

First

UTILITY DISTRICT

OF KNOX COUNTY

Document Title: Cross-Connection Manual

Released Date: August 1, 2012

Program: Cross-Connection Control

Revised Date: N/A

Department: Cross Connection

Page: 1 of 23

GOAL

The goal of First Utility District (FUD) is to supply safe water to each and every customer under all foreseeable circumstances. Each instance where water is used improperly may create the possibility of backflow due to cross connections threatens the health and safety of customers and chances of realizing this goal. The possibility of backflow due to improper use of water within the customer's premises is especially significant because such cross connections may easily result in the contamination of our water supply mains. Such situations may result in the public water system becoming a transmitter of diseased organisms, toxic materials, or other hazardous substances that may adversely affect large numbers of people. The only protection against such occurrences is the elimination of such cross connections or the isolation of such hazards from the water supply lines by properly installed approved backflow prevention assemblies.

Protect public water supply from the possibility of contamination or pollution by isolating within the customer's internal distribution system(s) or the customer's private water system(s) such contaminants or pollutants that could backflow into the public water system.

Promote the elimination or control of existing cross connections, actual or potential, between the customer's in-plant potable water system(s) and nonpotable water systems, plumbing fixtures, and industrial piping systems.

Provide for the maintenance of a continuing program of cross connection control that will systematically and effectively prevent the contamination or pollution of all potable water systems.

Prepared By: Kent Bowman

Creation Date: May 22, 2012

Approved By: Bruce Giles

Board Approved Date: July 31, 2012

PLAN OF ACTION

FUD is determined to take every reasonable precaution to ensure that cross connections are not allowed to contaminate the water being distributed to its customers. This cross connection plan outlines a course of action designed to control cross connection within the area served by the water provider. This plan is intended to be a practical guide for safeguarding the quality of water distributed from becoming contaminated or polluted through backflow. By following the plan of action, the water provider will ensure that all aspects of the policy/ordinance on Cross Connection are being followed by customer.

Intent: The water provider will implement and use this plan to implement the program to eliminate existing and potential unprotected cross connections. The plan will be implemented to ensure that all codes, ordinances, statutes, and regulations are being followed.

TABLE OF CONTENTS

GOAL1

PLAN OF ACTION.....2

TABLE OF CONTENTS.....3

DEFINITIONS.....4

ACRONYMS.....7

I. BACKGROUND AND AUTHORITIES8

 1.1 ENVIRONMENTAL PROTECTION AGENCY.....8

 1.2 TENNESSEE CODE ANNOTATED.....8

 1.3 TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION8

 1.4 FIRST UTILITY DISTRICT8

 1.4.1 Backflow Manual.....8

 1.4.2 Rules and Regulations.....9

 1.4.3 Standards and Specifications9

 1.4.4 Procedures Manual.....9

 1.5 ROLES AND RESPONSIBILITIES.....9

II. FUD APPLICABILITY.....11

III. COMPLIANCE AND MANAGEMENT POLICIES13

 3.1 ACTIVE AND ONGOING PROGRAM13

 3.1.1 Public Awareness.....13

 3.1.2 Staffing13

 3.1.3 Surveys14

 3.2 ENFORCEMENT14

 3.2.1 Customer Responsibility.....14

 3.2.2 Premises Inspection15

 3.2.3 Determination of backflow protection16

 3.2.4 Approved devices and installation.....16

 3.2.5 Alterations or changes to a BFD.....17

 3.2.6 Annual inspection and device testing18

 3.2.7 Device Repairs.....18

 3.3 VIOLATIONS OF FUD’S CROSS CONNECTION PROGRAM.....18

 3.3.1 Requirement to Install a BFD – New or Existing Service.....19

 3.3.2 Failure of an Existing BFD– Residential & Commercial20

 3.3.3 Annual Required Testing – Fire System BFD21

 3.3.4 Annual Required Testing – Portable Hydrant Meter Backflow Assembly.....21

 3.4 TERMINATION OF SERVICE21

 3.5 IMMEDIATE THREAT TO THE WATER SYSTEM22

IV. RECORDS AND RETENTION.....23

 4.1 MODIFICATIONS TO BACKFLOW MANUAL, WATER RULES AND REGULATIONS, AND STANDARDS AND SPECIFICATIONS.....23

DEFINITIONS

Air Gap. The vertical, physical separation between a water supply line outlet and the overflow from a non-pressurized receiving vessel.

Approved Air Gap. An air gap separation with a minimum distance of at least twice the diameter of the supply line when measured vertically above the overflow rim of the vessel but in no case less than one inch.

Approved. Any condition, method, device, or procedure accepted by TDEC DWS and FUD.

Auxiliary Intake. Any piping connection or other device whereby water may be secured from any sources other than from FUD.

Auxiliary Water Supply. Any water supply on or available to the premises other than the water supplied by FUD.

Backflow. The reversal of the intended direction of flow of water causing the potential for mixture of water and other liquids, gases, or other substances into the distribution pipes of a potable water system from any source.

