Final

CROSS-CONNECTION CONTROL/ BACKFLOW PREVENTION PROGRAM PLAN

Joint Base Pearl Harbor-Hickam, Hawaii

Naval Facilities Engineering Systems Command Pacific

December 2025

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Department of the Navy
Naval Facilities Engineering Systems Command Pacific
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ACRONYMS AND ABBREVIATIONS

40 CFR	Title 40 of the Code of Federal Regulations
A.R.I.	A.R.I. USA, Inc.
AFB	Air Force Base
AG	air gap
AH/BC	AH/BC Navy JV, LLC
Ames®	Ames® Fire & Waterworks
Apollo®	Apollo® Valves
Army	United States Army
ASME	American Society of Mechanical Engineers
ASSE	American Society of Sanitary Engineering
AVB	atmospheric vacuum breaker
AWWA	American Water Works Association
BFP	backflow prevention
BPMS	Business Process Management System
CalEPA	California Environmental Protection Agency
CCC	cross-connection control
Cla-Val	Cla-Val Company
CT	Connecticut
DCDA	double check valve detector assembly
DCVA	double check valve assembly
DoD	United States Department of Defense
DOH	Hawaii Department of Health
DPH	Department of Public Health
EPA	United States Environmental Protection Agency
FCCCHR	Foundation for Cross-Connection Control and Hydraulic Research
FFHC	fit for human consumption
gpm	gallons per minute
HAR	Hawaii Administrative Rules
HBVB	hose bibb vacuum breaker
HI	Hawaii
HQ	Headquarters
IAPMO	International Association of Plumbing and Mechanical Officials
IBM®	International Business Machines Corporation
ICC	International Code Council, Inc.
ID	Identification

IPC	*2024 International Plumbing Code*
JBPHH	Joint Base Pearl Harbor-Hickam
M	Manual
Maximo®	Maximo® Application Suite
NAVFAC	Naval Facilities Engineering Systems Command
NAVFACHIINST	Naval Facilities Engineering Systems Command Hawaii Instruction
NAVMED	Navy Medicine
Navy	United States Navy
No. (or no.)	number
OPNAV	Office of the Chief of Naval Operations
P	Publication
PAC	Pacific
POU	point of use
PPE	personal protective equipment
psi	pounds per square inch
PVB	pressure vacuum breaker
PWD	Public Works Department
PWO	Public Works Officer
PWS	public water system
RP	reduced pressure zone (or principle) assembly
SBCC	State Building Code Council
SDWA	Safe Drinking Water Act
SOP	standard operating procedure
SVB	Spill-Resistant Pressure Vacuum Breaker
UFC	Unified Facilities Criteria
UG	User's Guide
UPC	*2021 Uniform Plumbing Code*
US	United States
USC	University of Southern California
USMC	United States Marine Corps
USPACFLT	United States Pacific Fleet

RECORD OF REVIEW AND AMENDMENTS

All review and amendments to this Cross-Connection Control (CCC)/Backflow Prevention (BFP) Program Plan will be summarized in the table below. Naval Facilities Engineering Systems Command (NAVFAC) Hawaii (HI) will be responsible for maintaining updated copies of this plan.

Date	Update By	NAVFAC HI Lead Reviewer	Amendment Description
December 2024	AH Engineering Consultants	[redacted]	Initial Plan Draft
March 2025	AH Engineering Consultants		Initial Plan Draft, Revision 1
September 2025	AH Engineering Consultants		Initial Plan Pre-Final
December 2025	AH Engineering Consultants		Initial Plan Final

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1. PROGRAM OVERVIEW

The primary objective of this Cross-Connection Control (CCC)/Backflow Prevention (BFP) Program Plan is the protection of public health through the establishment of procedures and guidance intended to ensure that the Joint Base Pearl Harbor-Hickam (JBPHH) drinking water distribution system will not be subject to the backflow of liquids, gases, or other substances. This program shall identify cross-connections that create or have the potential to create an imminent and substantial danger to public health from contamination. Federal, state, and local regulations, rules, and codes and United States (US) Navy (Navy) policies, criteria, and guidance establish the requirements for this program.

A cross-connection is "[a]ny actual or potential connection or structural arrangement between a public or a consumer's potable water system and any other source or system through which it is possible to introduce into any part of the potable system any used water, industrial fluid, gas, or substance other than the intended potable water with which the system is supplied."[1] It can be either direct (actual physical connection such as a line/pipe connection) or indirect (potential for a connection to be created such as hose attachment).

Backflow is "[t]he undesirable reversal of flow of water or mixtures of water and other liquids, gases[,] or other substances into the distribution pipes of the potable supply of water from any source or sources." It can occur as either backpressure ("[a]ny elevation of pressure in the downstream piping system … above the supply pressure") or backsiphonage ("a reduction in system pressure, which causes a sub-atmospheric pressure to exist in the water system").[2]

[1] University of Southern California Foundation for Cross-Connection Control and Hydraulic Research. "Cross-Connection." *Manual of Cross-Connection Control*. Section 1.27. October 2009 (10th Edition).

[2] University of Southern California Foundation for Cross-Connection Control and Hydraulic Research. "Cross-Connection." *Manual of Cross-Connection Control*. Sections 1.14, 1.16, and 1.17. October 2009 (10th Edition).

1.1 APPLICABILITY

In its current state, this CCC/BFP Program Plan applies solely to the JBPHH public water system (PWS) (PWS Identification [ID] HI0000360). It does not cover separate PWSs for JBPHH outlying areas, including Camp Stover (PWS ID HI0000354), Naval Magazine Lualualei (PWS ID HI0000358), Naval Computer and Telecommunications Area Master Station Pacific (PAC) (PWS ID HI0000357), and PAC Missile Range Facility Barking Sands (PWS ID HI0000430).

In addition, the current focus of this plan is on containment protection, which aims to protect the public water supply by isolating a customer's plumbing. This is primarily achieved through protection at the facility service line. Isolation protection (i.e., protection of facility occupants/users from drinking water contamination within the facility) shall be considered for implementation at a future time. There are currently some known isolation-level BFP assemblies that are being tracked prior to development of this CCC/BFP Program Plan. They will continue to be tracked, tested, and certified in accordance with the same requirements as containment-level assemblies discussed in this plan. Proper inclusion of additional isolation-level assemblies and BFP devices in the JBPHH CCC/BFP program must be preceded by an isolation-level survey, to be conducted at a future time.

The JBPHH PWS actively provides safe drinking water to several non-Navy facilities and sites including, but not limited to, the following:

- Privatized housing
  - Ohana Military Communities - Navy
  - Ohana Military Communities - US Marine Corps (USMC)
  - Hickam Communities
- Aliamanu Military Reservation (US Army [Army])
  - Consecutive PWS (PWS ID HI0000337)
- Pearl Harbor National Memorial (US National Park Service)
- Pearl Harbor Aviation Museum
- Defense Prisoners of War/Missing in Action Accounting Agency administrative offices

- National Oceanic and Atmospheric Administration Daniel K. Inouye Regional Center and supporting facilities
- Third-party restaurant/cafe tenants

Containment-level BFP at the service connections to these facilities and sites (i.e., where Navy jurisdiction ends) is included as part of this CCC/BFP Program Plan. Any CCC/BFP application downstream of these connections is considered outside the scope of this program and remains the responsibility of the non-Navy owner/occupants.

The US Air Force occupies most facilities that compose what was previously Hickam Air Force Base (AFB) at JBPHH. These facilities are considered part of the scope of this CCC/BFP program.

1.2 BACKGROUND

JBPHH is a US military installation situated along the shoreline of Pearl Harbor on the island of Oahu, Hawaii (HI), northwest of Honolulu (see Figure 1-1). This joint installation was established following the integration of Naval Station Pearl Harbor with Hickam AFB on 1 October 2010. JBPHH's mission is "to enable maximum mission readiness of [its] tenant commands and activities by providing the highest quality installation services, facilities support and quality of life programs." It has a total population of over 107,000 and hosts more than 270 tenant commands including commanders of the US PAC Fleet (USPACFLT); Submarine Force, USPACFLT; Navy Region HI; Naval Surface Group, Middle Pacific; and Naval Facilities Engineering Systems Command (NAVFAC) PAC.[3]

[3] Commander, Navy Region Hawaii. *About*. Updated 2022. https://cnrh.cnic.navy.mil/Installations/JB-Pearl-Harbor-Hickam/About/. Accessed 22 December 2025.

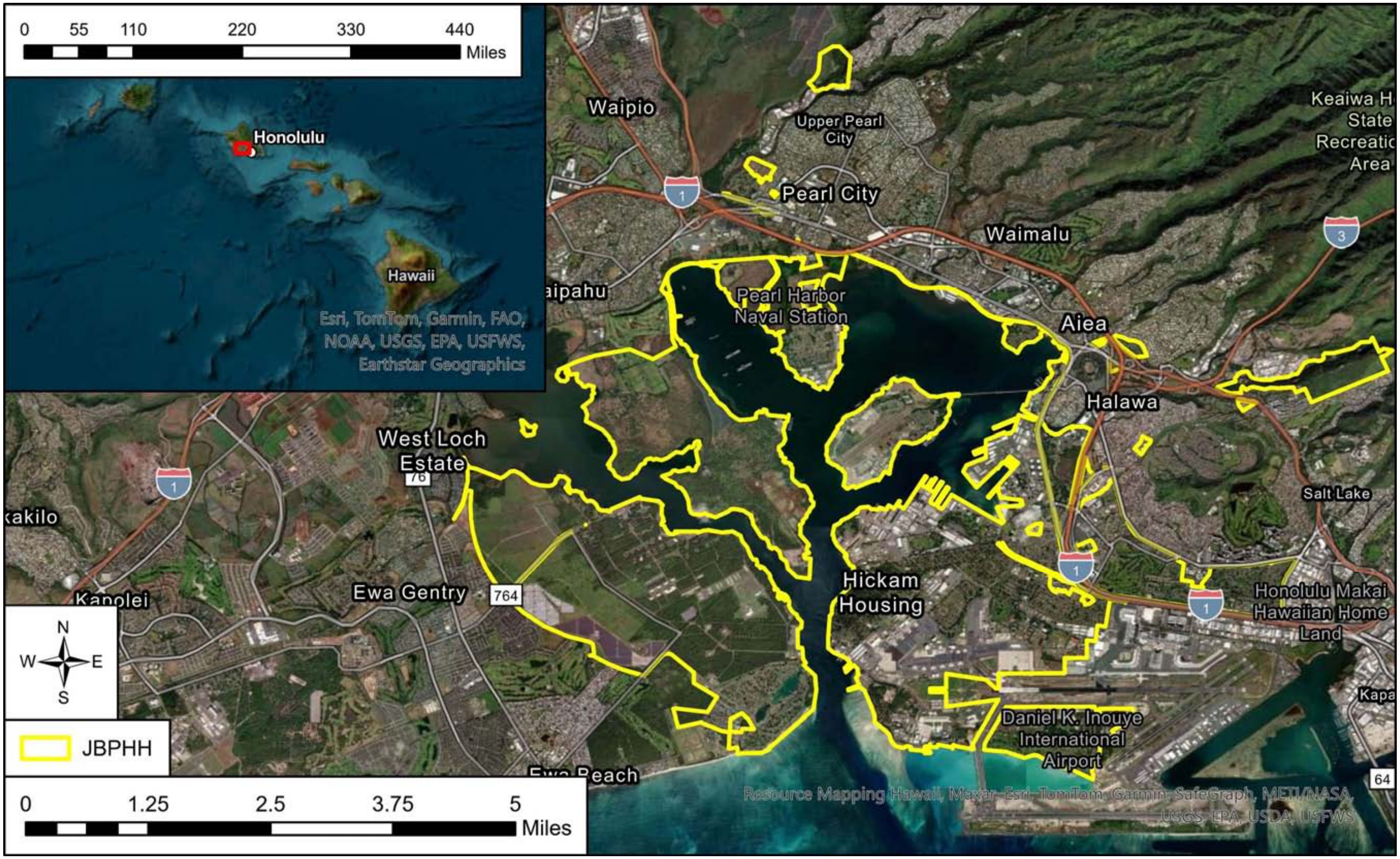

Figure 1-1 Location and Vicinity Maps

JBPHH owns and operates a PWS that serves approximately 70,000 people at the main installation, USMC Base Hawaii Camp H. M. Smith, and a consecutive system owned and operated by the Army. This system is regulated by the following:

- The Safe Drinking Water Act (SDWA), a federal law that authorizes the US Environmental Protect Agency (EPA) to establish minimum drinking water standards, requires that each federal activity with jurisdiction over a PWS comply with applicable federal, state, and/or local requirements, whether substantive or administrative.[4]
- The SDWA and requirements specified in the *National Primary Drinking Water Regulations* and *Other Safe Drinking Water Act Regulations* (Parts 141 and 143, respectively, of Title 40 of the Code of Federal Regulations [40 CFR]) are designed to ensure that every user of a PWS receives water that is safe to consume.
  - The EPA delegated primacy for implementing and enforcing the SDWA over state PWSs to the HI Department of Health (DOH) in January 1978,[5] which established the Safe Drinking Water Branch and Chapters 19 to 21, 23, 25, and 65 to Title 11 of the Hawaii Administrative Rules (HAR). These chapters establish regulations that state PWSs and other drinking water-related entities must follow.
- Section 21-3 of the Navy's *Environmental Readiness Program* Manual (Office of the Chief of Naval Operations [OPNAV] Manual [M]-5090.1, 25 June 2021) requires that Navy drinking water systems be constructed, operated, and maintained to comply with SDWA standards. Additional US Department of Defense (DoD) guidelines are presented in Section 2 of this plan.

1.3 FUNDING

The Navy owns and operates the PWS that supplies JBPHH.

Financial support for the installation, testing, certification, repair, relocation, and replacement of BFP assemblies and devices that comprise the JBPHH CCC/BFP program will be included in the cost to operate and maintain the water system, and is the responsibility of Commander, Navy Region Hawaii, which is funded by the US Government.

[4] 104th United States Congress. *Safe Drinking Water Act Amendments of 1996*. Public Law 104-182. 6 August 1996.

[5] Hawaii Department of Health, Environmental Management Division, Safe Drinking Water Branch. *State of Hawaii Annual Public Water System Compliance Report, Calendar Year 2023*. August 2024.

Sufficient funding for the above tasks will be incorporated into the JBPHH Public Works Department (PWD) annual budget.

1.4 PLAN LAYOUT

This CCC/BFP Program Plan is developed as follows:

- Section 1 provides a program overview.
- Section 2 lists applicable CCC/BFP regulations, references, and definitions.
- Section 3 reviews hazard assessment and applicable BFP assemblies and devices.
- Section 4 details surveying, testing, and repairs of BFP assemblies and devices.
- Section 5 presents guidance on recordkeeping and public communication.
- Appendix A contains NAVFAC Headquarters' (HQ's), Business Process Management System (BPMS) B-24.10: *Cross-Connection Control and Backflow Prevention* (2022).
- Appendix B provides survey and testing field forms.
- Appendix C includes a standard operating procedure (SOP) for field testing BFP assemblies.
- Appendix D contains NAVFAC HI technical requirements for contractors requesting temporary water service.
- Appendix E provides a backflow incident reporting form
- Appendix F includes public notification letter templates
- Appendix G contains public awareness and education documentation to assist CCC/BFP program personnel in community outreach.
- NAVFAC HI Instruction (NAVFACHIINST) 11330.1A, a separate document to this plan, summarizes roles and responsibilities of CCC/BFP program personnel.

2. REGULATIONS, REFERENCES, AND DEFINITIONS

This section describes applicable state (i.e., HI) and federal regulations for the JBPHH CCC/BFP program, references used to develop this plan, and definitions of specific CCC/BFP-related terms utilized in this plan.

2.1 REGULATIONS

Federal, state, and local statutes, regulations, and rules and Navy policies, criteria, and guidance establish CCC/BFP requirements for JBPHH and other Navy installations. The SDWA of 1974 and SDWA Amendments of 1986 and 1996 are the basis of the federal regulations. Paragraph 21-3 of OPNAV M-5090.1 (2021) requires that Navy drinking water systems be constructed, operated, and maintained to comply with SDWA standards.

The regulatory basis (requirements) for the JBPHH CCC/BFP program is listed below:

State/Local Requirements and Guidelines:

- HAR, Title 11, Chapter 20, *Rules Relating to Public Water Systems* (https://health.hawaii.gov/sdwb/files/2021/08/11-20-October-29-2020-Appendices.pdf)
  - Section 11-20-29.5(7)
- HAR, Title 11, Chapter 21, *Cross-Connection and Backflow Control* (https://health.hawaii.gov/opppd/files/2015/06/11-21.pdf)
- International Association of Plumbing and Mechanical Officials (IAPMO) *2021 Uniform Plumbing Code* (UPC), 4th Printing, February 2023 (https://epubs.iapmo.org/2021/UPC/)
  - Section 603.0, *Cross-Connection Control*
  - Adopted automatically by the State Building Code Council (SBCC) per Section 107-24(c) of the HI Revised Statutes[6]

[6] Hawaii Revised Statutes. *Authority and duties of the council*. HRS §107-24. https://www.capitol.hawaii.gov/hrscurrent/Vol02_Ch0046-0115/HRS0107/HRS_0107-0024.htm . Accessed 22 December 2025.

  - Authority and duties of the SBCC to amend/update the state code suspended since 17 July 2023[7]
- American Society of Sanitary Engineering (ASSE)/IAPMO/American National Standards Institute Series 5000-2022e1, Cross-Connection Control Professional Qualifications Standard, Approved March 2022 (https://assewebstore.com/asse-iapmo-ansi-series-5000-2022e1-download/)
  - Referenced by the UPC (2023)

Federal/DoD Requirements and Guidelines:

- SDWA
  - Public Law Number (No.) 93-523, 16 December 1974 (https://www.congress.gov/93/statute/STATUTE-88/STATUTE-88-Pg1660-2.pdf)
  - Public Law No. 99-339, 19 June 1986 (https://www.congress.gov/99/statute/STATUTE-100/STATUTE-100-Pg642.pdf)
  - Public Law No. 104-182, 6 August 1996 (https://www.congress.gov/104/statute/STATUTE-110/STATUTE-110-Pg1613.pdf)
- 40 CFR
  - Part 141, *National Primary Drinking Water Regulations* (https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-141)
  - Part 142, *National Primary Drinking Water Regulations Implementation* (https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-142)
  - Part 143, *Other Safe Drinking Water Act Regulations* (https://www.ecfr.gov/current/title-40/chapter-I/subchapter-D/part-143)
- OPNAV M-5090.1, *Environmental Readiness Program Manual*, 25 June 2021 (https://www.navsea.navy.mil/Portals/103/Documents/SUPSALV/Environmental/5090.1.pdf)
  - Paragraph 21-3.10, *Cross-Connection and Backflow Prevention*
- Navy Medicine (NAVMED) Publication (P)-5010-5, *Manual of Naval Preventive Medicine*, 1 July 2019 (https://www.med.navy.mil/Portals/62/Documents/BUMED/Directives/All%20Pubs/5010-5.pdf?ver=krhf6wyhEZCIMnHqaoMzvw%3D%3D)
  - Article 5-9.3g, *Cross-Connection Control and Backflow Prevention*
- NAVFAC Headquarters (HQ), Business Process Management System (BPMS) B-24.10, *Cross-Connection Control and Backflow Prevention*, 19 April 2022
  - Included as Appendix A of this plan

[7] State of Hawaii's Office of the Governor's Housing Team. *Emergency Proclamation*. https://hale.hawaii.gov/emergency-proclamation/. Accessed 22 December 2025.

- EPA 816-R-03-002, *Cross-Connection Control Manual*, February 2003 (https://www.epa.gov/sites/default/files/2015-09/documents/epa816r03002_0.pdf)
- Unified Facilities Criteria (UFC) 1-200-01, *DoD Building Code*, Change 4, 17 December 2024 (https://www.wbdg.org/FFC/DOD/UFC/ufc_1_200_01_2022_c4.pdf)
- UFC 3-230-02, *Operation and Maintenance: Water Supply Systems*, Change 2, 1 November 2023 (https://www.wbdg.org/FFC/DOD/UFC/ufc_3_230_02_2019_c2.pdf)
  - Chapter 9, *Cross-Connection Control and Backflow Prevention*
- United Facilities Guide Specifications 22 00 00, *Plumbing, General Purpose*, Change 1, November 2024 (https://www.wbdg.org/FFC/DOD/UFGS/UFGS%2022%2000%2000.pdf)
  - Paragraph 2.5, *Backflow Preventers*
  - Paragraph 3.3.6, *Backflow Prevention Devices*
  - Paragraph 3.9.1.1, *Test of Backflow Prevention Assemblies*
- American Water Works Association (AWWA) M14, *Backflow Prevention and Cross-Connection Control – Recommended Practices*, 5th Edition, 2024 (https://store.awwa.org/M14-Backflow-Prevention-and-Cross-Connection-Control-Recommended-Practices-Fifth-Edition-PDF)
  - Referenced by OPNAV M-5090.1 (2021), NAVMED P-5010-5 (2019), NAVFAC HQ's BPMS B-24.10 (2022), and EPA 816-R-03-002 (2003)
- University of Southern California (USC) Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR), *Manual of Cross-Connection Control*, 10th Edition, October 2009 (https://www.uscfoundationstore.com/Manual-of-Cross-Connection-Control-Tenth-Edition-P44.aspx)
  - Referenced by NAVMED P-5010-5 (2019), NAVFAC HQ's BPMS B-24.10 (2022), and EPA 816-R-03-002 (2003)
- USC FCCCHR, *List of Approved Backflow Prevention Assemblies*, 15 December 2025 (https://fccchr.usc.edu/_downloads/List/list.pdf)
  - Referenced by NAVMED P-5010-5 (2019)
- International Code Council, Inc. (ICC), *2024 International Building Code*, 2nd Printing, August 2025 (https://codes.iccsafe.org/content/IBC2024V2.0)
  - Referenced by UFC 1-200-01 (2024)
- ICC, *2024 International Plumbing Code* (IPC), 2nd Printing, May 2024 (https://codes.iccsafe.org/content/IPC2024V2.0)
  - Section 608, *Protection of Potable Water Supply*
  - Referenced by UFC 1-200-01 (2024) and UFC 3-230-02 (2023)
- ASSE International, *Guide to Cross-Connection Protection Devices and Assemblies – Application and Selection*, 3rd Edition, 2018

(https://assewebstore.com/guide-to-cross-connection-protection-devices-and-assemblies-download)

2.2 ADDITIONAL REFERENCES

Below are additional references utilized for the development of this CCC/BFP Program Plan:

- California Environmental Protection Agency (CalEPA) State Water Resources Control Board, *Cross-Connection Control Policy Handbook – Standards and Principles for California's Public Water Systems*, Adopted 19 December 2023 (https://www.waterboards.ca.gov/drinking_water/certlic/drinkingwater/docs/2023/cccph-adopt-2023-12-19.pdf)
- Connecticut (CT) Department of Public Health (DPH) Drinking Water Division, *State of Connecticut Cross Connection Control Manual*, 5th Edition, January 2003 (https://portal.ct.gov/-/media/departments-and-agencies/dph/dph/drinking_water/pdf/xcmanualpdf.pdf?rev=d6265e59d01b4ca8ae1c958207bcec39&hash=29E3893630772B37A56D55C316EC2DE0)
- AH/BC Navy JV, LLC (AH/BC), *Cross-Connection Control and Backflow Prevention Survey*, JBPHH, HI, October 2022
- IAPMO *2024 Uniform Plumbing Code*, 1st Printing, February 2023 (https://epubs.iapmo.org/2024/UPC/)
  - Section 603.0, *Cross-Connection Control*

2.3 DEFINITIONS

Below are select definitions related to this CCC/BFP Program Plan. They are compiled from multiple references, including Paragraph 21-5 (*Definitions*) of OPNAV M-5090.1 (2021), Appendix C (*Terms and Definitions*) of NAVMED P-5010-5 (2019), the glossary of EPA 816-R-03-002 (2003), the glossary of AWWA M14 (5th Edition, 2024), and Chapter 1 (*Definitions*) of the USC FCCCHR manual (10th edition, 2009).

- **Air Gap (AG)** – An unobstructed vertical physical separation through free atmosphere sufficient to prevent backflow between the lowest free-flowing discharge end of a fit for human consumption (FFHC) water supply pipe or faucet and an open or non-pressurized receiving vessel; must be at least twice the diameter (minimum 1 inch) of the supply pipe measured vertically above the overflow rim of the receiving vessel; meets American Society of Mechanical Engineers (ASME) Standard No. A112.1.2; see Subsection 3.2.1 of this plan
- **Atmospheric Vacuum Breaker (AVB)** – A BFP device containing an air inlet (float check) valve, a check seat, and an air inlet port; forms a check valve when the air inlet valve falls (due to atmospheric pressure entering through

the air inlet port) after the flow of water stops; designed to protect against backsiphonage conditions only; meets ASSE Standard No. 1001; see Subsection 3.2.2 of this plan

- **Backflow** – The undesirable reversal of flow of water or mixtures of water and other liquids, gases, or other substances into the distribution pipes of the FFHC water supply from any source or sources; created due to the existence of a pressure differential where the pressure on the non-FFHC side is greater than the pressure on the FFHC side; either backpressure or backsiphonage
- **Backflow Prevention (BFP) Assembly** – A testable plumbing mechanism used to prevent backflow into a FFHC water system; type of assembly based on existing or potential degree of hazard and backflow condition
- **Backflow Prevention (BFP) Device** – A non-testable plumbing mechanism used to prevent backflow into a FFHC water system; type of device based on existing or potential degree of hazard and backflow condition
- **Backpressure** – Any elevation of pressure in the downstream (non-FFHC) piping system (e.g., pumps, piping elevation, steam, or air pressure) above the supply pressure that would cause or tend to cause a reversal of the normal direction of flow (i.e., backflow)
- **Backsiphonage** – A form of backflow due to a reduction in system pressure that causes a negative pressure (partial vacuum) to exist in the water system
- **Check Valve** – A self-closing component of most BFP assemblies and devices that is drip-tight in the normal direction of flow when the inlet pressure is at least 1.0 pound per square inch (psi) and the outlet pressure is zero; permits no leakage in a direction reverse of normal flow; the closure element (e.g., clapper, poppet) is internally loaded to promote rapid and positive closure
- **Containment (Service Protection)** – The appropriate type or method of BFP at (or as close as possible to) the service connection, commensurate with the degree of hazard of the consumer's FFHC water system; confines potential contamination caused by cross-connection to within the consumer's system
- **Contaminant (Health or High Hazard)** – Any substance that, if introduced to the FFHC water system, will impair the quality of water in such a way as to create an actual hazard to public health and well-being (e.g., death, illness, poisoning, spread of disease)
- **Cross-Connection** – Any actual or potential connection or structural arrangement, directly or indirectly, between a PWS or a consumer's FFHC water system and any other source or system through which it is possible to introduce into any part of the FFHC system any used water, industrial fluid, gas, sewage, or substance other than the intended FFHC water with which the system is supplied (see Section 1 of this plan)
- **Cross-Connection Control (CCC)** – A program to eliminate cross-connections or prevent them from causing a public health threat
- **Degree of Hazard** – The danger posed by a particular substance or set of circumstances; either a pollutant (non-health) or contaminant (health); derived

from the assessment of the materials that may come in contact with the distribution system through a cross-connection

- **Double Check Valve Assembly (DCVA)** – A BFP assembly composed of two independently acting check valves; includes four properly located resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly; only used to protect against non-health (pollutant) hazard backflow; meets ASSE Standard No. 1015 and AWWA Standard No. C510; see Subsection 3.2.5 of this plan
- **Double Check Valve Detector Assembly (DCDA)** – A specially designed BFP assembly composed of a line-size DCVA with a bypass, either around both check valves and containing a specific water meter and DCVA or only around the second (downstream) check valve and containing a specific water meter and a check valve; meter shall register accurately for rates of flow up to [redacted] (b) (3) and show a registration for all rates of flow (used to detect leakage or unauthorized water use); only used to protect against non-health (pollutant) hazard backflow; meets ASSE Standard No. 1048; see Subsection 3.2.7 of this plan
- **Fit for Human Consumption (FFHC) Water** – Water from a source that has been confirmed via testing to meet established health-based water quality standards and is safe for drinking, cooking, bathing, showering, dishwashing, and maintaining oral hygiene; free from impurities present in amounts sufficient to cause disease or harmful physiological effects; bacteriological and chemical qualities conform to the requirements of Part 141 of 40 CFR
  - This terminology is used in lieu of “potable water”.
- **Hose Bibb Vacuum Breaker (HBVB)** – A BFP device composed of a spring-loaded check valve and atmospheric venting feature that may be connected to a standard hose-threaded faucet for the purpose of preventing backflow through the hose bibb; meets ASSE Standard No. 1011; alternate versions meet ASSE Standard No. 1052 (two check valves); see Subsection 3.2.3 of this plan
- **Isolation (Internal Protection)** – The appropriate type or method of BFP within the consumer’s FFHC water system at the point of use (POU) (e.g., fixture, area, zone), commensurate with the degree of hazard
- **Pollution (Non-Health or Low Hazard)** – An impairment of the quality of the water to a degree that does not create a hazard to public health but does adversely and unreasonably affect the cosmetic (e.g., skin/tooth discoloration) or aesthetic (e.g., taste, odor, color) qualities of such waters for domestic use
- **Pressure Vacuum Breaker (PVB)** – A BFP assembly containing an independently operating, internally spring-loaded check valve (“poppet valve”) and an independently operating loaded air inlet valve located on the discharge side of the check valve; equipped with two properly located resilient seated test cocks and tightly closing resilient seated shutoff valves attached at each end of the assembly; designed to protect against non-health (pollutant) and health (contaminant) hazards under backsiphonage condition only; meets ASSE Standard No. 1020; see Subsection 3.2.6 of this plan

- **Public Water System (PWS)** – Any publicly or privately owned water system operated as a public utility under a valid health permit to supply water for domestic purposes; consists of at least 15 service connections or regularly serves an average of at least 25 individuals daily at least 60 days out of the year; includes all sources, facilities and appurtenances between the source and point of delivery (e.g., valves, pumps, pipes, conduits, tanks, receptacles, fixtures, equipment, appurtenances) used to produce, convey, treat, or store FFHC water for public consumption or use
- **Reduced Pressure Zone (or Principle) Assembly (RP)** – A BFP assembly containing two independently acting check valves together with a hydraulically operating, mechanically independent pressure differential relief valve (spillage port) located between the check valves and at the same time below the first (upstream) check valve; includes four properly located resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly; designed to protect against non-health (pollutant) and health (contaminant) hazards; meets ASSE Standard No. 1013 and AWWA Standard No. C511; see Subsection 3.2.4 of this plan
- **Service Connection** – A pipe connection, including all fittings and appurtenances, between a PWS and the consumer's water system; where the PWS may lose jurisdiction and sanitary control of the water at its point of delivery to the consumer's system (typically the downstream end of the water meter, if installed)
- **Spill-Resistant Pressure Vacuum Breaker (SVB)** – A BFP assembly containing an independently operating, internally spring-loaded check valve ("poppet valve") and an independently operating loaded air inlet valve located on the discharge side of the check valve; equipped with one properly located resilient seated test cock, one properly located bleed/vent port, and tightly closing resilient seated shutoff valves attached at each end of the assembly; designed to protect against non-health (pollutant) and health (contaminant) hazards under backsiphonage condition only; meets ASSE Standard No. 1056; see Subsection 3.2.8 of this plan
- **Test Cock** – An appurtenance on BFP assemblies used when testing the assembly

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3. HAZARDS AND ASSEMBLIES/DEVICES

This section describes the methodology behind determination of the degree of hazard and the different types of applicable BFP assemblies and devices that can be used for protection against containment-level cross-connections.

