



Department of the Air Force
HQ AEDC (AFMC)
Arnold AFB, TN 37389

Safety, Health, and Environmental Standard

Title: CROSS-CONNECTION AND BACKFLOW PREVENTION

Standard No.: D14

Effective Date: 09/18/2012

Releasability: There are no releasability restrictions on this publication.

The provisions and requirements of this standard are mandatory for use by all AEDC personnel engaged in work tasks necessary to fulfill the AEDC mission. Please contact your safety, industrial health and/or environmental representative for clarification or questions regarding this standard.

Approved:

Contractor/ATA Director
Safety, Health, and Environmental

Air Force Functional Chief
Base Civil Engineer



Safety, Health, and Environmental Standard

CROSS-CONNECTION AND BACKFLOW PREVENTION

1.0 INTRODUCTION/SCOPE/APPLICABILITY

- 1.1 **Introduction** – This standard along with the AEDC Cross Connection and Control Plan (CCCP) establishes requirements and responsibilities for protection of the Arnold Engineering Development Center (AEDC) drinking water system from contamination by cross-connection or backflow.
- 1.2 **Scope** – The AEDC Cross-Connection and Backflow Prevention Program adopts the *Uniform Plumbing Code* (latest edition) for technical requirements related to cross-connection control and the *Cross-Connection Control Manual and Design Criteria for Cross-Connection Control Plans, Ordinances, and Policies*, published by the Tennessee Department of Environment and Conservation Division of Water Supply.
- 1.3 **Applicability** – This standard applies to all AEDC personnel, including Department of Defense (DoD) and Contractors (including the Base Operating Contractor's Subcontractors and Outside Contractors), who are involved in the installation or maintenance of potable water piping and/or backflow prevention devices at the Tennessee location. The Base Operating Contractor Base Civil Engineer or his designee has responsibility for the implementation of the Cross-Connection Control Program. This role is currently executed by the potable water system engineer.

2.0 BASIC HAZARDS/HUMAN FACTORS

- 2.1 Potential contaminants include untreated water, chemicals, and sewage. The AEDC potable water supply system must be designed, installed, and maintained to prevent contamination from non-potable liquids, solids, or gases through cross-connections or any other piping connections to the system.

2.2 Causes of Backflow

When water flows backwards from its normal direction or returns toward its source, it's called backflow. It results when certain hydraulic conditions occur in piping systems. Causes can include fire hydrant flushing, water main breaks/leaks, water outages, and pumps overpowering the water supply pressure. There are two types of backflow: backsiphonage and backpressure.

- 2.2.1 Backsiphonage is a reverse flow of water within a water supply system due to negative pressures. It occurs when conditions cause a drop in potable water pressure allowing contaminants to be sucked into supply piping through an unprotected cross-connection. The source may be something as simple as a hose placed below the rim of a bucket, barrel, or tank containing a toxic or contaminated substance.
- 2.2.2 Backpressure occurs when downstream pressure is higher than the supply pressure in the drinking-water distribution supply system. It can result from an unprotected cross-connection to a make-up water line connected to a circulating system. Also, connections to pressurized material including gases or liquids may cause backflow into the potable water system. Other possible causes include thermal expansion of gases and liquids in elevated piping or tanks.

3.0 DEFINITIONS

Note: Additional definitions are provided in the AEDC CCCP.

Base Operating Contractor – A base contractor directly accountable to the Air Force for the AEDC mission.

Outside Contractor/Subcontractor – An organization employed by a contractor or the Air Force to do construction, maintenance, repair or other work at AEDC; also referred to as the construction contractor.

4.0 REQUIREMENTS/RESPONSIBILITIES

This section, along with the CCCP, provides instructions for all AEDC personnel, including Department of Defense (DoD) and Contractors (including the Base Operating Contractor's Subcontractors and Outside Contractors). Specific instructions directly applying to Outside Contractors/Subcontractors are provided in the Annex A to this standard.

4.1 Persons Authorized to Work on Potable Water System – Base Operating Contractor Base Civil Engineering (BCE) Pipe Shop shall be the only organizational unit authorized to install or modify the piping system associated with the AEDC potable water system or the fire-fighting water lines. No other shop or organization shall make any extension, connection, modification, change, or alteration to any potable or fire-fighting water line, unless, coordinated and approved by the AEDC Potable Water System Engineer. All personnel who work on backflow prevention devices shall maintain current State of Tennessee cross-connection certification.