Backflow Prevention Assembly. An approved mechanical assembly designed to prevent backflow.

Backpressure. A pressure in the downstream piping that is higher than the supply pressure.

Back-siphonage. Negative or sub-atmospheric pressure in the supply piping.

Bypass. Any system of piping or other arrangement whereby the water may be diverted around a backflow prevention assembly, meter, or any other FUD controlled device.

Contamination. The introduction or admission of any foreign substances that causes an adverse affect on the quality of the water.

Contaminant. Any physical, chemical, biological, or radiological substance or matter, which may or may not be harmful depending on the concentration.

Cross Connection. Any physical arrangement whereby a public water system is connected, directly or indirectly, with any other water supply system, sewer, drain, conduit, pool, storage reservoir, or other device which does or may contain sewage or other waste or liquid which would be capable of imparting contamination to the public water system as a result of backflow. Bypass arrangements, jumper connections, removable sections, swivel, or changeover devices through which, or because of which, backflow could occur are considered to be cross-connections.

Cross-Connection Control Coordinator. The person who is vested with the authority and responsibility for the implementation and/or management of the Cross-Connection Control Program.

Customer. Any natural or artificial person, business, industry, or governmental entity that obtains water by purchase or without charge from FUD.

Double Check Valve Assembly. An assembly of two internally loaded check valves, either spring loaded or internally weighted, installed as a unit between tightly closing resilient seated

shutoff valves and fitted with properly located resilient seated test cocks. This type of device shall only be used to protect against non-health hazard pollutants.

Failed. The status of a backflow prevention assembly determined by a performance evaluation based on the failure to meet all minimums set forth by the approved testing procedure.

Fire System Classifications Protection. The classes of fire protection systems, as designated by the American Water Works Association (AWWA) “M14” for cross-connection control purposes based on water supply source and the arrangement of supplies, are as follows:

Class 1. Direct connection to the FUD main only; no pumps, tanks, or reservoirs; no physical connection from other water supplies; no antifreeze or other additives of any kind; all sprinkler drains discharging to the atmosphere, dry well, or other safe outlets.

Class 2. Same as Class 1, except booster pumps may be installed in connection from the street mains.

Class 3. Direct connection to FUD mains in addition to any one or more of the following: elevated storage tanks; fire pumps taking suction from above ground covered reservoirs or tanks; and pressure tanks.

Class 4. Directly supplied from FUD mains, similar to Class 1 and Class 2, with an auxiliary water supply dedicated to fire department use and available to the premises, such as an auxiliary supply located within 1700 feet of the pumper connection.

Class 5. Directly supplied from FUD mains and interconnection with auxiliary supplies such as pumps taking suction from reservoirs exposed to contamination, or from rivers, ponds, wells, or industrial water systems; where antifreeze or other additives are used.

Class 6. Combined industrial and fire protection systems supplied from FUD mains only, with or without gravity storage or pump suction tanks.

Hazard, Degree of. A term derived from evaluation of the potential risk to public health and the adverse effect of the hazard upon the FUD water distribution system.

Hazard, Health. A cross connection or potential cross connection involving any substance that could, if introduced in the FUD system, cause death, illness, or disease.

Hazard, Non-health. A cross connection or potential cross connection involving any substance that would not be a health hazard but would constitute a nuisance or be aesthetically objectionable if introduced into the FUD water distribution system.

Hazard, Plumbing. A cross connection in a customer’s potable water system plumbing that is not properly protected by an approved air gap or backflow prevention assembly.

Industrial Fluid. Any fluid or solution that may be chemically, biologically, or otherwise contaminated or polluted in a form or concentration that could constitute a health, system, pollution, or plumbing hazard if introduced into the FUD water distribution system. This shall include, but is not limited to: polluted or contaminated water; all types of process water or used water originating from the FUD system and that may have deteriorated sanitary quality; chemicals; plating acids and alkalis; circulating cooling water connected to an open cooling tower; cooling towers that are chemically or biologically treated or stabilized with a toxic substance; contaminated natural water systems; oil, gases, glycerin, paraffin, caustic, acid solutions, and other liquids or gases used in industrial processes or for fire purposes.

Inspection. An on-site evaluation of an establishment to determine if backflow prevention assemblies are required to protect the FUD water distribution system from actual or potential cross connections.

Interconnection. Any system of piping or other arrangement whereby the public water system is connected with a sewer, drain, conduit, pool, storage reservoir, or other device which does or may contain sewage or other waste or liquid which would be capable of imparting contamination to the public water system.

Passed. The status of a backflow prevention assembly determined by a performance evaluation in which the assembly meets all minimums set forth by the approved testing procedure.

Performance Evaluation. An evaluation of an approved Double Check Valve Assembly or Reduced Pressure Principle Assembly (including approved Detector Assemblies) using the latest approved testing procedures in determining the status of the assembly.

Pollutant. A substance that would constitute a non-health hazard and would be aesthetically objectionable if introduced into the FUD water distribution system.

Pollution. The presence of a pollutant or substance in the FUD water distribution system that degrades its quality so as to constitute a non-health hazard.