3.1 DEGREE OF HAZARD

The two types of hazard classification are defined, per multiple references, in Table 3-1. As shown, the definitions closely compare with no discernable conflicts. The most notable difference is the interchangeable terminology of the hazard classification titles.

Table 3-1 Degree of Hazard Definitions

Degree of Hazard	Source(s)	Definition
Contamination/Health/High Hazard		
Contamination	HAR Section 11-21-2 (1981)	An impairment of the quality of the FFHC water by sewage, industrial fluids or waste liquids, compounds or other materials to a degree which creates an actual hazard to the public health through poisoning or through the spread of disease.
Contaminant (Health)	USC FCCCHR Manual (10th Edition, 2009) Sections 1.24 and 1.34	Any substance that shall impair the quality of water in such a way as to create an actual hazard to the public health through poisoning, the spread of disease, or other means.
Contamination (High)	ICC IPC (2024) Section 202 IAPMO UPC (2023) Sections 205.0 and 210.0	An impairment of the quality of the FFHC water that creates an actual hazard to the public health through poisoning or the spread of disease by sewage, industrial fluids, or waste.
High Health (High)	AWWA M14 (5th Edition, 2024) Glossary	A cross-connection or potential cross-connection involving any substance that could, if introduced into the FFHC water supply, cause death or illness, spread disease, or have a high probability of causing such effects. An example substance would be any one of the National Primary Drinking Water Standards (i.e., Part 141 of 40 CFR).

Table 3-1 Degree of Hazard Definitions (continued)

Degree of Hazard	Source(s)	Definition
Pollution/Non-Health/Low Hazard		
Pollution	HAR Section 11-21-2 (1981)	The presence of any foreign substance (organic, inorganic, radiological, or biological) in water that may degrade the water quality so as to constitute a hazard or impair its usefulness.
Pollutant (Non-Health)	USC FCCCHR Manual (10th Edition, 2009) Sections 1.43 and 1.47	An impairment of the quality of the water to a degree which does not create a hazard to the public health but which does adversely and unreasonably affect the aesthetic qualities of such waters for domestic use.
Pollution (Low)	ICC IPC (2024) Section 202 IAPMO UPC (2023) Sections 214.0 and 218.0	An impairment of the quality of the FFHC water to a degree that does not create a hazard to public health but adversely and unreasonably affects the aesthetic qualities of such FFHC water for domestic use.
Non-Health (Low)	AWWA M14 (5th Edition, 2024) Glossary	Any substance that generally would not be a health hazard but would constitute a nuisance or be aesthetically objectionable if introduced into the FFHC water supply. An example substance would be any one of the National Secondary Drinking Water Standards (i.e., Part 143 of 40 CFR).

Each cross-connection hazard must be characterized as either contamination (health or high hazard) or pollution (non-health or low hazard) to determine appropriate protection. Hazard ranking is critical to the selection of appropriate BFP assemblies and devices as some types are only rated to protect against pollution.

For containment-level protection, Table 3-2 presents the hazard ranking rationale to be used as part of the JBPHH CCC/BFP program. No universal list of facility classifications exists; however, this table is based on common industry practices along with applicable references (Table 3-3 of the 2022 JBPHH containment-level CCC/BFP survey report, "Building Category" section [page 4] of the ASSE BFP assembly and device guide [2018], and Section 6.2 of the CT DPH CCC manual [2003]). If a specific facility or piece of equipment is not on this list, the hazard classification and applicable BFP assembly or device shall be determined by the CCC/BFP Program Manager.

Table 3-2 Containment-Level Cross-Connection Hazard Assessments and Applicable Backflow Prevention Assemblies and Devices

Description	Degree of Hazard	BFP Assembl(y/ies)/ Device(s)[1]
Facilities		
Aircraft and Missile Plants	Contamination	RP
Airport Terminals	Contamination	RP
Barber Shops and Beauty Salons	Contamination	RP
Barracks and Quarters	Pollution	DCVA
Buildings with Frequent Occupancy Changes	Contamination	RP
Buildings with Multiple Water Supplies	Contamination	RP
Buildings with Piping Alterations	Contamination	RP
Chemical Research Plants	Contamination	RP
Classified or Restricted Buildings	Contamination	RP
Clinics (dental, medical, veterinary) and Hospitals, Medical Laboratories, and Sanitariums	Contamination	RP
Commercial Car Washes	Contamination	RP
Commercial Dry Cleaners and Laundromats	Contamination	RP
Cold Storage Buildings	Contamination	RP
Docks and Dockside Buildings	Contamination	AG or RP
Electroplating Plants	Contamination	RP
Fire Stations	Contamination	RP
Food Establishments (e.g., restaurants)	Contamination	RP
Funeral Homes, Morgues, and Mortuaries	Contamination	RP
Garden Centers, Nurseries, and Greenhouses	Contamination	RP
Gymnasiums and Sports Complexes	Contamination	RP
Hangars (maintenance spaces)	Contamination	RP
Hangars (office spaces)	Pollution[2]	DCVA
Hush Houses	Contamination	RP
Metal Cleaning, Fabrication, Manufacturing, and Processing Plants	Contamination	RP
Offices	Pollution[2]	DCVA
Petroleum Processing Plants and Storage Buildings	Contamination	RP
Pleasure Boat Marinas	Contamination	AG or RP
Rainwater Harvesting Systems	Contamination	AG or RP
Reclaimed Water Systems	Contamination	AG or RP
Restroom Buildings	Contamination	RP
Sewage Treatment Plants	Contamination	AG or RP
Schools	Contamination	RP
Sewage Lift Stations	Contamination	AG or RP
Sewage Treatment Plants	Contamination	AG or RP
Tall Buildings (i.e., elevation difference between highest POU and water meter 80 feet or greater)	Pollution[2]	DCVA
Wells (individual, private, and unmonitored)	Contamination	AG or RP

Table 3-2 Containment-Level Cross-Connection Hazard Assessments and Applicable Backflow Prevention Assemblies and Devices (continued)

Description	Degree of Hazard	BFP Assembl(y/ies)/ Device(s)[1]
Equipment		
Cooling Towers with Chemical Additives	Contamination	AG or RP
Fire Protection and FFHC Water Storage Tanks	Pollution[2]	AG or DCVA
Fire Protection Systems with Chemical Additives (e.g., toxic liquid foam concentrates)	Contamination	RP
Fire Protection Systems with Fire Department Service Connection(s) and No Chemical Additives	Pollution	DCVA or DCDA
Heating Equipment with No Chemical Additives	Pollution[2]	DCVA
Hose Bibbs	Contamination or Pollution[3]	HBVB
Irrigation Systems	Contamination	AVB[4] [5], RP, PVB, or SVB
Multi-Family Housing Units	Pollution[2]	DCVA
Non-Navy Consecutive PWSs for Housing	Pollution[2]	DCVA
Ornamental Fountains	Contamination	AVB[4] [5], RP, PVB, or SVB
Swimming Pools (public)	Contamination	AG or RP
Wash Racks	Contamination	RP

[1] See Subsection 3.2 of this plan for details on BFP assemblies and devices.
[2] When a greater hazard exists (due to toxicity or other potential health impact) that is unique to the specific building/equipment, contamination protection (e.g., RP) is required.
[3] The degree of hazard for a hose bibb is largely dependent on the facility it is located at or near and potential contamination/pollution sources that can be reached via hose attachment
[4] While AVBs are technically applicable, they are non-testable BFP devices and are to be replaced (including proper recordkeeping of replacement) every 5 to 10 years per Subsection 4.2 of this plan. They are not recommended for future installation at JBPHH.
[5] AVBs cannot be subjected to continuous pressure; therefore, there cannot be any shutoff or control valves downstream of the BFP device.

Note that domestic use service lines for single-family housing units are considered low-risk pollution sources at JBPHH; therefore, they will not be required to implement containment-level BFP. Non-Navy housing areas sourced by the JBPHH PWS include a mixture of distribution systems that are owned, operated, and maintained by either non-Navy entities (e.g., the Army's Aliamanu Military Reservation) or JBPHH (e.g., Ohana Military Communities, Hickam Communities). As noted in Table 3-2, containment-level BFP against pollution will be applied to interconnections between the JBPHH PWS and non-Navy housing distribution systems. Proper education of water system customers and stakeholders (detailed in Subsection 5.3 of this plan) is implemented as part of this CCC/BFP program to encourage contributing practices by housing occupants.

3.2 BACKFLOW PREVENTION ASSEMBLY AND DEVICE DESCRIPTIONS

Different BFP assemblies and devices are rated to protect against contamination (health or high hazard) and/or pollution (non-health or low hazard) and backpressure and/or backsiphonage. In many cases, a cross-connection can have the potential to exhibit both backpressure and backsiphonage.

Table 3-3 lists each type of BFP assembly and device covered under this CCC/BFP Program Plan. Detailed descriptions of each assembly and device, including operation, installation, application, and additional information are provided in the following subsections.

Table 3-3 List of Backflow Prevention Assemblies and Devices

BFP Assembly/ Device Name	BFP Assembly/ Device Acronym	Applicable Standard No(s).[1]	Degree of Hazard		BFP		Continuous Pressure
			Contamination (Health or High)	Pollution (Non-Health or Low)	Backpressure	Backsiphonage	
Air Gap	AG	ASME A112.1.2	Yes	Yes	Yes[2]	Yes	No
Atmospheric Vacuum Breaker	AVB	ASSE 1001	Yes	Yes	No	Yes	No
Hose Bibb Vacuum Breaker	HBVB	ASSE 1011 ASSE 1052	Yes	Yes	No	Yes	No
Reduced Pressure Zone (or Principle) Assembly	RP	ASSE 1013 AWWA C511	Yes	Yes	Yes	Yes	Yes
Double Check Valve Assembly	DCVA	ASSE 1015 AWWA C510	No	Yes	Yes	Yes	Yes
Pressure Vacuum Breaker	PVB	ASSE 1020	Yes	Yes	No	Yes	Yes
Double Check Valve Detector Assembly	DCDA	ASSE 1048	No	Yes	Yes	Yes	Yes
Spill-Resistant Pressure Vacuum Breaker	SVB	ASSE 1056	Yes	Yes	No	Yes	Yes

[1] Per Table 603.2 of the IAPMO UPC (excluding Canadian Standards Association)
[2] Applicable for backpressure per Chapter 3 of the USC FCCCHR manual (10th Edition, 2009) and Table 608.1 of the ICC IPC (2024)

3.2.1 Air Gaps

AGs are unobstructed vertical physical separations through free atmosphere sufficient to prevent backflow between the lowest free-flowing discharge end of a FFHC water supply pipe or faucet and an open or non-pressurized receiving vessel. They provide applicable BFP against contamination (health or high hazard) and pollution (non-health or low hazard) under backpressure and backsiphonage conditions. Figure 3-1 shows examples of AGs.

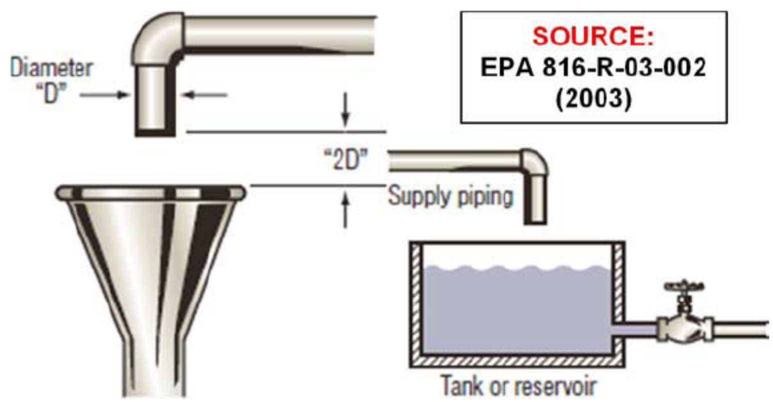

Figure 3-1 Air Gap Examples

3.2.1.1 Standard

Applicable AGs meet ASME Standard No. A112.1.2. The most recent version of this standard was developed in 2022 (https://webstore.ansi.org/standards/asme/asmea1122012r2022).

3.2.1.2 Operation

An AG is extremely effective for preventing backflow as it creates a separation between the supply water and the substance in the receiving vessel. If backpressure were to occur, the resulting backflow would only flow over the rim of the receiving vessel but would never be introduced to the supply line.

An AG should not be used in an area with a hazardous atmosphere because backsiphonage could cause the atmosphere to enter into the supply line.

Although very effective at preventing backflow, AGs are not practical in most cases of BFP, especially containment-level protection with service connections.

3.2.1.3 Installation

AGs must be installed with a minimum separation distance of at least twice the diameter (minimum 1 inch) of the supply pipe measured vertically above the overflow rim of the receiving vessel.

Careful attention must be paid in situations where a hose or extension piece can be attached to the supply line and create a potential cross-connection. AGs must be inspected periodically to ensure that the AG is not bypassed or altered against requirements.

3.2.1.4 Uses

Per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, AGs were observed at fill inlets for cooling towers, storage tanks, and swimming pools. See Table 3-2 for additional containment-level applications.

3.2.2 Atmospheric Vacuum Breakers

AVBs consist of an air inlet (float check) valve, a check seat, and an air inlet port. They are non-testable BFP devices that provide applicable BFP against contamination (health or high hazard) and pollution (non-health or low hazard) under backsiphonage conditions. Figure 3-2 shows examples of AVBs.

Figure 3-2 Atmospheric Vacuum Breaker Examples

3.2.2.1 Standard

Applicable AVBs meet ASSE Standard No. 1001. The most recent version of this standard was developed in 2021 (https://assewebstore.com/asse-standard-1001-2021-download/).

The USC FCCCHR's *List of Approved Backflow Prevention Assemblies* (2025) includes multiple AVB models from manufacturers such as Ames® Fire & Waterworks (Ames®) and Watts®.

3.2.2.2 Operation

When water flows into an AVB, it causes the air inlet valve to close, allowing water to flow through the BFP device. When the flow of water stops, the air inlet valve drops into the check seat, which also allows the air inlet port to open and allow air into the body of the device to compensate for any vacuum. The air separates the downstream non-FFHC water from the upstream FFHC water.

This BFP device cannot be subjected to continuous pressure. It may only be in use for 12 hours out of any 24-hour period and have no shutoff or control valves downstream.

AVBs should not be installed in pits, underground, or submerged locations. They should also not be used in an area with a hazardous atmosphere because the atmosphere can enter the BFP device through the air inlet port and contaminate/pollute the FFHC water lines.

3.2.2.3 Installation

AVBs are single pipe-applied BFP devices that must be installed in the upright position at least 6 inches above all downstream piping, outlets, and flood level rims of receptors. They are also to be installed downstream of the last control valve. Any other manufacturer-specific installation requirements should be followed.

3.2.2.4 Uses

Per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, AVBs were predominantly used for irrigation and downstream of a control valve. Other uses of this BFP device are for isolation protection inside facilities (e.g., flush valve toilets, dishwashers, janitor deep sinks/mop sinks, spray hoses). See Table 3-2 for additional containment-level applications.

3.2.3 Hose Bibb Vacuum Breakers

HBVBs are a type of AVB commonly found on hose bibbs. They consist of a check valve spring-loaded to the closed position and an air inlet valve loaded to the open position. They are non-testable BFP devices that provide applicable BFP against contamination (health or high hazard) and pollution (non-health or low hazard) under backsiphonage conditions. Figure 3-3 shows examples of HBVBs.

Figure 3-3 Hose Bibb Vacuum Breaker Examples

3.2.3.1 Standards

Applicable HBVBs meet ASSE Standard No. 1011. The most recent version of this standard was developed in 2023 (https://assewebstore.com/asse-ansi-1011-2023-download/).

An alternate classification of HBVBs includes those that contain two independent check valves (ASSE Standard No. 1052). The most recent version of this standard was developed in 2023 (https://webstore.ansi.org/standards/asse-sanitary/asseansi10522023).

3.2.3.2 Operation

When water flows into an HBVB, it causes the check valve to open and air inlet valve to close. When the water flow stops and the BFP device is not under pressure, the air inlet valve opens allowing air to enter.

This BFP device cannot be subjected to continuous pressure. It may only be in use for 12 hours out of any 24-hour period and have no shutoff or control valves downstream.

3.2.3.3 Installation

HBVBs are designed to be attached, without plumbing changes, onto the discharge side of a hose bibb, hydrant, or faucet that has hose threads.

3.2.3.4 Uses

Per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, a few HBVBs were utilized on standalone outdoor hose bibbs that were not downstream of any other BFP device. Use of this BFP device is more commonly for isolation protection (e.g., hose bibbs inside facilities, exterior hose bibbs supplied by internal building plumbing). See Table 3-2 for additional containment-level applications.

3.2.4 Reduced Pressure Zone (or Principle) Assemblies

RPs consist of two independently acting, internally loaded check valves in series (normally closed); an intermediate chamber with a mechanically independent differential pressure relief valve (for venting to the atmosphere) located between the two check valves; two resilient seated shutoff valves at each end of the BFP assembly; and four resilient seated test cocks for field-testing purposes. They are a very reliable means of BFP as they are designed to prevent backflow even if one or both check valves fail. These assemblies provide applicable BFP against contamination (health or high hazard) and pollution (non-health or low hazard) under backpressure and backsiphonage conditions. Figure 3-4 shows examples of RPs.

Figure 3-4 Reduced Pressure Zone (or Principle) Assembly Examples

3.2.4.1 Standards

Applicable RPs meet ASSE Standard No. 1013 and AWWA Standard No. C511. The most recent versions of these standards were developed in 2021 (https://assewebstore.com/asse-standard-1013-2021-download/, https://store.awwa.org/AWWA-C511-17R21-Reduced-Pressure-Principle-Backflow-Prevention-Assembly-PDF).

The USC FCCCHR's *List of Approved Backflow Prevention Assemblies* (2025) includes multiple RP models from manufacturers such as Ames®, Apollo® Valves (Apollo®), A.R.I. USA, Inc. (A.R.I.), Backflow Direct, BEECO®, Cla-Val Company (Cla-Val), FEBCO®, Watts®, and Wilkins.

3.2.4.2 Operation

The differential pressure relief valve, although mechanically independent, is hydraulically dependent upon the difference in pressure across the first (upstream) check valve. The relief valve is designed to discharge water from the intermediate chamber between the two check valves when the differential pressure across the first check valve drops below 2.0 psi. This keeps the pressure downstream of the first check valve at least 2.0 psi less than the pressure upstream of the check valve, ensuring that water will only flow in the proper direction.

This BFP assembly is intended to operate under continuous pressure conditions.

3.2.4.3 Installation

RPs are single pipe-applied BFP assemblies that must be installed horizontally unless otherwise listed by the manufacturer. Vertical and horizontal clearances must also be in accordance with those defined by Section 11-21-5 of the HAR (see Table 4-1 in Subsection 4.4 of this plan) and manufacturer's instruction. Any other manufacturer-specific installation requirements should be followed.

There must be an AG between the bottom of the differential pressure relief valve, whether immediately underneath the valve or at the end of a drain pipe receiving the discharge.

RPs should not be installed in pits, underground, or submerged locations. They should also not be used in an area with a hazardous atmosphere because the atmosphere can enter the BFP assembly through the differential pressure relief valve and contaminate/pollute the FFHC water lines.

Strainers are typically recommended upstream of RPs per manufacturer's instructions to prevent fouling of the BFP assembly by debris that may be stirred up through such activities as water main repairs, breaks, and flushing.

3.2.4.4 Uses

Per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, over 1,800 RPs are in use at the installation. They are primarily installed on domestic service lines for facilities with the potential for contamination (health or high hazard) under backflow conditions. Some notable facilities include car washes, chemical storage, cooling towers, hazardous material/waste storage, laboratories, laundromats, medical/dental clinics, sewage lift stations (no direct connection to sewer), swimming pool pump rooms, treatment plants, wash racks, waterfront areas (e.g., service connections for docked vessels on docks/piers), and workshops. They are also used on some fire protection service connections (typically for systems that utilize chemicals) and irrigation. Other uses of this BFP assembly are for isolation protection inside facilities (e.g., boiler/chiller/heater makeup). See Table 3-2 for additional containment-level applications.

3.2.5 Double Check Valve Assemblies

DCVAs consist of two independently acting, internally loaded check valves in series (normally closed); two resilient seated shutoff valves at each end of the BFP assembly; and four resilient seated test cocks for field-testing purposes. These assemblies provide applicable BFP against pollution (non-health or low hazard) under backpressure and backsiphonage conditions. Figure 3-5 shows examples of DCVAs.

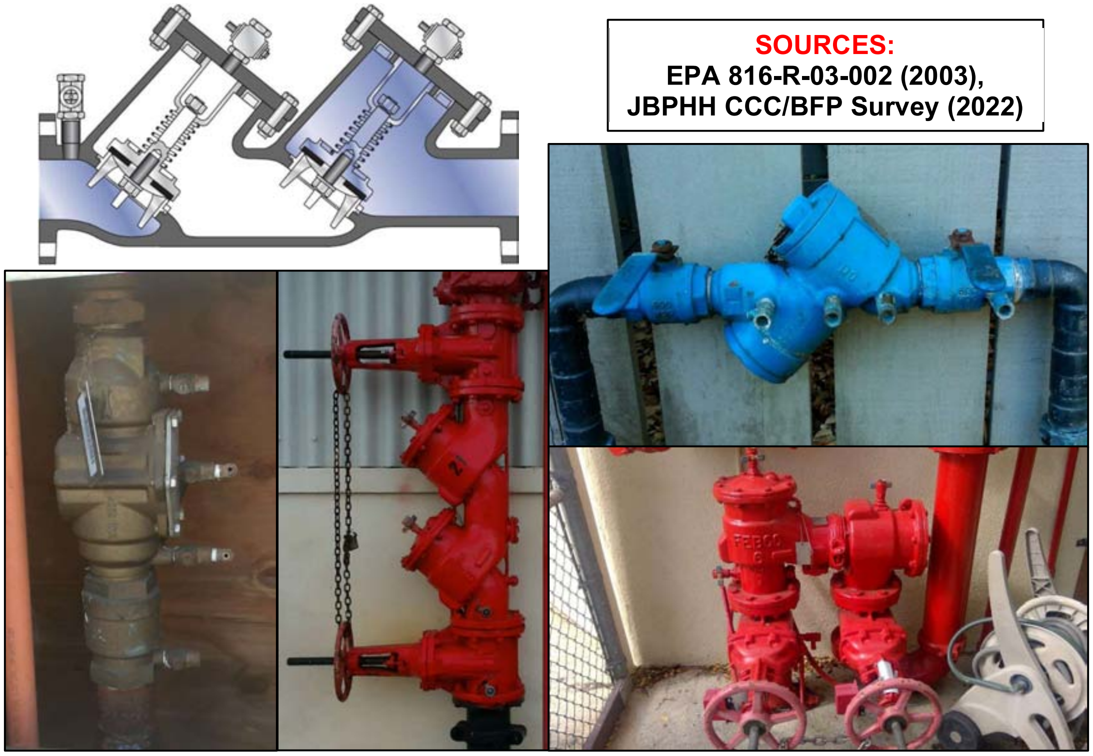

Figure 3-5 Double Check Valve Assembly Examples

3.2.5.1 Standards

Applicable DCVAs meet ASSE Standard No. 1015 and AWWA Standard No. C510. The most recent versions of these standards were developed in 2021 (https://assewebstore.com/asse-standard-1015-2021-download/, https://store.awwa.org/AWWA-C510-17R21-Double-Check-Valve-Backflow-Prevention-Assembly-PDF).

The USC FCCCHR's *List of Approved Backflow Prevention Assemblies* (2025) includes multiple DCVA models from manufacturers such as Ames®, Apollo®, A.R.I., Backflow Direct, BEECO®, Cla-Val, FEBCO®, Watts®, and Wilkins.

3.2.5.2 Operation

Each check valve in a DCVA is biased to the closed position, typically generated in the form of an internal spring loading, and is designed to have a drip-tight seal, typically using a soft sealing surface or elastomer (i.e., rubber) disc to seal against a seat. When the inlet (upstream) pressure increases sufficiently, the water pressure will overcome the force of the spring and open the check valve. This allows water to flow from the inlet through each check valve to the outlet (downstream). When the flow of water ceases, the check valves will close.

If the upstream pressure drops, the check valves close because of the force of the springs. If backpressure occurs, the force of the spring and the backpressure close the check valves. If one of the check valves fails to seal properly (e.g., fouled by debris in the water), the other check valve acts as a backup and should prevent backflow from occurring.

A single check valve is not considered protection against backflow.

This BFP assembly is intended to operate under continuous pressure conditions.

3.2.5.3 Installation

DCVAs are single pipe-applied BFP assemblies that must be installed horizontally unless otherwise listed by the manufacturer. Vertical and horizontal clearances must also be in accordance with those defined by Section 11-21-5 of the HAR (see Table 4-1 in Subsection 4.4 of this plan) and manufacturer's instruction. Any other manufacturer-specific installation requirements should be followed.

Strainers are typically recommended upstream of DCVAs per manufacturer's instruction to prevent fouling of the BFP assembly from debris that may be stirred up through such activities as water main repairs, breaks, and flushing.

3.2.5.4 Uses

Per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, over 570 DCVAs are in use at the installation. They are primarily installed on fire protection service lines (for systems that do not utilize chemicals) and a handful of domestic service lines with the potential for pollution (non-health or low hazard) under backflow conditions (e.g., administration offices, family quarters, park water fountains, youth centers). See Table 3-2 for additional containment-level applications.