4.2 Work Request and Project Coordination – All work requests to modify or add to the AEDC potable water system shall include a change request and be approved by the Potable Water Systems Engineer. The Base Operating Contractor shall have a procedure for processing a change request for asset configuration changes which shall be followed unless otherwise directed by the BCE. AEDC/TSD-SG (Air Force Bioenvironmental Engineering) and the AEDC Water Plant, must be notified anytime a potable water system is tapped at AEDC.

4.3 Cross Connection Control Plan (CCCP) –The Base Operating Contractor shall develop the AEDC Cross Connection Control Plan in accordance with requirements of the Tennessee Department of Environment and Conservation Rules for Public Water Supplies, and Air Force Instruction 32-1006, Backflow Prevention Program. This plan requires approval of the Cross Connection Program Manager and is submitted to the Tennessee Department of Environment and Conservation through AEDC/TSCA and TSD-SG. See Annex B for the plan content.

4.4 Base Operating Contractor Inspection and Testing of Backflow Prevention Devices – Inspections and testing of backflow devices shall be conducted and documented by certified personnel. The degree of hazard as determined from facility surveys shall be used to develop the schedule. Results of the inspection and testing program shall be documented and delivered to the Potable Water System Engineer and made available the Environmental Branch, and the Safety and Health Group for review. Records are stored and maintained at the Water Treatment Plant for five years. Asset location and maintenance history shall be maintained electronically in the base wide computerized maintenance management system.

4.5 Modifications to Potable Water System

4.5.1 Required project installations of potable water piping and/or permanent backflow preventers shall be identified on design drawings and specifications. The type and location shall be clearly defined and be in accordance with the State of Tennessee Cross-Connection Control Manual. Specifications shall require coordination and incorporate inspection point requirements prior to and during the installation of any back flow prevention device. An inspection point shall provide for the AEDC installation of configuration locks to maintain potable water integrity during construction. The configuration lock will enable inspection, checkout and approval of the completed installation by the AEDC Water System Engineer and/or Water Plant prior to activation of the new device.

4.5.2 Submittals – Specifications shall require submittals of all Contractor installations. Submittals shall include, at a minimum, the type of device being provided and the specific installation details. Submittals shall be coordinated through the Construction Manager and approved by the responsible design organization. Design approval of backflow prevention submittals shall include coordination with the potable water system engineer.

4.5.3 Outages – Disruptions of potable water service shall be coordinated using the AEDC outage process. Coordination shall include means of providing an acceptable water supply during the work effort and ensuring no illegal cross-connections are introduced.

4.5.4 New backflow prevention devices shall be installed and repaired in accordance with the AEDC Cross Connection Control Plan (CCCP).

4.5.5 Operation and Maintenance – After installation of new backflow devices, the device shall be entered into the AEDC preventive maintenance program by the potable water system engineer upon removal of the

configuration lock. Maintenance requirements shall at a minimum comply with the State of Tennessee Cross-Connection manual.

5.0 TRAINING

Persons testing backflow prevention assemblies must maintain a current Certificate of Competency via a State of Tennessee-approved Cross-Connection Control training program. Initial certification requires completion of 32 hours of training and satisfactory completion of a written exam and practical exam. The State requires that the certificate be renewed every three years via refresher training and exam.

6.0 REFERENCES

- 6.1 Cross-Connection Control Manual and Design Criteria for Cross-Connection Control Plans, Ordinances, and Policies, Tennessee Department of Environment and Conservation Division of Water Supply
- 6.2 Illustrated Training Manual, International Association of Plumbing and Mechanical Officials
- 6.3 Uniform Plumbing Code, International Association of Plumbing and Mechanical Officials
- 6.4 Unified Facilities Criteria (UFC) 3-420-01 Plumbing Systems, U.S. Department of Defense
- 6.5 Air Force Instruction 32-1066 – Backflow Prevention Program
- 6.6 Air Force Instruction 48-144 – Drinking Water Surveillance Program
- 6.7 American Water Works Association (AWWA) Manual M-14