Potable Water. Water that meets the criteria of TDEC and the Environmental Protection Agency (EPA) for safe human consumption.

Public Water Supply. An entity that furnishes potable water for general use and which is recognized as the public water supply by TDEC DWS.

Public Water System. A water system furnishing water to the public for general use that is recognized as a public water supply by the State of Tennessee.

Reduced Pressure Principle Detector Assembly. A specially designed assembly composed of a line-size approved reduced pressure principle backflow prevention assembly with a bypass containing a water meter and approved reduced pressure principle backflow prevention assembly specifically designed for such application. The meter shall register for very low flow rates up to 3 gpm and shall show registration for all flow rates. This assembly shall be used to protect against non-health and health hazards.

Service Connection. The point of delivery to the customer's water system; the terminal end of a service connection from the FUD water system. It shall include connections to fire hydrants and all other temporary or emergency water service connections to the distribution system.

Survey. An evaluation of a premise by a water system performed for the determination of actual or potential cross-connection hazards and the appropriate backflow prevention needed.

Test. The series of steps prescribed by the DWS performed to ensure the viability and capability of a BFD to prevent the backflow of water from a customer's premise into the public water system.

ACRONYMS

AWWA	American Water Works Association
BFD	backflow prevention device
CCC	cross-connection control
CCR	Consumer Confidence Report
CIS	Customer Information System
CSD	Customer Service Department
DWS	Division of Water Supply
ENS	Engineering New Service
EPA	Environmental Protection Agency
FUD	First Utility District
GIS	Geographic Information System
GPM	gallons per minute
NSV	New Service
PSI	pounds per square inch
PWS	public water systems
QA/QC	quality assurance /quality control
QRG	quick reference guide
SDWA	Safe Drinking Water Act
SOP	standard operating procedure
TCA	Tennessee Code Annotated
TCH	Safety and Technical Services
TDEC	Tennessee Department of Environment and Conservation
UGC	Underground Construction

I. BACKGROUND AND AUTHORITIES

1.1 ENVIRONMENTAL PROTECTION AGENCY

Under the provisions of the *Safe Drinking Water Act (SDWA)* of 1974, the Federal Government established, through the Environmental Protection Agency (EPA), the national standards for drinking water. The states are responsible for the enforcement of these standards as well as the supervision of the public water systems (PWSs) and the sources of drinking water. The water supplier, (i.e., FUD) is held responsible for complying with the standards at the source and ensuring that water is delivered to the customer without the quality being compromised as a result of its delivery through the distribution system.

1.2 TENNESSEE CODE ANNOTATED

Title 68, Chapter 221, Part 7 of the *Tennessee Code Annotated (TCA)* establishes that the people of the State of Tennessee have a right to quality drinking water, part of which requires that public water systems eliminate or control cross connections in the distribution system as outlined in sections 703 and 711 of this Statute.

1.3 TENNESSEE DEPARTMENT OF ENVIRONMENT AND CONSERVATION

Tennessee Department of Environment and Conservation (TDEC) *Rule 1200-5-1-.17* requires that a PWS do the following:

1. Adopt an ordinance or policy prohibiting the improper installation, allowing the installation, or maintenance of any cross connection, auxiliary intake, or bypass unless the source and quality of water within the facility has been approved.
2. Develop a written plan for a cross-connection control (CCC) program to detect and eliminate or protect the system from cross connections. TDEC DWS must approve this plan.
3. Establish an ongoing program for the detection and elimination of hazards associated with cross connections.
4. Maintain records associated with the CCC program including such items as:
 - Date of inspection
 - Person contacted
 - Follow-up
 - Testing results

1.4 FIRST UTILITY DISTRICT

1.4.1 Backflow Manual

The First Utility District (FUD) Backflow Manual describes how FUD operates the overall program management strategy for achieving compliance and protection of the water distribution system.

1.4.2 Rules and Regulations

FUD's Water Rules and Regulations prohibits cross connections between FUD's mains and the water from another source, authorizes the public water system to make inspections of the customer's premises, requires that cross-connection hazards be corrected, and provides for enforcement. It is considered to be a sound basis for the control of cross-connection hazards by the operating staff and management of FUD.

1.4.3 Standards and Specifications

FUD's Standards and Specifications specifies FUD's requirement to protect its water distribution system from contamination and eliminate or control existing cross connections. This document establishes the following:

1. Situations and types of facilities requiring backflow prevention devices (BFDs)
2. Materials necessary for proper selection and installation of BFDs
3. Installation requirements
4. Inspection of new and existing facilities
5. Testing of new and existing BFDs
6. Responsibility of cost for devices, installation, and testing

1.4.4 Procedures Manual

The FUD Procedures Manual, located in the Appendices of this document, establishes the standard operating procedures (SOPs), quick reference guides (QRGs), and checklists used for inspecting and re-inspecting premises, conducting follow up visits, notifying customers of testing, inputting customer/device information into the system of record, querying the system of record for devices in need of testing, etc.

