CROSS-CONNECTION CONTROL AND REQUIRED BACKFLOW PREVENTION METHODS

PURPOSE
As a water purveyor, the city of Phoenix is obligated to protect its public water supply from the possibility of contamination or pollution by enacting and enforcing a containment (secondary) backflow prevention program.

This document provides general information about backflow prevention requirements for city water customers, including an outline of city department responsibilities and procedures for enforcing these requirements.

PLUMBING CODE – PRIMARY PROTECTION
The Phoenix (Uniform) Plumbing Code protects the public water supply and private on-site water supply and distribution systems by prohibiting cross-connections between potable and non-potable water systems (UPC Section 602) and by requiring installation of PRIMARY and SECONDARY backflow prevention methods (UPC Section 603).

CITY CODE – SECONDARY PROTECTION
In addition to the level of protection required by the plumbing code, Phoenix City Code Chapter 37, Sections 37-141 through 146 also requires installation of SECONDARY backflow prevention methods in certain listed situations. The purpose of secondary backflow protection is to provide an increased level of protection for the public water supply system from potential backflow that may occur from private property. Section 37-144 (b) of this Chapter contains the specific list of occupancies, facilities and water-using equipment which require SECONDARY backflow protection.

The backflow prevention provisions contained in City Code Chapter 37 were adopted by Ordinance G-3672 on July 7, 1993, as amended by Ordinance G-3774 on June 15, 1994, and Ordinance G-4033 on July 2, 1997. These provisions replaced the city's previous backflow prevention ordinance and regulations dating to 1971.

STATE OF ARIZONA DEPARTMENT OF ENVIRONMENTAL QUALITY (DEQ) RULES
The secondary backflow prevention requirements contained in Phoenix City Code Chapter 37 are intended to meet requirements imposed by the State of Arizona Department of Environmental Quality, as set forth in Arizona Administrative Code, Title 18, Chapter 4, Article 215 (R18-4-215), entitled "Backflow Prevention," effective August 8, 1991 and revised April 28, 1995 (the "state rule"). The state rule requires that new water services comply with secondary backflow prevention requirements as of August 8, 1991, and that all existing water services comply as
July 1, 1994. Therefore, the provisions of the state rule and City Code Chapter 37 are retroactive. The state rule also mandates the annual testing and recordkeeping requirements now contained in City Code Chapter 37.

**ADMINISTRATION**

City of Phoenix backflow prevention requirements are administered by city departments, as follows:

The PLANNING AND DEVELOPMENT DEPARTMENT (P&D) is responsible for administering three portions of City Code Chapter 37.

1. **EXISTING SERVICE IDENTIFICATION.** All existing water services (connected prior to August 1, 1993) are being reviewed and an initial determination is made as to whether or not those services supply occupancies or facilities which are required to have secondary backflow prevention as listed in City Code Chapter 37.

   a) Where SECONDARY backflow protection is not required by Chapter 37, this information is noted in the backflow prevention inventory record.

   b) Where SECONDARY backflow preventers already exist, this information is entered into the backflow prevention inventory records.

   c) Where an occupancy or facility is listed in Chapter 37 but no SECONDARY backflow preventer exists at the point of service, the water service customer is provided with basic backflow prevention information and P&D determines whether additional backflow prevention is required.

2. **BACKFLOW INVENTORY RECORDS.** An inventory of all City Code Chapter 37 required backflow prevention assemblies is to be maintained by P&D as required by the ADEQ state rule, including copies of annual certification tests and maintenance records for each required assembly.

3. **INCIDENT RESPONSE AND ENFORCEMENT.** P&D is responsible for responding to all reported incidents of backflow into the public water mains; for enforcement of compliance with annual testing and maintenance of required backflow prevention assemblies; and for termination of water service if necessary to protect the public potable water supply.

P&D is responsible for determining the type and location of all required backflow prevention assemblies, including plan review, permit issuance and inspection of all such assemblies:

1. **NEW CONSTRUCTION** includes all new buildings, additions, remodeling, tenant improvements, changes in occupancy and new water services for existing properties. P&D staff reviews for and applies the backflow prevention requirements of the Phoenix Plumbing Code and City Code Chapter 37 as part of the standard plan review, permit issuance and inspection process.