7.0 ANNEX

- A. Requirements for Outside Contractor/Subcontractor of Potable Water Piping and Backflow Prevention Devices
- B. AEDC Cross Connection Control Plan Content

8.0 SUPPLEMENT

NFAC A321-0801-XSP D14 – Cross Connection and Backflow Prevention Supplement

**ANNEX A
REQUIREMENTS FOR OUTSIDE CONTRACTOR/SUBCONTRACTOR OF
POTABLE WATER PIPING AND BACKFLOW PREVENTION DEVICES**

1.0 Requirements – Installation of Potable Water Piping and Backflow Prevention Devices

- 1.1 Outside contractors/subcontractors shall notify the AEDC potable water plant (the water purveyor), through the government representative (construction manager), when tie-in to the potable water system is required. The AEDC potable water system engineer will coordinate with the contractor and provide for isolation of the work from the potable water system. A configuration lock will be placed on the valve upstream of new potable water piping and/or the new backflow prevention device location and will remain until the installation is complete and inspected.
- 1.2 The outside contractor/subcontractor shall notify the government representative when work on the potable water system is complete.
- 1.3 Prior to the removal of the configuration lock, the potable water system engineer, in coordination with the design engineer, shall ensure the installation is in accordance with the drawings and specifications, does not create cross-connection violations or violate cross-connection requirements, and is in accordance with the State of Tennessee Cross-Connection Control Manual requirements.
- 1.4 The configuration lock shall be removed by the AEDC Potable Water Plant or Potable Water System Engineer when the potable water system is ready for operation.
- 1.5 Modifications to the potable water system and newly installed backflow devices will be tested by AEDC personnel upon removal of the configuration lock.

2.0 Temporary connections to potable water hose bibs and fire hydrants

The outside contractor/subcontractor shall notify government representative if a connection to potable water supply is needed. This includes hose bibs and fire hydrants. No connection to any potable water source shall be made without an approved backflow preventer and specific approval from government representative.

NOTES:

1. New backflow prevention devices shall be installed and repaired in accordance with the approved drawings, specification and manufacturers' instructions approximately 30 inches above grade in locations easily accessible for testing and maintenance. A reduced pressure backflow preventer shall never be installed where it could be submerged.
2. An approved reduced pressure type backflow device shall be used where antifreeze or other hazardous chemicals are added.

**ANNEX B
AEDC CROSS CONNECTION CONTROL PLAN CONTENT**

- Introduction
- Authority for cross-connector control
- Program to be pursued
- Premises requiring reduced pressure principle assemblies or air gap separation
- Inspection, testing and installation of backflow prevention assemblies/devices
- Parallel units
- Records
- Backflow contamination procedures
- Modifications to plan

The AEDC Cross Connection Control Plan may be obtained using the AEDC Publications Management (Pubs and Forms) Community Site linked to the Team AEDC Homepage.

A321-0801-XSP D14 Cross Connection and Backflow Prevention Supplement

This supplement has been approved for the NFAC Site.

Review: This supplement will be reviewed and updated using the same cycle as the AEDC Standard D14 “Cross Connection and Backflow Prevention”.

References: AEDC Safety Standard D14 – Cross Connection and Backflow Prevention at the AEDC NFAC Site.

NASA Ames Procedural Requirements APR 8800.3 Chapter 16 “Drinking Water Management”.

Scope:

This supplement establishes requirements and responsibilities for protection of the NFAC drinking water system from contamination by cross connection or backflow at NFAC.

This supplement applies to all NFAC personnel, customers and vendors.

NFAC Worksite Application:

NFAC will follow the local NASA Ames Procedural Requirements APR 8800.3 Chapter 16 “Drinking Water Management”.

NFAC drinking water source is maintained and controlled by NASA Ames.

I. NFAC Site Management shall:

1. Ensure that the supplement is followed.

II. NFAC Supervisors and Test Directors shall:

1. Ensure supplement is followed
2. Contact NASA Facility Group to report any problems with the drinking water system
3. Ensure all NFAC vendors and NASA Facilities Group working at NFAC follow supplement

III. NFAC Safety Engineer/Management Designee shall:

1. Monitor any work involving drinking water

NFAC Staff shall:

1. Ensure that the supplement is followed
2. Not disturb any system(s) involving NFAC drinking water