1.5 ROLES AND RESPONSIBILITIES

Listed in Table 1 are the personnel and their roles and responsibilities for maintaining FUD's CCC Program compliance.

Table 1. CCC Program Roles and Responsibilities

Position/Title	Responsibilities
FUD – Backflow Control Service Department	
Manager	<ul style="list-style-type: none">▪ Oversees compliance of CCC Program▪ Ensures that all aspects of the Cross Connection Manual and FUD's Rules and Regulations are followed▪ Ensures appropriate personnel and resources are allocated to effectively manage the Program▪ Develops/reviews compliance goals based on corporate vision
Coordinator	<ul style="list-style-type: none">▪ Manages all aspects of the program▪ Reviews all regulatory compliance requirements for applicability▪ Ensures that all aspects of the Cross Connection Manual and FUD's Rules and Regulations are followed▪ Responsible for CCC public awareness, including the CCR▪ Oversees data management and the electronic system of record

Coordinator (cont.)	<ul style="list-style-type: none"> ▪ Coordinates CCC compliance and training with external agencies ▪ Coordinates CCC training with internal departments ▪ Develops cross connection surveys ▪ Ensures that all aspects of the Cross Connection Manual and FUD's Rules and Regulations are followed ▪ Receives and maintains data including customer information, device information, test information, and tester information (see Section 4.0, Records and Retention) ▪ Distributes First Notices to Test, Second Notices to Test, and Notices of Violation. Queries reports for devices due for testing for Coordinator, contractors, or other applicable personnel
Inspector	<ul style="list-style-type: none"> ▪ Follows all aspects of the Cross Connection Manual and FUD's Rules and Regulations ▪ Inspects facilities for cross connections ▪ Makes recommendations on required BFDs ▪ Tests devices ▪ Conducts periodic cross-connection surveys ▪ Conducts field inspections to review project specifications and evaluates for potential cross connections for new service installations ▪ Coordinates CCC requirements with developers ▪ Notifies applicable FUD CCC personnel of any observed or potential cross connections

FUD – Customer Service Department (CSD)

Customer Service Representative	<ul style="list-style-type: none"> ▪ Receives requests for service and requests for change of service ▪ Classifies service to determine if follow up inspection is needed
---------------------------------	---

City/County

Plumbing Inspector	<ul style="list-style-type: none"> ▪ Reviews plans for potential cross connections ▪ Conducts site inspections for potential cross connections. ▪ Issues permits for the installation or alteration of BFDs
--------------------	--

Other Personnel

State Certified Backflow Assembly Testers	<ul style="list-style-type: none"> ▪ Maintains current State certification ▪ Ensures testing equipment is calibrated at least annually and provides current information (certification and calibration) to FUD ▪ Tests devices in compliance with pre-established procedures for all fire system backflows ▪ Reports results of device tests to FUD promptly ▪ Reports installation of new devices to FUD promptly ▪ Complies with FUD's CCC program guidelines and Std. And Spec. requirements
---	---

II. FUD APPLICABILITY

The CCC Program applies to all areas of FUD's water distribution system. The FUD CCC Coordinator shall work with internal FUD personnel, City or County Plumbing Inspectors' Office, and any additional agencies to ensure that new or existing connections with customers of the types listed in Table 2 possess appropriate BFDs or maintain approved air gaps. The list of high risk/high hazard facilities are included on Table 2 and notated by an asterisk (*).

Table 2. Types of Facilities Requiring Backflow Prevention

Agricultural processing facilities*	Farms, feedlot operations*	Paper and paper product plants*
Aircraft and missile plants*	Fertilizer plants*	Penal institutions and jails*
Airports	Fertilizer (liquid and spray) distributors	Petroleum process and storage plant*
Amusement Parks	Film laboratory*	Power plants
Animal hospitals and clinics*	Fire suppression systems*	Portable water meters
Apartments – (single and multi-structures)*	Food processing plant*	Printing company
Automotive plants*	Funeral home	Private wells
Automotive repair shops, including radiator and transmission shops*	Greenhouse*	Radioactive materials or substance plants that process/use*
Autopsy facilities*	Hospital*	Railroad terminal*
Auxiliary water systems*	Hotels and motels (single and multi-structure)*	Recreational areas, parks*
Beauty schools and colleges*	Industries (All)	Restaurants and food service facilities*
Beauty shops and hair salons*	Laboratories and research facilities*	Restricted establishments*
Beverage bottling plant*	Laundry – Laundromats*	Rubber plants*
Boat docks and piers*	Lawn sprinkler systems, public or private*	Sand and Gravel plants*
Breweries*	Manufacturing plants (toxins used in plant)*	Sanitarium*
Bulk Distributors and users of pesticides, herbicides, and liquid fertilizers*	Meat packing house and rendering plants*	Schools and colleges*
Bus and truck terminals*	Medical buildings, clinics*	Sewage pumping stations*
Campgrounds and recreational vehicle parks*	Metal plating plant, pickling, and anodizing operations*	Shopping center (occupancy unknown)*
Cannery*	Mobile Home Parks*	Stockyard
Car wash*	Morgue or mortuary*	Swimming pools, ponds, and fountains*
Chemical plants (manufacturing, processing, compounding, or treatment)*	Motion picture studio	Tanneries of all kinds
Chemically contaminated water systems*	Multi-story buildings (3 stories or more)*	Tattoo shops and parlors
Cold storage plants*	Multiple services – inter-connected	Therapeutic tanks and hot tubs
Condominium – single and multi-structures (3 stories or more)*	Nail salons	Travel trailer park or trailers
Dairies and creameries*	Newspapers and printing facilities	Vegetable and food processing facilities*
Dental buildings*	Nursery, botanical*	Waterfront facilities and industries
Dry cleaners*	Nursing or convalescent homes*	Water treatment plants*
Dye works	Oil and gas production, storage or transmission facilities*	Wastewater treatments plants*
Extermination Companies*	Oil refineries*	

