Cross-Connection Control Policy Handbook Staff Report

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1. HISTORY OF CROSS-CONNECTION CONTROL REGULATIONS AND POLICY IN CALIFORNIA

1.1. Summary of Cross-Connection Control Regulation & Policy in California

Cross-connection control regulation is not new in California. A summary of regulations and laws and their effective dates in California are provided in Table 1 below.

Table 1: Summary of Cross-Connection Control Regulation & Policy in California

Date	US or CA	Description	Comment
1914	US	General Procedures	U.S. Public Health Service general procedures for common carriers.
1919 Nov.	CA	Regulation on private water	Adopted by the State Board of Health, Bureau of Sanitary Engineering. Prohibited interconnection of private water supply with PWS's without a permit.
1924 May 12	CA	Regulation on private water	Amended 1919 regulation
1930 Jan. 11	US	U.S. Surgeon General Directive	Full certification for common carriers would not be given to potable supply if it were cross-connected with another supply which was not under sanitary supervision.
1930 Feb. 8	CA	Rescinded 1919 and 1924 regulations.	The regulation was ineffective as no water department wished to admit it wanted private water in its system. Followed U.S. Surgeon General Directives.
1942 Jun. 27	CA	Regulation on waterfront cross-connections	Regulation by State Board of Health called for protection of all drinking water lines both on the premises and in public system and also required provision of independent piping system for supplying drinking water on premises were inferior or polluted water could be introduced. Inferior water was to be identified.
1943 Aug. 28	CA	New regulations on cross-connection control. Rescinded 1942 regulations.	Approved by the State Department of Public Health. Defined cross-connections, required backflow protection, check valve, double check valve installation, protection against fire systems, and protection against process waters

Date	US or CA	Description	Comment
1953 May 9	CA	New regulations on cross-connection control. Rescinded 1943 regulations.	Rescinded 10 articles in 1943 regulation and replaced with 4 articles. Approved regulation under Health and Safety Code sections 203 and 208. (Register 53, No. 8 and December 22, 1956 Register 56, No. 22)
1987 Jun. 6	CA	New regulations on cross-connection control. Rescinded two articles from 1953 regulations.	Rescinded four articles in 1953 regulations and replaced with two articles. (Register 87, No. 23) Editorial correction in 1995 of first paragraph and Table 1, subdivision (d)(1) (12/8/1995, Register 95, No. 49). Revisions in 2000 to add backflow protection for recycled water in section 7604, Table 1 (11/2/2000, Register 2000, No. 4) Change without regulatory effect in 2015 amending subdivision (c)(3) of section 7604, Table 1 to read State Water Board (6/2/2015, Register 2015, No. 23)
1987 Sep. 24	CA	SB784 added sections 4049.50 and 4049.51 to Health and Safety Code which allowed local health officers (County Health Programs) to maintain internal cross-connection control programs.	Added by 1987 Statutes, Chapter 1128 (pg. 3848)
1989 Sep. 29	CA	SB1153 added sections 4049.52 and 4049.53 to Health and Safety Code which allowed local health officers (County Health Program) to have	Added by 1989 Statutes, Chapter 956 (pg. 3367)

Date	US or CA	Description	Comment
		backflow assembly tester certification programs and have enforcement authority.	
1992 Aug. 18	CA	AB2731 added Health and Safety Code section 4049.54 requiring use of purple pipe for reclaimed water.	Added by 1992 Statutes, Chapter 242 (pg. 1042).
1995 Aug, 10	CA	Health and Safety Code was recodified. Sections 4049.50-4049.54 were repealed and replaced with sections 116800-116820	Recodified by 1995 Statutes, Chapter 415 (pg. 2936)

1.2. Additional History of Public Health Significance

The original US Public Health Service (USPHS) regulations were focused on Common Carriers since the primary cause of cholera outbreaks in the early 1900's was associated with passenger ships along river routes. Subsequently railroads were also subject to these requirements. The 1930 USPHS directive included the requirements for the use of "modern backflow protective devices approved by the state department of public health and under its control."

The first California regulations, adopted in 1924, recognized that private water supplies represented a public health threat to PWS's if they were interconnected without protection to the public water supply.

The need to address cross-connection control at waterfront locations and other industrial sites was identified shortly after the end of World War II due to the expansion of shipbuilding and other industrial activity. This led to the adoption of the 1942 regulations which focused primarily on fire protection of harbor installations using bay water through the drinking water piping; the use or reuse of inferior or polluted water supplies in industrial plants and defense industries; and the increase in negative pressure experienced in water systems from excessive demands.

The 1942 regulations were rescinded on August 28, 1943 by the State Board of Public Health and replaced with new regulations that were designed to: (1) abate, as rapidly as practicable, existing cross-connections between drinking water systems and unsafe and nonpotable sources of water which cannot be approved; (2) eliminate cross-connections between drinking water systems and other sources of water or process water which jeopardized the safety of the supply; (3) prevent the making of such cross-connections in the future; (4) assure at all times a supply of safe drinking water. The regulations included required backflow protection with acceptable devices and their required design. The regulation also included requirements for protecting fire systems and process waters. This regulation also included the need for a designated water supervisor at sites deemed to have hazardous activities.