3.2.6 Pressure Vacuum Breakers

PVBs consist of an internally spring-loaded check valve (“poppet valve”), a loaded air inlet valve located on the discharge side of the check valve, two resilient seated shutoff valves at each end of the BFP assembly, and two resilient seated test cocks for field-testing and maintenance purposes. These assemblies provide applicable BFP against contamination (health or high hazard) and pollution (non-health or low hazard) under backsiphonage conditions. Figure 3-6 shows examples of PVBs.

SOURCES: EPA 816-R-03-002 (2003), JBPHH CCC/BFP Survey (2022)

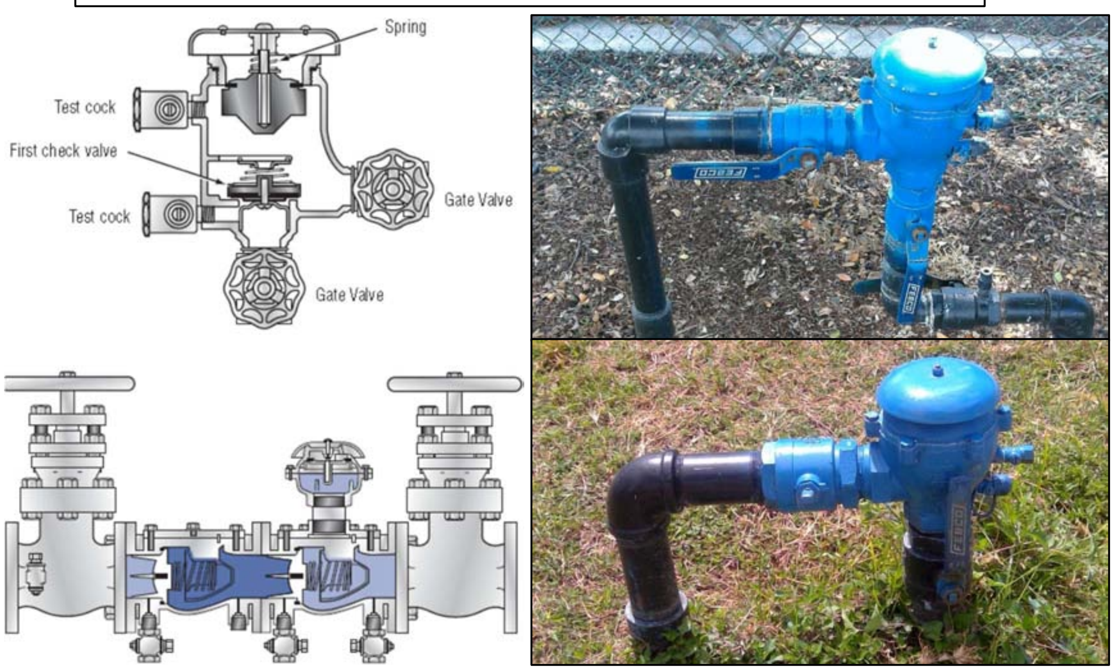

Figure 3-6 Pressure Vacuum Breaker Examples

3.2.6.1 Standard

Applicable PVBs meet ASSE Standard No. 1020. The most recent version of this standard was developed in 2025 (https://assewebstore.com/asse-standard-1020-2020-r2025-download/).

The USC FCCCHR's *List of Approved Backflow Prevention Assemblies* (2025) includes multiple AVB models from manufacturers such as Ames®, Apollo®, A.R.I., FEBCO®, Watts®, and Wilkins.

3.2.6.2 Operation

When a PVB is pressurized, the check valve opens and the air inlet valve closes, allowing water to flow through the BFP assembly. The loaded check valve prevents water from flowing in the reverse direction of flow. When the body pressure is reduced, the air inlet valve opens, allowing air into the body of the assembly to separate the upstream FFHC water from the downstream non-FFHC water.

The air inlet valve is loaded to ensure the inlet will open, even if the BFP assembly has been subjected to continuous pressure.

PVBs should not be installed in pits, underground, or submerged locations. They should also not be used in an area with a hazardous atmosphere because the atmosphere can enter the BFP assembly through the air inlet port and contaminate/pollute the FFHC water lines.

3.2.6.3 Installation

PVBs are single pipe-applied BFP assemblies that must be installed in the upright position at least 12 inches above all downstream piping, outlets, and flood level rims of receptors. Any other manufacturer-specific installation requirements should be followed.

3.2.6.4 Uses

Per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, over 220 PVBs are in use at the installation. They are primarily installed for irrigation. Other sparing uses of this BFP assembly are domestic service lines and swimming pool pump rooms. See Table 3-2 for additional containment-level applications.

3.2.7 Double Check Valve Detector Assemblies

DCDAs are similar to DCVAs. They include a mainline DCVA and a bypass arrangement, which attaches to the mainline BFP assembly upstream of the first (upstream) check valve and downstream of the second (downstream) check valve. The bypass arrangement includes a specific DCVA along with a specific water meter and DCVA. An alternative bypass arrangement, attached to the mainline downstream of the first (upstream) check valve and downstream of the second (downstream) check valve, contains a single check valve and water meter. These assemblies provide applicable BFP against pollution (non-health or low hazard) under backpressure and backsiphonage conditions. Figure 3-7 shows examples of DCDAs.

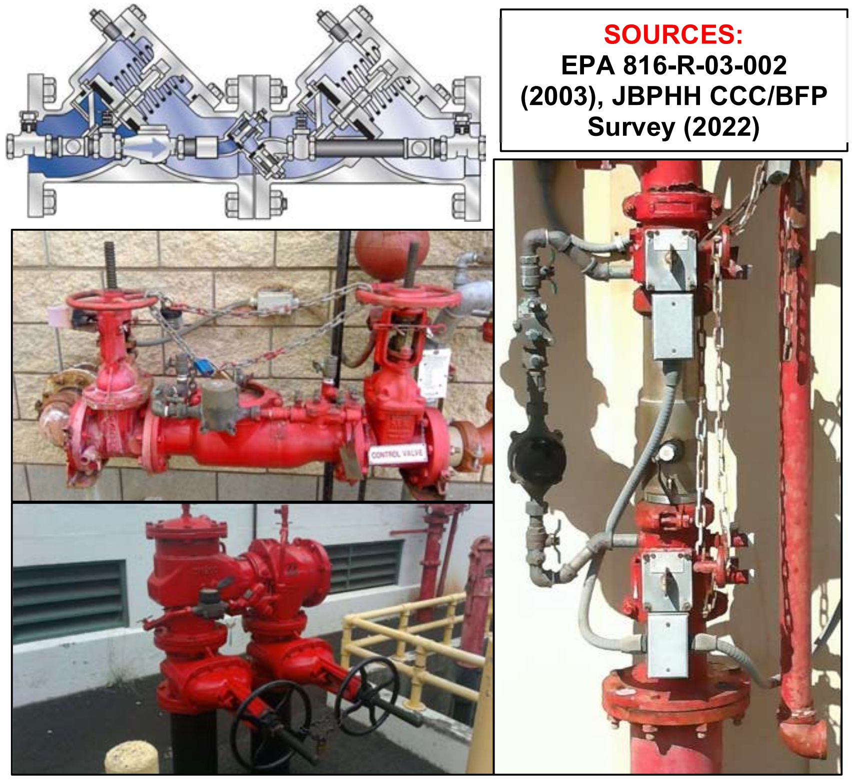

Figure 3-7 Double Check Valve Detector Assembly Examples

3.2.7.1 Standard

Applicable DCDAs meet ASSE Standard No. 1048. The most recent version of this standard was developed in 2021 (https://assewebstore.com/asse-standard-1048-2021e1-download/).

The USC FCCCHR's *List of Approved Backflow Prevention Assemblies* (2025) includes multiple DCVA models from manufacturers such as Ames®, Apollo®, Backflow Direct, FEBCO®, Watts®, and Wilkins.

3.2.7.2 Operation

DCDAs are designed to require all flows of (b) (3) or less to flow exclusively through the bypass arrangement and register accurately on the water meter. At greater flows, water will flow through the mainline assembly as well as the bypass arrangement. The meter on the bypass arrangement will continue to register; however, registration will not be accurate, as most of the flow will be through the mainline, which is not metered.

The DCVA and check valve components of the DCDA operate in the same manner as previously discussed in Subsection 3.2.5.2 of this plan.

This BFP assembly is intended to operate under continuous pressure conditions.

3.2.7.3 Installation

DCDAs are single pipe-applied BFP assemblies that must be installed horizontally unless otherwise listed by the manufacturer. Vertical and horizontal clearances must also be in accordance with those defined by Section 11-21-5 of the HAR (see Table 4-1 in Subsection 4.4 of this plan) and manufacturer's instruction. Any other manufacturer-specific installation requirements should be followed.

Strainers are typically recommended upstream of DCDAs per manufacturer's instruction to prevent fouling of the BFP assembly by debris that may be stirred up through such activities as water main repairs, breaks, and flushing.

3.2.7.4 Uses

DCDAs are generally used on water lines that are usually static but need the ability to detect water use (e.g., unmetered fire protection systems). These BFP assemblies provide a means to detect any unauthorized use of water or leaks in the system.

Per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, 24 DCDAs are in use at the installation. They are all installed on fire protection service lines (for systems that do not utilize chemicals). See Table 3-2 for additional containment-level applications.

3.2.8 Spill-Resistant Pressure Vacuum Breakers

SVBs consist of an internally spring-loaded check valve ("poppet valve"), a loaded air inlet valve located on the discharge side of the check valve, two resilient seated shutoff valves at each end of the BFP assembly, and one resilient seated test cock and one bleed/vent port for field-testing and maintenance purposes. These assemblies provide applicable BFP against contamination (health or high hazard) and pollution (non-health or low hazard) under backsiphonage conditions.

These BFP assemblies are essentially the same as PVBs in application except they are designed to minimize water from the air inlet port. This is preferable for situations where water discharges to the surrounding area is not preferred.

3.2.8.1 Standard

Applicable SVBs meet ASSE Standard No. 1056. The most recent version of this standard was developed in 2021 (https://assewebstore.com/asse-standard-1056-2013-r2021-download/).

The USC FCCCHR's *List of Approved Backflow Prevention Assemblies* (2025) includes multiple AVB models from manufacturers such as Watts® and Wilkins.

3.2.8.2 Operation

When an SVB is pressurized, the air inlet valve closes before the check valve opens, preventing water from discharging through the air inlet valve. The loaded check valve prevents water from flowing in the reverse direction of flow while the air inlet valve remains closed..

SVBs should not be installed in pits, underground, or submerged locations. They should also not be used in an area with a hazardous atmosphere because the atmosphere can enter the BFP assembly through the air inlet port and contaminate/pollute the FFHC water lines.

3.2.8.3 Installation

SVBs are single pipe-applied BFP assemblies that must be installed in the upright position at least 12 inches above all downstream piping, outlets, and flood level rims of receptors. Any other manufacturer-specific installation requirements should be followed.

3.2.8.4 Uses

SVBs are not distinguished from the over 220 PVBs in use at the installation, per Appendix B of the 2022 JBPHH (containment-level) CCC/BFP survey report, due to the fact that the devices are similar in nature. They are primarily installed for irrigation and other areas where discharges to the surrounding area is not preferred. See Table 3-2 for additional containment-level applications.

4. SURVEYS, TESTING, AND REPAIRS

The following section summarizes requirements and procedures for conducting CCC/BFP field surveys, BFP assembly testing, and assembly and BFP device repairs at JBPHH.

4.1 INSTALLATION SURVEYS

Process Step 24.10.4 of NAVFAC HQ's BPMS B-24.10 (2022) requires the JBPHH PWD to conduct an initial baseline CCC/BFP survey of the installation PWS. This survey involves identifying locations of possible or actual cross-connections and existing BFP assemblies and devices (including type, size, manufacturer, model no., and serial no.). For every finding, the degree of hazard and potential or actual backflow conditions must be determined. For each cross-connection, it must be determined whether the connection can be removed or which type of BFP assembly or device is applicable for adequate protection. For each existing assembly or device, it must be determined if the mechanism is applicable for the identified hazard and backflow conditions. If the assembly or device is inadequate, a proper solution must be selected, including replacement, relocation, or removal. If the potential/actual cross-connection for an existing assembly or device has been eliminated, the mechanism can be designated for removal.

In 2022, NAVFAC PAC contracted AH/BC to conduct a containment-level baseline CCC/BFP survey of the JBPHH system, performed under Contract No. N62470-19-D-4001, Task Order No. N6274222F0110. The survey reviewed all service line connections to facilities, sites, equipment, and non-FFHC systems (e.g., irrigation) and identified over 3,300 existing BFP assemblies and devices, over 1,100 proposed assemblies and devices (for unprotected or under-protected cross-connections), and over 300 additional findings (e.g., mechanism relocation, improper tagging, repairs, missing components).[8] The data from this survey was formatted for integration into an existing database of system components, maintained via International Business Machines Corporation (IBM®) Maximo® Application Suite (Maximo®) software (see Subsection 5.1 of this plan for additional information on recordkeeping).

In the absence of stricter federal, state, and local requirements, subsequent installation-wide CCC/BFP surveys are required at least every 5 years per Subparagraph 21-3.10b(1) of OPNAV M-5090.1 (2021) and Process Step 24.10.4 of NAVFAC HQ's BPMS B-24.10 (2022). Under the JBPHH program, these surveys will be conducted at containment-level and utilize, at a minimum, the latest BFP assembly and device information maintained via the IBM® Maximo® database. The data from these surveys will also be formatted for integration into the database, updating entries for existing assemblies and devices and creating entries for new mechanisms.

These reoccurring CCC/BFP surveys will be performed under the direction of the CCC/BFP Program Manager, whether by in-house PWD personnel or contractors. Per Chapter 5 of AWWA M14 (5th Edition, 2024), surveys should be performed by personnel trained in CCC with a thorough understanding of the adopted plumbing code(s) and impact of installing BFP assemblies and devices and other equipment on plumbing systems. Acceptable training courses include, but are not limited to, the USC FCCCHR's CCC Program Specialist training course (https://fccchr.usc.edu/specialist.html) and the University of Florida Training, Research and Education for Environmental Occupations' CCC Program Manager Certification Series (https://reg.pwd.aa.ufl.edu/public/category/programStream.do?method=load&selectedProgramAreaId=1015917&selectedProgramStreamId=1081255).

Some isolation-level BFP assemblies (e.g., RPs for boiler/chiller/heater makeup) are already documented in the current IBM® Maximo® database. Reviewing and updating information on these assemblies will continue to under this CCC/BFP program.

[8] AH/BC Navy JV, LLC. *Cross-Connection Control and Backflow Prevention Survey*. Joint Base Pearl-Harbor-Hickam, Hawaii. October 2022.

The following are standard operating procedures (SOPs) for scheduling, performing, and documenting containment-level survey activities for the JBPHH PWS (largely based on Chapter 5 of the USC FCCCHR manual [10th Edition, 2009]):

- **Scheduling**
    1. The CCC/BFP Program Manager will identify the facilities, sites, and/or areas to be included in the survey.
    2. The CCC/BFP Program Manager will determine if survey activities are to be conducted by in-house Navy personnel or a contractor.
    3. The CCC/BFP Program Manager will provide survey personnel with the following documentation in its most up-to-date format, at a minimum:
        a. Mapping of the water distribution system
        b. Building layout maps, including plumbing, for facilities requiring entry
        c. BFP assembly and device information from the IBM® Maximo® database
    4. Upon review of the materials provided and follow-up discussions with the CCC/BFP Program Manager, survey personnel will provide a proposed survey schedule.
        a. Developing a schedule for large-scale surveys (e.g., installation-wide, multiple facilities) must be flexible due to varying access restrictions and tenant commands, distribution/plumbing system complexities, and unforeseen circumstances. Schedules for these types of surveys should remain broad (i.e., provide a range of dates for groups of facilities). Survey personnel will provide regular updates as necessary to the CCC/BFP Program Manager, along with any notable schedule changes.
    5. The CCC/BFP Program Manager will notify facility/building managers of the planned survey activities before the scheduled survey dates. Refer to Subsection 5.2.1 of this plan for additional notification details.
- **Survey**
  Equipment: Notepad/clipboard and/or tablet/laptop computer (verify computer restrictions with CCC/BFP Program Manager), personal protective equipment (PPE) (e.g., hard hat, safety glasses, ear protection), flashlight, laser pointer, camera (verify photo restrictions with CCC/BFP Program Manager)
    1. Using provided mapping and visual observation, the surveyor will identify all service connections to the facilities, buildings, and systems sourced from the JBPHH PWS.
    2. For service lines located outside with no access restrictions, the surveyor will conduct a visual survey of the service line and BFP assembly or device, if present. If the exterior line and/or assembly or device is secured (e.g., behind locked fence line, in a padlocked cover

box), the surveyor is to request access from the building/facility manager or designated facility personnel. This information should be previously communicated and coordinated as part of the initial facility/building manager notification under Scheduling Step No. 5.

3. For service lines that are buried or don't have an observed exterior BFP assembly or device, the surveyor will access the facility/building interior and obtain access to where the service line first enters the building (typically a mechanical room), utilizing assistance from the building/facility manager or designated facility personnel. Any access/security restrictions related to facility entry should be previously communicated and coordinated as part of the initial facility/building manager notification under Scheduling Step No. 5. The surveyor will conduct a visual survey of the service line and BFP assembly or device, if present.
4. If a BFP assembly or device is not present on a service line (i.e., a cross-connection), the surveyor will determine the water use for that connection and identify proper classification using the guidance provided in Subsection 3.1 of this plan.
    a. If water use for a service connection is unclear, the surveyor will interview the building/facility manager or designated facility personnel to make this determination.
    b. If the facility/equipment type is not included in Table 3-2 of this CCC/BFP Program Plan, the surveyor will provide an explanation for hazard classification and BFP assembly or device type selection. The CCC/BFP Program Manager will review and either accept this decision or provide an alternate recommendation (with explanation).
5. If a BFP assembly or device is present but requires repairs, follow-up activities will follow those provided in Subsection 4.3 of this plan.

- **<u>Recordkeeping</u>**
    1. Using the CCC/BFP survey form included in Appendix B of this plan, the surveyor will record the following information, at a minimum, for each surveyed service line and BFP assembly or device, if present:
        a. JBPHH asset no.
        b. Facility no., name, and address
        c. Service line (and BFP assembly or device) location (e.g., inside/room, outside, nearby features)
        d. Service type (e.g., domestic, fire protection, irrigation)
        e. Degree of hazard (i.e., contamination/health/high or pollution/non-health/low)
        f. Service line material
        g. Asset tag condition
        h. Existing BFP assembly or device type, size (i.e., pipe diameter), manufacturer, model no., and serial no. (if present)

    i. Proposed BFP assembly or device type (if unprotected/under-protected cross-connection)
2. A copy of each survey form will be provided to the CCC/BFP Program Manager by the surveyor.
3. The CCC/BFP Program Manager, or designated PWD personnel, will input information from the survey into the IBM® Maximo® database (additional details in Subsection 5.1 of this plan).
    a. New service lines and/or BFP assemblies or devices will be new entries in the IBM® Maximo® database.
    b. BFP assemblies and devices with existing entries in the IBM® Maximo® database will have those entries updated, as necessary.
    c. If a BFP assembly or device is discovered to be replaced, the existing assembly or device entry in the IBM® Maximo® database will be updated to note its removal and a new entry will be entered for the new mechanism.

Findings identified during CCC/BFP surveys that require installation, modification, repair, or removal of a BFP assembly or device will be addressed by in-house PWD personnel or contractors under the direction of the CCC/BFP Program Manager. Each activity will be documented and tracked as work orders in IBM® Maximo® and include a description of the task(s) to be performed, an estimated completion date, the actual completion date, and personnel that performed the work.

4.2 ASSEMBLY TESTING, DEVICE REPLACEMENT, AND AIR GAP INSPECTIONS

Section 11-21-8(b) of the HAR requires periodic testing and inspection of BFP assemblies by certified testers at intervals not to exceed 1 year.[9] Testing of BFP assemblies is also required following installation, repair, or replacement per Section 603.2 of the UPC (2023) and Article 5-9.3g(3)(c)4c of NAVMED P-5010-5 (2019).

Testable BFP assemblies under the JBPHH CCC/BFP program include RPs, DCVAs, PVBs, DCDAs, and SVBs. Containment-level non-testable BFP devices under this program (i.e., AVBs and HBVBs) will be replaced within every 5 to 10 years.[10]

[9] Deviation from Process Step 24.10.4 of NAVFAC HQ's BPMS B-24.10 (2022), which states that BFP assemblies used for contamination (health or high hazard) protection will be tested every 6 months, at a minimum

[10] Deviation from Process Step 24.10.4 of NAVFAC HQ's BPMS B-24.10 (2022), which states that non-testable BFP devices will be replaced every 5 years, at a minimum

Replacement can consist of the entire device or the internal components while retaining the device body (e.g., replacing the air inlet valve, check seat, and air inlet port of an AVB). Inspections of containment-level AGs will be conducted annually.

Testing will be performed under the direction of the CCC/BFP Program Manager by in-house PWD personnel or contractors. Training and other requirements specific to certified testers of BFP assemblies on the JBPHH PWS are detailed in NAVFACHIINST 11330.1A.

All testable BFP assemblies identified and monitored in the IBM® Maximo® database will be tested and certified under the installation program, regardless of containment-level or isolation-level classification.

Procedures specific to preparing for and performing BFP assembly testing for the JBPHH PWS are included in the SOP provided as Appendix C of this plan (largely based on Chapter 9 of the USC FCCCHR manual [10th Edition, 2009]).

4.3 ASSEMBLY AND DEVICE REPAIRS

Defective BFP assemblies and devices are to be promptly repaired or replaced per Subparagraph 21-3.10b(5) of OPNAV M-5090.1 (2021) and Article 5-9.3g(3)(c)4b of NAVMED P-5010-5 (2019). For the JBPHH CCC/BFP program, a purchase request for repair/replacement must be submitted within 7 days of identifying the defect.

If a BFP assembly or device requires replacement, a new assembly or device should be selected from the USC FCCCHR's *List of Approved Backflow Prevention Assemblies* (2025). If an assembly or device not included on the USC FCCCHR list is selected, the CCC/BFP Program Manager must review and approve the selection in writing.

Repairs will be performed under the direction of the CCC/BFP Program Manager by in-house PWD personnel or contractors that are also certified testers (see NAVFACHIINST 11330.1A for tester requirements).

Section 11-21-8(a) of the HAR does not permit piping or other arrangements for the purpose of bypassing a BFP assembly or device. This includes during repair/maintenance activities.

The following are SOPs for scheduling, performing, and documenting BFP assembly and device repair activities for the JBPHH PWS (largely based on Chapter 5 of the USC FCCCHR manual [10th Edition, 2009]):

- **Scheduling**
  1. The CCC/BFP Program Manager will determine if repair activities are to be conducted by in-house Navy personnel or a contractor.
  2. If necessary, the CCC/BFP Program Manager will provide repair personnel with a summary of the BFP assembly or device requiring repair (i.e., IBM® Maximo® database entry), survey and/or testing forms that detail the issue, and any other pertinent details.
  3. Upon review of the materials provided and follow-up discussions with the CCC/BFP Program Manager, repair personnel will provide a proposed repair duration.
  4. The CCC/BFP Program Manager will notify facility/building managers of the planned repair activities before the scheduled repair dates. Refer to Subsection 5.2.2 of this plan for additional notification details.
- **Repair**
  Equipment: BFP assembly or device repair kit(s), PPE (e.g., hard hat, safety glasses, ear protection), flashlight
  1. Using provided documentation, repair personnel will locate the BFP assembly or device. If the assembly or device is inside a secured area or structure (e.g., behind locked fence line, in a padlocked cover box, inside), repair personnel will request access from the building/facility manager or designated facility personnel. This information should be previously communicated and coordinated as part of the initial facility/building manager notification under Scheduling Step No. 4.
  2. Repair personnel will verify that BFP assembly or device details (e.g., asset no., assembly or device type, size, manufacturer, model no., serial no.) match available records.
  3. Repair personnel will observe the area around the BFP assembly or device for any signs of unsafe conditions.
     a. If conditions are deemed unsafe to conduct field repairs and/or require additional PPE, repair personnel will inform the CCC/BFP Program Manager, who will assist them in developing a solution.
  4. Repair personnel will observe the BFP assembly or device and verify that the documented issue requiring repair is accurate.

5. Repair personnel will repair the BFP assembly or device according to manufacturer instructions.
6. For BFP assemblies, test the assembly before returning to service. If the assembly fails, it will continue to be repaired and retested until it passes. The assembly will not be returned to service without a passing test report.

- **Recordkeeping**
  1. Repair personnel will document the following information, at a minimum:
     a. BFP assembly or device information (e.g., JBPHH asset no., assembly or device type, size, manufacturer, model no., serial no.)
     b. Facility no., name, and address
     c. Description of repair activities
     d. Date(s) of repair activities
  2. The repair information from Step No. 1 will be provided to the CCC/BFP Program Manager by repair personnel.
  3. The CCC/BFP Program Manager, or designated PWD personnel, will input information the repair information from Step No. 1 into the existing BFP assembly or device entry in the IBM® Maximo® database (additional details in Subsection 5.1 of this plan).

4.4 NEW CONSTRUCTION

Any new construction must be provided with proper BFP per Article 5-9.3g(3)(c)4d of NAVMED P-5010-5 (2019). Process Step 24.10.3 of NAVFAC HQ's BPMS B-24.10 (2022) requires new facilities and systems to be designed to eliminate or minimize potential cross-connections. An effective technique for accomplishing this is to have CCC/BFP program personnel provide technical review of all plans and specifications associated with construction of new facilities and/or repair/modification of existing facilities to ensure that appropriate BFP is incorporated during the design phase.

Under this CCC/BFP program, all new facilities and repairs/modifications that impact service connections to the JBPHH PWS and/or internal plumbing must be reviewed for containment- and isolation-level BFP and approved by the CCC/BFP Program Manager in writing during the design phase. BFP design must be in accordance with CCC/BFP program and state plumbing code (IAPMO UPC) requirements.

Per Section 11-21-5 of the HAR, BFP assembly and devices are to be installed on the consumer side of the property line (only applies to non-Navy facilities and sites, including private housing) and as close to the water meter as possible, if present. Assemblies and devices cannot be installed underground or in vaults without written approval by the Director of the DOH. Table 4-1 lists clearance requirements for RPs, DCVAs, and DCDAs as defined in the same section (see Subsections 3.2.2.3, 3.2.6.3, and 3.2.8.3 of this plan for AVB, PVB, and SVB clearance requirements, respectively). All other installation requirements are to follow those previously discussed in Subsection 3.2 of this plan and manufacturer's instructions.

Table 4-1 Clearance Requirements for Backflow Prevention Assemblies

BFP Assembly Sizes	Vertical Clearance[1]		Minimum Horizontal Clearance[1]
	Minimum	Maximum	
0.75 to 1.5 inches	18 inches	48 inches	24 inches
2 to 3 inches	24 inches		
4 to 6 inches	30 inches		
8 to 10 inches	36 inches		

[1] Clearances apply to RPs, DCVAs, and DCDAs.

BFP assemblies (e.g., RPs, DCVAs, PVBs, DCDAs, SVBs) must be successfully tested (see Subsection 4.2 of this plan) before water service is turned on.

4.5 TEMPORARY SERVICE

Process Step 24.10.3 of NAVFAC HQ's BPMS B-24.10 (2022) requires that this CCC/BFP program ensure that temporary service connections for construction activities include appropriate BFP.

These connections are typically applied to fire hydrants. Under these circumstances, Chapter 6 of AWWA M14 (5th Edition, 2024) recommends the installation of a hydrant meter (for measuring usage) and BFP via an RP or AG.

Whenever a temporary service connection is to be established, the party responsible, whether in-house or contractor, must contact the CCC/BFP Program Manager and provide documentation for review that details the BFP assembly or device and other relative appurtenances/information prior to installation of the connection. Any alterations to the connection, whether prior to or after initial installation, must also be reviewed by the CCC/BFP Program Manager. In addition, contractors must also follow the NAVFAC HI technical requirements provided in Appendix D of this plan.

Once the CCC/BFP Program Manager approves the setup in writing, the temporary connection (or alteration) may be installed. Prior to operation of the temporary service connection, the CCC/BFP Program Manager, or a designated representative, will conduct an onsite inspection to ensure correct installation, which will be approved in writing. The installed BFP assembly or device will then be incorporated into the JBPHH CCC/BFP program, particularly the survey, testing, and repair aspects previously detailed in Subsections 4.1 to 4.3 of this plan, until the service is terminated (see Appendix D of this plan).