III. COMPLIANCE AND MANAGEMENT POLICIES

3.1 ACTIVE AND ONGOING PROGRAM

FUD is determined to take every reasonable precaution to ensure that unprotected cross connections do not allow contamination of the water distributed to its customers. FUD has established an active, ongoing cross-connection control program in a continuing effort to locate, correct, and monitor all existing cross-connection hazards and to discourage the creation of new problems.

3.1.1 Public Awareness

FUD recognizes that it is important to inform its customers of the health hazards associated with cross connections and to acquaint them with the CCC program to safeguard the quality of the water distributed. FUD will seek to use every practical means available to acquaint customers with the health hazards associated with cross connections in an effort to obtain cooperation and eliminate cross connections. FUD may use one or more of the following methods to increase public awareness regarding cross connections:

- Customer notification letters or brochures
- Brochure for new customers
- Consumer confidence report (CCR)
- Local video and print media
- Presentations to public forums or meetings
- Article on FUD website
- Posters posted at customer service locations

3.1.2 Staffing

FUD has designated staffing to ensure that the Cross-Connection Control Program is pursued in an aggressive and effective manner. The internal, subcontracted, and external personnel are listed in Table 1. FUD has established a Coordinator and Inspector within the backflow control department to further ensure the continued success of the program. FUD also ensures that personnel charged with BFD testing maintain a Certificate of Competency from TDEC DWS.

3.1.3 Surveys

FUD will actively survey the distribution system for both residential and commercial customers for cross connections. If it is determined from the survey results that possible cross connections may exist, the premises will be inspected (see Section 3.2.2 for more information on inspections). FUD requires a written survey at the time a customer request a new service connection. FUD staff follows up the surveys with a physical inspection of the property.

FUD shall also conduct residential and commercial survey's based on risk to the public water system. Residential and commercial services not requiring an assembly shall be re-inspected as needed. A premise may be re-inspected upon discovery of any of the following criteria:

- Change in ownership
- Change in occupancy
- Plumbing permit issued
- Irrigation system installed
- Drilling of well within the FUD system

Inspections may also be performed based on the results of the annual surveys or the issuance of irrigation-only meters. Inspections will likewise be conducted on all new commercial service applications.

3.2 ENFORCEMENT

3.2.1 Customer Responsibility

Cross connections, created and maintained by the customer for his or her convenience endanger the health and safety of all who depend upon the public water supply. Therefore, the customer who creates a cross-connection problem shall bear the expense of providing necessary backflow protection and for keeping the protective measures in good working order, including installation, repair, and testing of backflow prevention devices or maintaining air gaps as required. Facility types listed in Table 2 or any other premises deemed a threat to the water system by FUD or FUD's authorized personnel shall install and maintain a backflow device or maintain proper backflow prevention measures.

Where there is no direct connection to the water system, but the use of water at the premise could pose a risk, the installation of a hose bibb vacuum breaker is highly suggested. Hose bibb vacuum breakers are used in hose bibb outlets and laboratory fittings where a hose can be attached. These are generally attached to sill cocks and in turn are connected to hose supplied outlets such as garden hoses, slop sink hoses, spray outlets, etc. They consist of a spring loaded check valve that seals against an atmospheric outlet when water supply pressure is turned on and are designed to prevent against back-siphonage situations only where the hose may be immersed in non-potable solutions.

3.2.2 Premises Inspection

FUD or its authorized agents shall inspect properties served by the public water system where cross connections with the water system are deemed possible. The frequency of inspections and re-inspection based on potential health hazards involved shall be established by FUD in accordance with guidelines acceptable to TDEC DWS.

FUD or its authorized representative shall have the right to enter at any reasonable time any property served by a connection to the FUD water system for the purpose of inspecting the piping system therein for cross connections, auxiliary intakes, bypasses, or interconnections, or for the testing of BFDs. On request, the owner, lessee, or occupant of any property so served shall furnish any pertinent information regarding the piping system on such property. The refusal of such information or refusal of access, when requested, shall be deemed evidence of the presence of cross connections.