2. INTRODUCTION TO BACKFLOW PROTECTION AND CROSS-CONNECTION CONTROL

2.1. What is a Cross-Connection?

CCCPH section 2.1 provides a general definition and some examples of cross-connections. This is not meant to define or expand the obligations of PWS's related to cross-connection control.

2.2. Public Health Significance of Cross-Connection Control

2.2.1. Occurrence of Cross-Connections and Backflow

The need to prevent cross-connections with auxiliary water supplies or contaminant sources was identified over 100 years ago, as indicated in Section 1.3 of this report. The ability to cause illness and disease by unprotected cross-connections has been well established. The risk posed by backflow can be mitigated through preventive and corrective measures. Preventative measures include the installation of backflow prevention devices and assemblies. Cross-Connection Control programs seek out and correct cross-connections within the distribution system and within individual service connections. Corrective measures after a detected incident include activities such as flushing and cleaning the distribution system. These measures may help mitigate any further adverse health effects from any contaminants that may remain in the distribution system.

There are currently no estimates of the frequency of occurrence of cross-connections or backflow events in a typical system. However, most cross-connections occur beyond the customer service connection, within residential, commercial, institutional, or industrial plumbing systems, making identification and estimation of the number of cross-connections difficult. The American Backflow Prevention Association (ABPA) survey of State and PWS cross-connection control programs found that 42 percent of cross-connection surveys conducted identified a cross-connection. The most common cross-connections reported were from irrigation (62 percent of systems), fire systems (43 percent), garden/washdown hoses (43 percent), and boilers (38 percent). (USEPA, 2001, p. 19)

The U.S. EPA has recognized the importance of cross-connection control programs to protect the health of water system customers. Guidance prepared by the U.S. EPA on backflow prevention and cross-connection control and a white paper that evaluated the risks posed to PWS distribution systems estimated that approximately 50% of distribution system disease outbreaks were a result of unprotected cross-connections. (USEPA, 2001)

The U.S. EPA compiled data from 459 backflow incidents and estimated that 12,093 illnesses between 1970–2001 were caused by those incidents. Most incidents are detected through customer complaints; many more likely go undetected. Backflow incidents were compiled from CDC outbreak reports, as well as from backflow industry organizations and local media outlets. As such, the technical and scientific rigor behind the reported backflow incidents is not as strict as for outbreaks reported to CDC.

The University of Southern California Foundation for Cross-Connection Control and Hydraulic Research (FCCHR), the Pacific-Northwest Section of American Water Works Association (PNWS-AWWA), and the American Backflow Prevention Association (ABPA) compile data on backflow incidents. There is no federal reporting requirement so national statistics are not readily available (Lee et al, 2003, p. 1).

Studies conducted on the occurrence of cross-connections noted that although there is documentation of some incidents, statistics for occurrence are underreported due to lack of documentation (Lee et al, 2003, p. 3). For the period from 1981 to 1998, the U.S. EPA found that only 97 of 309 incidents were reported to public health authorities (USEPA, 2001, pp. 7, 15-19; NRC, 2005, pp. 11-12).

2.2.2. Contaminants and Public Health Protection

Cross-connections can introduce contaminants into a potable water system through backflow and cause a public health hazard such as poisoning or spread of disease. Cross-connections can also introduce pollutants with undesirable aesthetics such as unpleasant tastes and odors, thereby eroding customer trust in public drinking water.

Chemical and biological contaminants have caused illness and deaths during known incidents of backflow. The public health risk from cross-connections is a function of factors including cross-connection and backflow occurrence, the type and quantity of contaminants, and the health effects resulting from exposure to those contaminants. Among 459 backflow incidents compiled by the U.S. EPA, the most common chemical contaminants were copper, chromium, ethylene glycol, detergents, chlordane, malathion, propylene glycol, freon, and nitrite (USEPA, 2001, p. 9). Biological contaminants were most often reported as “sewage” or non-specific microbes and included *Giardia* and *E. coli*. Public health protection is thereby achieved through a cross-connection control program to reduce the threat of backflow.

2.3. Cross-Connection Control in Public Water Systems

Regulators, health officials, PWS’s, building officials, plumbers, and manufacturers each have their own requirements and methods to address cross-connections. PWS’s are

tasked by Health and Safety Code section 116555, subdivision (a)(2), with ensuring that their distribution systems will not be subject to backflow under normal operating conditions.

Public health protection in PWS's is addressed by the State Water Board and by industry by implementing a multiple-barrier approach, a concept of using more than one technical and managerial barrier applied from source to tap, to provide a safe supply of drinking water to consumers. If one of these barriers were to fail, as long as other barriers are still in place, the public water supply and public health remain protected. PWS's implement a multi-barrier approach to cross-connection control to ensure that public health is protected in the event that any single barrier fails. Barriers include risk prevention, risk management, monitoring and compliance, and individual actions by consumers (USEPA, 2006b).

PWS's oversee drinking water from source until delivery to a user's service connection, often ending at a water meter. A PWS typically does not have control over the water once it has entered the user's premises. The California Plumbing Code applies to premise plumbing and includes requirements to prevent backflow. The CCCPH addresses cross-connection control requirements for PWS's to ensure that the safety of the public water supply is maintained.