   - Upon completion of the installation of any SECONDARY backflow prevention assembly required by City Code Chapter 37, the owner must submit the original certified test report to P&D for inclusion in the state-mandated backflow inventory record. Thereafter, the owner must also submit annual test reports to P&D.

2. **EXISTING SERVICES.** Three alternatives exist when the owner of an existing water service is referred to P&D for determination of compliance with City Code Chapter 37:

   a) The water service customer may choose to apply for a permit to install a SECONDARY backflow prevention assembly to be located as close as practicable to the point of water service to the property. P&D will review and process this permit application in accordance with standard procedures; or

   b) The water service customer may choose to submit an alternative plan for compliance with City Code Chapter 37 by means of alternative backflow prevention methods. This plan may be prepared by the owner, by a qualified contractor, or by a professional engineer depending upon the complexity of the existing plumbing system and/or the complexity of the compliance plan. Evaluation of the plan by P&D requires payment of a plan review fee. P&D staff will approve, modify or disapprove of the plan in the
same manner as any plumbing alteration plan review. A permit is required for installation of any additional backflow prevention assembly(s) as may be determined by this plan review; or

c) The water service customer may choose to request P&D to evaluate the customer's internal plumbing system for compliance with City Code Chapter 37 without requiring installation of additional backflow prevention assemblies. The form of this request must be a report or plan similar to that described in paragraph (b) above documenting why the owner believes that the property already complies with City Code Chapter 37 without requiring any additional backflow preventer. Evaluation of this request by P&D also requires payment of a plan review fee, and will result in either acceptance of the existing situation or orders to obtain a permit and install the proper backflow preventer indicated by the circumstances.

3. APPEALS. All decisions of P&D regarding backflow prevention are applicable as follows:

a) City Code Chapter 37 – P&D staff decisions as to the need for backflow prevention assemblies, the type of assembly, the installation standards, or the required location may be appealed to the Building Official as provided in Phoenix Building Construction Code Section 104.9.1 and, if necessary, to the Development Advisory Board as provided in Phoenix Building Construction Code, Section 104.9.4.

b) Design Review – Appeals from applicable Design Review guidelines may be made to the Design Review Appeals Board.

c) Zoning Ordinance – Appeals from applicable Zoning Ordinance requirements may be made to the Zoning Administrator, the Zoning Hearing Officer and the Board of Adjustment.

The PHOENIX FIRE DEPARTMENT is responsible for reviewing and approving installation of fire line piping downstream of the required backflow preventer serving fire hydrants, automatic fire sprinkler systems or standpipe systems

Effective July 1, 2007, the 2006 Uniform Plumbing Code Section 603.4.16 requires that: 

**Potable water supplies to fire protection systems that are normally under pressure, including but not limited to standpipes and automatic sprinkler systems, piped in materials approved for potable water distribution systems shall be protected from back-pressure and back-siphonage by one of the following testable devices:**

1) Double check valve assembly
2) Double check detector assembly
3) Reduced pressure backflow preventer
4) Reduced pressure detector assembly

**Potable water supplies to fire protection systems that are not normally under pressure shall be protected from backflow and shall meet the requirements of the appropriate standards referenced in Table 14-1.**

Essentially, all potable water supplies to fire lines serving fire protection systems require installation of backflow prevention assemblies.

WHERE BACKFLOW PREVENTION ASSEMBLIES ARE INSTALLED ON FIRE LINES, these assemblies, their installation and their installing contractor(s) must comply with both P&D/Plumbing Code/City Code Chapter 37 requirements, with the applicable Standard Detail P1351 - P1356 or an approved engineering detail; and Fire Department/Fire Code installation standards. Such backflow prevention assemblies are required on looped fire lines and on Class 1 through 6 sprinkler systems.

**CITY CODE CHAPTER 37 – WATER (Ordinance G-3794)**

Section 37-1. DEFINITIONS: (excerpts as applicable)
"Approved Backflow Prevention Assembly (Assembly)" means any testable assembly with the exception of an approved air gap, which has been issued a certificate of approval by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC-FCCCHR or the Foundation), or such other third party certifying entity, unrelated to the product's manufacturer or vendor, which may be acceptable to the Arizona Department of Environmental Quality. A list of assemblies shall be maintained by the Director of Water Services.

