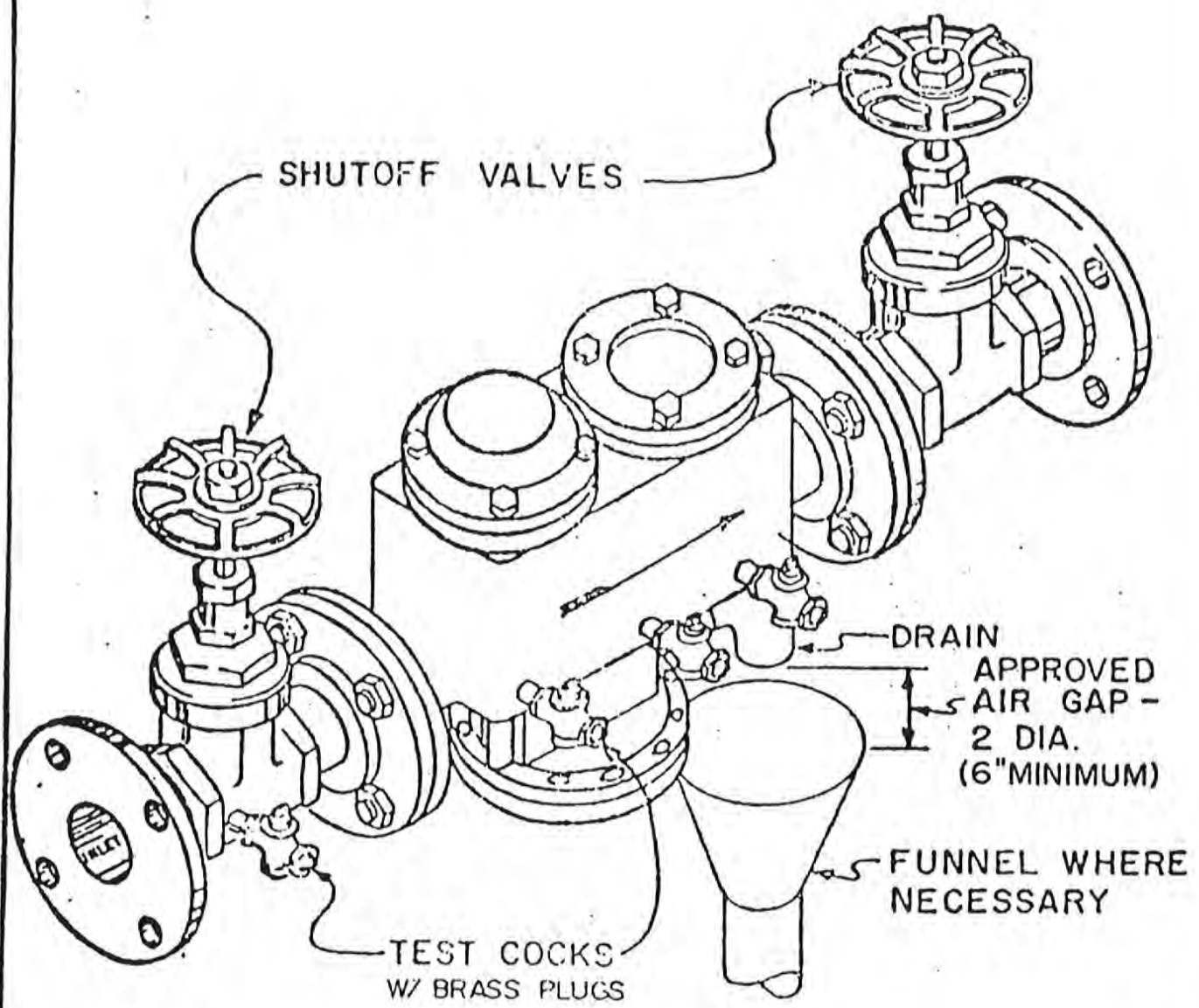


PROVISIONS MUST BE MADE
TO DRAIN VAULT

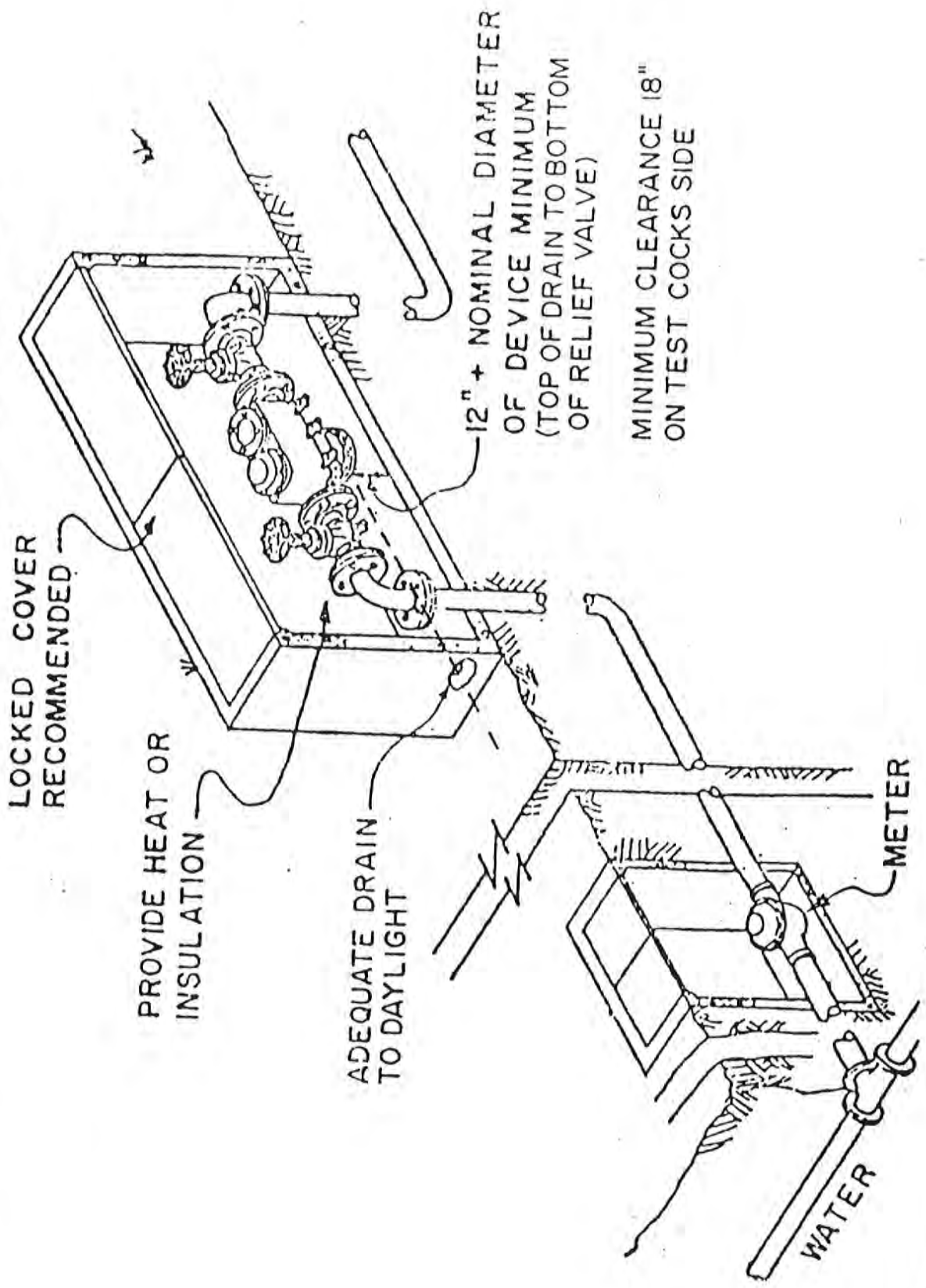
PROVIDE ADEQUATE ROOM IN VAULT
FOR REPAIR AND TESTING

PROTECT DEVICE AGAINST FREEZING
PLUG TEST COCKS WITH BRASS PLUGS

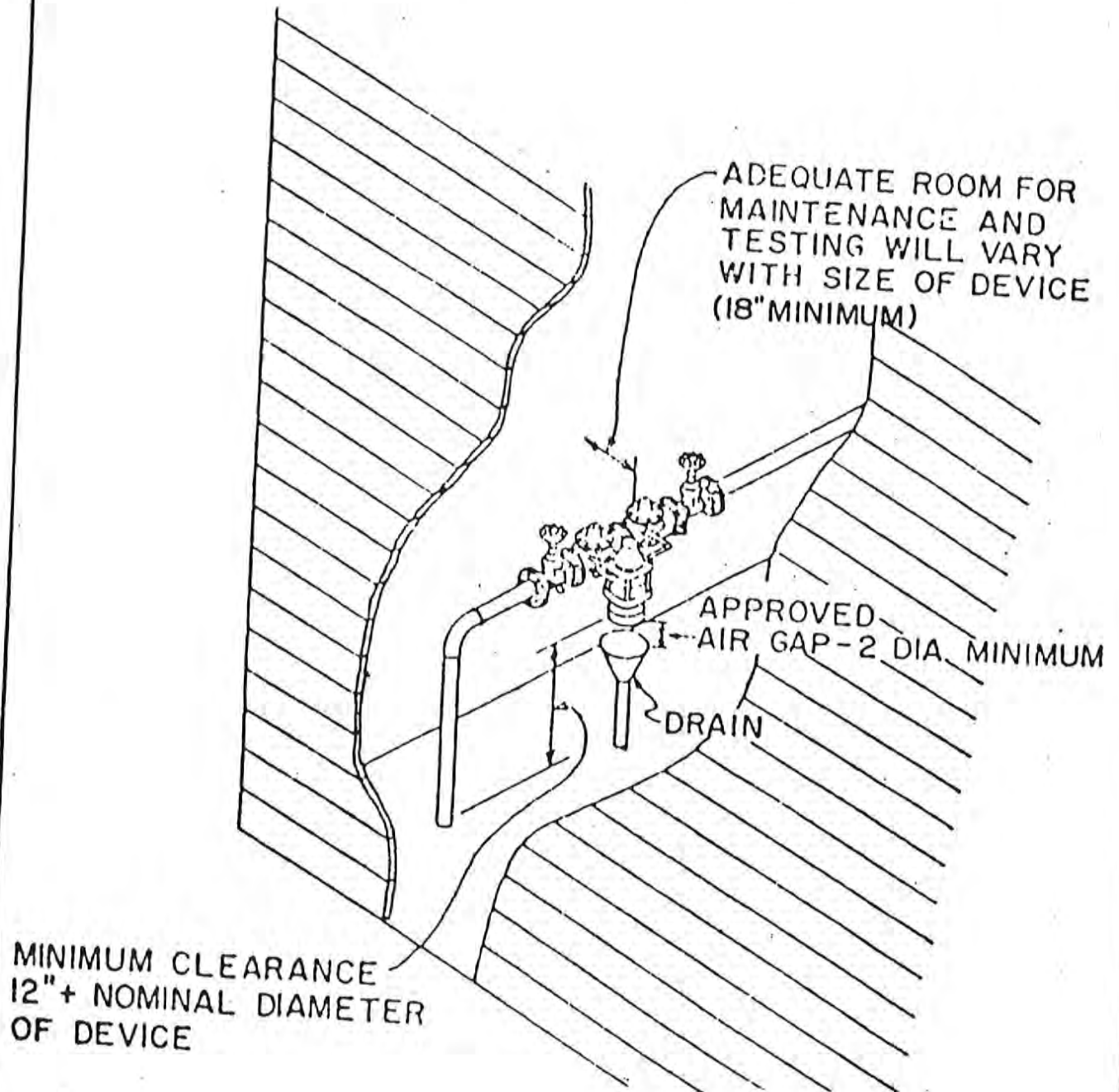
TYPICAL REDUCED PRESSURE BACKFLOW PREVENTION DEVICE



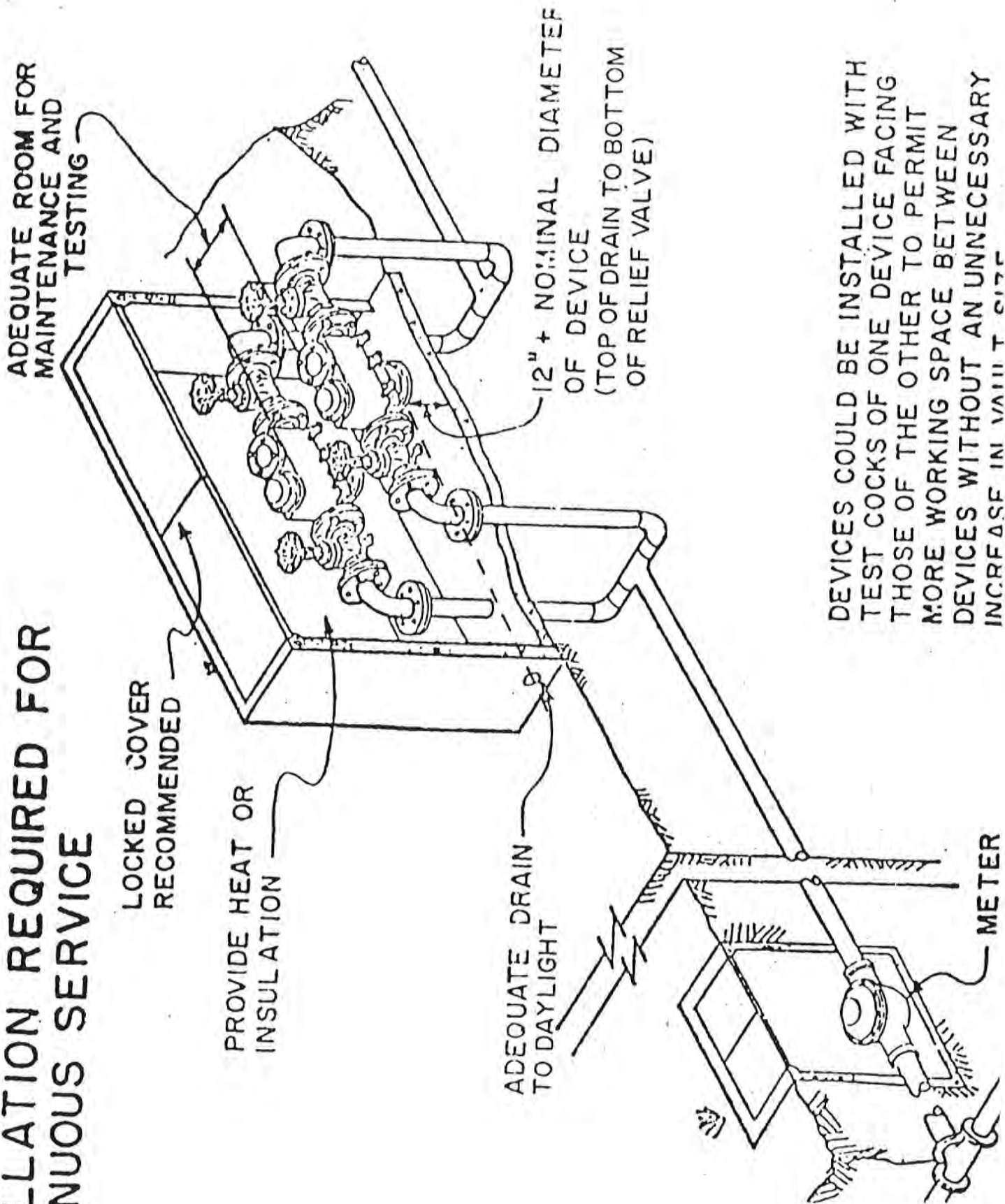
TYPICAL INSTALLATION OF REDUCED PRESSURE PRINCIPLE DEVICE



TYPICAL INSTALLATION OF REDUCED PRESSURE PRINCIPLE DEVICE IN BUILDING