The hazards posed by cross-connections have been recognized in California since the establishment of the Drinking Water Program in 1915. One of earliest cross-connection control regulations was adopted in 1919, which prohibited connections between a private water supply and a PWS without a permit (Shaw, 1945; Jones, 1924).

2.4. Major Changes to Existing Cross-Connection Control Regulations

Most of the existing Title 17 requirements will be carried over to the CCCPH with changes providing clarification and new requirements. The following is a summary of the larger changes between the existing Title 17 requirements and the CCCPH:

- The six elements of PWS responsibility and scope of program in Title 17, section 7584 will be expanded to ten elements and details provided on existing elements. The current six elements are summarized as:
    a. Adoption of operating rules or ordinances
    b. Conducting of surveys (hazard assessments)
    c. Provisions for backflow protection
    d. Provision of person trained in cross-connection to carry out the program
    e. Establishment of procedure for testing
    f. Maintenance of records
- Four elements have been added to the responsibility and scope of the PWS cross-connection control plan as summarized:

a. Use of certified backflow prevention assembly testers and cross-connection control specialists

b. Backflow incident response, reporting, and notification

c. Public outreach and education

d. Local entity coordination

- The CCCPH requires that PWS's prepare a Cross-Connection Control Plan that describes how the PWS will achieve compliance with the CCCPH.
- Minimum requirements have been added for backflow prevention assembly tester and cross-connection control specialist certification programs.
- The CCCPH includes follow-up hazard assessments periodically, or when user premise conditions change.
- The CCPH also includes various changes to the minimum backflow protection required for certain situations.

Further discussions of significant changes or notable requirements are included in this document.

2.5. Regulations Repealed

The existing articles 1 and 2 of Title 17, chapter 5, subchapter 1, group 4, adopted on June 6, 1987, will be inoperative and repealed within 90 days of the effective date of the CCCPH (Health & Saf. Code, § 116407, subd. (c)(1)).

2.6. Existing Laws Affecting CCCPH Implementation and or Affected by the CCCPH

Previous staff memos, guidance documents, or any other document referencing sections in Title 17 pertaining to cross-connection control or backflow prevention may no longer reference applicable information. Staff should refer to the CCCPH for current guidance on ensuring compliance with cross-connection control requirements.

As detailed in section 1.2 of this report, the adoption of the CCCPH is a result of amendments to the Health and Safety Code, specifically sections 116407 and 116555.5. Statutes, regulations, and laws exist outside of the CCCPH that reference or contain requirements for backflow prevention or cross-connection control that may overlap or coincide with portions or details of the CCCPH. PWS's may be required to comply with these requirements concurrently with those of the CCCPH. A list of laws and regulations outside of the CCCPH that are related to cross-connection control are listed in Appendix G of the CCCPH. A brief list of some of these statutes, laws, or regulations are summarized below:

Recycled Water:

With the adoption of the CCCPH, regulations governing the delivery and use of potable supplemental water to dual-plumbed recycled water premises and cross-connection control specialists have been affected. The recycled water regulations are being updated concurrently with the adoption of the CCCPH to ensure that references to Title 17 are corrected to reference the CCCPH, where applicable.

Backflow Protection for Some Association of Users in Existence Prior to 1990:

Health and Safety Code section 116405 prevents some PWS's serving both domestic water and untreated irrigation water in separate pressurized distribution systems to require backflow protection on the domestic water line side. The law is conditional in that the two distribution systems must not be interconnected, the PWS must have been in existence before January 1, 1990, the PWS must be operated by an incorporated or unincorporated association of users, and the PWS must be in a county that did not exceed 500,000 persons in the 1970 federal decennial census.

Of the 58 counties in 1970, all but the following ten counties had populations less than 500,000: Alameda, Contra Costa, Los Angeles, Orange, Sacramento, San Bernardino, San Diego, San Francisco, San Mateo, and Santa Clara (U.S. Bureau of the Census, 1973).

Backflow Protection for Fire Sprinklers:

Health and Safety Code section 13114.7 states that Class 1 and 2 fire sprinklers, as defined by the American Water Works Association (AWWA) Manual M-14, do not require backflow protection other than those specified in the National Fire Protection Association (NFPA) publication "Installation of Sprinkler Systems" (NFPA Pamphlet No. 13, 1980 edition). AWWA Manual M-14 (currently 4th edition (2015)) no longer includes classes of sprinkler systems, including class 1 and 2 sprinkler systems; this section of the Health and Safety Code was established in 1982 and referred to the 1st edition of the M-14 manual from 1973 and the 1980 edition of the NFPA-13 pamphlet. The current edition NFPA-13 is from 2019.

Since Health and Safety Code section 13114.7 was established, studies have been performed confirming the presence of contaminants in the sprinkler systems that are prohibited from requiring backflow protection by the statute (Duranceau et al., 1998; Schneider et al., 2010).

Section 13114.7 appears to conflict with Health and Safety Code section 116555, subdivision (a)(2), which requires that a PWS not be subject to backflow under normal operating conditions. This existing statute also conflicts with the more recent editions of AWWA Manual M-14, which no longer includes Class 1 and 2 fire sprinklers.