On new residential and commercial installations, FUD personnel will provide onsite evaluation and/or inspection of plans in order to determine the types of BFDs, if any, which will be required. Onsite inspections may be conducted if it is revealed that the customer is a type of facility or contains any of the risks listed in Table 2.

For residential and commercial premises existing prior to the start of this program, FUD will perform evaluations and inspections of plans and/or premises according to guidelines acceptable to TDEC DWS and inform the customer by letter of all of the following:

- Any corrective action deemed necessary
- The method of achieving the correction
- The amount of time allowed for the correction to be made

The period of time required for correction will be determined by the degree of hazard involved and shall not exceed 60 days (refer to Table 3 in Section 3.3.1 for a typical timeframe for BFD installation). All BFDs must be installed, operable, and tested prior to the initiation of water service.

3.2.3 Determination of backflow protection

FUD, City/County Plumbing Inspector, Fire Marshal, or other qualified representative shall determine that a backflow device is required where the nature of use of the water supplied to the premises by the water system is such that it is deemed:

- Impractical to provide an effective air-gap separation
- The owner and/or occupant of the premises cannot, or is not willing, to demonstrate to FUD or its designated representative that the water use and protective features of the plumbing are such as to pose no threat to the safety or potability of the water
- The nature and mode of operation within premises are such that frequent alterations are made to the plumbing
- The nature of the premises is such that the use of the structure may change to a use wherein backflow prevention is required
- There is a likelihood that protective measures may be subverted, altered, or disconnected
- The plumbing from a private well enters the building served by the public water supply, in such case FUD shall require the use of an approved protective device on the service line serving the premises to assure that any contamination that may originate in the customer's premises is contained therein
- BFDs shall be used in conjunction with all portable hydrant meter backflow assembly. Portable hydrant meter backflow assembly shall be returned to FUD at least annually for inspection or upon notification by FUD.

Types of facilities requiring BFDs are listed, but not limited to those in Table 2 of Section 2.0.

3.2.4 Approved devices and installation

The backflow devices shall be of the type approved by TDEC DWS and FUD as to manufacturer, model, size, and application. The method of installation of the BFD shall be approved by FUD prior to installation and shall comply with the criteria set forth by TDEC DWS and the FUD Cross Connection Manual. The installation shall be at the expense of the owner or occupant of the premises.

Minimum acceptable criteria for the installation of reduced pressure zone type backflow prevention devices and double check valve assemblies each requiring regular inspection and testing shall include the following:

- All required devices must be installed pursuant to FUD Standards and Specifications. All devices shall be installed in accordance with the manufacturer's installation instructions, and shall possess all test cocks and fittings required for testing the device. All fittings shall permit direct connection to test devices.
- The entire device including test cocks and valves shall be easily accessible for testing and repair.
- Reduced pressure backflow prevention devices shall be located a minimum of 12 inches plus the nominal diameter of the device above the floor surface. Maximum height above the floor surface shall not exceed 60 inches.
- Clearance of device from wall surfaces or other obstructions shall be a minimum of 6 inches.

- Devices shall be protected from freezing, vandalism, mechanical abuse, and from any corrosive, sticky, greasy, abrasive, or other damaging environment.
- Devices shall be positioned where discharge from relief port will not create undesirable conditions.
- Devices shall be installed such that they are unable to be bypassed unless redundant backflow protection is available.
- An approved air-gap shall separate the relief port from any drainage system.
- Devices shall be located in an area free from submergence or flood potential.
- A gravity drainage system is required on all installations. Below ground installations will not be permitted.
- Fire hydrant drains shall not be connected to the sewer nor shall fire hydrants be installed in such a manner that back-siphonage/backflow through the drain may occur.
- Where jockey (low volume-high pressure) pumps are utilized to maintain elevated pressure, as in a fire protection system, the discharge of the pump must be on the downstream side of any check valve or backflow prevention device. Where the supply for the jockey pump is taken from the upstream side of the check valve or backflow prevention device, an assembly of the same type as required on the main line shall be installed on the supply line.
- High volume fire pumps shall be equipped with a suction limiting control to modulate the pump if the suction pressure approaches 10 psi. Ideally, such pumps should draw from an in-house reservoir fed by several supply lines. If any of the supply lines have a source other than the public water supply, all supply lines must have air-gap discharges into the reservoir.

3.2.5 Alterations or changes to a BFD

For new installations, FUD along with the City or County Plumbing Inspections Office shall inspect the site and/or review plans in order to determine the type of backflow prevention device, if any, required, and notify the owners of the required device.

No installation, alteration, or change shall be made of any backflow prevention device connected to the FUD water system for water supply, fire protection, or any other purpose without pre approval. A copy of such permit shall be displayed in a conspicuous place at the job site at all times, from the time of issuance until the final inspection.

3.2.6 Annual inspection and device testing

FUD shall require, at a minimum, annual successful testing of installed backflow devices as directed by FUD's Cross Connection Control Program. FUD reserves the right to require customers to contract with an independent State Certified Backflow Tester, to use FUD employees to test devices, and/or to charge customers for these tests.