4.6 INCIDENT RESPONSE

Even with a comprehensive CCC/BFP program, backflow incidents may still occur. The following are response/contingency actions to be utilized in the event of such an incident. These actions are largely based on elements detailed in Chapter 4 of the USC FCCCHR manual (10th Edition, 2009).

1. **Identification** – A customer water quality complaint may be the first indication of a backflow incident. If the cause of a complaint is determined to be a backflow incident upon investigation by JBPHH PWD, the following steps will be taken.
2. **Isolation** – The source of the backflow incident will be isolated as soon as it is discovered. For containment-level protection, this may involve isolating a single or multiple facilities/buildings. Multiple water samples from upstream and downstream service connections may be necessary to verify that complete isolation has occurred.
3. **Source and Extent** – An investigation will be conducted to determine the cross-connection source and the extent of contamination/pollution. A visual survey/investigation will be performed by either in-house PWD personnel or contractors. Multiple water samples from within the isolated system may be necessary to identify the contaminant/pollutant.
4. **Notification** – All impacted customers will be notified immediately of the incident and informed not to use the water system until further notice. In addition, the NAVFAC HI Environmental office will be notified as soon as possible, but no later than 24 hours, following a backflow determination and kept informed on contamination/pollution details and remedial actions. NAVFAC HI Environmental, with input from the CCC/BFP Program Manager,

will determine if a courtesy notification to the DOH is warranted and, if so, contact the state department.

5. **Decontamination** – The affected area must be decontaminated, starting with adequate flushing. At a minimum, these activities shall be applied to all system lines and appurtenances upstream of a containment-level BFP; however, impacted facilities or buildings may coordinate with JBPHH to ensure decontamination of their internal plumbing systems.
6. **BFP** – The cross-connection source that caused the incident must either be removed or have proper BFP applied. BFP assembly or device selection will follow the same classifications as assembly and device selection in this program (e.g., type based on degree of hazard and hydraulic conditions).
7. **Documentation** – Detailed and defensible recordkeeping of all response activities and communication is important to help prevent and assist in responses to similar incidents in the future. Section 8.18 of the USC FCCCHR manual (10th Edition, 2009) and Appendix F of the CalEPA's handbook (2023) provide sample incident report forms. A modified version of the CalEPA template is included as Appendix E of this plan.

The CCC/BFP Program Manager is ultimately responsible for implementing the above incident response activities.

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5. RECORDKEEPING AND COMMUNICATION

The following section summarizes requirements and procedures for recordkeeping, public notification, and public education and awareness under the JBPHH CCC/BFP program.

5.1 RECORDKEEPING

Good recordkeeping is essential to proper operation and management of a CCC/BFP program. This practice also assists in applying risk assessment and responding to audits by regulatory agencies (e.g., DOH, EPA, NAVFAC HI). Chapter 4 of the USC FCCCHR manual (10th Edition, 2009) notes that records must be detailed and defensible, supporting all actions of the program and sufficiently demonstrating that the program is meeting all necessary requirements.

CCC/BFP records are to be maintained for a period of at least 5 years per Subparagraph 21-3.16h of OPNAV M-5090.1 (2021), Article 5-29.4h of NAVMED P-5010-5 (2019), and Process Step 24.10.5 of NAVFAC HQ's BPMS B-24.10 (2022).

Records are to include, but are not limited to, the following:

- A complete inventory of all BFP assemblies and devices, including
  - Locations
  - Conditions
  - Equipment classifications (i.e., facilities and/or utilities)
  - Hazard classifications (i.e., contamination/health/high or pollution/non-health/low)
  - Hydraulic conditions (i.e., backpressure and/or backsiphonage)
  - Types (e.g., AG, RP, DCVA, PVB, DCDA, SVB)
  - Sizes
  - Manufacturers
  - Model nos.
  - Serial nos.
  - Asset nos.

  - Installation dates
- CCC/BFP survey reports
- BFP assembly inspection, testing, certification reports
  - Testing reports to include tester name, test date, and test data (e.g., check valve conditions, differential pressure readings)
- BFP assembly and device repair and replacement reports
- Field test kit condition and calibration reports
- Certified tester training certifications

Original CCC/BFP survey reports, field test kit reports, BFP assembly test reports, and training certifications are to be maintained by the CCC/BFP Program Manager as hard copies and filed by asset no. The inventory of all BFP assemblies and devices will be maintained via IBM® Maximo® and reviewed annually by the CCC/BFP Program Manager to ensure that all assembly testing and device replacements have been conducted in accordance with the JBPHH CCC/BFP program. Individual tests and repairs will be documented via Maximo® as work orders, referencing the associated BFP assembly or device via asset no. and indicating whether tests are pass or fail. All documentation will be readily available to present to regulatory agencies, upon request.

All BFP assemblies and devices are to have asset and inspection tags per Article 5-9.3g(3)(c)3 of NAVMED P-5010-5 (2019) and Process Step 24.10.4 of NAVFAC HQ's BPMS B-24.10 (2022). Asset tags will include the assembly or device size, manufacturer, model no., serial no., and asset no. Inspection tags will include the date of most recent testing, pass/fail status, and certification no. of the certified tester.

All recordkeeping will be managed under the direction of the CCC/BFP Program Manager by in-house PWD personnel. Any records developed by contractors must be promptly provided to the CCC/BFP Program Manager.

5.2 PUBLIC NOTIFICATION

Public and customer notifications are critical to the development of an effective system-wide CCC/BFP program. There are several program-related activities that involve notifications: surveys, testing/repairs, and backflow incidents. Appendix F of this plan provides template notification letters for communication described in the following subsections.

5.2.1 Surveys

For installation-wide and facility-specific survey activities, it will be necessary to notify managers of facilities and buildings included in the survey of planned activities. The majority of containment-level BFP assemblies and devices at JBPHH are located along the exteriors of the facilities that they serve with no access restrictions. Others may be located within secured fence lines, locked structures (e.g., cages, cabinets), or inside buildings (e.g., mechanical rooms).

Facility/building managers will be notified of planned survey activities. Communication shall include a description of planned activities, the areas and BFP assemblies and devices to be inspected, the expected date(s) and duration of survey activities, and other pertinent information. The managers will assist in providing information on access requirements and coordinate with onsite facility/building personnel, including escort as necessary.

It will be clearly communicated that survey activities do not impact or interrupt water supply to the facility or building, as they are solely visual inspections. Any findings from the survey effort that require BFP assembly or device repair/replacement or other maintenance work will be communicated with the facility/building manager as detailed below.

Survey communication with facility/building managers will be initiated by the CCC/BFP Program Manager, who will then designate follow-up communication personnel (whether in-house or contractors), as required.

5.2.2 Testing and Repairs

For testing and repairs (including replacement) of BFP assemblies or devices, especially containment-level assemblies and devices on service lines, it will be critical to notify managers of facilities and buildings impacted prior to planned activities. Both activities involve a temporary outage or interruption of service through the service line or plumbing containing the assembly or device. Depending on the level of expected water service impact, managers may need to make special arrangements to limit hardship on system users. This may involve temporarily closing the building/facility, notifying occupants of "no water use" periods, or limiting onsite activities.

Facility/building managers will be initially notified of planned testing/repair activities via email with a follow-up phone call, as required. Communication shall include a description of planned activities, the BFP assemblies and devices to be tested and/or repaired, expected service impacts, the expected date(s) and duration of survey activities, and other pertinent information. The managers will assist in providing information on access requirements and coordinate with onsite facility/building personnel, including escort as necessary.

Once testing/repair activities are completed, the facility/building manager will be notified, including confirmation that regular activities impacted by water use can resume. This can be conducted via email, phone call, or in-person prior to leaving the facility/building.

Testing/repair communication with facility/building managers will be initiated by the CCC/BFP Program Manager, who will then designate follow-up communication personnel (whether in-house or contractors), as required.

5.2.3 Incident Response

Response activities to an active backflow incident are detailed in Subsection 4.6 of this plan.

Managers of facilities and buildings impacted by the incident will be immediately notified of the incident via phone call or in person and informed to discontinue water use until further notice.

Once response activities are completed, the facility/building manager will be notified, including confirmation that regular activities impacted by water use can resume.

5.2.4 Violations

Whenever a customer for the JBPHH PWS is found to be in violation of containment-level CCC/BFP, they shall be notified via written and/or email communication. The communication, to be signed by the JBPHH Public Works Officer (PWO), will provide details on the identified cross-connection, required/recommended corrective actions, and an explicit compliance period (length dependent on degree of hazard, complexity, and cost).

The CCC/BFP Program Manager will be responsible for enforcing and tracking the violation. As the affected customer provides details on corrective action progress, the Program Manager will document these activities in the same manner as BFP assembly and device repairs.

Once all corrective actions, including any necessary BFP assembly testing, have been applied and communicated by the customer, the CCC/BFP Program Manager will make the final determination on whether the violation has been resolved. A follow-up letter, signed by the PWO, documenting this resolution will be provided to the customer via written and/or email communication.

If corrective actions are not applied within the compliance period, termination of water service may be necessary. This decision will be recommended by the CCC/BFP Program Manager and approved by the PWO. Follow-up written or email communication documenting this decision will be provided to the customer, along with a request for the customer to verify receipt of the communication. If there is no response by the customer within 30 days after delivery of the communication, a second attempt at communication will be made. If there is no response by the customer within 30 days after the second attempt at communication, a mandatory meeting with the PWO and Installation Commanding Officer will be requested.

5.3 PUBLIC AWARENESS

Education and public awareness of CCC/BFP is a critical component of an effective program. Chapter 4 of the USC FCCCHR manual (10th Edition, 2009) provides a foundation for the importance of these activities.

JBPHH CCC/BFP program personnel will be provided with specific training as required by state and federal regulations (detailed in personnel roles/responsibilities in NAVFACHIINST 11330.1A). In addition, a general education on the concepts of CCC/BFP will assist installation personnel with more readily identifying a cross-connection and signs of a backflow incident.

Awareness education also contributes as an important public relations tool. This will assist in informing customers of their need to protect the FFHC water supply to their home/facility and their role in doing so.

The following public awareness activities will be implemented at JBPHH, at a minimum:

1. Distribute flyers and posters to customers detailing the importance of CCC/BFP. Also, display these documents in publicly accessible locations and within installation newspapers and other publications.
2. Include excerpts on CCC/BFP in the annual consumer confidence reports required under Section 11-20-48.5 of the HAR.

Appendix G of this plan includes public education documentation, including a sample presentation and flyers, that can assist CCC/BFP program personnel with community outreach described above.

Appendix A

Naval Facilities Engineering Systems Command Headquarters Business Process Management System B-24.10, *Cross-Connection Control and Backflow Prevention*

(19 April 2022)

B-24.10 Cross-Connection Control and Backflow Prevention

Process Owner Team, Lead: [redacted] (NAVFAC HQ)

Process Step	Associated Procedure	Resources
24.10.1 **Establish CCC/BFP Program**	Public Works Departments (PWDs), in coordination with Facility Engineering Command (FEC) Facilities Management & Sustainment (FM&S) and Utilities and Energy Management (UEM) Product Line Directors (PLDs), shall: • Develop and implement a site-specific instruction or policy establishing a Cross-Connection Control/Backflow Prevention (CCC/BFP) Program, which incorporates this Business Process Management System (BPMS) process and all applicable requirements including all local, state, or Final Governing Standards requirements. • Cross-connection control programs apply to building interior domestic plumbing systems, fire protection plumbing systems, and exterior water distribution systems.	OPNAV M-5090.1 Environmental Readiness Program Manual NAVMED P-5010-5
24.10.2 **Identify and Delegate Authority**	FEC Regional Commanders (REGCOMs) or Region N4 shall: • Designate, in writing, a CCC/BFP Regional Program Manager (RPM) at the FEC level to lead and manage the FEC-wide program. Traditionally, the RPM is from the UEM or FM&S Product Lines; however, the RPM may come from any business line which the REGCOM or N4 deem appropriate. Installation Commanding Officers or Public Works Officers (PWOs) shall: • Designate, in writing, a CCC/BFP Site Program Manager who will implement, administer, and maintain the site-specific program. • This CCC/BFP Site Program Manager will normally be in the PWD Production Division (PD) or Facilities Management Division (FMD). This Site Program Manager will be responsible for all aspects of the PWD CCC/BFP Program,	OPNAV M-5090.1 Environmental Readiness Program Manual NAVMED P-5010-5

Process Step	Associated Procedure	Resources
	whether in buildings or in utility distribution systems. • Assign, align, and describe the roles and responsibilities for administering the CCC-BFP Program, including cross-organizational coordination of the program between Divisions within the PWDs, tenant commands and organizations, contractors, and leasees. • Ensure there is cooperation between these organizations to support all BFPs, whether they are located in facilities or in utility systems. It may be most efficient to have properly trained and tasked personnel in just one Production Branch, and that branch covers both facilities and utility systems. The details regarding trained, tasked responsible personnel from these branches must be described in the installation site-specific instruction or policy.	
24.10.3 Procedures for Design and Selection	CCC/BFP Site Program Manager, with assistance from FEC/Facilities Engineering Acquisition Division (FEAD) Design/Project Managers, shall: • Review plans and specifications for CCC/BFP issues. • Ensure new facilities and systems are designed in accordance with UFC 3-230-02 and AWWA M14 to eliminate or minimize potential cross-connections. Coordination with the Design & Construction Business Line is required. • Ensure design changes to a facility or utility potable water system service connection (or any system making a direct or indirect connection to the potable water system) are reviewed and approved. Changes in a facility utilization may change the CCC hazard and BFP device requirement. • Document the engineering review process to ensure that potential cross-connections are identified; hazard degree is evaluated; cross-connections are appropriately addressed; and that design plans (for new, repair, and	UFC 3-230-02 NAVMED P-5010-5 PWBLL and CIBLL eOMSI Requirements letter AWWA M14 Manual of Cross-Connection Control, University of Southern California Foundation for Cross-Connection Control and Hydraulic Research NAVFACINST 5400.7B

Process Step	Associated Procedure	Resources
	renovation projects) in which BFP devices and assemblies are required are adequately reviewed during the design and construction phases with protection against potential or actual cross-connections. This includes new buildings, renovations, and all other projects with potential to touch the internal, external, or fire-protection systems. • Ensure construction activities are performed with appropriate BFP assemblies (BFPAs) for temporary water hookups. • Where a cross-connection cannot be avoided, ensure the design provides adequate backflow protection with approved BFPAs. BFPA design and selection shall be based on the degree of hazard associated with the cross-connection as identified in the latest edition of the Cross-Connection Control Manual published by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (USC FCCCHR). • Selection of BFP devices and assemblies to be installed shall be from the current list of approved devices and assemblies available on the USC FCCCHR website. For overseas locations, selection and installation of USC FCCCHR approved BFPAs is recommended. However, if USC FCCCHR approved BFPAs are not installed, the FEAD senior architect or engineer (Project Technical Staff as noted in NAVFACINST 5400.7B) must do a comparison analysis between the USC FCCCHR and the Host Nation standard. If the Host Nation standard is comparable to the USC FCCCHR standard with no significant deficiencies, and considered equivalent, the Host Nation standard may be used as an acceptable alternative to the USC FCCCHR standard without a need for a criteria exemption or waiver and the following will apply. Ensure the backflow preventer meets the site-specific instruction or policy and a Host Nation	

Process Step	Associated Procedure	Resources
	standard that is equivalent to the UFC in NAVFACINST 5400.7B, paragraph 3.a3 (e). Per NAVFACINST 5400.7B, questions and approval of alternatives or equivalent devices shall be directed to the authority having jurisdiction, who is the FEC Chief Engineer and: ◦ Certified by the senior FEAD architect or engineer as acceptable following consultation with the FEC Design and Construction Business Line Representative. ◦ Documented in the written site-specific instruction or policy. • Ensure BFPAs are certified as lead-free in accordance with NSF/ANSI-61, Annex G or NSF 372. • Ensure Electronic Operation and Maintenance Support Information (eOMSI) is provided on projects in accordance with the PWBLL and CIBLL (now DCBLL) eOMSI Requirements Letter. If a formal eOMSI is not specified due to the size of the project, the facilities data work book, operation, inventory, and maintenance information should be provided at a minimum.	
24.10.4 Testing, Certification, and Surveying	PWDs with their CCC/BFP Regional and Site Program Managers shall: • Establish procedures to regularly test and certify all BFPAs in accordance with guidance from the regulatory authority and the latest edition of the USC FCCCHR Cross-Connection Control Manual. • Ensure testing of BFPAs is completed by certified backflow testers using test equipment and procedures conforming to those outlined in the latest edition of the USC FCCCHR Cross-Connection Control Manual. • Ensure field-test equipment used to test BFPAs is accuracy verified at least annually, and if the accuracy is not within accepted standard, then the field-test equipment shall be calibrated and brought into acceptable accuracy tolerances.	OPNAV M-5090.1 Environmental Readiness Program Manual UFC 3-230-02 NAVMED P-5010-5 U.S. EPA Cross-Connection Control Manual MAXIMO User's Guide Manual of Cross-Connection Control, University of Southern California

Process Step	Associated Procedure	Resources
	• Ensure all newly installed BFPAs are tested, properly tagged, and certified before placed into service. • Ensure installation of the BFPA will comply with the criteria set forth by Federal, State, and local codes/regulations, the manufacturer's recommendations, and certification standards. • Ensure all BFPAs are certified for proper installation and operation. • Replace non-testable BFP devices at least every five years. • Ensure that all backflow test preventive (planned) maintenance work orders include a test, simple (maintenance) repairs, and retest for any initial failures. Should the BFPA fail the retest, then a corrective work order shall be generated. • Record the testing of BFPAs, including each initial and any retest, on a test and maintenance report. • Because the certification interval for the BFPAs will depend on the hazard classification, perform testing and certification for high-hazard BFPAs every six months, at a minimum. Low hazard BFPAs will be tested and certified every twelve months, at a minimum. • During BFPA certifications, if technicians observe new cross-connections or design/systemic backflow issues, report these issues to the CCC/BFP Site Program Manager for evaluation and addition to the CCC/BFP Program. • Conduct a baseline CCC survey for all facilities and utilities including a review of the water treatment and distribution systems, all service connections, and each facility and utility with potable water connections including inspection of mechanical rooms, various fixtures, water-using equipment, etc. • Identify:	Foundation for Cross-Connection Control and Hydraulic Research UG-2029-ENV P-501 Condition Based Maintenance Management (CBMM)

Process Step	Associated Procedure	Resources
	○ Location of possible or actual cross-connections ○ Hazard classification / Degree of Hazard ○ Location of existing BFP devices – verify type, size, make, model, and serial number ○ Adequacy of existing BFP devices ○ Need for installation of additional BFP devices or assemblies ○ Hydraulic Condition Protected (back pressure or back siphonage) • Fully update the CCC survey at least once every five years or sooner if required by local, state, or Final Governing Standards requirements. • Submit an emergency work order to immediately repair high hazard violations, and corrective work orders/projects to correct all other violations in a timely manner. • Ensure all BFPAs have an associated preventive maintenance (PM) for testing and repair assigned based on the hazard classification and/or type of BFPA. • Ensure future PMs are scheduled per degree of hazard. • Include verbiage in contracts and leases for the installation, maintenance, testing, repair, replacement, and documentation of BFP devices and assemblies. • Ensure the inventory and condition index (CI) of BFPAs are inspected and updated in accordance with P-501 CBMM Program.	
24.10.5 Recordkeeping	CCC/BFP Site Program Manager shall: • Maintain a complete inventory of all BFP devices and assemblies in enterprise databases (Maximo/GIS) including location, condition CI, equipment classification (Facilities/Utilities), hazard classification, hydraulic condition (back siphonage or back pressure), type, size, make, model, and serial number.	OPNAV M-5090.1 Environmental Readiness Program Manual MAXIMO User's Guide

Process Step	Associated Procedure	Resources

	• Maintain historical records containing:
	  ○ CCC Surveys
	  ○ List of BFP devices and assemblies including type, hazard classification, and location
	  ○ BFP devices and assembly inspections, testing, retesting, service, repairs, overhauls, replacements, and certification
	  ○ Field test device verification records
	  ○ Training and certification records for BFPA testers
	• Maintain records for a minimum of five years.
	• Ensure BFP device inventory and test data are updated regularly in enterprise databases (Maximo, GIS) and that future testing PMs are scheduled per degree of hazard.	

24.10.6
Training and Education
	FEC PWBLD and PWO shall ensure the following training requirements are met:
	• FEC RPM and CCC/BFP Site Program Managers shall be trained on the two separate courses below:
	  ○ CCC/BFP Program Specialist for a minimum of 5 days (35 hours); and
	  ○ BFP Tester Training for a minimum of 5 days (35 hours).
	• Testing technicians shall be trained for a minimum of five days on acceptable test procedures for identifying and testing backflow prevention assemblies.
	• Training may be obtained through numerous contractors including USC FCCCHR; University of Florida, Training, Research, and Education for Environmental Occupations (UF TREEO); or other equivalent training resources.
	• FEC RPM and CCC/BFP Site Program Managers and testing technicians will be certified in the appropriate training
		OPNAV M-5090.1 Environmental Readiness Program Manual
		
		Manual of Cross-Connection Control, University of Southern California Foundation for Cross-Connection Control and Hydraulic Research

Process Step	Associated Procedure	Resources
	courses by the Governing Body as required.	

APPENDIX B

Survey and Testing Field Forms

Joint Base Pearl Harbor-Hickam Cross-Connection Inventory Survey Form   Form #:_____

Area:	Descriptive Location:
Building #:	
Building Name:	
Floor/Room:	

Describe Cross-Connection Found:

Health Hazard: ☐ Low ☐ High	Previously-Assigned BFP ID/Tag #: NAVFAC ID:

BFP:	Date Installed:	Type of BFP:
☐ Installed ☐ Required		☐ AG ☐ AVB ☐ ASBC ☐ HBVB ☐ SHVB ☐ DCVI ☐ RP ☐ DCVA ☐ PVB ☐ DCV ☐ DCVC ☐ DCVB ☐ LFVB ☐ RPDA ☐ DCDA ☐ Other ________

Make/Manufacturer:	Model:	ASSE #:
Size:	Serial #:	
Latest Test Date:	Tested By:	

BFP Status:		
☐ Pass ☐ Fail	Date Repaired:______________ Date Retested:______________	Retested By:______________________________ Retest Status: ☐ Pass ☐ Fail

Next Test Date:	Date of Last Overhaul/Replacement:

Comments:

Surveyed By:	Picture #:	Date:

1000 AG = air gap
1001 AVB = atmospheric vacuum breaker
1002 ASBC = anti siphon anti spill vacuum breaker
1011 HBVB = hose bib vacuum breaker
1011 SHVB = shower handheld sprayer vacuum breaker
1012 DCVI = dual check valve w/intermediate atm vent
1013 RP = reduced pressure principle backflow preventer
1015 DCVA = double check valve assembly
1020 PVB = pressure vacuum breaker
1024 DCV = dual check valve
1032 DCVC = double check valve for carbonators
1035 DCVB = dual check valve w/intermediate vacuum breaker
1035 LFVB = lab faucet vacuum breaker
1047 RPDA = reduced pressure principle detector assembly
1048 DCDA = double check detector assembly

Type of Device - Check one:			
AVB	☐	DC	☐
PVB/SVB	☐	RPPD	☐

For Office Use Only	
Equipt	54
J.O.	
P.M.	
Frequency - Check one:	
Annual	☐
Semi annual	☐
Quarterly	☐

BACKFLOW PREVENTION DEVICE TEST & MAINTENANCE REPORT

TO: NAVFAC Hawaii Utilities, OPHP61 Potable Water
The cross-connection control device detailed hereon has been tested and maintained and meets the requirements of the Foundation For Cross-Connection and Hydraulic Research, USC and COMNAVBASEPEARLINST 11330.2B.

Make of Device:	Size:
Model No:	Serial No:
Location:	

	REDUCE PRESSURE DEVICE / DOUBLE CHECK DEVICE		DIFFERENTIAL RELIEF VALVE	PRESSURE VACUUM BREAKER	
	1st CHECK	2nd CHECK		Air Inlet	Check Valve
INITIAL TEST: PASS ☐ FAIL ☐ Line Pressure psi	Closed Tight ☐ RP ____ psid Leaked ☐	Closed Tight ☐ Leaked ☐	Opened at ____ psid Did Not Open ☐	Opened at: ____ psid Did Not Open ☐	Closed Tight: Held at ____ psid Leaked ☐
REPAIRS:	CLEANED ☐ Disc Spring Guide Module Seat Hinge Pins Others (list)	CLEANED ☐ Disc Spring Guide Module Seat Hinge pins Others (list)	CLEANED ☐ Disc Spring Guide Module Seat Diaphragms Others (list)	CLEANED ☐ Disc Spring Float Module Poppet Others (list)	CLEANED ☐ Disc Spring Guide Module Seat Hinge Pins Others (list)
FINAL TEST: PASS ☐ FAIL ☐	Closed Tight ☐ RP ____ psid	Closed Tight ☐	Opened at ____ psid	Opened at ____ psid	Closed Tight ☐ Held At ____ psid

AIR GAP:	Functional ☐	Hazard ☐

This assembly isolated the entire building ☐, the entire property ☐, or is undetermined ☐ (check one)

REMARKS: ____

Firm Name: NAVFAC Hawaii OPHP61
Address: Building 149, Power Plant No. 2
Pearl Harbor, Hawaii 96860-5470

Certified Tester: [redacted]
Certified Tester No: 0783
Date: ___/___/___

APPENDIX C

Field Testing
Standard Operating Procedure

(based on procedures in the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research's *Manual of Cross-Connection Control* [10th Edition, 2009])

1. PURPOSE AND SCOPE

This standard operating procedure (SOP) for Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii (HI), outlines the procedures for proper field testing of backflow prevention (BFP) assemblies for the installation drinking water system. It includes preliminary activities, specific assembly testing practices, and report documentation.

2. SUMMARY/BACKGROUND

This SOP provides guidance on how to properly field test BFP assemblies in compliance with the JBPHH cross-connection control (CCC)/BFP program. Procedures are included for the following assemblies:

BFP Assembly Name	BFP Assembly Acronym	Applicable Standard Number(s) [No(s).]
Reduced Pressure Zone (or Principle) Assembly	RP	ASSE[1] 1013 AWWA[2] C511
Double Check Valve Assembly	DCVA	ASSE[1] 1015 AWWA[2] C510
Pressure Vacuum Breaker	PVB	ASSE[1] 1020
Double Check Valve Detector Assembly	DCDA	ASSE[1] 1048
Spill-Resistant Pressure Vacuum Breaker	SVB	ASSE[1] 1056

[1] ASSE - American Society of Sanitary Engineering
[2] AWWA - American Water Works Association

The procedures presented herein are derived from Sections 9.1 to 9.5, 9.7, and 9.9 of the University of Southern California (USC) Foundation for Cross-Connection Control and Hydraulic Research (FCCCHR)'s *Manual of Cross-Connection Control* (10th Edition, October 2009).

3. DEFINITIONS

Refer to Subsection 2.3 of the JBPHH CCC/BFP Program Plan (December 2025) for basic definitions related to the program, including the BFP assemblies in this SOP.

4. HEALTH AND SAFETY

The following health and safety requirements should be followed by all certified testers and other JBPHH personnel present during the field-testing procedures described in this SOP:

- Identify and wear all appropriate personal protective equipment (e.g., hard hat, gloves, ear protection, safety glasses).
- For BFP assemblies located in confined spaces, follow all requirements defined by Section 1910.146 (*Permit-required confined spaces*) of Title 29 of the Code of Federal Regulations (29 CFR).
- Utilize appropriate ladder or stairway access to BFP assemblies installed in elevated locations. Follow all requirements defined by Subpart M (*Fall Protection*, Sections 1926.500 to 1926.503) of 29 CFR.
- Identify additional utility services (e.g., steam, natural gas, electrical, telecommunications) that may be in the same location as the BFP assembly. Apply proper safety procedures for working near these utilities.
- Conduct field testing procedures with commercially available tools and equipment specialized for field testing BFP assemblies.

5. KEY PERSONNEL

Personnel associated with the field testing procedures described in this SOP are the CCC/BFP Program Manager and Testing Technicians (i.e., certified testers). Descriptions of these roles, along with responsibilities and training requirements, are documented in Paragraphs 4.d and 4.e of Navy Facilities Engineering Systems Command HI Instruction 11330.1A.

6. PROCEDURES

6.1 PRELIMINARY

6.1.1 Field Test Kits

This subsection details procedures related to preparing field test kits that will be utilized in the field testing procedures provided in Subsections 6.2 to 6.6 of this SOP. They are to be carried out by the certified tester scheduled to conduct the field testing procedures.