Potable Supplemental Water to Recycled Water Dual-Plumbed Facilities:

California Code of Regulations, title 22, section 60315, "Design Requirements" prohibits the use of a public water supply as a backup or supplemental source of water for dual-plumbed recycled water systems unless the connection between the two systems is protected by an air gap separation that complies with Title 17, sections 7602, subdivision (a), and 7603, subdivision (a), and approval of the PWS is obtained. References to air gaps will be revised by the State Water Board in a future regulation update.

Cross-connection Control Specialists in Dual-Plumbed Facilities:

California Code of Regulations, title 22, section 60316, subdivision (a), "Operation Requirements" requires that inspections and cross-connection tests of dual-plumbed facilities be completed by a "cross connection control specialist certified by the California-Nevada section of the American Water Works Association or an organization with equivalent certification requirements." References to cross-connection control specialists will be revised by the State Water Board in a future regulation update.

Local Health Officer Programs:

Local health officers may maintain programs for the control of cross-connections by water users, within water users' premises, where public exposure to backflow may occur. Such programs may include water user premise inspections, collection of fees, certification of backflow prevention assembly (BPA) testers, and other discretionary elements. Local health officer BPA tester certification standards must be consistent with the standards prescribed in the CCCPH. For water systems that operate within counties that maintain local health officer BPA tester certification programs, the PWS must ensure that all testers also meet the requirements of certified testers within the CCCPH. Water users are required to comply with all orders, instructions, regulations, and notices from the local health officer regarding installation, testing, and maintenance of a BPA. (Health & Saf. Code, §§ 116800-116820)

3. JUSTIFICATION AND RATIONALE FOR CHAPTER 3 ARTICLE 1

The CCCPH replaces existing regulations with new requirements for the purposes improving cross-connection control and thereby protecting public health. Many of the new requirements simply restate the previous regulations, but other requirements represent significant changes and therefore require additional discussion. Some of these changes are listed in section 2.4 of this staff report and, along with other notable changes or elements, are as follows:

- Four new elements added to the responsibility and scope of requirements for cross-connection control program, including public outreach and education, and local entity coordination
- A requirement for PWS's to document how they achieve compliance with the ten elements of the cross-connection control program

- New minimum requirements for backflow prevention assembly tester and cross-connection control specialist certification programs
- Requirements for PWS to specify resurvey frequency
- For the purposes of the CCCPH, defining a PWS receiving a change in ownership permit as a new PWS
- A requirement for all PWS's to consult with a cross-connection control specialist when performing hazard assessments
- A requirement for reduced-pressure backflow prevention assemblies to be installed on certain fire protection systems
- The establishment of criteria for the approval or use of backflow protection assemblies
- Allowances for a local health agency to maintain their own backflow prevention assembly tester and cross-connection control specialist certification programs
- A prescriptive list of activities that would designate a premise as having a high hazard cross-connection potential
- Requirements for all premises with wastewater lift stations, pumping stations, or auxiliary water supplies, including those located on single-family residences, to be isolated using reduced-pressure backflow prevention assemblies

3.1. Definitions

The definitions are provided in the CCCPH to ensure consistency in application of requirements. Unless otherwise noted, the definitions apply to CCCPH. The definitions were developed from existing regulations, industry references and standards, discussion with State Water Board staff, and public comments received. Most of the definitions are not expected to be controversial or require further explanation, but the following definitions are provided for additional discussion:

"**Auxiliary water supply**": The definition is broad and places the emphasis on the cross-connection control specialist to document the premises hazards. Equipped or can be equipped can reasonably pose a hazard to the PWS if not properly protected against backflow. Compliance with the plumbing code requirements may provide sufficient protection to the PWS as determined by the cross-connection control specialist.

"**High hazard cross-connection**" and "**low hazard cross-connection**": These new terms were chosen to provide consistency in the industry to describe a threshold where the materials entering the PWS can pose a risk to public health and where more protective backflow prevention assemblies will be required. High and low hazard cross-connections are not defined in the previous regulations; rather, each type of hazardous activity and corresponding protection requirement was listed in Title 17, section 7604. The CCCPH includes many more types of hazardous activities in Appendix D and

contains multiple sections that discuss what a PWS must do or consider when confronted with a hazardous activity, including ones not listed in Appendix D. The State Water Board considers these additions to be a benefit to the protection of public health.

"**New public water system**" or "**New PWS**": The definition of a new PWS includes both PWS's not previously recognized as PWS's and PWS's receiving a new permit as a result of a change in ownership. New PWS are required in CCCPH section 3.1.4, subdivision (a)(2), to submit a Cross-Connection Control Plan for State Water Board review prior to being issued a permit. Previously unrecognized PWS's being required to submit Cross-Connection Control Plans should not be controversial, as they probably would not have a Cross-Connection Control Plan prior to being permitted by the State Water Board. An existing PWS applying for a new permit following a change of ownership, however, should have an existing Cross-Connection Control Plan, and many of the elements of the existing plan may apply to the PWS following a change in ownership.

The State Water Board is requiring a PWS applying for a new permit following a change of ownership to submit a new Cross-Connection Control Plan because some elements of the existing plan may change. These elements may include, for example, any ordinances or authorities allowing the PWS to require backflow prevention assemblies, changes in personnel tasked with maintaining and implementing the Cross-Connection Control Plan, or changes to the public outreach and education program. A change in ownership may also include a change in type of business performed at the PWS, and may therefore require different considerations or requirements in the type of backflow prevention assemblies used. For example, a campground is not always considered a high hazard cross-connection activity, but the new campground owners may want to include RV hookups, which is a high hazard cross-connection activity.