Only BFD tests performed by persons possessing a valid and current Certificate of Competency will be considered official tests by FUD. Records of all tests shall be provided to the FUD CCC Program Administrator and testing shall be conducted within the following criteria:

- Immediately following installation
- Tested annually if active, on FUD's required schedule
- Any time BFDs have been partially disassembled for cleaning and repair
- Where there is indication the BFD may not be functioning properly (i.e., excessive or continuous discharges from the relief valve, chatter, or vibration of internal parts)

Where the use of water is critical to the continuance of normal operations or protection of life, property, or equipment, duplicate units shall be required to avoid the necessity of discontinuing water service to test or repair the protective device.

FUD shall require the occupant of the premises to make all repairs indicated promptly, and to keep any protective device working properly. The expense of such repairs shall be borne by the owner or occupant of the premises.

3.2.7 Device Repairs

Should a BFD be found defective or have a status of Failed, FUD requires the BFD to be repaired promptly with manufacturer's specified parts, according to the manufacturer's specified procedure, and placed in proper operating condition within the time limit specified in Tables 4 and 5. Following repairs, the device is to be tested again to verify that it meets performance standards and has a status of Passed. The owner of the BFD will be responsible for maintaining protective measures ensuring the device remains in a good state of repair. The failure to maintain a BFD in proper working order shall be grounds for discontinuance of water service to a premise.

3.3 VIOLATIONS OF FUD'S CROSS CONNECTION PROGRAM

Any premises found to have cross connections, auxiliary intakes, bypasses, or interconnections in violation of the provisions of the FUD Cross Connection Manual shall be allowed a reasonable time within which to comply with the provisions of this manual. Every effort will be made to secure the voluntary cooperation of the customer in correcting cross connection hazards. After a thorough investigation of existing conditions and subsequent finding of a potential hazard to the public water system, the amount of time given to eliminate the hazard or potential hazard shall be determined by FUD.

3.3.1 Requirement to Install a BFD – New or Existing Service

If FUD or other authorized personnel determine during review of plans or premises that a BFD is required for a new water installation, a letter shall be issued to the customer by FUD informing the customer of:

- Any corrective action deemed necessary,
- Method of achieving the correction, and
- Time allowed for the correction to be made.

A list of certified testers shall be provided to the customer with the “First Notice of Cross Connection, Installation Requirement”. FUD shall determine the timeframe for the installation of an appropriate BFD depending on the degree of hazard presented to the water distribution system. See Table 3 for the typical compliance timeline. Failure to install a BFD as required by FUD or other authorized personnel shall result in denial or termination of water service.

Table 3. Timeline of Installation of Backflow Prevention Device.

Day	Type of Notification	Requirements
0	Letter - “First Notice of Cross Connection, Installation Requirement”	Customer shall have backflow device installed and tested <i>within 30 days</i>
30	Letter – “Second Notice of Cross Connection, Installation Requirement”	Customer shall have backflow device installed and tested <i>within 20 days</i>
50	Letter – “Notice of Violation, Final Notice of Installation Requirement”	Customer shall have backflow device installed and tested <i>within 10 business days</i>
61	Termination of FUD water service upon approval of General Manager	Customer shall have backflow device installed and tested and shall set-up an appointment for water service to be restored

3.3.2 Failure of an Existing BFD– Residential & Commercial

FUD will notify the residential & commercial customers upon the failure of an existing BFD and request that the appropriate repairs are made. A list of ‘Certified Backflow Assembly Repair/Testers’ shall be provided to the customer with the “First Notice of Cross Connection, Repair and Test”. The customer shall be given 30 days to have the device repaired and retested according to Section 3.2. If, after 30 days, the device has not had applicable repairs made and received a status of Passed from a certified tester, then FUD shall issue a “Second Notice of Cross Connection, Repair and Test” and request that the repair and retest be conducted within 20 days. If, after 50 days from the original notice, the device has not been repaired and successfully retested, FUD shall issue a “Notice of Violation, Final Notice of Cross Connection, Repair and Test” informing the customer of the intent to terminate water service. Table 4 summarizes the device repair timeframe.

Table 4. Timeline of Repair – Residential Backflow Prevention Device

Day	Type of Notification	Requirements
0	Letter - “First Notice of Cross Connection, Repair and Test”	Customer shall have backflow device installed and tested <i>within 30 days</i>
30	Letter – “Second Notice of Cross Connection, Repair and Test”	Customer shall have backflow device installed and tested <i>within 20 days</i>
50	Letter – “Notice of Violation, Final Notice to Cross Connection, Repair and Test”	Customer shall have backflow device installed and tested <i>within 10 business days</i>
61	Termination of FUD water service upon approval of General Manager	Customer shall have backflow device installed and tested and shall set-up an appointment for water service to be restored