"Backflow" means the undesirable reversal of flow of water or mixtures of water and other liquids, gases or other substances into the distribution system of the public potable water supply.

"Backpressure" means a form of backflow due to any elevation of pressure in the downstream piping system (by pump, elevation of piping, or steam and/or air pressure) above the supply pressure at the point of service delivery which could cause, or tend to cause, a reversal of the normal direction of flow through the backflow prevention assembly.

"Backsiphonage" means a form of backflow due to a reduction in system pressure, which causes a negative or sub-atmospheric pressure to exist at a site in the water system.

"Certified Tester" means an individual certified to test backflow prevention assemblies by the California-Nevada section of the American Water Works Association (AWWA) or the Arizona State Environmental Technology Training (ASETT) Center or other agencies or organizations involved with the training and certification of testers if they are acceptable to the Arizona Department of Environmental Quality.

"Cross-Connection" means any unprotected or potential connection or structural arrangement between a public or a customer's potable water system and any other source or system through which it is possible to introduce into any part of the potable water system any used water, industrial fluid, gas or substance other than the intended potable water with which the system is supplied. By-pass arrangements, jumper connections, removable sections, swivel or change-over devices and other temporary or permanent devices through which or because of which "backflow" can or may occur are considered to be cross-connections. Compliance with the Phoenix Plumbing Code creates a rebuttable presumption that a cross-connection does not exist.

"Director" means the Water Services Director of the city of Phoenix or his/her authorized deputy, agent, designee or representative.

"Point of Service Delivery" means the terminal end or a service connection from the public water system. If a meter is installed at the end of the service connection, then the point of service delivery shall mean the downstream end (i.e., customer's side) of the meter. If an unmetered connection exists, then the point of service delivery shall mean at the point of demarcation between the public right-of-way or easements and private property.

"Planning and Development Director" means the director of the Planning and Development Services Department, or his/her authorized deputy, agent, designee or representative.

"Used Water" means any water supplied by the city, from the public potable water system to a customer's water system, after it has passed through the point of service delivery.

"Water from Any Source" means any water, including reclaimed wastewater from a wastewater treatment facility or cooling tower.

Section 37-141. DECLARATION OF POLICY: AUTHORIZATION

It is declared that danger to the public health, safety and welfare resulting from contamination or pollution of the public potable water supply system requires that measures be adopted to protect that system by authorizing City officials to:
a. Protect the public potable water supply from the possibility of contamination or pollution by preventing the backflow of contaminants or pollutants into the public potable water supply system;

b. Promote the awareness and elimination of cross-connections, actual or potential, of a customer's internal potable water system with the public water supply system;

c. Provide for a continuing program of backflow prevention control which will prevent the contamination or pollution of the public potable water system supply;

d. Provide for the monitoring and enforcement of a continuing program of backflow prevention which will prevent the contamination or pollution of the public potable water supply;

e. Comply with the state requirements contained in Arizona Administrative Code; title 18, chapter 4, article 215 (R18-4-215) entitled, "Operation: Backflow Prevention" that was promulgated by the Arizona Department of Environmental Quality. One copy shall be on file with the City Clerk and the Planning and Development Services Department.

Section 37-142. CROSS-CONNECTIONS FROM OR TO SOURCE OF WATER SUPPLY OTHER THAN THAT OF THE CITY

It shall be unlawful for any customer to cause a connection to be made or to allow one to exist for any purpose whatsoever between City water supply and any other source of water supply without the approval of the Director. (Ord. No. G-3672, § 1).

Section 37-143. RESPONSIBILITY FOR BACKFLOW PREVENTION CONTROL

a) Water Services Director.
   It shall be the responsibility of the Water Services Director to protect the public water supply by applying the remedies and enforcement provisions set forth in City Code Section 37-146.

b) Planning and Development Department (P&D) Responsibilities.
   It shall be the responsibility of Planning and Development Director to enforce certain provisions of this chapter, as follows:

   1. The P&D Director shall administer and enforce all applicable cross-connection control provisions of the Phoenix Plumbing Code, including issuance of permits for all required backflow prevention assemblies.