1. Prior to conducting field tests, visually observe the physical condition of the field test kit. Verify that there are no obvious signs of damage that would cause leaks and/or render the test kit inoperable.
    a. During field testing, conduct regular visual observations to ensure that the field test kit was not damaged during testing activities.
2. Verify that the field test kit reads zero when not pressurized.
3. Verify that the valves and fittings are drip tight. Ensure that the field test kit is not holding any water (should be drained after field testing to prevent internal damage from freezing).
4. Follow all additional manufacturer inspection and maintenance requirements for the field test kit.
5. Conduct field test kit calibration in accordance with manufacturer instructions, including calibration frequency. Provide a record of the most recent test kit calibration to the CCC/BFP Program Manager prior to starting any field testing with the test kit.

6.1.2 Notification

This subsection details procedures to be carried out by the CCC/BFP Program Manager related to notifying facility personnel and other impacted users of field testing activities.

1. Contact the facility/building manager that will be impacted by planned testing activities before the scheduled testing dates.
    a. Provide a description of planned activities, the BFP assembl(y/ies) to be tested (and locations, if known), expected service impacts, the expected date(s) and duration of testing activities, and other pertinent information.

   b. Request any necessary access and coordination requirements that will allow the certified testers to access the BFP assembl(y/ies) to be tested. Coordination may need to include other parties (e.g., fire department, security) as identified by the facility/building manager.
2. Once all field testing procedures have been completed and water service has been returned, notify the facility/building manager within 24 hours.
   a. If field testing identifies BFP assembly failure or other conditions requiring repair, provide details on the perceived risks and next steps.

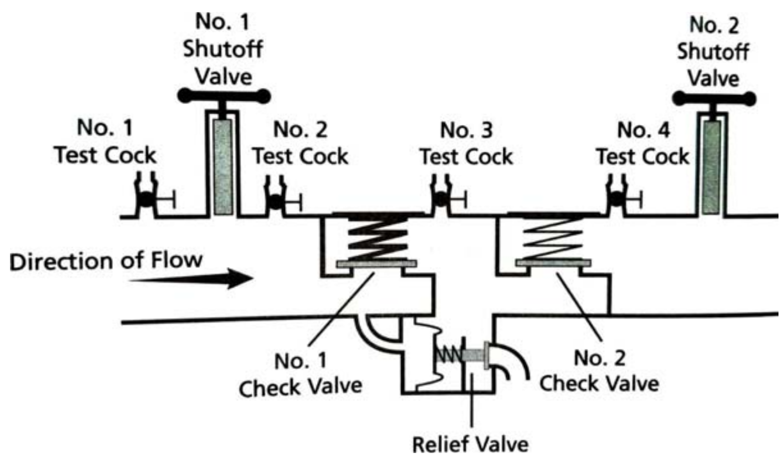
6.1.3 Site Inspection

This subsection details procedures to be carried out by the certified tester related to inspecting the area around a BFP assembly slated for testing.

1. Locate the BFP assembly and verify that its information (e.g., asset number [no.], assembly type, size, manufacturer, model no., serial no.) match available records.
   a. If one or more details don't match existing records, record the changes.
2. Inspect the BFP assembly and verify that all required components for field testing (e.g., shutoff valves, test cocks) are present and in working order.
3. Observe the area around the BFP assembly for signs of leakage (e.g., moss/algae/plant growth, erosion, stains, wet spots). Record any observations, including whether the assembly is actively leaking.
4. Observe the area around the BFP assembly for any signs of unsafe conditions.
   a. If conditions are deemed unsafe to conduct field testing, record the condition(s).

6.2 REDUCED PRESSURE ZONE (OR PRINCIPLE) ASSEMBLIES

This subsection details field testing procedures for RPs. A diagram of a typical RP is presented in the following figure with standard components labeled (Figure 9.3 from the USC FCCCHR manual [2009]):

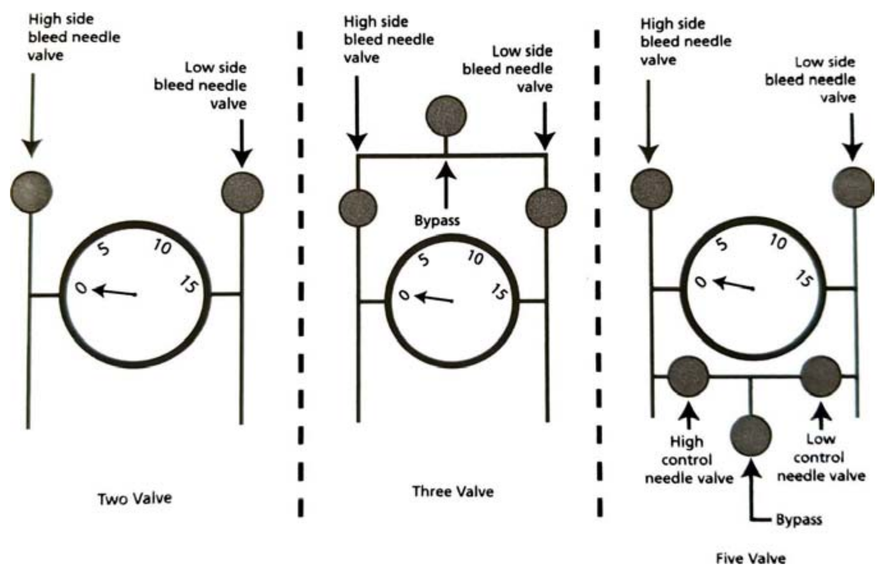


6.2.1 Equipment Required

The following equipment is required for testing RPs:

- Differential pressure field test kit with minimum range of 0 to 15 pounds per square inch (psi) differential (psid) with 0.1 or 0.2 psid gradations
- Temporary bypass hose comparable to the size of the test cocks
- Four (4) brass ¼-inch iron pipe size (IPS), 45-degree (°) Society of Automotive Engineers (SAE) flare connectors
- Brass adapter fittings for each test cock size (e.g., ⅛-inch, ½-inch, ¾-inch)

RPs can be tested using one of three test kit configurations: five, three, and two needle valves. The following figure presents the standard configuration of these test kits (Figure 9.1 from the USC FCCCHR manual [2009]):



6.2.2 Field Test Procedures for Five Needle Valve Field Test Kit

6.2.2.1 Test Number 1

Purpose: Test the operation of the differential pressure relief valve.

Requirement: The differential pressure relief valve must operate to maintain the zone between the two check valves at least 2 psi less than the supply pressure.

Notes: Do not cause the differential pressure relief valve to discharge until Step 14. The relief valve should not be discharging continuously.

1. Bleed water through all test cocks to eliminate foreign material.
2. Open Test Cock No. 4 fully to establish flow through the RP. Then, fully open Test Cock Nos. 3, 2 (slowly), and 1 in the order listed.
3. Close Test Cock Nos. 1, 2, 3, and 4 in the order listed.
4. Install appropriate fittings to the test cocks, if necessary.
5. Attach the hose from the high side of the field test kit to Test Cock No. 2.
6. Attach the hose from the low side of the field test kit to Test Cock No. 3.
7. Slowly open Test Cock No. 3 fully.
8. Bleed all air from the low side of the field test kit by fully opening the low side bleed needle valve. Keep the valve open.
9. Slowly open Test Cock No. 2 fully to pressurize the field test kit.
10. Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve. Keep the valve open.

11. Close Shutoff Valve No. 2.
12. Close the high side bleed needle valve.
13. After the field test kit reading has reached the upper end of the gage/scale, slowly close the low side bleed needle valve.
    a. If the reading remains above the differential pressure relief valve opening point (i.e., valve does not discharge), observe the reading. This is the apparent differential pressure across Check Valve No. 1. Continue to Step 14.
    b. If the reading drops to the low end of the gage/scale and the differential pressure relief valve discharges continuously, Check Valve No. 1 is leaking and should be recorded as such. Test Nos. 1, 2, and 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.
14. Open the high side control needle valve approximately one turn.
15. Slowly open the low side control needle valve no more than one-quarter turn to bypass water from Test Cock No. 2 to Test Cock No. 3.
16. Observe the differential pressure reading as it slowly drops to the relief valve opening point. Record the opening point value when the first discharge of water is detected.
    a. If the differential pressure reading drops to zero and the relief valve does not discharge any water, record that the relief valve did not open.
17. Close the low side control needle valve. Continue to Test No. 2.

6.2.2.2 Test Number 2

Purpose: Test Check Valve No. 2 for tightness against backpressure.

Requirement: Check Valve No. 2 must be tight against backpressure.

1. Maintain Shutoff Valve No. 2 in the closed position and the high side control needle valve in the fully open position.
2. Attach the bypass hose to the bypass needle valve.
3. Bleed all air through the bypass hose by fully opening the bypass control needle valve.
4. Close the bypass control needle valve.
5. Attach the bypass hose from the field test kit to Test Cock No. 4.
6. Open Test Cock. No. 4 fully.
7. Open the low side bleed needle valve fully.
8. Once the field test kit reading reaches a value above the apparent Check Valve No. 1 differential pressure reading (see Step 13.a in Test No. 1), slowly close the low side bleed needle valve.
9. Open the bypass control needle valve fully.

a. If the differential pressure reading remains steady, record that Check Valve No. 2 is closed tight. Continue to Test No. 3.
b. If the differential pressure reading decreases but stabilizes above the relief valve opening point, Check Valve No. 2 can also be recorded as closed tight. Continue to Test No. 3.
c. If the differential pressure reading falls to the relief valve opening point, open the low side bleed needle valve until the reading reaches approximately the apparent Check Valve No. 1 differential pressure reading. Slowly close the low side bleed needle valve.
    i. If the differential pressure reading settles above the relief valve opening point and the valve does not open, record Check Valve No. 2 as closed tight. Continue to Test No. 3.
    ii. If the differential pressure reading falls to the relief valve opening point again, record Check Valve No. 2 as leaking. Test No. 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.
d. If the differential pressure reading falls to zero and the relief valve does not open, open the low side bleed needle valve until the reading reaches a value above the apparent Check Valve No. 1 differential pressure reading. Slowly close the low side bleed needle valve.
    i. If the differential pressure reading settles at a value above zero and the relief valve does not open, record Check Valve No. 2 as closed tight. Continue to Test No. 3.
    ii. If the differential pressure reading falls to zero again and the relief valve does not open, Record Check Valve No. 2 as leaking. Test No. 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.

6.2.2.3 Test Number 3

Purpose: Determine the tightness of and static differential pressure across Check Valve No. 1.

Requirement: The static differential pressure across Check Valve No. 1 must be greater than the relief valve opening point (Test No. 1) and at least 5.0 psid.

1. Keep the bypass hose connected to Test Cock No. 4.
2. Open the low side bleed needle valve until the field test kit reading reaches a value above the apparent Check Valve No. 1 differential pressure (see Step 13.a in Test No. 1).
3. Slowly close the low side bleed needle valve.

4. After the reading settles, the differential pressure reading indicated (reading not falling) is the actual static differential pressure across Check Valve No. 1. Record this value.
5. Close all test cocks.
6. Slowly open Shutoff Valve No. 2 fully.
7. Remove all test equipment and fittings from the RP.

6.2.3 Field Test Procedures for Three Needle Valve Field Test Kit

6.2.3.1 Test Number 1

Purpose: Test the operation of the differential pressure relief valve.

Requirement: The differential pressure relief valve must operate to maintain the zone between the two check valves at least 2 psi less than the supply pressure.

Notes: Do not cause the differential pressure relief valve to discharge until Step 14. The relief valve should not be discharging continuously.

1. Bleed water through all test cocks to eliminate foreign material.
2. Open Test Cock No. 4 fully to establish flow through the RP. Then, fully open Test Cock Nos. 3, 2 (slowly), and 1 in the order listed.
3. Close Test Cock Nos. 1, 2, 3, and 4 in the order listed.
4. Install appropriate fittings to the test cocks, if necessary.
5. Attach the hose from the high side of the field test kit to Test Cock No. 2.
6. Attach the hose from the low side of the field test kit to Test Cock No. 3.
7. Slowly open Test Cock No. 3 fully.
8. Bleed all air from the low side of the field test kit by opening the bypass needle valve approximately one turn and then fully opening the low side bleed needle valve. Keep the valves open.
9. Slowly open Test Cock No. 2 fully to pressurize the field test kit.
10. Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve. Keep the valve open.
11. Close Shutoff Valve No. 2.
12. Close the high side bleed needle valve.
13. After the field test kit reading has reached the upper end of the gage/scale, slowly close the low side bleed needle valve. Close the bypass needle valve.
    a. If the reading remains above the differential pressure relief valve opening point (i.e., valve does not discharge), observe the reading. This is the apparent differential pressure across Check Valve No. 1. Continue to Step 14.

   b. If the reading drops to the low end of the gage/scale and the differential pressure relief valve discharges continuously, Check Valve No. 1 is leaking and should be recorded as such. Test Nos. 1, 2, and 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.

14. Open the high side control needle valve approximately one turn.
15. Slowly open the low side control needle valve no more than one-quarter turn to bypass water from Test Cock No. 2 to Test Cock No. 3.
16. Observe the differential pressure reading as it slowly drops to the relief valve opening point. Record the opening point value when the first discharge of water is detected.
    a. If the differential pressure reading drops to zero and the relief valve does not discharge any water, record that the relief valve did not open.
17. Close the low side control needle valve. Continue to Test No. 2.

6.2.3.2 Test Number 2

Purpose: Test Check Valve No. 2 for tightness against backpressure.

Requirement: Check Valve No. 2 must be tight against backpressure.

1. Maintain Shutoff Valve No. 2 in the closed position and the high side control needle valve in the fully open position.
2. Attach the bypass hose to the bypass needle valve.
3. Bleed all air through the bypass hose by fully opening the bypass control needle valve.
4. Close the bypass control needle valve.
5. Attach the bypass hose from the field test kit to Test Cock No. 4.
6. Open Test Cock. No. 4 fully.
7. Loosen the low side hose on Test Cock No. 3.
8. Once the field test kit reading reaches a value above the apparent Check Valve No. 1 differential pressure reading (see Step 13.a in Test No. 1), slowly tighten the low side hose on Test Cock No. 3.
9. Open the bypass control needle valve fully.
    a. If the differential pressure reading remains steady, record that Check Valve No. 2 is closed tight. Continue to Test No. 3.
    b. If the differential pressure reading decreases but stabilizes above the relief valve opening point, Check Valve No. 2 can also be recorded as closed tight. Continue to Test No. 3.
    c. If the differential pressure reading falls to the relief valve opening point, loosen the low side hose on Test Cock No. 3 until the reading reaches approximately the apparent Check Valve No. 1 differential pressure reading. Slowly tighten the low hose on Test Cock No. 3.

   i. If the differential pressure reading settles above the relief valve opening point and the valve does not open, record Check Valve No. 2 as closed tight. Continue to Test No. 3.
   ii. If the differential pressure reading falls to the relief valve opening point again, record Check Valve No. 2 as leaking. Test No. 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.

d. If the differential pressure reading falls to zero and the relief valve does not open, loosen the low side hose on Test Cock No. 3 until the reading reaches a value above the apparent Check Valve No. 1 differential pressure reading. Slowly tighten the low hose on Test Cock No. 3.
   i. If the differential pressure reading settles at a value above zero and the relief valve does not open, record Check Valve No. 2 as closed tight. Continue to Test No. 3.
   ii. If the differential pressure reading falls to zero again and the relief valve does not open, Record Check Valve No. 2 as leaking. Test No. 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.

6.2.3.3 Test Number 3

Purpose: Determine the tightness of and static differential pressure across Check Valve No. 1.

Requirement: The static differential pressure across Check Valve No. 1 must be greater than the relief valve opening point (Test No. 1) and at least 5.0 psid.

1. Keep the bypass hose connected to Test Cock No. 4.
2. Loosen the low side hose on Test Cock No. 3 until the field test kit reading reaches a value above the apparent Check Valve No. 1 differential pressure (see Step 13.a in Test No. 1).
3. Slowly tighten the low hose on Test Cock No. 3.
4. After the reading settles, the differential pressure reading indicated (reading not falling) is the actual static differential pressure across Check Valve No. 1. Record this value.
5. Close all test cocks.
6. Slowly open Shutoff Valve No. 2 fully.
7. Remove all test equipment and fittings from the RP.

6.2.4 Field Test Procedures for Two Needle Valve Field Test Kit

6.2.4.1 Test Number 1

Purpose: Test the operation of the differential pressure relief valve.

Requirement: The differential pressure relief valve must operate to maintain the zone between the two check valves at least 2 psi less than the supply pressure.

Notes: Do not cause the differential pressure relief valve to discharge until Step 16. The relief valve should not be discharging continuously.

1. Bleed water through all test cocks to eliminate foreign material.
2. Open Test Cock No. 4 fully to establish flow through the RP. Then, fully open Test Cock Nos. 3, 2 (slowly), and 1 in the order listed.
3. Close Test Cock Nos. 1, 2, 3, and 4 in the order listed.
4. Install appropriate fittings to the test cocks, if necessary.
5. Attach the hose from the high side of the field test kit to Test Cock No. 2.
6. Attach the hose from the low side of the field test kit to Test Cock No. 3.
7. Attach the bypass hose to the low side bleed needle valve.
8. Slowly open Test Cock No. 3 fully.
9. Bleed all air from the low side of the field test kit by opening the low side bleed needle valve fully. Keep the valve open.
10. Slowly open Test Cock No. 2 fully to pressurize the field test kit.
11. Bleed all air from the high side of the field test kit by opening the high side bleed needle valve fully. Keep the valve open.
12. Close Shutoff Valve No. 2.
13. Close the high side bleed needle valve.
14. After the field test kit reading has reached the upper end of the gage/scale, slowly close the low side bleed needle valve.
    a. If the reading remains above the differential pressure relief valve opening point (i.e., valve does not discharge), observe the reading. This is the apparent differential pressure across Check Valve No. 1. Continue to Step 15.
    b. If the reading drops to the low end of the gage/scale and the differential pressure relief valve discharges continuously, Check Valve No. 1 is leaking and should be recorded as such. Test Nos. 1, 2, and 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.

15. Attach the bypass hose from the low side bleed needle valve to the high side bleed needle valve.
16. Open the high side control needle valve approximately one turn.
17. Slowly open the low side control needle valve no more than one-quarter turn to bypass water from Test Cock No. 2 to Test Cock No. 3.
18. Observe the differential pressure reading as it slowly drops to the relief valve opening point. Record the opening point value when the first discharge of water is detected.
    a. If the differential pressure reading drops to zero and the relief valve does not discharge any water, record that the relief valve did not open.
19. Close both control needle valves.
20. Detach the bypass hose from the low side bleed needle valve. Continue to Test No. 2.

6.2.4.2 Test Number 2

Purpose: Test Check Valve No. 2 for tightness against backpressure.

Requirement: Check Valve No. 2 must be tight against backpressure.

1. Maintain Shutoff Valve No. 2 in the closed position.
2. Attach the bypass hose from the high side bleed needle valve to Test Cock No. 4.
3. Open Test Cock No. 4 fully.
4. Open the low side bleed needle valve fully.
5. Once the field test kit reading reaches a value above the apparent Check Valve No. 1 differential pressure reading (see Step 14.a in Test No. 1), slowly close the low side bleed needle valve.
6. Open the high side needle valve fully.
    a. If the differential pressure reading remains steady, record that Check Valve No. 2 is closed tight. Continue to Test No. 3.
    b. If the differential pressure reading decreases but stabilizes above the relief valve opening point, Check Valve No. 2 can also be recorded as closed tight. Continue to Test No. 3.
    c. If the differential pressure reading falls to the relief valve opening point, open the low side bleed needle valve until the reading reaches approximately the apparent Check Valve No. 1 differential pressure reading. Slowly close the low side bleed needle valve.
        i. If the differential pressure reading settles above the relief valve opening point and the valve does not open, record Check Valve No. 2 as closed tight. Continue to Test No. 3.
        ii. If the differential pressure reading falls to the relief valve opening point again, record Check Valve No. 2 as leaking. Test No. 3 cannot be completed. Close all test cocks. Slowly open

Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.

d. If the differential pressure reading falls to zero and the relief valve does not open, open the low side bleed needle valve until the reading reaches a value above the apparent Check Valve No. 1 differential pressure reading. Slowly close the low side bleed needle valve.
   i. If the differential pressure reading settles at a value above zero and the relief valve does not open, record Check Valve No. 2 as closed tight. Continue to Test No. 3.
   ii. If the differential pressure reading falls to zero again and the relief valve does not open, Record Check Valve No. 2 as leaking. Test No. 3 cannot be completed. Close all test cocks. Slowly open Shutoff Valve No. 2 fully. Remove all test equipment and fittings from the RP.

6.2.4.3 Test Number 3

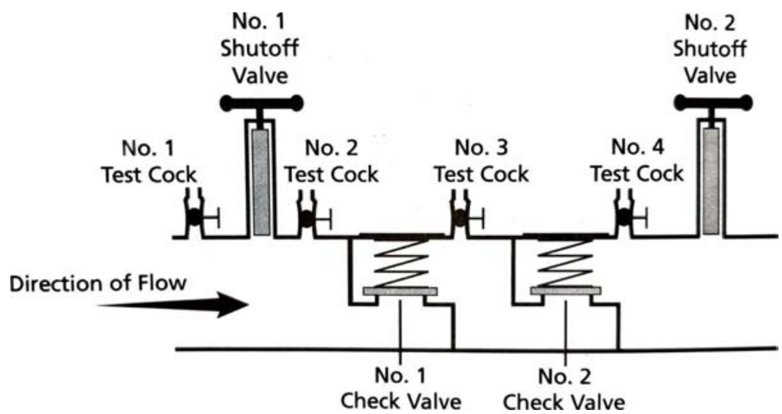
Purpose: Determine the tightness of and static differential pressure across Check Valve No. 1.

Requirement: The static differential pressure across Check Valve No. 1 must be greater than the relief valve opening point (Test No. 1) and at least 5.0 psid.

1. Keep the bypass hose connected to Test Cock No. 4.
2. Open the low side bleed needle valve until the field test kit reading reaches a value above the apparent Check Valve No. 1 differential pressure (see Step 14.a in Test No. 1).
3. Slowly close the low side bleed needle valve.
4. After the reading settles, the differential pressure reading indicated (reading not falling) is the actual static differential pressure across Check Valve No. 1. Record this value.
5. Close all test cocks.
6. Slowly open Shutoff Valve No. 2 fully.
7. Remove all test equipment and fittings from the RP.

6.3 DOUBLE CHECK VALVE ASSEMBLIES

This subsection details field testing procedures for DCVAs. A diagram of a typical DCVA is presented in the following figure with standard components labeled (Figure 9.18 from the USC FCCCHR manual [2009]):



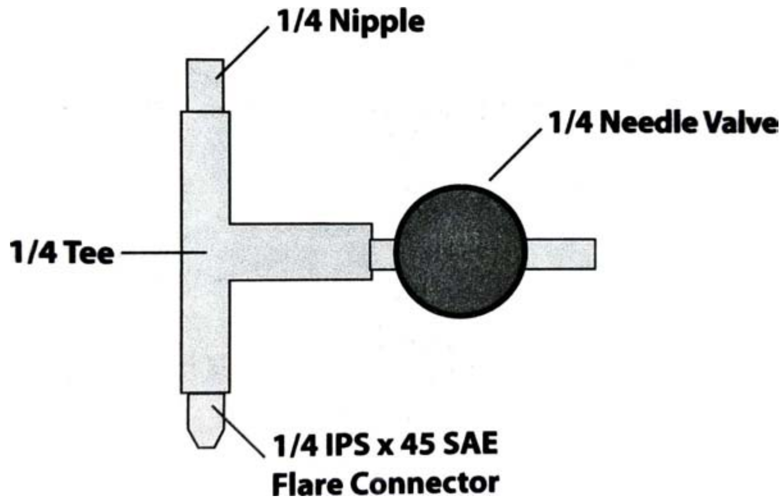
6.3.1 Equipment Required

The following equipment is required for testing DCVAs:

- Differential pressure field test kit with minimum range of 0 to 15 pounds psid with 0.1 or 0.2 psid gradations
- Brass ¼-inch IPS, 45° SAE flare connector
- Brass adapter fittings for each test cock size (e.g., ⅛-inch, ½-inch, ¾-inch)
- Street elbow, pipe nipple, or tube
- Bleed-off valve arrangement, consisting of
  - ¼-inch needle valve
  - Brass ¼-inch nipple
  - Brass ¼-inch tee
  - Brass ¼-inch IPS, 45° SAE flare connector

DCVAs can be tested using one of three test kit configurations: five, three, and two needle valves. A figure showing the standard configurations of these test kits is included in Subsection 6.2.1 of this SOP.

The following figure presents the standard bleed-off valve arrangement (Figure A.1 from the USC FCCCHR manual [2009] with labeling correction).



Alternate arrangements also include using a swivel connection attached to the nipple so that it may be attached to a 45° SAE flare connector inserted in the test cock and two-needle valve arrangements for larger assemblies.

6.3.2 Field Test Kit Location

During field tests for DCVAs, it is important to keep the field test kit and unused hoses at appropriate elevations. A visible downstream reference point is needed. If the downstream test cock is at the highest point of the assembly body, then this can be used as the reference point; however, if the test cock is below the top of the assembly body, then a vertical pipe or tube must be attached to the test cock so that it rises above the assembly body.

To record the correct differential pressure reading, the field test kit must be held at the same elevation as the water level on the downstream side of the check valve being tested. If a pipe or tube is attached to the downstream test cock, the field test kit must be maintained at the same height as the water in the pipe or tube. If this is not done properly, inaccurate values might be recorded.

All unused hoses must be maintained at the same elevation as the field test kit. If the low side hose contains water and the hose is maintained above or below the field test kit, the water in the hose will create a false reading.

6.3.3 Field Test Procedures

6.3.3.1 Test Number 1

Purpose: Determine the static differential pressure across Check Valve No. 1.

Requirement: The static differential pressure across Check Valve No. 1 must be at least 1.0 psid.

Notes: The following procedures apply to five, three, and two needle valve field test kits. The only step that requires alternative action for three needle valve test kits is Step 7 (detailed below).

1. Bleed water through all test cocks to eliminate foreign material.
2. Install appropriate fittings to the test cocks, if necessary.
3. If Test Cock No. 3 is not at the highest point of the DCVA body, install a vertical pipe or tube on the test cock so that it rises to the top of the assembly body.
4. Attach the bleed-off valve arrangement to Test Cock No. 2.
5. Attach the hose from the high side of the field test kit to the bleed-off valve arrangement.
6. Open Test Cock No. 2 fully.
7. Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve. Close the valve.
    a. **Three Needle Valve Field Test Kits:** Bleed all air from the high side of the field test kit by fully opening the bypass needle valve and then fully opening the high side bleed needle valve. Close the high side bleed needle valve.
8. Open Test Cock No. 3 to fill the test cock (or pipe or tube, if attached) so that the water is above the top of the DCVA body. Close the test cock.
9. Close Shutoff Valve No. 2.
10. Maintain the field test kit at the same elevation as the water at Test Cock No. 3.
11. Close Shutoff Valve No. 1.
12. Slowly open Test Cock No. 3 fully.
13. After the reading on the field test kit stabilizes and water stops running out of Test Cock No. 3 (or is no more than a drip), the reading indicated is the differential pressure across Check Valve No. 1. Record this value.
14. Close all test cocks.
15. Open Shutoff Valve No. 1 fully.

16. Remove all test equipment from the DCVA. Continue to Test No. 2.

6.3.3.2 Test Number 2

Purpose: Determine the static differential pressure across Check Valve No. 2.

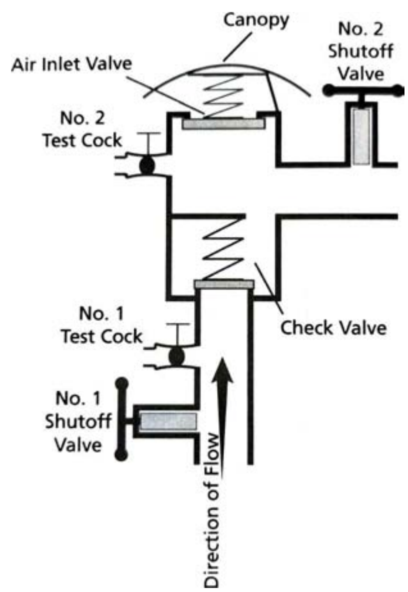
Requirement: The static differential pressure across Check Valve No. 2 must be at least 1.0 psid.

Notes: The following procedures apply to five, three, and two needle valve field test kits. The only step that requires alternative action for three needle valve test kits is Step 5 (detailed below).