"**Noncommunity water system**": The definition of a noncommunity water system includes nontransient-noncommunity water systems and transient-noncommunity water systems. Nontransient-noncommunity water system is defined in California Code of Regulations, title 22, section 64400.80. Transient-noncommunity water system is defined in California Code of Regulations, title 22, section 64401.85. Examples of noncommunity water systems include schools, businesses, restaurants, amusement parks, and campgrounds.

3.2. Applicability

The section on applicability is a simple statement of which entities the CCCPH applies to, i.e., all PWS.

3.3. Program for Public Water System Cross-Connection Control

Title 17, section 7584, identified the required minimum elements, responsibility, and scope for a PWS's cross-connection control program. CCCPH section 3.1.3 reaffirms most of Title 17, section 7584, adds additional requirements to the reaffirmed elements,

and adds new elements to better protect the public and ensure that a PWS has a robust cross-connection control program.

CCCPH section 3.1.3 also includes a statement from Title 17, section 7585, that clarifies that “the water supplier, however, shall not be responsible for abatement of cross-connections which may exist within a user’s premises.” Internal protection of potential cross-connections generally lies outside the scope of the CCCPH, and outside the responsibilities of the PWS. Many transient and noncommunity-nontransient PWSs that produce water for their own use, however, will maintain responsibility for internal protection. This statement does not nullify the requirement to ensure that all potential hazards are abated, as described in CCCPH section 3.2.2.

The CCCPH expands the minimum required elements of a cross-connection control program to a total of ten elements, which are all described below:

(1) Operating rules or ordinances

Without sufficient legal authority by a PWS to implement a cross-connection control program the resulting program would be effectively useless. The requirements for operating rules or ordinances remain largely unchanged from Title 17, but the CCCPH details the requirements for enforcement.

(2) Cross-Connection Control Program Coordinator

A cross-connection control program coordinator is required by the CCCPH to ensure that the program is consistently maintained by at least one designated person, which should help to ensure continued application and adherence to an approved program, as well as providing a point of contact between the State Water Board and the PWS. The requirements for a cross-connection control program coordinator remain largely unchanged from Title 17. For PWS’s that are required to employ a specialist per CCCPH section 3.1.3, subdivision (c), the coordinator must be a certified specialist. Smaller PWS that do not employ a specialist must still designate a person who is responsible for the operation of the cross-connection control program; ideally this person would have knowledge and training of cross-connection control. The change in training requirements is offset by CCCPH section 3.1.3, subdivision (b), which requires that for some PWS the program be developed by a certified cross-connection specialist, and a requirement in CCCPH section 3.2.1 that all hazard assessments must be conducted in consultation with a certified cross-connection control specialist.

(3) Hazard Assessments

Hazard assessments, also known as cross-connection control surveys, are the primary means by which a PWS will identify any cross-connections and associated hazards in the PWS. A hazard assessment is necessary for a PWS to engage in adequate backflow prevention and cross-connection elimination – without an assessment the PWS would not know what to protect against. This section is largely unchanged from

Title 17, and a much deeper discussion of hazard assessments is in section 4.1 of this report and CCCPH section 3.2.1.

(4) Backflow Prevention

This subpart describes the minimum actions that a cross-connection control program must contain to protect against backflow. When possible, actual and potential cross-connections should be removed to better protect public health. This section is largely unchanged from Title 17, and a much deeper discussion of backflow prevention assemblies is in sections 4.2, 5.1, and 5.2 of this report and CCCPH section 3.2.2.

(5) Certified Backflow Prevention Assembly Testers and Certified Cross-Connection Control Specialists

The CCCPH establishes a performance standard for backflow assembly testers and cross-connection control specialists. A PWS may use any accepted certification program that is approved by the State Water Board and can meet the performance standard detailed in the CCCPH. A much deeper discussion of backflow prevention assembly testers is in section 5.1 of this report and CCCPH section 3.4.1 and cross-connection control specialists is in section 5.2 of this report and CCCPH section 3.4.2.

(6) Backflow Prevention Assembly Testing

This subpart describes the minimum actions that a cross-connection control program must contain to for ensuring that backflow prevention assemblies are field tested, inspected, and maintained and air gaps are inspected and maintained. This section is largely unchanged from Title 17, and a much deeper discussion of backflow prevention assembly testing is in section 5.3 of this report and CCCPH section 3.3.3.

(7) Recordkeeping

This subpart describes the minimum records that a cross-connection control program must contain for inclusion in a PWS's recordkeeping system. This section has been expanded from what was included in Title 17 to include the new requirements of the CCCPH. A much deeper discussion of recordkeeping is in section 7.1 of this report and CCCPH section 3.5.1.

(8) Backflow Incident Response, Reporting, and Notification

This subpart describes the minimum procedures that a cross-connection control program must include for investigating and responding to suspected or actual backflow incidents. This is a new requirement. The purpose of requiring reporting of backflow incidents is to better understand the prevalence and public health impacts of backflow incidents. A much deeper discussion of backflow prevention assemblies is in sections 7.2 and 7.3 of this report and CCCPH article 5.