   2. The P&D Director shall determine whether a facility is a listed facility or activity in Section 37-144 and therefore requires backflow protection. This responsibility includes inspection as necessary of all existing facilities connected to city of Phoenix water services.

   3. The P&D Director shall, as a condition of issuance of any building permit, require installation of appropriate backflow prevention as required by Section 37-144 and the Phoenix Plumbing Code.

   4. The P&D Director shall determine the type and location of all backflow prevention assemblies in accordance with this chapter and all other codes and ordinances of the City.

   5. The P&D Director shall keep adequate records of each test of an approved backflow prevention assembly and any subsequent maintenance or repair thereof.

c) Customer responsibilities.
   It shall be the responsibility of the customer to prevent pollutants or contaminants from entering the customer's building potable water system and the public potable water system. The customer's responsibility starts at the point of service delivery from the public potable water system and includes all water piping systems. The customer is required to properly locate, install, test and maintain each backflow prevention
assembly in good working condition and shall provide the necessary inspections to assure that the assembly is operating properly. These responsibilities include, but are not limited to the following:

1. The customer shall obtain a permit from P&D for the installation of any backflow prevention assembly or for the modification of any plumbing system.

2. The customer shall test all backflow prevention assemblies at least once a year except that the P&D Director may require more frequent testing if warranted. As to fire lines or fire sprinkler systems with backflow prevention assemblies, the initial and annual test shall be performed by a certified tester. The initial and annual test shall include a full flow test. It is the responsibility of the customer to test and submit all testing results to the P&D Director. If the test reveals the assembly to be defective or in unsatisfactory operating condition, the customer shall perform to the satisfaction of the P&D Director all repairs or replacement so that the assembly is in satisfactory operating condition.

3. If the Director, the P&D Director, or customer becomes aware during the interim period between annual tests that an assembly is defective or in unsatisfactory operating condition, the customer shall perform to the satisfaction of the P&D Director all repairs, replacement and any retesting so that the customer has an assembly in satisfactory operating condition.

4. Assembly testing shall be performed by a certified tester. Testing requirements shall be in accordance with the procedures outlined in the Ninth Edition of the University of Southern California Manual of Cross-Connection Control and Hydraulic Research (USC-FCCCHR or the Foundation) Los Angeles, CA, December 1993 (hereinafter USC Manual), Section 9. The USC Manual is incorporated herein by reference. One copy of the USC Manual shall be on file with the City Clerk and P&D.

5. The customer shall be responsible for submitting copies of testing records pertaining to assemblies, on forms approved by the P&D Director, by the date specified by the P&D Director. The customer shall be required to retain all records for a minimum of three years from the date that a copy of the record was provided to the P&D Director.

6. Backflow prevention assemblies shall be installed by the customer, at the customer's expense, in compliance with the standards and specifications adopted by the City.

7. In the event the customer's or the public water system is contaminated or polluted due to a cross-connection or other cause, and the same comes to the knowledge of the customer, the Water Services Director, the P&D Director and the Maricopa County Health Authority shall be promptly notified by the customer so that appropriate measures may be taken to overcome the contamination.

Section 37-144. BACKFLOW PREVENTION METHODS.

Unless otherwise specifically designated by the Director:

a) An approved backflow prevention method shall be one of the following types:

1. Air Gap: an unobstructed vertical distance through the free atmosphere between the opening of any pipe or faucet supplying potable water to the tank, plumbing fixture or other device and the flood lever rim of said tank, plumbing fixture or other device. An approved air gap shall be at least double the diameter of the supply pipe or faucet and in no case less than one inch.

2. Reduced Pressure Principle Assembly (hereafter "RP"): An assembly containing two independently acting approved check valves together with a hydraulically operating mechanically independent pressure differential relief valve located between the check valves and at the same time below the first check valve. The assembly shall include properly located test cocks equipped with brass plugs and tightly closing resilient seated shut-off valves at each end of the assembly.
3. Pressure Vacuum Breaker Assembly (hereafter "PVB"): An assembly containing an independently operating, loaded check valve and an independently operating, loaded air inlet valve located on the discharge side of the check valve. The assembly shall be equipped with properly located test cocks fitted with brass plugs and tightly closing resilient seated shut-off valves located at each end of the assembly.