1. If Test Cock No. 4 is not at the highest point of the DCVA body, install a vertical pipe or tube on the test cock so that it rises to the top of the assembly body.
2. Attach the bleed-off valve arrangement to Test Cock No. 3.
3. Attach the hose from the high side of the field test kit to the bleed-off valve arrangement.
4. Open Test Cock No. 3 fully.
5. Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve. Close the valve.
    a. **Three Needle Valve Field Test Kits:** Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve (bypass needle valve still open from Test No. 1). Close the high side bleed needle valve.
6. Open Test Cock No. 4 to fill the test cock (or pipe or tube, if attached) so that the water is above the top of the DCVA body. Close the test cock.
7. Maintain the field test kit at the same elevation as the water at Test Cock No. 4.
8. Close Shutoff Valve No. 1.
9. Slowly open Test Cock No. 4 fully.
10. After the reading on the field test kit stabilizes and water stops running out of Test Cock No. 4 (or is no more than a drip), the reading indicated is the differential pressure across Check Valve No. 2. Record this value.
11. Close all test cocks.
12. Remove all test equipment and fittings from the DCVA.
13. Open Shutoff Valve No. 1 fully.
14. Slowly open Shutoff Valve No. 2 fully.

6.4 PRESSURE VACUUM BREAKERS

This subsection details field testing procedures for PVBs. A diagram of a typical PVB is presented in the following figure with standard components labeled (Figure 9.31 from the USC FCCCHR manual [2009]):



6.4.1 Equipment Required

The following equipment is required for testing PVBs:

- Differential pressure field test kit with minimum range of 0 to 15 pounds psid with 0.1 or 0.2 psid gradations
- Two (2) brass ¼-inch IPS, 45° SAE flare connectors
- Brass adapter fittings for each test cock size (e.g., ⅛-inch)
- Bleed-off valve arrangement, consisting of
  - ¼-inch needle valve
  - Brass ¼-inch nipple
  - Brass ¼-inch tee
  - Brass ¼-inch IPS, 45° SAE flare connector

PVBs can be tested using one of three test kit configurations: five, three, and two needle valves. A figure showing the standard configurations of these test kits is included in Subsection 6.2.1 of this SOP.

A figure showing the standard bleed-off valve arrangement is included in Subsection 6.3.1 of this SOP. Alternate arrangements also include using a swivel connection attached to the nipple so that it may be attached to a 45° SAE flare connector inserted in the test cock and two-needle valve arrangements for larger assemblies.

6.4.2 Field Test Kit Location

During field tests for PVBs, it is important to keep the field test kit and unused hoses at appropriate elevations.

To record the correct differential pressure reading during the air inlet valve test (Test No. 1), the field test kit must be held at the same elevation as the air inlet valve. To record the correct differential pressure reading during the check valve test (Test No. 2), the field test kit must be held at the same elevation as the water level on the downstream side of the check valve (i.e., Test Cock No. 2).

All unused hoses must be maintained at the same elevation as the field test kit. If the low side hose contains water and the hose is maintained above or below the field test kit, the water in the hose will create a false reading.

6.4.3 Field Test Procedures

6.4.3.1 Test Number 1

Purpose: Determine the pressure in the PVB body when the air inlet valve opens.

Requirement: The air inlet valve must open when the pressure in the PVB body is at least 1.0 psi above atmospheric pressure. The valve must also be fully open when water drains from the assembly body.

Notes: The following procedures apply to five, three, and two needle valve field test kits. The only step that requires alternative action for three needle valve test kits is Step 7 (detailed below).

1. Remove the air inlet valve canopy.
2. Bleed water through both test cocks to eliminate foreign material. Open Test Cock No. 1 fully, and then close. Open Test Cock No. 2 fully, and then close.
3. Install appropriate fittings to the test cocks, if necessary.
4. Attach the bleed-off valve arrangement to Test Cock No. 1.
5. Attach the hose from the high side of the field test kit to Test Cock No. 2.
6. Open Test Cock No. 2 fully.
7. Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve. Close the valve.
    a. **Three Needle Valve Field Test Kits:** Bleed all air from the high side of the field test kit by fully opening the bypass needle valve and then fully opening the high side bleed needle valve. Close the high side bleed needle valve.
8. Close Shutoff Valve No. 2.
9. Maintain the field test kit at the same elevation as the air inlet valve.
10. Close Shutoff Valve No. 1.
11. If the reading on the field test kit begins to decrease, prepare to record the reading when the air inlet valve opens.
12. Slowly open the high side bleed needle valve no more than one-quarter turn, being careful not to drop the differential pressure reading on the field test kit too fast.
13. Record the differential pressure reading on the field test kit when the air inlet valve opens.
    a. If the reading drops to 0.0 psid and the air inlet valve does not open, record that the valve did not open. Close the high side bleed needle valve and Test Cock No. 2. Remove the high side hose from Test Cock No. 2. Continue to Step 18.
14. Close the high side bleed needle valve.
15. Remove the high side hose from Test Cock No. 2 to drain water from the PVB body.
16. Record whether or not the air inlet valve is in the fully open position.
17. Close Test Cock No. 2.
18. Open Shutoff Valve No. 1 fully. Continue to Test No. 2.

6.4.3.2 Test Number 2

Purpose: Determine the static differential pressure across the check valve.

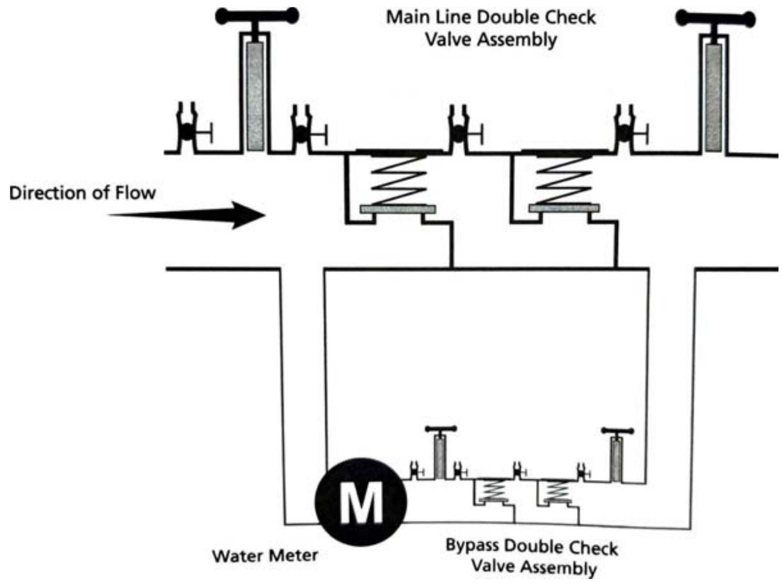
Requirement: The static differential pressure across the check valve must be at least 1.0 psid.

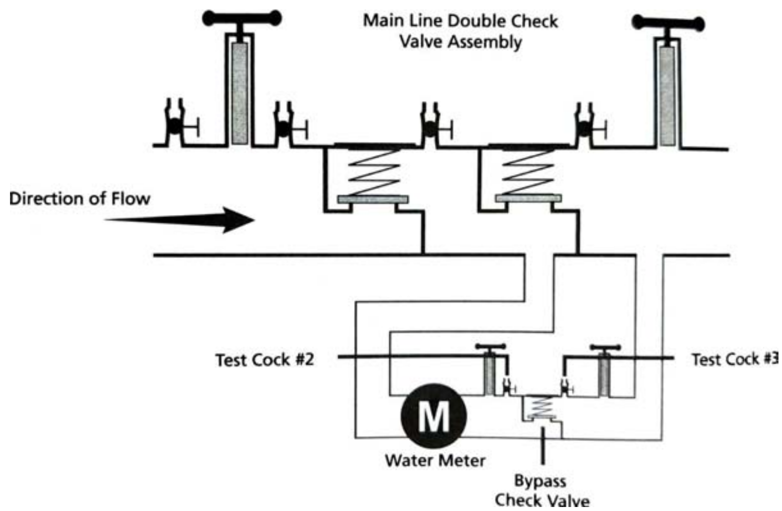
Notes: The following procedures apply to five, three, and two needle valve field test kits. The only step that requires alternative action for three needle valve test kits is Step 3 (detailed below).

1. Attach the hose from the high side of the field test kit to the bleed-off valve arrangement on Test Cock No. 1.
2. Slowly open Test Cock No. 1 fully.
3. Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve. Close the valve.
    a. **Three Needle Valve Field Test Kits:** Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve (bypass needle valve still open from Test No. 1). Close the high side bleed needle valve.
4. Maintain the field test kit at the same elevation as the water at Test Cock No. 2.
5. Close Shutoff Valve No. 1.
    a. If the reading on the field test kit begins to decrease, continue to Step 6. This may be caused by Shutoff Valve No. 2 leaking and may not affect the outcome of the field test procedure.
6. Open Test Cock No. 2 fully to drain water from the PVB body.
7. After the reading on the field test kit stabilizes and water stops running out of Test Cock No. 2 (or is not more than a drip), the reading indicated is the differential pressure across the check valve. Record this value.
8. Close both test cocks.
9. Remove all test equipment and fittings from the PVB.
10. Open Shutoff Valve No. 1 fully.
11. Slowly open Shutoff Valve No. 2 fully.
12. Replace the air inlet valve canopy.

6.5 DOUBLE CHECK VALVE DETECTOR ASSEMBLIES

This subsection details field testing procedures for DCDAs. Diagrams of typical DCDAs are presented in the following figures with standard components labeled (Figures 9.44 and 9.46 from the USC FCCCHR manual [2009]):





6.5.1 Equipment Required

The following equipment is required for testing DCDAs:

- Differential pressure field test kit with minimum range of 0 to 15 pounds psid with 0.1 or 0.2 psid gradations
- Brass ¼-inch IPS, 45° SAE flare connector
- Brass adapter fittings for each test cock size (e.g., ⅛-inch, ½-inch, ¾-inch)
- Street elbow, pipe nipple, or tube
- Bleed-off valve arrangement, consisting of

- ¼-inch needle valve
- Brass ¼-inch nipple
- Brass ¼-inch tee
- Brass ¼-inch IPS, 45° SAE flare connector

DCDAs can be tested using one of three test kit configurations: five, three, and two needle valves. A figure showing the standard configurations of these test kits is included in Subsection 6.2.1 of this SOP.

A figure showing the standard bleed-off valve arrangement is included in Subsection 6.3.1 of this SOP. Alternate arrangements also include using a swivel connection attached to the nipple so that it may be attached to a 45° SAE flare connector inserted in the test cock and two-needle valve arrangements for larger assemblies.

6.5.2 Field Test Kit Location

During field tests for DCDAs, it is important to keep the field test kit and unused hoses at appropriate elevations. Refer to the requirements described in Subsection 6.3.2 of this SOP.

6.5.3 Field Test Procedures

6.5.3.1 Test Number 1

Purpose: Test the operation of the bypass assembly.

Requirement: If the bypass assembly is a DCVA, it must comply with the field test requirements in Subsection 6.3 of this SOP. If the bypass assembly is a single check valve assembly, it must comply with the field test requirements of Subsection 6.3.3.1 (DCVA Test No. 1) of this SOP.

Notes: Request the owner or occupant to notify the authority having jurisdiction, the fire department, and/or the alarm-receiving facility, as required, prior to shutting down the fire protection system or its water supply. Record the water meter reading prior to and at the conclusion of this field test to aid in the determination of unauthorized water usage between field tests.

1. If the bypass assembly is a DCVA, perform the field test procedures per Subsection 6.3 of this SOP. If the bypass assembly is a single check valve assembly, perform the field test procedures per Subsection 6.3.3.1 (DCVA Test No. 1) of this SOP.
2. Maintain Shutoff Valve No. 2 of the bypass assembly in the closed position.

6.5.3.2 Test Number 2

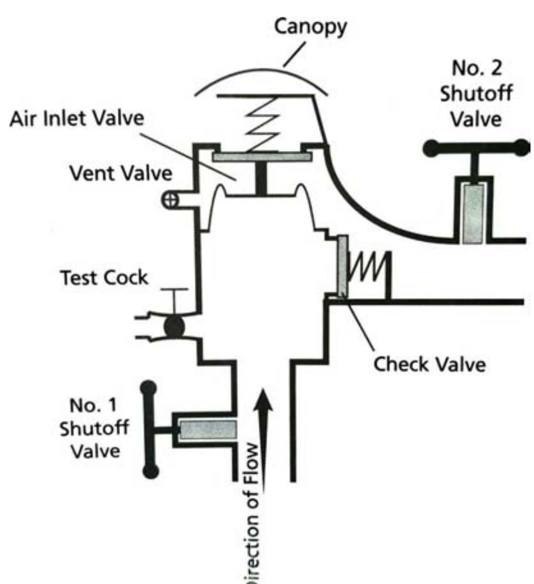
Purpose: Test the operation of the main line assembly.

Requirement: The main line assembly (a DCVA) must comply with the field test requirements in Subsection 6.3 of this SOP.

1. Perform the field test procedures per Subsection 6.3 (DCVA) of this SOP for the main line assembly.
2. Open all shutoff valves of the DCDA.

6.6 SPILL-RESISTANT PRESSURE VACUUM BREAKERS

This subsection details field testing procedures for SVBs. A diagram of a typical SVB is presented in the following figure with standard components labeled (Figure 9.39 from the USC FCCCHR manual [2009]):



6.6.1 Equipment Required

The following equipment is required for testing SVBs:

- Differential pressure field test kit with minimum range of 0 to 15 pounds psid with 0.1 or 0.2 psid gradations
- One (1) brass ¼-inch IPS, 45° SAE flare connectors
- Brass adapter fittings for each test cock size (e.g., ⅛-inch)
- Bleed-off valve arrangement, consisting of
  - ¼-inch needle valve
  - Brass ¼-inch nipple
  - Brass ¼-inch tee
  - Brass ¼-inch IPS, 45° SAE flare connector

SVBs can be tested using one of three test kit configurations: five, three, and two needle valves. A figure showing the standard configurations of these test kits is included in Subsection 6.2.1 of this SOP.

A figure showing the standard bleed-off valve arrangement is included in Subsection 6.3.1 of this SOP. Alternate arrangements also include using a swivel connection attached to the nipple so that it may be attached to a 45° SAE flare connector inserted in the test cock and two-needle valve arrangements for larger assemblies.

6.6.2 Field Test Kit Location

During field tests for SVBs, it is important to keep the field test kit and unused hoses at appropriate elevations.

To record the correct differential pressure reading during the check valve test (Test No. 1) and air inlet valve test (Test No. 2), the field test kit must be held at the same elevation as the vent valve.

All unused hoses must be maintained at the same elevation as the field test kit. If the low side hose contains water and the hose is maintained above or below the field test kit, the water in the hose will create a false reading.

6.6.3 Field Test Procedures

6.6.3.1 Test Number 1

Purpose: Determine the static differential pressure across the check valve.

Requirement: The static differential pressure across the check valve must be at least 1.0 psid.

Notes: The following procedures apply to five, three, and two needle valve field test kits. The only step that requires alternative action for three needle valve test kits is Step 7 (detailed below).

1. Remove the air inlet valve canopy.
2. Bleed water through the test cock and vent valve to eliminate foreign material.
3. Install an appropriate fitting to the test cock, if necessary.
4. Attach the bleed-off valve arrangement to the test cock.
5. Attach the hose from the high side of the field test kit to the bleed-off valve arrangement.
6. Open the test cock fully.
7. Bleed all air from the high side of the field test kit by fully opening the high side bleed needle valve. Close the valve.
    a. **Three Needle Valve Field Test Kits:** Bleed all air from the high side of the field test kit by fully opening the bypass needle valve and then fully opening the high side bleed needle valve. Close the high side bleed needle valve.
8. Close Shutoff Valve No. 2.
9. Maintain the field test kit at the same elevation as the vent valve.
10. Close Shutoff Valve No. 1.
    a. If the reading on the field test kit does not decrease, continue to Step 11.
    b. If the reading on the field test kit begins to decrease and the air inlet valve does not open, Shutoff Valve No. 2 is leaking and should be recorded as such. Continue to Step 11.
    c. If the air inlet valve was continuously discharging upon arrival, continue to Step 11.
11. Open the vent valve to lower outlet pressure to the atmosphere.
    a. If the air inlet valve does not open, continue to Step 12.

12. When the flow of water from the vent valve stops or is no more than a drip, the reading indicated is the differential pressure across the check valve. Record this value.
13. Continue to Test No. 2.

6.6.3.2 Test Number 2

Purpose: Determine the operating characteristics of the air inlet valve.

Requirement: The air inlet valve must open when the inlet pressure is at least 1.0 psi above atmospheric pressure and the outlet pressure is atmospheric pressure. The valve must also be fully open when the inlet pressure is atmospheric.

Notes: The following procedures apply to five, three, and two needle valve field test kits. The only step that requires alternative action for three needle valve test kits is Step 3 (detailed below).

1. Maintain the field test kit at the same elevation as the vent valve.
2. Slowly open the high side bleed needle valve no more than one-quarter turn, being careful not to drop the differential pressure reading on the field test kit too fast.
    a. **Three Needle Valve Field Test Kits:** Slowly open the high side of the field test kit no more than one-quarter turn, being careful not to drop the differential pressure reading on the field test kit too fast (bypass needle valve still open from Test No. 1).
3. Record the differential pressure reading on the field test kit when the air inlet valve opens.
    a. If the reading drops to 0.0 psid and the air inlet valve does not open, record that the valve did not open. Continue to Step 5.
4. Close the high side bleed needle valve.
5. Remove the high side hose from the bleed-off valve arrangement to drain water from the SVB body.
6. Record whether or not the air inlet valve is in the fully open position.
7. Close the test cock and vent valve.
8. Remove all test equipment and fittings from the SVB.
9. Open Shutoff Valve No. 1 fully.
10. Slowly open Shutoff Valve No. 2 fully.
11. Replace the air inlet valve canopy.

7. REPORTING AND RECORDKEEPING

Field testing forms to be utilized for these procedures are included in Appendix B of the JBPHH CCC/BFP Program Plan (December 2025).

A copy of each field testing form will be provided to the CCC/BFP Program Manager by the certified tester. The Program Manager, or designated JBPHH Public Works Department personnel, will input information from the field tests into the BFP assembly and device database maintained via International Business Machines Corporation Maximo® Application Suite software. Refer to Subsection 5.1 of the JBPHH CCC/BFP Program Plan (December 2025) for additional information.

8. REFERENCES

University of Southern California Foundation for Cross-Connection Control and Hydraulic Research. *Manual of Cross-Connection Control*. 10th Edition. October 2009.

9. REVISION HISTORY

Date	Update By	Lead Reviewer	Revision Description
December 2024	AH Engineering Consultants	(b) (6) [redacted]	Initial Draft
March 2025	AH Engineering Consultants		Initial Draft, Revision 1
September 2025	AH Engineering Consultants		Initial Pre-Final
December 2025	AH Engineering Consultants		Initial Final

10. DOCUMENT MAINTENANCE

The JBPHH CCC/BFP Program Manager shall annually review and update this SOP, as necessary, and assure that all applicable components of the CCC/BFP program are managed in accordance with this document's requirements.

This SOP is maintained with the CCC/BFP Program Plan (December 2025).

APPENDIX D

Naval Facilities Engineering Systems Command Hawaii Water Utilities Technical Requirements for Contractors Requesting Temporary Water Services

(14 May 2021)

NAVFAC Hawaii Water Utilities Technical Requirements for Contractors Requesting Temporary Water Services

These requirements apply to all contractors requesting temporary water services in areas serviced by the NAVFAC Hawaii Potable Water System. These locations include, but are not limited to, Joint Base Pearl Harbor – Hickam (JBPHH), MCBH Camp Smith, Pearl City Peninsula, Waipio Peninsula, West Loch, Iroquois Point, Puuloa, all Navy, Air Force and Marine Corps Housing Areas within JBPHH, NCTAMS PAC Wahiawa, and RTF & NAVMAG Lualualei.

SUMMARY: Any Contractor temporary water connection to the NAVFAC Hawaii potable water system shall have (1) a reduced pressure principle (RPP) backflow preventer, and (2) a water meter. The RPP backflow preventer is required on the connection as part of NAVFAC Hawaii's Cross Connection Control Program to mitigate potential contamination to the Navy potable water system resulting from the Contractor's activities. The water meter is required to enable NAVFAC Hawaii the means to bill the Contractor appropriately for their water consumption.

Questions? Contact NAVFAC Hawaii Water Utilities at phone 808-473-0958.

Item No.	Description	Notes
1	<u>**Initial inquiry with Contractor:**</u> Contractor shall notify Contracting Officer if a temporary water connection is needed during construction.	Note that the most common need for water is typically for dust control. So a contractor working on a road repaving or street light installation project may still require water, even though their scope of work may have nothing to do with the Navy water system. Also note that the Contractor's scope of work may require them to restore their laydown/storage area after completion of their project, or provide landscaping maintenance which will typically extend past contractor's demobilization from project site. All temporary water connections to the Navy water system shall be made via fire hydrants. Any other means of connection shall be reviewed and approved by APWO, area FOS, and NAVFAC HI Water Utilities.
2	<u>**Required Documentation:**</u> If Contractor requires water service, Contracting Officer shall setup: a. Determination and Findings for Utility Sales (D&F): this is the Government's validation that the contractor has a need for Navy provided water. b. Utility Sales Agreement (USA): this establishes the agreement between the Government and the Contractor for sale of Navy-provided utilities and related utility services during construction.	Note that setting up a D&F and a USA typically requires several (2-3) weeks for processing and approval. Therefore, contractor temporary utility requirements should be determined at the very start of the project, not when the contractor has already setup their field office/trailer and is ready to hookup to the Navy water system. For the D&F, note that NAVFAC HI Water Utilities is ***NOT*** obligated to provide temporary water services for contractors. NAVFAC HI Water Utilities can refuse service to a contractor if the proposed point of connection to the Navy water system is located near to a competing water source (such as a municipal Honolulu Board of Water Supply fire hydrant).

NAVFAC
Naval Facilities Engineering Systems Command
NAVFAC Hawaii

NAVFAC Hawaii Water Utilities Technical Requirements for Contractors Requesting Temporary Water Services

These requirements apply to all contractors requesting temporary water services in areas serviced by the NAVFAC Hawaii Potable Water System. These locations include, but are not limited to, Joint Base Pearl Harbor – Hickam (JBPHH), MCBH Camp Smith, Pearl City Peninsula, Waipio Peninsula, West Loch, Iroquois Point, Puuloa, all Navy, Air Force and Marine Corps Housing Areas within JBPHH, NCTAMS PAC Wahiawa, and RTF & NAVMAG Lualualei.

SUMMARY: Any Contractor temporary water connection to the NAVFAC Hawaii potable water system shall have (1) a reduced pressure principle (RPP) backflow preventer, and (2) a water meter. The RPP backflow preventer is required on the connection as part of NAVFAC Hawaii's Cross Connection Control Program to mitigate potential contamination to the Navy potable water system resulting from the Contractor's activities. The water meter is required to enable NAVFAC Hawaii the means to bill the Contractor appropriately for their water consumption.

Questions? Contact NAVFAC Hawaii Water Utilities at phone 808-473-0958.

Item No.	Description	Notes
3	**<u>Getting Contractor's Water Hookup Request to NAVFAC HI Water Utilities:</u>** Once the D&F and USA has been approved, NAVFAC HI Financial Management (FM) will assign GLAs to the Contractor for (1) temporary utilities consumption and (2) reimbursable EUR (Emergency, Urgent, Recurring) service requests. When Contractor has these accounts setup and funded, they can submit a work request (through FM) to the JBPHH Service Desk.	See attached sample Work Request Form that Contractor fills out to request the temporary water connection.
4.	**<u>Equipment Required for Temporary Water Connection:</u>** Contractor shall provide a reduced pressure principle backflow preventer (BFP) approved by the University of Southern California Foundation of Cross Connection Control and Hydraulic Research (i.e. "USC-approved"). NAVFAC HI Water Utilities will provide a calicrated water meter, which is typically 2-in in size. The water meter is normally installed directly to the fire hydrant, with the backflow preventer installed downstream of the meter – see attached example of a temporary water connection. Contractor shall ensure that meter/BFP assembly is adequately supported and shall not impede passage of water from the BFP dump port.	The BFP is required under NAVFAC HI's Cross Connection Control Program. This device protects the Navy water system from any potential contamination caused by the Contractor's activities. All installed BFPs shall be tested and certified by NAVFAC HI Water Utilities. The test/certification for an installed BFP is only valid at that specific location - once the device has been tested, Contractor shall not move it to another location without approval from NAVFAC HI Water Utilities. If the Contractor desires to move the temporary water connection to another location, Contractor shall submit another Work Request to have NAVFAC HI Water Utilities re-test/re-certify BFP in its new location. Note that once BFP has been tested and certified by NAVFAC HI, the Contractor is responsible for its proper operation – if the device should malfunction and start dumping water, Contractor will be financially responsible for the water lost during the dump episode.

NAVFAC Hawaii Water Utilities Technical Requirements for Contractors Requesting Temporary Water Services

These requirements apply to all contractors requesting temporary water services in areas serviced by the NAVFAC Hawaii Potable Water System. These locations include, but are not limited to, Joint Base Pearl Harbor – Hickam (JBPHH), MCBH Camp Smith, Pearl City Peninsula, Waipio Peninsula, West Loch, Iroquois Point, Puuloa, all Navy, Air Force and Marine Corps Housing Areas within JBPHH, NCTAMS PAC Wahiawa, and RTF & NAVMAG Lualualei.

SUMMARY: Any Contractor temporary water connection to the NAVFAC Hawaii potable water system shall have (1) a reduced pressure principle (RPP) backflow preventer, and (2) a water meter. The RPP backflow preventer is required on the connection as part of NAVFAC Hawaii's Cross Connection Control Program to mitigate potential contamination to the Navy potable water system resulting from the Contractor's activities. The water meter is required to enable NAVFAC Hawaii the means to bill the Contractor appropriately for their water consumption.

Questions? Contact NAVFAC Hawaii Water Utilities at phone 808-473-0958.

Item No.	Description	Notes
5.	**<u>Termination of Temporary Water Services:</u>** Within 30 days of terminating water services, Contractor shall provide a letter on company letterhead to NAVFAC HI FM indicating the desire to terminate utility services. Upon confirmation of letter receipt by NAVFAC HI FM, Contractor shall submit a minor work request, checking off the box indicating to "take final read and remove temporary water meter".	Failure by Contractor to formally notify NAVFAC HI of utility service termination may result in the water meter remaining on the fire hydrant after completion of project. There have been cases where other parties start taking water off the same metered connection, resulting in the Contractor being continuously billed for water usage even though they were completed with the project.

-- End of Requirements --

:: Contractor Shall Fill Out Info in Red ::

Request for Routine Service and Minor Work

To NAVFAC Hawaii Financial Management, Code FM11 - Fax: 471-0155	Date: *Today's Date*
From Requestor:	Check One:
ABC Contracting *1234 North Avenue* *Honolulu, HI 96860*	☐ Service ☑ Minor Job Order No: *H.2021STC6.123456.654321* Authorized By:
Location: *Makalapa*	*Contractor Authorized Financial POC*

Floor:	Room No:	Bldg No.	Geographic Area:
			Fire Hydrant 21 on Alpha St

Submitted By:

1st Contac	*Ktr 1st POC*	Phone No.:	*Ktr 1st POC ph #*	Fax No.:	N/A
2nd Contac	*Ktr 2nd POC*	Phone No.:	*Ktr 2nd POC ph #*	Fax No.:	N/A

Please check all that apply:

CONTRACT NO: (#/TO) *N62478-20-D-4835/N62478-20-F-3993*

1) POTABLE WATER

- ☐ Tapping the Navy's Potable Water Lines.
- ☐ Testing/Certifying New Backflow Prevention Devices.
- ☐ Supporting Scheduled/Unscheduled Outages.
- ☐ Calibrating New Water Meters.
- ☑ Provide Calibrated Water Meters and Certifying Contractgor provided backflow prevention devices for temporary water services.

2) ELECTRICAL

- ☐ Operation of NES including electrical switch.
- ☐ Calibration and Installation of Electrical Meters.

3) WASTEWATER

- ☐ Work on Lift Station, Collection System and Treatment Plant including:
- ☐ Ship-to-Shore hose connections to Ships Wastewater Collection Ashore Abatement System (SWWCAAS).
- ☐ Work related to Wastewater Spillage.
- ☐ Work related to the Navy's wastewater Superiory Control and Data Acquisition (SCADA) system.

Description of Work to be Accomplished: (Please be specific):

NAVFAC Water Utilities to install water meter and test/certify contractors BFP
Proposed date/time is Thursday, January 30 at 0800 hrs.