(9) Public Outreach and Education

Many customers perceive no risk and believe cross-connection control programs are unnecessary. Experts involved in cross-connection control believe that public education is the most effective means of bringing customers into compliance (Lee et al, 2003). Efforts to educate the public have not been previously required and are a new requirement of the CCCPH. The purpose of adding this requirement is to help educate staff, customers, and the community on the importance of a cross-connection control program. The CCCPH proposes various methods that PWS's can implement to comply with this requirement. Additionally, PWS's can propose and submit alternative means of conducting public outreach and education in the cross-connection control plan submitted to the State Water Board.

(10) Local Entity Coordination

Coordination between PWSs and local entities involved in cross-connection control (e.g., building officials, plumbing officials, etc.) can be critical, especially when responding to a backflow incident. This subpart includes examples of actions that would benefit from local entity coordination, and examples of local entities that a PWS may need to coordinate with. Not all local entity examples will be applicable to all PWSs, but when applicable, coordination is important. An example may be coordinating with county agencies to verify that all BPAs are tested by a certified tester every year, or coordinating with law enforcement during a backflow incident if the owner of the user premises causing the backflow incident is uncooperative with the PWS. It is not the PWS's responsibility to make sure that the local entities cooperate with the PWS, but it will often be the PWS's responsibility to attempt coordination, whether the local entity is cooperative or not. The best time to coordinate is before things go wrong, so routine coordination with some local entities may be necessary. It will be the PWS's responsibility to determine procedures for local coordination, and include those procedures in its Cross-Connection Control Plan.

CCCPH section 3.1.3 also includes a specialist staffing requirement for some PWSs. All PWSs would benefit from having a cross-connection control specialist on staff or through contract but this may not be financially feasible for many PWSs. For PWSs required to have a cross-connection control specialist, the specialist is required to be able to be contacted within one hour, similar to the requirement for a distribution system chief or shift operator. The PWS may designate an alternate qualified staff member or contractor to be able to be contacted within one hour. This designee should have some experience with responding to cross-connection control issues and be listed in the PWS's Cross-Connection Control Plan.

3.4. Plan for Public Water System Cross-Connection Control

The CCCPH adds a new requirement to develop a Cross-Connection Control Plan (CCC Plan). The need for a PWS to prepare and submit a CCC Plan is similar to the need for a PWS to prepare and submit other plans that the State Water Board requires

via regulations or permits (e.g., bacteriological monitoring plans, operations plans, etc.). The CCC Plan is required to be submitted no later than 12 months after the effective date of the CCCPH. The CCC Plan does not need approval to begin implementation. The State Water Board will review and approve or request changes or clarification as needed. If special or expedited review is needed, a PWS can coordinate with their State Water Board field office.

In general, each PWS is unique and there is a level of system specific detail that is needed by the State Water Board and the PWS to ensure compliance with the regulations.

The State Water Board experience implementing Title 17 has found that many PWS may not be very knowledgeable regarding cross-connection control. This includes smaller PWS, who may contract with a third-party entity for the management of their cross-connection control program. The aim for the development of a CCC Plan and having it available is to raise PWS awareness and increase knowledge.

In addition to increased awareness and knowledge resulting from a formal CCC Plan, there are also inherent gray areas with respect to cross-connection control. For example, decisions must be made between one type of backflow protection versus another. Having a specialist consult on the cross-connection control program and sign-off on the hazard assessment (which is a part of a CCC Plan) increases the likelihood that gray area cross-connection control decisions are more consistent, more conservative, and more protective of public health.

Required elements of the CCC Plan are from the PWS program requirements listed in section 3.1.3(a) of the CCCPH. There are some compliance options that if implemented would need to be included in the CCC Plan for the PWS to show compliance with the requirements of the CCCPH. Examples are specifics on how a PWS will respond to cross-connection incidents, and if site supervisors are needed.

CCCPH section 3.1.4, subdivisions (b)(5) and (c)(5), require that all non-testable backflow preventers used for internal protection that are under the PWS ownership or administration are installed and maintained according to the California Plumbing Code. For non-community systems, like a restaurant, that may have internal backflow devices they should be aware. For public water system owned facilities, like sources and treatment plants, there may be devices that are relied on. This does not require an internal program of the entire distribution system. CCCPH section 3.1.4(b)(6) includes quality assurance and quality control components for backflow assembly tests. Since results of backflow tests depend on calibrated field kits, the PWS should have the ability check calibration and ensure test results can be relied on. How a PWS checks this can vary and can be tailored to needs.

Community water systems can solely use meter protection and do not need to allow internal protection in lieu of meter protection; however, if the PWS chooses to allow internal protection, the CCC Plan needs to include how the PWS will comply with this

requirement. Noncommunity water systems typically have ownership of the premise plumbing, making internal protection more likely than it is for community water systems. Examples of non-testable backflow preventer include dual check valves and atmospheric vacuum breakers.