4. Double Check Valve Assembly (hereafter "DC"): An assembly composed of two independently acting, approved check valves, including tightly closing resilient seated shut-off valve at each end of the assembly and fitted with properly located test cocks equipped with brass plugs.

b) Requirements for new services and existing services. An approved backflow prevention method is required for the activities or facilities listed in this paragraph that are connected to the public water system. The backflow prevention method shall be in accordance with that specified in Section 6 of the USC Manual. The location shall be as close as practicable to the point of service delivery. For purposes of this paragraph, the listed facilities, equipment or conditions shall be as defined in Section 7 of the USC Manual, or if not listed in the USC Manual, shall be defined in the City of Phoenix Zoning Ordinance or Construction Code:

**Industrial Facilities:**
1) Aircraft and missile plants (Air gap or RP)
2) Automotive plants (Air gap or RP)
3) Beverage bottling plants (Air gap, RP or DC)
4) Breweries (Air gap or RP)
5) Canneries, packing houses, reduction plants and food processing plants (Air gap or RP)
6) Chemical plants - manufacturing, processing, compounding or treatment (Air gap or RP)
7) Dairies and cold storage plants (Air gap, RP or DC)
8) Film laboratories (Air gap or RP)
9) Laundry and dye works (Air gap or RP)
10) Metal Manufacturing, cleaning, processing and fabricating plants (Air gap, RP or DC)
11) Oil and gas production, storage or transmission properties (Air gap or RP)
12) Paper and paper products plants (Air gap or RP)
13) Plating plants (Air gap or RP)
14) Power plants (Air gap or RP)
15) Radioactive materials or substances - plants or facilities handling (Air gap or RP)
16) Rubber plants - natural or synthetic (Air gap or RP)
17) Sand and gravel plants (Air gap or RP)
18) Semiconductor manufacturing facilities (Air gap or RP)
19) Sewage and storm drain facilities, reclaimed water (Air gap or RP)

**Medical Facilities:**
20) Research laboratories (Air gap or RP)
21) Hospitals, medical buildings, sanitariums, morgues, mortuaries, autopsy facilities, nursing and convalescent homes and clinics (Air gap or RP)
22) Veterinary hospital, animal research, or animal grooming shops (Air gap or RP)

**Commercial and Educational Facilities:**
23) Buildings - any structure having a cross-connection in violation of the Phoenix Plumbing Code or water operated sewage pumping facilities, auxiliary water supplies or other like sources of contamination which would create a potential hazard to the public water system. (Air gap, RP or DC)
24) Car wash facilities (Air gap or RP)
25) Motion picture studios (Air gap or RP)
26) Multi-storied buildings having booster pumps or above ground storage tanks (Air gap, RP or DC)
27) Multiple services - interconnected (Air gap, RP or DC)
   *Exception: Existing facilities which are not otherwise listed in Section 37-144 constructed prior to August 1, 1993*
28) Mobile home parks (RP or DC)
   *Exception: Existing mobile home parks unless a specific hazard is identified.*
29) Recreational vehicle parks (RP or DC)
30) Schools and colleges with laboratories (air gap or RP)
31) Retail shopping centers and strip malls; retail and industrial shell buildings (when one service supplies more than one tenant) (RP)

*Exception: Existing retail shopping centers and strip malls; retail and industrial shell buildings (when one service supplies more than one tenant) unless a specific hazard is identified.*

**Portable or Temporary Services or Equipment:**
32) Construction sites or construction water services (Air gap or RP)
33) Mobile equipment utilizing public potable water (i.e., water trucks, street sweepers, hydro-vacs, etc.) (Air gap or RP)
34) Portable insecticide and herbicide spray tanks (Air gap or RP)