INSTALLATION REQUIRED FOR CONTINUOUS SERVICE



DEVICES COULD BE INSTALLED WITH TEST COCKS OF ONE DEVICE FACING THOSE OF THE OTHER TO PERMIT MORE WORKING SPACE BETWEEN DEVICES WITHOUT AN UNNECESSARY INCREASE IN VALVE SIZE

PORTABLE SPRAY AND CLEANING EQUIPMENT

Any portable pressure spray or cleaning units that have the capability of connecting to any potable water supply and do not contain a built-in approved air gap, should be fitted with a reduced pressure backflow device or double check valve assembly depending on the degree of hazard. This should not include fire or street cleaning equipment. (See Page 60.)

MISCELLANEOUS USES OF WATER FROM FIRE HYDRANTS

Many cities allow the use of water directly from fire hydrants for flushing storm and sanitary sewers and similar uses. Where this is permitted, it is recommended a portable backflow device be required to protect the city system from backflow through the hydrant.

STANDARD SAFETY ELECTRICAL BONDING WIRE FOR DEVICES

Water pipe can become electrically charged. In high resistance soil, electric power agencies tend to use water pipe as a grounding media and stray currents from electrical conduit also may induce a current in a water pipe. If a backflow device should have to be removed for repair, the circuit will be broken. A répairman can receive a severe electrical shock if he accidentally grabs both ends of the pipe so the current is allowed to flow through his body or if he grabs one end of the pipe and the current goes to ground through his body. For these reasons, it is recommended a ground wire be installed around the device. (For illustration, see Page 61.)