4. JUSTIFICATION AND RATIONALE FOR CHAPTER 3 ARTICLE 2

4.1. Hazard Assessments

Hazard assessments, as they relate to cross-connection control, refer to an evaluation of a user premise to determine if there are actual or potential cross-connections and the associated degree of hazard to public health. Hazard assessments are often performed through a survey which typically includes, but is not limited to, a physical inspection of a user premise, a review of water use practices, and a review of plumbing plans.

Existing regulations in title 17, sections 7584 and 7585, require PWSs to conduct surveys to identify where cross-connections are likely to occur as part of their cross-connection control program, evaluate the degree of potential health hazards at a user premise, have provisions for backflow protection, and have at least one person that is trained in cross-connection control to carry out the program.

After identifying health hazards at a user premise, title 17, section 7604, requires the PWS to provide adequate protection at the user premise to prevent backflow. Section 7604, table 1, lists various frequently encountered types of health hazards and associates a minimum type of backflow prevention required for each health hazard. PWSs may use more protective forms of backflow protection than those listed in Table 1 but may not use less protective forms unless specifically allowed in regulation and approved by the appropriate health agency (e.g. State Water Board or local county health program) and the water system. Health hazards not listed in Table 1 are evaluated on a case-by-case basis.

The CCCPH replaces the title 17 survey requirement with a hazard assessment requirement. Hazard assessments are similar to the surveys in that the intent of a hazard assessment is to identify potential hazards on user premises that pose health risks to the PWS's distribution system. The CCCPH significantly expands on the Title 17 requirements and provides clearer instructions to PWSs. The hazard assessment requirements are located in the CCCPH, section 3.2.1. Below are brief discussions of each subdivision:

(a) This subdivision creates the requirement for PWSs to perform initial hazard assessments and establishes some minimum considerations for the assessments. The minimums are included to help PWSs better understand the expectations of the assessments and to create a baseline to ensure that the assessments are adequate for identifying potential hazards.

Numerous public comments were received for this section in both rounds of public comments. Answers are included in the complete response to comments for each round, but the following two general comments are also addressed here:

1. **Do the hazard assessments require an in-person assessment of each user premise?** Not necessarily. A PWS may use administrative tools to determine likely hazards and needed protection, such as census data or permitting records. Appendix D of the CCCPH lists a variety of user premise activities and associated backflow prevention requirements, and a PWS could combine Appendix D with permitting records to remotely determine, for example, that a particular premise contains a mortuary and therefore must have a RP assembly installed. PWSs may also propose means of grouping service connection types together to reduce the effort of the hazard assessments, but each PWS must make their own proposals for this grouping and include the details in their cross-connection control plan.

2. **Must single-family residences be included in the hazard assessment process?** Yes, existing title 17 regulations do not exclude single-family residences from the survey process and the CCCPH continues this requirement. The State Water Board recognizes that PWSs may not have sufficient access to residential user premises to adequately determine the degree of hazard on a given user premise to complete an in-person assessment, but PWSs may be able to use customer self-reporting forms and other tools (e.g., satellite photography) to make those determinations.

(b) This subdivision establishes a requirement to categorize hazard assessments into three categories. The three categories correspond to required types of backflow prevention assemblies or other protections and should help to provide clear follow-up actions for the PWS after identifying a hazard. Some commenters requested the option to avoid having to perform hazard assessments as required in subdivision (a) and instead determine the level of hazard based on water use at similar premises. The State Water Board agrees that PWSs may be able to reduce the effort required in the hazard assessments through a comparison of activities, but each PWS must make those proposals as part of their specific, approved cross-connection control plan, and that some PWSs may not receive approval.

(c) This subdivision requires that any user premises with existing backflow prevention assemblies provide adequate protection from hazards as required in the CCCPH. Standards for backflow prevention in the CCCPH are more stringent and better defined than the standards in title 17, and a backflow prevention assembly installed to comply with Title 17 might not be adequate for compliance with the CCCPH.

(d) This subdivision allows a PWS that has performed a hazard assessment prior to the adoption of the CCCPH to use that assessment to meet the initial assessment requirement of subdivision (a), provided that the prior assessment meets certain criteria. This subdivision should reduce the effort needed by a PWS to comply with subdivision (a). There is no maximum time range for prior hazard assessments, but each PWS must determine if the previous assessment still reflects the current user premise. Each PWS is different and can identify in its cross-connection control plan the best approach to conduct hazard assessments that will not create an undue burden

depending on the PWS size, resources, and finances. Requirements that are too prescriptive may remove flexibility of CCCPH implementation.

(e) This subdivision establishes criteria for the reassessment of hazards by community water systems at user premises after the initial hazard assessment is completed. Conditions at a user premise at the time of a hazard assessment are unlikely to be absolutely permanent and reassessments will eventually be necessary. The criteria will provide minimum requirements and clarity on expectations for reassessment. The criteria may also provide PWSs with the necessary rationale when interacting with customers to explain why a reassessment is required.

Many commenters requested that the exclusion of single-family residences in subdivision (e)(1) be removed or modified to specify that the PWS can perform a hazard assessment at the time of ownership change. The State Water Board did not remove or modify this exclusion because some PWSs may not reasonably have the capacity to perform a hazard assessment at that frequency, and PWSs that do have the capacity may perform these assessments at their discretion. Types or specific arrangements of account holders can be included in the cross-connection control plans and when a hazard assessment would be needed.