**Miscellaneous Activities and Equipment:**
35) Auxiliary water systems (Air gap or RP)
36) Chemically contaminated water systems (Air gap or RP)
37) Fire systems:
   i) Class 1 or 2: (DC or RP) Check valve assemblies required by the Phoenix Fire Code shall be inspected, tested and maintained at least annually to verify the valves are properly installed and functioning. Annual flow and valve confidence tests shall be performed by a tester who is permitted by the city Fire Marshal to test or maintain fire lines or fire sprinkler systems. Test results, on forms approved by the City, shall be provided to the Director and the city Fire Marshal within thirty days following the inspection. Any fire sprinkler system which fails shall be repaired as required by the Fire Code.
   ii) Class 3, 4, 5, or 6: (RP)
38) Industrial fluid systems. Any industrial fluid system interconnected with the public water supply and containing any fluid or solution which may be chemically, biologically or otherwise contaminated or polluted in a form or concentration such as would constitute a health, system, pollution or plumbing hazard if introduced into an approved water supply: (RP or DC)
39) Irrigation Systems:
   i) System using a chemical injection system: (RP)
   ii) System having elevated areas which are higher than 6 inches below the PVB or multiple services: (RP)
   iii) System not subjected to backpressure: (PVB)
40) Restricted, classified or other closed facilities including civil works: (Air gap or RP)
41) Solar heating systems - direct and auxiliary: (RP)

*Exception: Once through solar heating systems*

c) The P&D Director shall determine on a case by case basis backflow prevention requirements for any facility or activity not listed in this Section in order to prevent contamination or pollution of the public potable water system.

d) All assemblies shall be accessible for testing and maintenance. A reduced pressure principle assembly or double check valve assembly shall not be installed in a basement, meter box, pit, or vault unless adequate clearance and drainage is provided. A pressure vacuum breaker assembly shall be installed above-ground.

e) Unless a cross connection problem is specifically identified, or as otherwise provided in this ordinance, the requirements of this ordinance do not apply to single-family residences used solely for residential purposes.

f) Close as practicable is the point nearest the service delivery area where the assembly can be installed. Where the assembly installation may interfere with obstacles such as driveways and sidewalks, then close as practicable is the nearest point after the obstacles, but in no event beyond the first tap.

g) An air-gap separation shall be located as close as practicable to the customer's point of service delivery. All piping between the customer's connection and receiving tank shall be entirely visible unless otherwise approved by the P&D Director.

Section 37-145 – APPEALS.

An action or decision concerning the determination of the P&D Director may be appealed to the Development Advisory Board in accordance with the procedures set forth in chapter 2, article IX of the Phoenix City Code. (Ord. No. G-3672, § 1; Ord. No. G-4176, § 14, passed 5-19-1999, eff. 6-18-1999)

Section 37-146 – REMEDIES.

a) If a customer has committed one or more of the acts contained in paragraph (d) below and has not taken the corrective action as required by the P&D Director, the Water Services Director may elect to impose a civil penalty not to exceed one thousand percent per billing period on the charges for all water used beginning from the date the corrective action was required and until the corrective action has been completed by the customer.

b) If a situation, which would otherwise result in discontinuance of water service, is not remedied within the time provided in the notice of termination sent to the customer, the Water Services Director, at his discretion, may install a backflow prevention assembly at the customer's point of service delivery and bill the customer for all costs, together with all applicable penalties.

c) The Water Services Director, at his discretion, may publish in the largest daily newspaper published in the city, notice of customers, who at least once during the preceding twelve (12) month period, were in violation with any requirement of this article. The publication shall also summarize any enforcement action taken.

d) In addition to any other remedy available to the Water Services Director under Chapter 37 of the Phoenix City Code, to enforce this article, the P&D Director may request the Water Services Director to terminate water service if the customer:

1) Fails to properly locate, install, test or maintain a required backflow prevention assembly; or
2) Removes or bypasses a required backflow prevention assembly without the prior approval of the P&D Director; or
3) Allows a cross-connection to occur;
4) Fails to timely submit records of tests and repairs of a backflow prevention assembly; or
5) Fails to comply with the written policy on backflow prevention and cross-connection on file with the City Clerk and P&D Director; or
6) Fails to comply with any requirements imposed upon the customer by the State Rule.

Termination of water service shall be immediate and without prior notice if the Water Services Director determines that the customer's water system may cause a health hazard to the public potable water supply. Otherwise, the Water Services Director shall give ten days' written notice to the customer prior to termination of water service. Water service may be restored when the condition forming the basis for the termination has been remedied to the satisfaction of the P&D Director. All costs, fees, and expenses incurred, and all surcharges and penalties relating to the termination and restoration of water service shall be paid prior to the water service being restored. (Ord. No. G-3672, § 1; Ord. No. G-4033, § 3, passed 7-2-1997, eff. 9-1-1997)