To Be Filled By NAVFAC HI, Code 20 Only

To:	Date:
Type of Service:	Assigned Service/Minor Number(s):
Processed By:	Assigned Work Center(s):

:: Contractor Shall Fill Out Info in Red ::


520
WILKINS
Logistics Center
Hawaii

APPENDIX E

Backflow Incident Report Form

(modified from Appendix F of the California Environmental Protection Agency's *Cross-Connection Control Policy Handbook*, adopted 19 December 2023)

BACKFLOW INCIDENT REPORT FORM

Water System: ____

Water System Number: ______________________________________

Incident Date: ____

Incident Time (if known):_____________________________________

Incident Location: ____

How was the incident discovered?

____

Backflow Originated from:

Premise Location: _______________________________________

Address: ____

Premise Contact Person: ___________________ Title:________________

Phone:____________ Email: __________________________

Connection Type: (please check one)

Industrial ☐ Commercial ☐ Single-Family Residential ☐ Multi-Family Residential

Irrigation ☐ Recycled Water ☐ Water System Facility

Other: _________________________________

Description and source of backflow substance (please be as descriptive as possible):

____

____

If available, please attach an SDS or other chemical description form.

Was the backflow fluid contained within the user side? YES NO

Estimated Number of Affected Persons: _______________________________

Number and description of consumer complaints received:

____

____

Did any consumers report illness? Please describe.

____

____

If applicable, please describe the consumer notification:

____

____

INVESTIGATION

Please describe the water system investigation including time frames:

____

____

____

____

____

____

What was the area system pressure? ____

Is this within typical range: YES ☐ NO ☐ - typical pressure: ______________

Was a sample of the water contaminated by the backflow incident collected and stored before flushing? YES ☐ NO ☐

Please describe all sampling:

____

____

____

CORRECTIVE ACTIONS

Please describe the corrective actions taken by the water system:

____

____

____

____

____

____

Was the chlorine residual increased after discovery of backflow incident? YES ☐ NO

Date of the last cross-connection control hazard assessment of the premise with the backflow incident conducted: ______________________________________

Did the premise have backflow prevention assemblies? YES ☐ NO ☐

Date of most recent backflow prevention assembly test(s): ____________________

When was the NAVFAC HI Environmental office notified?

Dates: _______________Times: __________ Contact Persons: __________________

Was the NAVFAC HI Environmental office notified within 24 hours? YES ☐ NO

Other agencies or organizations contacted?

CERTIFICATION

Name: __________________________________ Job Title: _______________________

Certification(s): ____

____

Please list all cross-connection control related certifications including number and expiration date

I certify that the forgoing information is true and correct to the best of my ability.

Signature: ______________________________ Date: _____________________________

Attach the following applicable documentation

1. Laboratory Test Results
2. Sketch of the cross-connection and modifications
3. SDS or chemical information forms if chemical hazard is known
4. Applicable backflow assembly test reports including the most recent test before the incident
5. Other relevant supporting documentation

APPENDIX F

Public Notification Letters

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND HAWAII
JOINT BASE PEARL HARBOR-HICKAM
PUBLIC WORKS DEPARTMENT
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

[LETTER DATE]

[FACILITY/BUILDING MANAGER NAME]
[ADDRESS]
[CITY, STATE ZIP CODE]

Subj: CROSS-CONNECTION CONTROL (CCC) AND BACKFLOW PREVENTION (BFP) SURVEY

Ref: (a) NAVFACHIINST 11330.1A, [INST DATE]
(b) JBPHH CCC/BFP Program Plan, [PLAN DATE]

Dear [FACILITY/BUILDING MANAGER NAME],

NAVFAC HI policy, established via reference (a), requires a survey of potential cross-connections and existing BFP assemblies and devices related to the JBPHH public water system (PWS) as described in reference (b). The objective is to review system conditions to ensure that no actual or potential cross-connections exist without proper BFP applied. You are hereby given notice to comply with these survey requirements for [FACILITY NAME(S) AND/OR BUILDING NO(S).]. Survey activities are tentatively scheduled for [SURVEY DATE(S)].

Per the JBPHH CCC/BFP Program Plan, a cross connection is defined as "[a]ny actual or potential connection or structural arrangement, directly or indirectly, between a PWS or a consumer's [fit for human consumption (FFHC)] water system and any other source or system through which it is possible to introduce into any part of the FFHC system any used water, industrial fluid, gas, sewage, or substance other than the intended FFHC water with which the system is supplied."

Survey activities will be conducted by [PWD PERSONNEL/CONTRACTOR] and consist of a visual review of the service line connection(s) and, if necessary, internal plumbing to facilities. There will be **no impacts to the water supply**. Attached is a summary of existing BFP assemblies and devices for the abovementioned facilit(y/ies), based on current JBPHH PWD records, that will be included in survey activities, at a minimum.

Please contact me at [PROGRAM MANAGER PHONE NO. AND/OR EMAIL] to provide information on access and coordination requirements along with any questions.

Sincerely,

[PROGRAM MANAGER NAME]
JBPHH CCC/BFP Program Manager

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND HAWAII
JOINT BASE PEARL HARBOR-HICKAM
PUBLIC WORKS DEPARTMENT
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

[LETTER DATE]

[FACILITY/BUILDING MANAGER NAME]
[ADDRESS]
[CITY, STATE ZIP CODE]

Subj: BACKFLOW PREVENTION (BFP) ASSEMBLY TESTING

Ref: (a) NAVFACHIINST 11330.1A, [INST DATE]
(b) JBPHH CCC/BFP Program Plan, [PLAN DATE]
(c) Hawaii Administrative Rules, Section 11-21-8(b)

Dear [FACILITY/BUILDING MANAGER NAME],

NAVFAC HI policy, established via reference (a), requires annual testing of BFP assemblies associated with the JBPHH public water system (PWS) as described in reference (b). This is also a requirement of state regulations, established through reference (c). One or more BFP assemblies associated with [FACILITY NAME(S) AND/OR BUILDING NO(S).] are due for their field tests. These activities are tentatively scheduled for [SURVEY DATE(S)].

The purpose of periodically testing BFP assemblies is to ensure that they are operating properly and thus protecting the upstream fit for human consumption (FFHC) water system from the introduction of any non-FFHC water or other substances introduced into the downstream system via backflow.

Testing activities will be conducted by [PWD PERSONNEL/CONTRACTOR] and consist of **temporarily interrupting service downstream of each BFP assembly** during testing procedures, developed under reference (b). Attached is a list providing details for each affected assembly based on current JBPHH PWD records.

Please contact me at [PROGRAM MANAGER PHONE NO. AND/OR EMAIL] to provide information on access and coordination requirements along with any questions. Failure to respond to this notification may result in water service to your facilit(y/ies) being terminated.

Sincerely,

[PROGRAM MANAGER NAME]
JBPHH CCC/BFP Program Manager

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND HAWAII
JOINT BASE PEARL HARBOR-HICKAM
PUBLIC WORKS DEPARTMENT
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

[LETTER DATE]

[FACILITY/BUILDING MANAGER NAME]
[ADDRESS]
[CITY, STATE ZIP CODE]

Subj: BACKFLOW PREVENTION (BFP) ASSEMBLY AND/OR DEVICE REPAIR

Ref: (a) NAVFACHIINST 11330.1A, [INST DATE]
(b) JBPHH CCC/BFP Program Plan, [PLAN DATE]

Dear [FACILITY/BUILDING MANAGER NAME],

NAVFAC HI policy, established via reference (a), requires repair or replacement of defective BFP assemblies and devices within 30 days of identifying a defect, as described in reference (b). One or more BFP assemblies and/or devices associated with [FACILITY NAME(S) AND/OR BUILDING NO(S).] has been identified to have an operational defect requiring [REPAIR AND/OR REPLACEMENT]. These activities are tentatively scheduled for [SURVEY DATE(S)].

BFP assemblies and devices are plumbing mechanisms that protect the upstream fit for human consumption (FFHC) water system from the introduction of any non-FFHC water or other substances introduced into the downstream system via backflow.

[REPAIR AND/OR REPLACEMENT] activities will be conducted by [PWD PERSONNEL/CONTRACTOR] and consist of **temporarily interrupting service downstream of each BFP assembly and/or device** during procedures. Attached is a list providing details for each affected assembly and/or device based on current JBPHH PWD records.

Please contact me at [PROGRAM MANAGER PHONE NO. AND/OR EMAIL] to provide information on access and coordination requirements along with any questions. Failure to respond to this notification may result in water service to your facilit(y/ies) being terminated.

Sincerely,

[PROGRAM MANAGER NAME]
JBPHH CCC/BFP Program Manager

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND HAWAII
JOINT BASE PEARL HARBOR-HICKAM
PUBLIC WORKS DEPARTMENT
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

[LETTER DATE]

[DOH CONTACT NAME]
[DOH CONTACT POSITION]
Safe Drinking Water Branch
Environmental Management Division
Hawaii State Department of Health
2385 Waimano Home Road, Suite 110
Uluakupu Building 4
Pearl City, Hawaii 96782-1400

Subj: BACKFLOW INCIDENT AT [FACILITY NAME(S) AND/OR BUILDING NO(S).], JOINT BASE PEARL HARBOR-HICKAM

Dear [DOH CONTACT NAME],

Please be advised that personnel for the JBPHH public water system (PWS) have determined that a backflow incident has occurred within the system.

Evidence of the incident was first discovered at approximately [TIME OF INCIDENT DISCOVERY] on [DATE OF INCIDENT DISCOVERY]. [INCIDENT DESCRIPTION, INCLUDING LOCATION OF DISCOVERY, SOURCE (IF KNOWN), AND EXTENT OF CONTAMINATION/POLLUTION].

The portion of the JBPHH PWS distribution system impacted by this backflow incident has been isolated and all impacted customers have been notified of water service interruption and/or to cease use of the system. Further details on the source of the incident, impacts on the water system and customers, planned remedial actions, and progress on those remedial actions will be provided as they are developed.

Please contact me at [PWO PHONE NO. AND/OR EMAIL] with any comments or questions.

Sincerely,

[PWO NAME]
JBPHH Public Works Officer

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND HAWAII
JOINT BASE PEARL HARBOR-HICKAM
PUBLIC WORKS DEPARTMENT
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

[LETTER DATE]

[FACILITY/BUILDING MANAGER NAME]
[ADDRESS]
[CITY, STATE ZIP CODE]

Subj: CROSS-CONNECTION CONTROL (CCC)/BACKFLOW PREVENTION (BFP) PROGRAM VIOLATION – 1ST NOTICE

Ref: (a) NAVFACHIINST 11330.1A, [INST DATE]
(b) JBPHH CCC/BFP Program Plan, [PLAN DATE]

Dear [FACILITY/BUILDING MANAGER NAME],

NAVFAC HI policy, established via reference (a), requires proper implementation of the CCC/BFP program for the JBPHH public water system as described in reference (b). It has been determined that water service to [FACILITY NAME(S) AND/OR BUILDING NO(S).] is in violation of this program and requires remedial action. [VIOLATION DESCRIPTION, INCLUDING LOCATION OF VIOLATION, EXTENT OF POTENTIAL IMPACT, AND REQUIRED REMEDIAL ACTIONS].

Proper implementation of the JBPHH CCC/BFP program is necessary to ensure protection of the fit for human consumption (FFHC) water within the PWS from cross-connections and/or backflow incidents.

This incident must be resolved within 30 days of the date of this letter. Failure to respond to this notification may result in water service to your facilit(y/ies) being terminated.

Please contact me at [PWO PHONE NO. AND/OR EMAIL] to verify receipt of this letter along with a description of your planned remedial actions and schedule, along with any questions.

Sincerely,

[PWO NAME]
JBPHH Public Works Officer

DEPARTMENT OF THE NAVY
NAVAL FACILITIES ENGINEERING SYSTEMS COMMAND HAWAII
JOINT BASE PEARL HARBOR-HICKAM
PUBLIC WORKS DEPARTMENT
400 MARSHALL ROAD
JBPHH, HAWAII 96860-3139

[LETTER DATE]

[FACILITY/BUILDING MANAGER NAME]
[ADDRESS]
[CITY, STATE ZIP CODE]

Subj: CROSS-CONNECTION CONTROL (CCC)/BACKFLOW PREVENTION (BFP) PROGRAM VIOLATION – 2ND NOTICE

Ref: (a) NAVFACHIINST 11330.1A, [INST DATE]
(b) JBPHH CCC/BFP Program Plan, [PLAN DATE]

Dear [FACILITY/BUILDING MANAGER NAME],

This letter is a follow up response to an initial CCC/BFP program violation previously dated [1ST NOTICE LETTER DATE]. It is being sent after no response was received after 30 days.

NAVFAC HI policy, established via reference (a), requires proper implementation of the CCC/BFP program for the JBPHH public water system as described in reference (b). It has been determined that water service to [FACILITY NAME(S) AND/OR BUILDING NO(S).] is in violation of this program and requires remedial action. [VIOLATION DESCRIPTION, INCLUDING LOCATION OF VIOLATION, EXTENT OF POTENTIAL IMPACT, AND REQUIRED REMEDIAL ACTIONS].

Proper implementation of the JBPHH CCC/BFP program is necessary to ensure protection of the fit for human consumption (FFHC) water within the PWS from cross-connections and/or backflow incidents.

This incident must be resolved within 30 days of the date of this letter. Failure to respond to this notification may result in water service to your facilit(y/ies) being terminated. In addition, a mandatory meeting with myself and [NAME OF ICO], JBPHH Installation Commanding Officer, will be scheduled.

Please contact me at [PWO PHONE NO. AND/OR EMAIL] to verify receipt of this letter along with a description of your planned remedial actions and schedule, along with any questions.

Sincerely,

[PWO NAME]
JBPHH Public Works Officer

APPENDIX G

Public Awareness Documentation

All personnel employed by Naval Facilities Engineering Systems Command Hawaii (HI) and/or within a facility at Joint Base Pearl Harbor-Hickam, HI, should receive minimal awareness training to inform them of the importance of cross-connection control (CCC) and backflow prevention (BFP), their role in CCC, and health hazards associated with cross-connections. This information should also be shared with non-Navy customers for the JBPHH public water system (PWS).

At a minimum, the items listed below should be covered. Included with this document are a public awareness presentation and flyers that can be utilized for this process. Modifications should be made to reflect the intended audience. Instructors/presenters must be familiar with the JBPHH CCC/BFP Program Plan.

1. <u>What is a cross-connection?</u>

   A cross-connection is any actual or potential, direct (e.g., plumbing) or indirect (e.g., hose) connection between a PWS (or a system containing water fit for human consumption [FFHC]) and any other source or system through which it is possible to introduce used water, industrial fluid, gas, sewage, or any other non-FFHC substance. This covers any part of the PWS (or FFHC water system) regardless of application (e.g., fire protection).

2. <u>What are examples of cross-connections?</u>

   Example direct cross-connections include fill pipes to chemical or non-FFHC water storage tanks, service connections for irrigation or to facilities/systems utilizing chemical applications, or drain lines connected to sewer systems.

   Example indirect cross-connections include attaching a garden hose to a pesticide/chemical spray bottle, submerging a hose into a swimming pool, or a showerhead hose that extends below the fill rim of a tub or shower basin.

3. <u>What is CCC?</u>

   CCC is a program by which cross-connections are eliminated or prevented from happening and causing a public health threat.

4. <u>What is backflow?</u>

   Backflow is the undesirable reverse flow of water or mixtures of water and other substances into the distribution pipes of a FFHC water supply or system. It can happen either from backpressure or backsiphonage. There must be a cross-connection for backflow to occur.

Backflow from backpressure occurs when the pressure from the downstream (i.e., non-FFHC) piping system is greater than the upstream (i.e., FFHC) supply pressure, forcing the reversal of flow.

Backsiphonage occurs when the upstream (i.e., FFHC) water supply experiences negative pressure (partial vacuum), sucking any non-FFHC water or other substances into the supply.

5. What is the best way to prevent backflow?

   The best way to prevent backflow is to eliminate any cross-connections. This includes disconnecting hoses when not in use, not submerging hoses when filling tanks or basins, and avoiding connections to any machinery or equipment without installing proper BFP.

   Remember, DO NOT connect anything to the water system that you wouldn't want to drink.

6. What is BFP?

   Whenever a cross-connection must be made, BFP must be installed. When this is the case, an effective mechanism (called a BFP assembly or device) must be used. These assemblies and devices are designed to prevent backflow into the FFHC water supply or system. There are many types of assemblies and devices that are selected based on the existing or potential degree of hazard and backflow condition (i.e., backflow and/or backsiphonage).

Contact the JBPHH CCC/BFP Program Manager with any questions about CCC, BFP, and implementation of the CCC/BFP program at the installation. The program manager should also be contacted regarding any concerns or observations related to actual or potential cross-connections or backflow incidents.

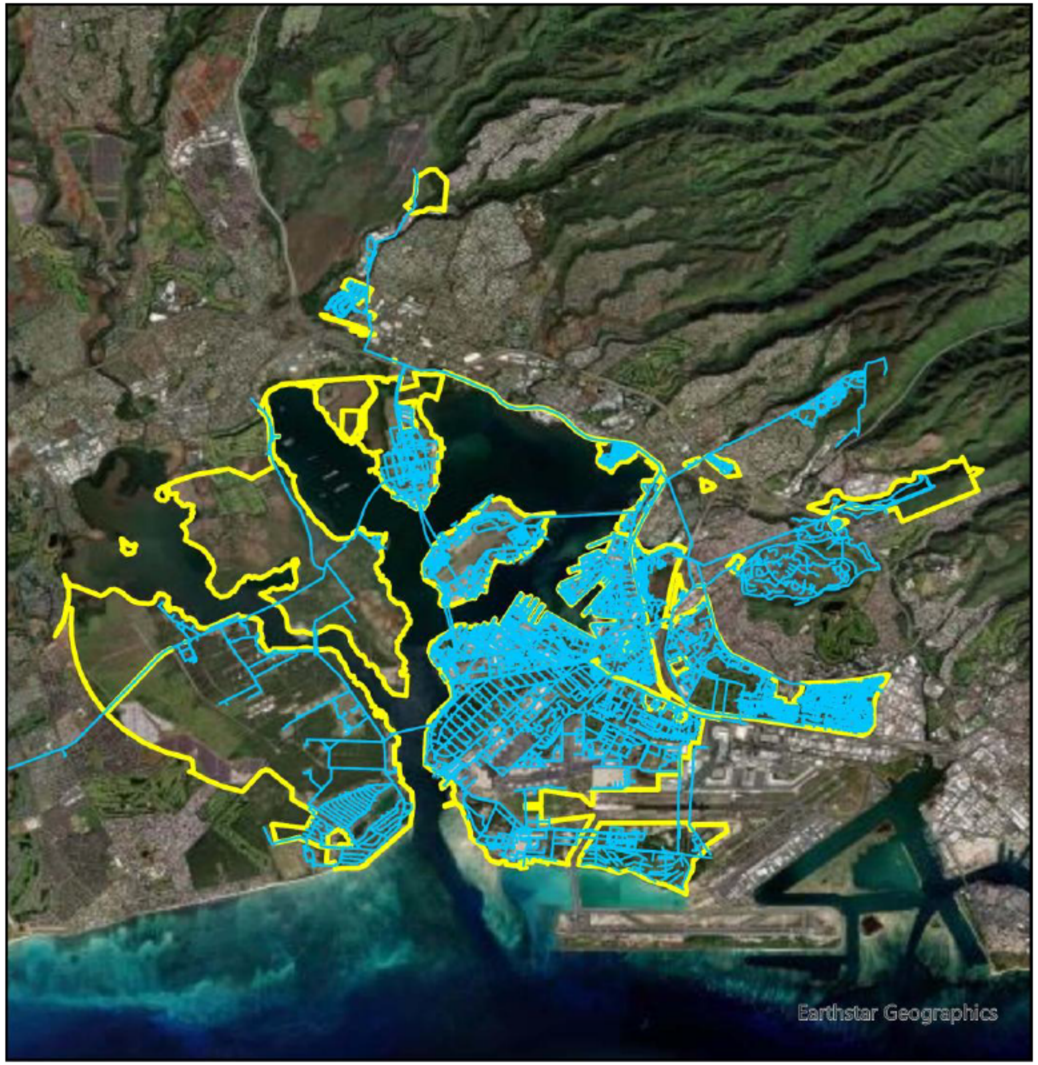
Drinking Water System Cross-Connection Control (CCC)/Backflow Prevention (BFP) Program Public Awareness Education/Training

Joint Base Pearl Harbor-Hickam (JBPHH), Hawaii (HI)

[DATE]

JBPHH Public Water System (PWS)

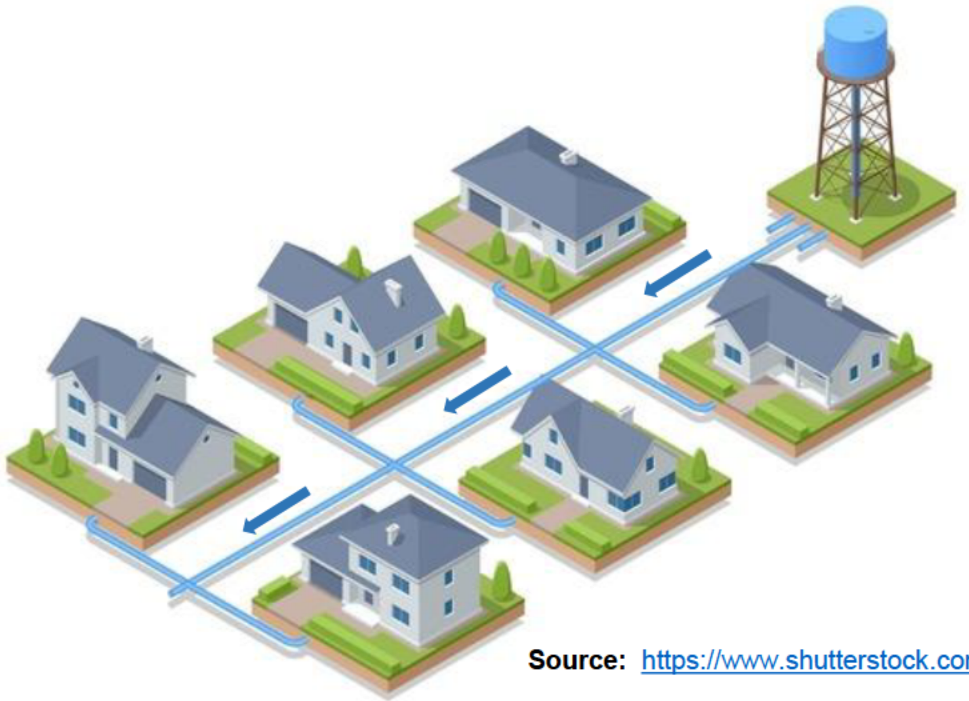
- **Owned and operated by JBPHH**
- **Serves approximately 70,000 people at main installation, Camp Smith (Marines), Aliamanu Military Reservation (Army), and privatized Navy/Marines housing**
- **Regulated by the HI Department of Health per the Safe Drinking Water Act (1974, 1986, 1996)**
  - PWS ID HI0000360
- **Additional DoD regulations (e.g., OPNAV M-5090.1)**



Water Distribution System

- **One-Directional Flow**
  - Driven by pressure (e.g., pumps, elevation)
  - Ensures drinking water flows in intended direction, preventing contamination

- **Water Separation**
  - Maintain a clear distinction between water that is fit for human consumption (FFHC) and non-FFHC water, substances, and sources
  - "FFHC" term used in lieu of "potable" by Navy

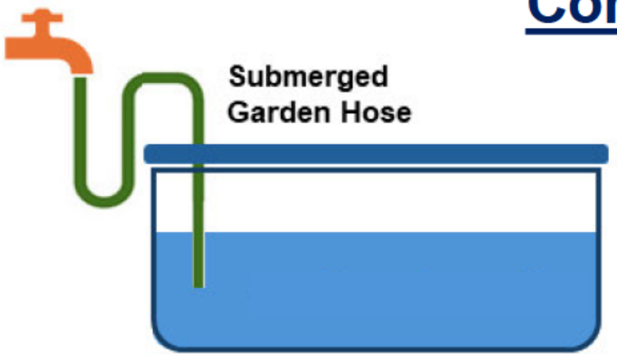


Source: https://www.shutterstock.com/

Cross-Connections

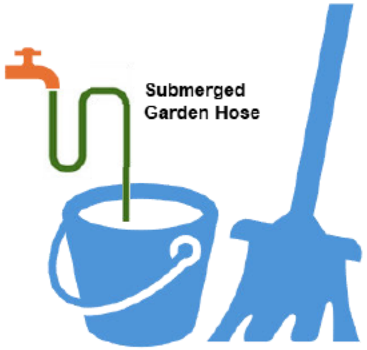
"Any actual or potential connection or structural arrangement, directly or indirectly, between a PWS or a consumer's FFHC water system and any other source or system through which it is possible to introduce into any part of the FFHC system any used water, industrial fluid, gas, sewage, or substance other than the intended FFHC water with which the system is supplied"
–JBPHH CCC/BFP Program Plan

Common Household Examples

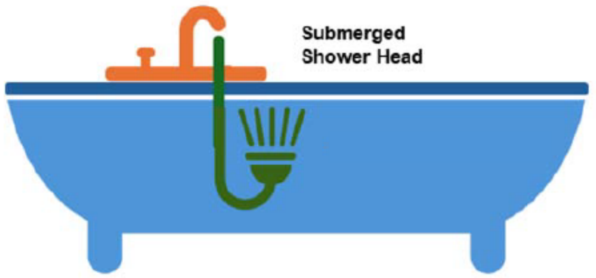


Source: https://www.brwater.com/

Swimming Pools



Toxic Bucket



Bathtubs

Protecting Your Drinking Water at Home

DOs

- Keep the ends of hoses off the ground and clear of any contaminants
- Install self-retractable kitchen sink sprayers
- Verify that detachable showerhead hoses do not extend below rim of tub or shower base
- Ensure that toilet tanks have properly installed and operating anti-siphon fill valves
- Install hose bibb vacuum breakers on all threaded faucets
- Consider having a licensed plumber inspect your home for cross-connections

DON'Ts

- Submerge hoses in buckets, tubs, sinks, pools, or ponds
- Leave non-FFHC water or substances stored near points of water use
- Use hoses to unplug blocked toilets or sewer pipes
- Connect drain lines from ice machines, water softeners, and other appliances/equipment using FFHC water directly to the sewer
- Install lawn irrigation without proper BFP

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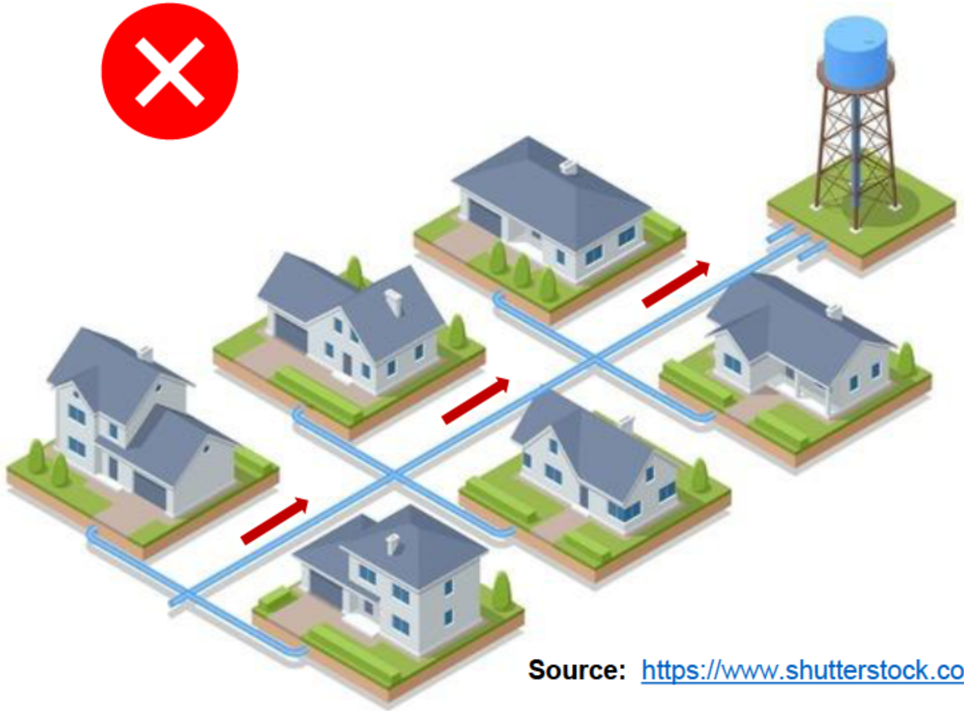
Backflow