3.3.3 Annual Required Testing – Fire System BFD

The commercial customers, that have a fire line BFD, shall have a total 30 days from the issuing of the “First Notice to Test” to have backflow prevention device(s) tested. If, after 30 days, the device has not been tested and any applicable repairs made, and issued a status of Passed, then FUD shall issue a “Second Notice to Test”. If, after 50 days from the original notice, the device has not been tested and any applicable repairs made, and issued a status of Passed, then FUD shall issue a “Notice of Violation, Final Notice to Test” informing the customer of the intent to terminate water service. The time frame allowed to test commercial backflow prevention devices shall be determined by FUD and may be altered depending on the degree of hazard; however the time shall not exceed 60 days. Table 5 summarizes the device testing timeframe:

Table 5. Timeline of Testing – Commercial Fire Line Backflow Assembly Device

Day	Type of Notification	Requirements
0	Letter - “First Notice to Test”	Customer shall have backflow device tested and applicable repairs made <i>within 30 days</i>
30	Letter – “Second Notice to Test”	Customer shall have backflow device tested and applicable repairs made <i>within 20 days</i>
50	Letter – “Notice of Violation, Final Notice to Test”	Customer shall have backflow device tested, and applicable repairs made <i>within 10 days</i>
61	Termination of FUD water service upon approval of General Manager	Customer shall have backflow device repaired or replaced and shall set-up an appointment for water service to be restored

3.3.4 Annual Required Testing – Portable Hydrant Meter Backflow Assemblies

FUD will perform an annual test and repair if needed on all portable hydrant meter backflow assemblies.

3.4 TERMINATION OF SERVICE

The failure to correct conditions threatening the safety of the public water system as described in this manual or failure to test a device as prescribed by the State of Tennessee, within the time limits set by FUD, shall be grounds for denial or termination of water service. If proper protection has not been provided after a reasonable time, FUD shall give the customer notification that water service is to be discontinued, and physically separate the public water system from the customer’s on-site piping system in such a manner that the two systems cannot again be connected by an unauthorized person. Water service will not be reinstated until proper installation and/or testing documentation is received by FUD.

The removal, bypassing, or altering of a protective device or the installation thereof so as to render a device ineffective shall constitute grounds for discontinuance of water service. Water service to such premises shall not be restored until the customer has corrected or eliminated such conditions or defects to the satisfaction of FUD.

3.5 IMMEDIATE THREAT TO THE WATER SYSTEM

Where cross connections, auxiliary intakes, bypasses, or interconnections are found that constitute a threat warning of immediate concern regarding contamination of the water system, FUD has the right to require immediate corrective action be taken to eliminate the threat warning to the public water system. The list of high risk/high hazard facilities are included on Table 2 and notated by an asterisk (*).

Expeditious steps may be taken to disconnect the water system from the on-site piping system unless the threat warning is corrected immediately. The time allowed for preparation for a due process hearing shall be in relationship with the risk of hazard to the public, and may follow disconnection when the risk of public health and safety in the opinion of FUD warrants disconnection prior to a due process hearing.

If backflow occurs or is believed to have occurred and there is the potential of contamination within the public water system, FUD will take the necessary steps to protect the health of the customer. These steps include, as necessary, and not limited to:

- Isolate potentially contaminated lines or facilities
- Determine cross connections and hazards
- Separate cross connections from FUD water distribution system
- Notify regulatory entities
- Notify the affected public
- Remove contamination from public water system
- Test and ensure safety of potable water
- Return public water system to service
- Rescind any public notification
- Investigate and document the details including cause, isolation, and correction
- Send report to Knoxville TDEC DWS

IV. RECORDS AND RETENTION

Listed below are the records maintained by FUD for the CCC Program. Records are maintained as a hard copy, electronic, or hard copy and electronic as applicable. The Administrator in the LRC department maintains the electronic system of record and hard copy records.

Table 6. Records and retention for CCC Program

Record	Record Type	Retention Time
Annual public education documents and pamphlets	Hard / electronic copy	Five years
State approved Cross Connection Manual	Hard / electronic copy	Maintained and updated copy retained indefinitely
Records – Initial surveys, recommendations, follow-up, corrective action	Hard / electronic copy	Five years
Master list of establishments with BFDs including location, BFD (make, model, serial number, etc)	Cross connection database	Five years
Customer correspondence / notifications	Cross connection database	Five years
Test records	Hard copies / Cross connection database	Five years
Tester information (name of device tester)	Cross connection database	Five years
Certificate of Competency for each tester	Hard / electronic copy	Five years
Copies of test kit certifications	Hard / electronic copy	Five years
Final Notice	Hard / electronic copy	Five years

4.1 MODIFICATIONS TO BACKFLOW MANUAL, WATER RULES AND REGULATIONS, AND STANDARDS AND SPECIFICATIONS

FUD may modify this Backflow Manual, the Water Rules and Regulations, or the Standards and Specifications relating to cross connection control and BFDs. The Backflow Manual and Water Rules and Regulations will be reviewed as needed to determine if they meet the requirements set forth by TDEC DWS and that they promote an ongoing program. The Manager shall be authorized to modify this manual as needed. Significant modifications shall be reported to General Board of Commissioners and TDEC DWS for their review and approval.