"The undesirable reversal of flow of water or mixtures of water and other liquids, gases, or other substances into the distribution pipes of the FFHC water supply from any source or sources; created due to the existence of a pressure differential where the pressure on the non-FFHC side is greater than the pressure on the FFHC side"
–JBPHH CCC/BFP Program Plan

In other words, water flowing in the opposite direction of its intended flow



Source: https://www.shutterstock.com/

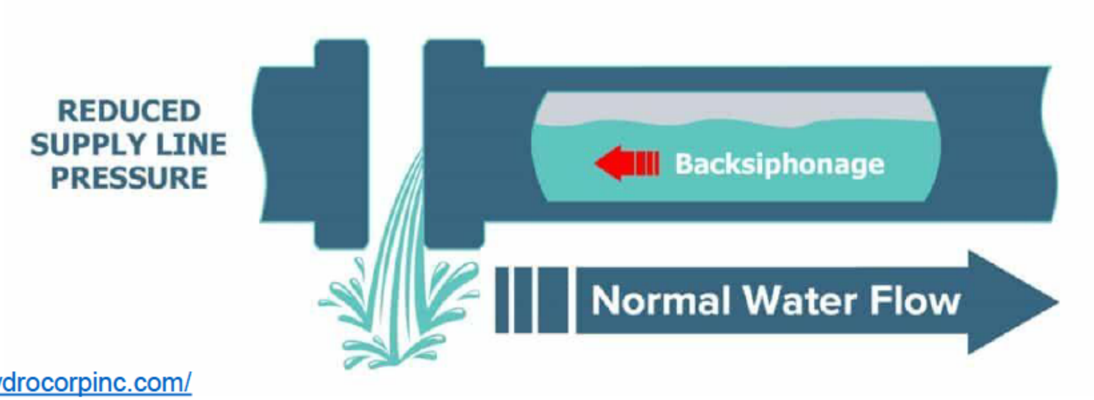
Types of Backflow

Backpressure

"Any elevation of pressure in the downstream (non-FFHC) piping system (e.g., pumps, piping elevation, steam, or air pressure) above the supply pressure"
–JBPHH CCC/BFP Program Plan

Backsiphonage

"A form of backflow due to a reduction in system pressure that causes a negative pressure (partial vacuum) to exist in the water system"
–JBPHH CCC/BFP Program Plan



Source: https://hydrocorpinc.com/

Degrees of Hazard

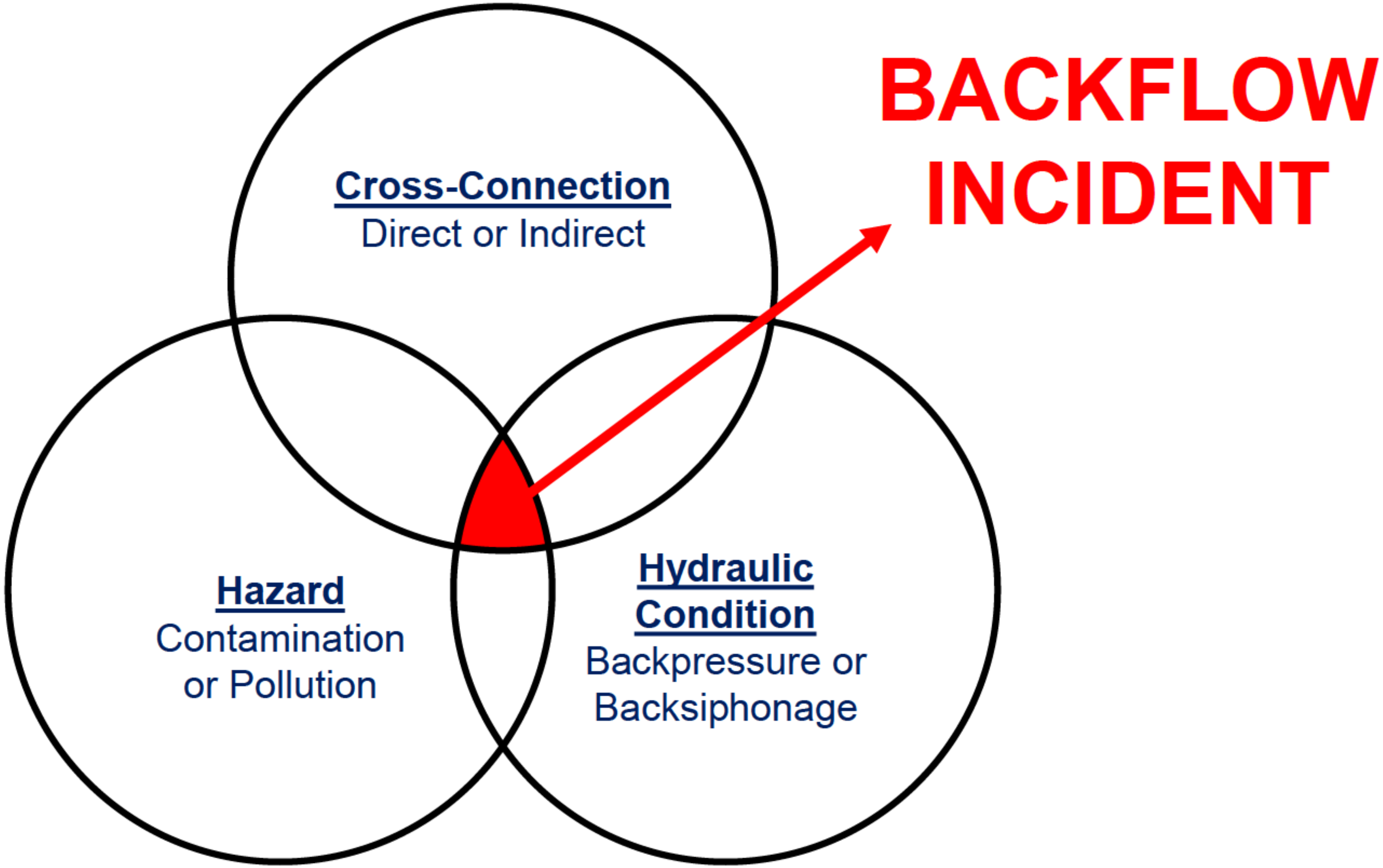
Contamination/ Health Hazard/ High Hazard

"Any substance that, if introduced to the FFHC water system, will impair the quality of water in such a way as to create an actual hazard to public health and well-being (e.g., death, illness, poisoning, spread of disease)"
–JBPHH CCC/BFP Program Plan

Pollution/ Non-Health Hazard/ Low Hazard

"An impairment of the quality of the water to a degree that does not create a hazard to public health but does adversely and unreasonably affect the cosmetic (e.g., skin/tooth discoloration) or aesthetic (e.g., taste, odor, color) qualities of such waters for domestic use"
–JBPHH CCC/BFP Program Plan

Backflow Requirements



Backflow in the Headlines

GRAND PRAIRIE

Fire foam contaminates Grand Prairie water supply, local schools remain closed

Affected customers who live north of Interstate 20 should avoid all contact with tap water

By De'Anthony Taylor and Vince Sims • Published September 3, 2024 • Updated on September 5, 2024 at 11:38 am

The mayor reassured the public that no threat or act of terrorism was involved and reiterated that the backflow incident involved non-PFAS foam that he called "environmentally friendly."

Source: https://www.nbcdfw.com/

NEWS

Days-long "do not use" order remains in effect in West Springfield

Posted: Jul 24, 2024 / 05:18 PM EDT
Updated: Jul 25, 2024 / 06:22 PM EDT

"It likely wasn't coming from the construction on Memorial Ave it wasn't coming from any other break. It looks like some kind of backflow incident," said Mayor Reichelt. The city says backflow of contaminated water into clean water pipes caused the incident.

Source: https://www.wwlp.com/

Financial Impacts of Backflow

- **1999 Survey by the American Backflow Prevention Association**
  - Average of 494 hours for mitigation of one backflow incident
  - Estimated to cost $14,800 per incident

  - Average of 3,683 hours for mitigation of one significant backflow incident
  - Estimate to cost $110,500 per incident

  - Other losses due to food spoilage, property damage, and ***lawsuits***

Source: EPA Office of Ground Water and Drinking Water. *Potential Contamination Due to Cross-Connections and Backflow and the Associated Health Risks*. Distribution System Issue Paper. 27 September 2001. https://www.epa.gov/sites/default/files/2015-09/documents/2007_05_18_disinfection_tcr_issuepaper_tcr_crossconnection-backflow.pdf.

CCC/BFP Implementation

CCC/BFP Program

- **Requirements established by states (e.g., HI) acting as SDWA primacy agents**
- **Establishes policy and procedures for implementing CCC and BFP**
- **Typically applies to all PWSs, at a minimum**
- **Key components include:**
  - Finding and eliminating cross-connections through surveys
  - Installing, inspecting, and testing BFP assemblies and/or devices where cross-connections cannot be eliminated
  - Keeping an inventory of BFP assemblies and devices
  - Regular certification of BFP assemblies
  - Repairing and replacing defective BFP devices

BFP Assemblies and Devices

- **Testable (assemblies) and non-testable (devices) used to prevent backflow into a FFHC water system; type of assembly or device based on existing or potential degree of hazard and backflow condition**
  –JBPHH CCC/BFP Program Plan
- **Common devices include:**
  - Atmospheric Vacuum Breakers
  - Hose Bibb Vacuum Breakers
- **Common assemblies include:**
  - Reduced Pressure Zone (or Principle) Assemblies
  - Double Check Valve Assemblies
  - Pressure Vacuum Breakers
- **Majority of assemblies and devices require installation by qualified professional (e.g., licensed master plumber certified in BFP)**

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JBPHH CCC/BFP Program Plan

- **Required per state and DoD regulations**
  - HAR Section 11-20-29.5(7)
  - OPNAV M-5090.1 Section 21-3.10.b
- **Prioritizes containment-level (or service) protection**
  - "The appropriate type or method of BFP at (or as close as possible to) the service connection, commensurate with the degree of hazard of the consumer's FFHC water system; confines potential contamination caused by cross-connection to within the consumer's system"
- **Isolation-level (or internal) protection to be incorporated at a future time**
  - "The appropriate type or method of BFP within the consumer's FFHC water system at the point of use (e.g., fixture, area, zone), commensurate with the degree of hazard"
- **Establishes methodology, procedures, and responsibilities for surveys, testing, repairs, incident responses, recordkeeping, public notifications, and public awareness**
- **Main goal is to "protect the health and welfare of the community at large by protecting the main water distribution system against contamination emanating within a facility"**


Final

CROSS-CONNECTION CONTROL/
BACKFLOW PREVENTION PROGRAM PLAN

Joint Base Pearl Harbor-Hickam, Hawaii

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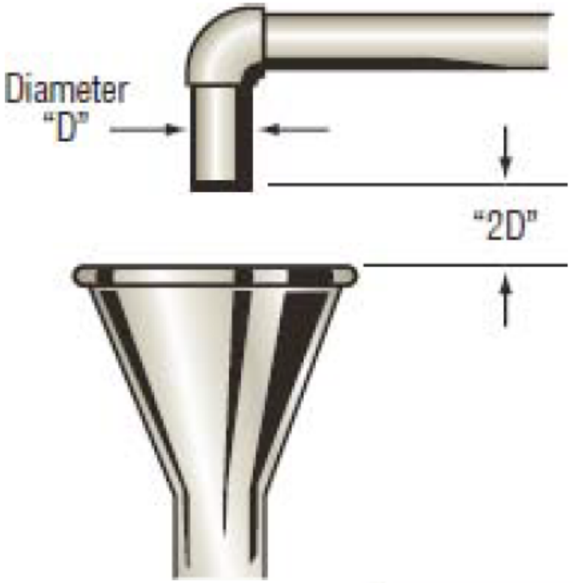
Naval Facilities Engineering Systems Command Pacific

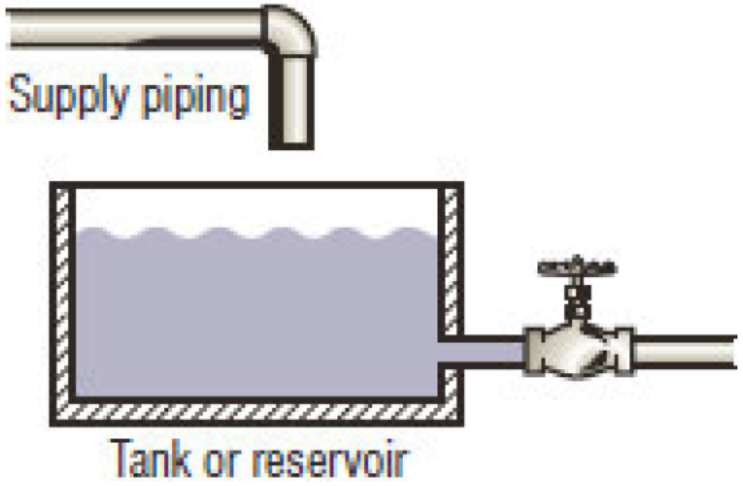
December 2025

Air Gaps

- "An unobstructed vertical physical separation through free atmosphere sufficient to prevent backflow between the lowest free-flowing discharge end of a FFHC water supply pipe or faucet and an open or non-pressurized receiving vessel"
  –JBPHH CCC/BFP Program Plan
- Must be at least twice the diameter (minimum 1 inch) of the supply pipe measured vertically above the overflow rim of the receiving vessel
- Meets ASME A112.1.2
- Applicable for all degrees of hazard
- Protects against backpressure and backsiphonage
- Do NOT use in an area with hazardous atmosphere
- Commonly used at fill inlets for cooling towers, storage tanks, and swimming pools

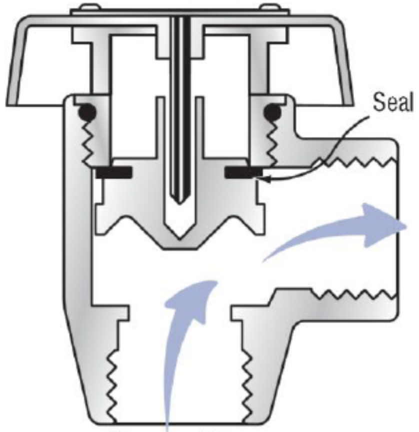


Source: EPA 816-R-03-002

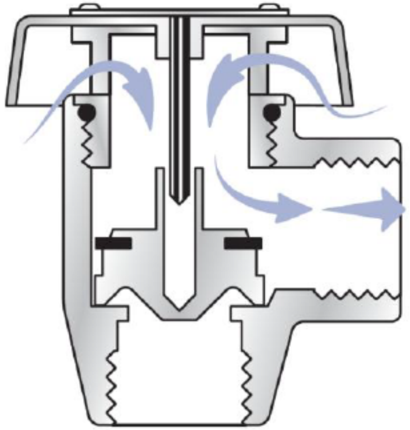


Atmospheric Vacuum Breakers

- "A BFP device containing an air inlet (float check) valve, a check seat, and an air inlet port; forms a check valve when the air inlet valve falls (due to atmospheric pressure entering through the air inlet port) after the flow of water stops"
  –JBPHH CCC/BFP Program Plan
- NON-testable
- Meets ASSE 1001
- Applicable for all degrees of hazard
- Protects against backsiphonage ONLY
- Cannot be subjected to continuous pressure (minimum 12 hours out of any 24-hour period)
- No shutoff or control valves downstream
- Do NOT use in an area with hazardous atmosphere
- Commonly used for irrigation and isolation-level protection (e.g., flush valve toilets, dishwashers, deep/mop sinks, spray hoses)



Flow condition

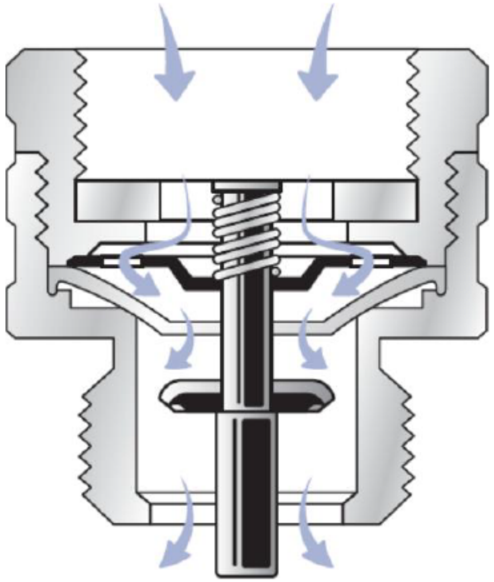


Non flow condition

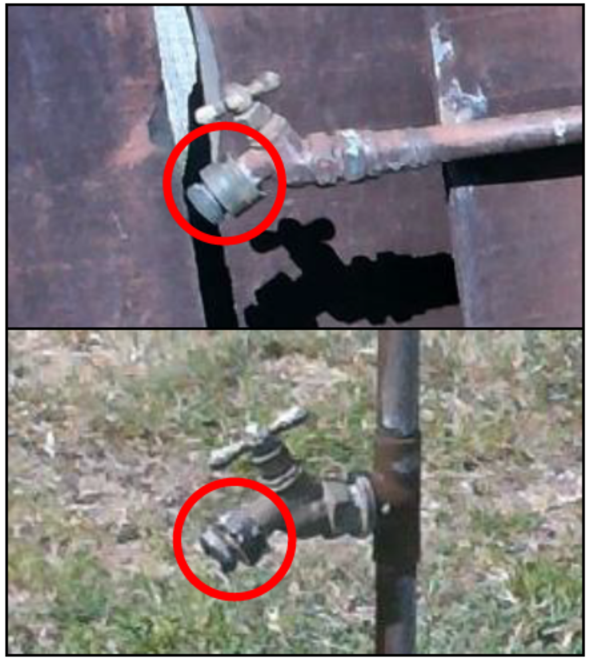
Source: EPA 816-R-03-002

Hose Bibbs Vacuum Breakers

- A BFP device composed of a spring-loaded check valve and atmospheric venting feature that may be connected to a standard hose-threaded faucet for the purpose of preventing backflow through the hose bibb"
  –JBPHH CCC/BFP Program Plan
- NON-testable
- Meets ASSE 1011
  - Alternate version with 2 check valves that meets ASSE 1052
- Applicable for all degrees of hazard
- Protects against backsiphonage ONLY
- Cannot be subjected to continuous pressure (minimum 12 hours out of any 24-hour period)
- No shutoff or control valves downstream
- Can be installed without changes to plumbing
- Commonly used for hose bibbs, hydrants, and faucets with hose threads

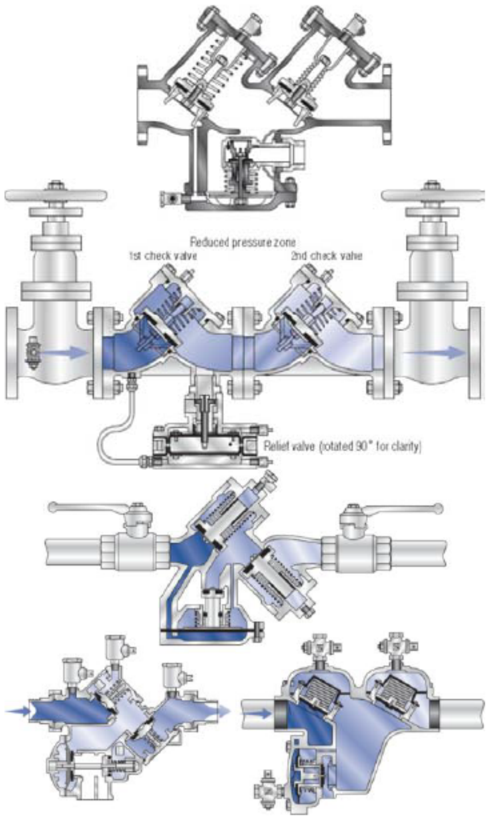


Source: EPA 816-R-03-002



Reduced Pressure Zone (or Principle) Assemblies

- "A BFP assembly containing two independently acting check valves together with a hydraulically operating, mechanically independent pressure differential relief valve (spillage port) located between the check valves and at the same time below the first (upstream) check valve; includes four properly located resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly" –JBPHH CCC/BFP Program Plan
- Testable
- Meets ASSE 1013/AWWA C511
- Applicable for all degrees of hazard
- Protects against backpressure and backsiphonage
- Horizontal installation typically required
- AG required underneath differential pressure relief valve
- Do NOT use in an area with hazardous atmosphere
- Commonly used on contamination/health/high hazard containment- and isolation-level connections

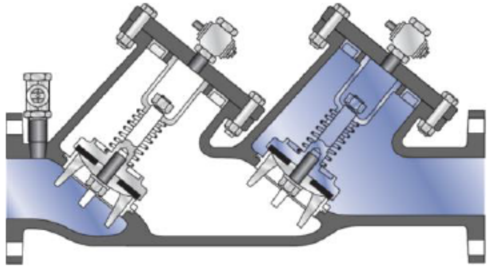


Source: EPA 816-R-03-002

Double Check Valve Assemblies

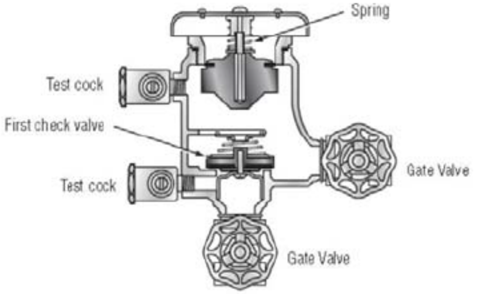
- “A BFP assembly composed of two independently acting check valves; includes four properly located resilient seated test cocks and tightly closing resilient seated shutoff valves at each end of the assembly” –JBPHH CCC/BFP Program Plan
- Testable
- Meets ASSE 1015/AWWA C510
- Only applicable for pollution/non-health/low hazard protection
- Protects against backpressure and backsiphonage
- Commonly used on fire protection (no chemicals) and certain domestic (e.g., administration offices, family quarters, park water fountains, youth centers)
- Double Check Valve Detector Assemblies (ASSE 1048)
  - Consist of mainline DCVA with metered bypass containing a 2nd DCVA or check valve
  - Used to detect unauthorized water use or leaks

Source: EPA 816-R-03-002



Pressure Vacuum Breakers

- “A BFP assembly containing an independently operating, internally spring-loaded check valve (“poppet valve”) and an independently operating loaded air inlet valve located on the discharge side of the check valve; equipped with two properly located resilient seated test cocks and tightly closing resilient seated shutoff valves attached at each end of the assembly”
  –JBPHH CCC/BFP Program Plan
- Testable
- Meets ASSE 1020
- Applicable for all degrees of hazard
- Protects against backsiphonage ONLY
- Do NOT use in an area with hazardous atmosphere
- Commonly used for irrigation and occasionally for certain service connections (e.g., swimming pool pump rooms)



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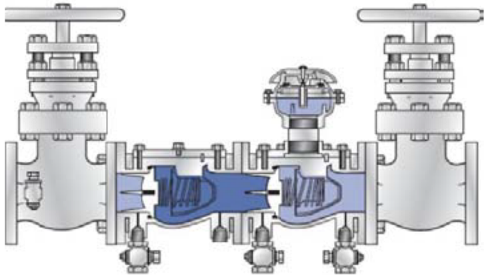

Public Resources

FREE

- **Hawaii Administrative Rules, Title 11, Chapter 21, *Cross-Connection and Backflow Control***
  - https://health.hawaii.gov/opppd/files/2015/06/11-21.pdf
- **EPA, *Cross-Connection Control: A Best Practices Guide*, EPA 816-F-06-035, September 2006**
  - https://www.epa.gov/sites/default/files/2015-09/documents/epa816f06035.pdf
- **EPA, *Cross-Connection Control Manual*, EPA 816-R-03-002, February 2003**
  - https://www.epa.gov/sites/default/files/2015-09/documents/epa816r03002_0.pdf
- **EPA Office of Water, *Potential Contamination Due to Cross-Connections and Backflow and the Associated Health Risks*, Distribution System Issue Paper, 27 September 2001**
  - https://www.epa.gov/sites/default/files/2015-09/documents/2007_05_18_disinfection_tcr_issuepaper_tcr_crossconnection-backflow.pdf
- **USC FCCCHR, *List of Approved Backflow Prevention Assembles, 15 December 2025***
  - https://fccchr.usc.edu/_downloads/List/list.pdf

PAID

- **AWWA M14, *Backflow Prevention and Cross-Connection Control – Recommended Practices, 5th Edition, 2024***
  - https://store.awwa.org/M14-Backflow-Prevention-and-Cross-Connection-Control-Recommended-Practices-Fifth-Edition-PDF
- **USC FCCCHR, *Manual of Cross-Connection Control*, 10th Edition, October 2009**
  - https://www.uscfoundationstore.com/Manual-of-Cross-Connection-Control-Tenth-Edition-P44.aspx
- **ASSE, *Guide to Cross-Connection Protection Devices and Assembles – Application and Selection*, 3rd Edition, 2018**
  - https://assewebstore.com/guide-to-cross-connection-protection-devices-and-assemblies-download

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Questions?

Naval Facilities Engineering Systems Command

CROSS-CONNECTION CONTROL/ BACKFLOW PREVENTION
Protect Our Water

What is a Cross-Connection?

An actual or potential connection between safe drinking water (fit for human consumption [FFHC]) and another source of a non-FFHC substance

Common Household Examples

Source: https://www.brwater.com/

Swimming Pool

Toxic Bucket

Bathtub

What is Backflow?

The undesirable reverse flow of a non-FFHC substance into the distribution system of a FFHC water supply

2 Types of Backflow

Backpressure

Pressure elevation in the downstream (non-FFHC) system above the supply (FFHC) pressure

Backsiphonage

A reduction in upstream (FFHC) system pressure which causes negative pressure (partial vacuum)

Source: https://hydrocorpinc.com/

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Dangers of Cross-Connections and Backflow

Contamination: Any substance that can create an actual hazard to public health and well-being (e.g., death, illness, poisoning, spread of disease)

Pollution: An impairment that adversely and unreasonably affects the cosmetic (e.g., skin/tooth discoloration) or aesthetic (e.g., taste, odor, color) qualities of water

Financial: Mitigating backflow incidents (494 hours/$14,800 per event*), food spoilage, property damage, and ***lawsuits***

*Source: EPA Office of Ground Water and Drinking Water. *Potential Contamination Due to Cross-Connections and Backflow and the Associated Health Risks*. Distribution System Issue Paper. 27 September 2001.

Protecting Your Drinking Water at Home

DOs

- ✓ Keep the ends of hoses off the ground and clear of any contaminants
- ✓ Install self-retractable kitchen sink sprayers
- ✓ Verify that detachable showerhead hoses do not extend below rim of tub or shower base
- ✓ Ensure that toilet tanks have properly installed and operating anti-siphon fill valves
- ✓ Install hose bibb vacuum breakers on all threaded faucets
- ✓ Consider having a licensed plumber inspect your home for cross-connections

DON'Ts

- × Submerge hoses in buckets, tubs, sinks, pools, or ponds
- × Leave substances not fit for human consumption (FFHC) stored near points of water use
- × Use hoses to unplug blocked toilets or sewer pipes
- × Connect drain lines from ice machines, water softeners, and other appliances/equipment using FFHC water directly to the sewer
- × Install lawn irrigation without proper backflow prevention

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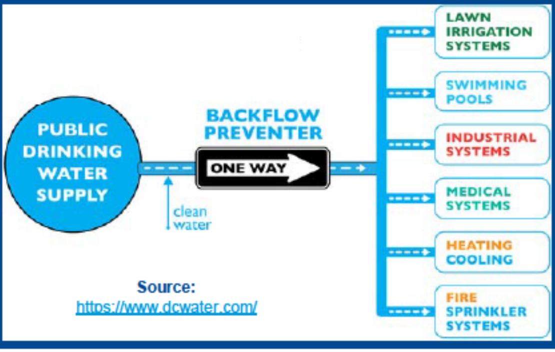
Backflow Prevention (BFP) Assemblies and Devices

Effective plumbing mechanisms used to prevent backflow into a system containing water fit for human consumption (FFHC)



Source: https://www.dcwater.com/

How Does a BFP Assembly/Device Work?

1. Water enters your home from one or more service connections to the main water supply line (flows in single direction)
2. Pressure changes can cause non-FFHC substances to enter the water system via backflow.
3. The non-FFHC substance attempts to enter the water supply.
4. The BFP assembly or device restricts flow to only one direction and stops the non-FFHC substance from flowing further upstream.

Signs That Your BFP Assembly/Device Needs Repair

⚠ **Water Leaks**

Sign of a mechanical problem

⚠ **Discolored/Foul-Smelling Water**

Sign of contamination/ pollution from cross-connection

⚠ **Slow Draining**

Sign of a partial blockage

⚠ **Water Pressure Fluctuations**

Sign of improper function