Commenters requested that multi-family residences be included in the exclusion granted to single-family residences in (e)(1) so that multi-family residences are not required to have a hazard reassessment when the user premises changes account holder. The request was made in part due to concerns that multi-family residences see a higher frequency of turnover of tenants (e.g., apartment renters) or owners (e.g., condominium owners) than single-family residences and would result in a high resource burden to perform hazard assessments. The State Water Board did not modify this exclusion to include multi-family residences.

The State Water Board intends for the hazard assessment requirement to be applied when a multi-family residence account holder changes, not when a tenant changes. The CCCPH defines the “User premises” as “property under the ownership or control of a [person or entity authorized to receive water] and served… via a service connection…”. Apartment buildings, condominium complexes, and multiplexes are often served by a master meter which then either provides water to tenants or owners at a flat rate, or through sub-metered connections; in either case, a hazard reassessment would only be required if the master meter account holder changed, such as an apartment building being sold or a condominium complex undergoing a complete change in ownership. An apartment unit or individual condominium unit (e.g., townhome) sold and also individually metered or sub-metered, and therefore an “account holder”, would also be considered as a single-family residence and eligible for the exclusion.

The State Water Board intends the requirement of multi-family residence hazard assessments to represent events where the change in account holder has an increased chance of major changes to the user premises, such as development plans, major irrigation modifications, swimming pool installation, etc., but would not necessarily be captured by subsection (e)(3) due to different permitting processes within a water system (i.e., business activity changes may be noticed more readily than residential activity changes). The term “multi-family residences” is used by public water systems as a broad definition that includes too many unique variations to be effectively broken out into types of multi-family residences that pose more or less hazards than others, thus the need for the encapsulating term. The State Water Board anticipates that public water systems may identify unique types of multi-family residences that present both resource challenges and regulatory compliance difficulties, and will adjust the CCCPH if needed.

Section 3.2.1 (e)(5) requires additional hazard assessments be conducted periodically. Periodically is not defined in the CCCPH as each PWS is different and can identify in its cross-connection control plan the best approach to conduct hazard assessments that will not create an undue burden depending on the PWS size, resources, and finances. Requirements that are too prescriptive may remove flexibility of CCCPH implementation and a uniform definition that would cover all types and sizes of PWSs may not allow the desired flexibility.

Commenters requested that a user premise that has an RP or AG be exempted from further hazard assessments once an initial hazard assessment is completed. The State Water Board did not remove this requirement though as PWSs need to maintain an account of what hazards exist and how the PWS is protected against those hazards. PWSs must be notified of any hazard or protection changes in order to have an accurate accounting of the hazards present in their system. Existing protection may be adequate, but the PWS must know why an AG/RP exists even if no change to protection is needed. PWSs are expected to be able to modify their accounting and/or administrative practices to ensure that those implementing or enforcing its cross-connection control program are notified when there is a change at the user premise. If described in its cross-connection control plan, this information can be used to determine if additional steps are required to assess any hazards, or if the hazard assessment requirement was fulfilled by a user survey.

(f) This subdivision establishes a due date for noncommunity water systems to conduct an initial or updated hazard assessment. Community water systems are not given a due date for the hazard assessment to be conducted because the varying sizes of community water systems makes a one-size-fits-all approach impractical. Community water systems will be held accountable to acceptable timeframes through the review of the cross-connection control plan.

(g) This subdivision establishes criteria for noncommunity water systems to perform hazard reassessments. Subdivision (e) provides a variety of criteria for community

water systems to perform a reassessment at a user premise which do not necessarily apply to a noncommunity water system. Noncommunity water systems often are indistinguishable from the user premise itself; therefore, rather than including a variety of criteria for triggering a reevaluation, noncommunity water systems must simply reevaluate when any changes or backflow events occur.

(h) This subdivision establishes a requirement that the hazard assessments be reviewed by a cross-connection control specialist. The requirement is necessary to ensure that hazard assessments are performed correctly. It allows, where appropriate, someone who is not a cross-connection control specialist but is trained on how to conduct a hazard assessment to perform a hazard assessment, as long as the hazard assessment is reviewed and approved by a cross-connection control specialist.

4.2. Backflow Protection Required

The existing Title 17, section 7604, requires that the type of backflow protection installed at a user's premise be commensurate with the degree of hazard identified through a hazard assessment. Table 1 included many different types of commonly identified hazards within distributions systems. For certain hazards the minimum type of backflow protection was specified. However, many of the hazards included provisions for the use of an alternate level of protection upon approval of the health agency and PWS. Changes introduced with the CCCPH include the categorization of hazards as either high or low hazards. There is a list in Appendix D of high hazard premises. As discussed in section 8.4 of this report, based on State Water Board experience, having such a list would be more beneficial to a PWS than the current table in Title 17. Although the table in Title 17 may provide some necessary general and broad requirements, the broadness of the table can lead to inconsistent application and does not provide sufficient information for those needing more guidance.

The backflow prevention assembly provided must be no less protective than the highest identified degree of hazard at a user's premise. For example, a residence with a swimming pool and a private well (considered an auxiliary water supply) would require at least a RP or AG, as the private well would be the highest degree of hazard present. All high hazard premises require the installation of a minimum an AG or RP to provide premise isolation. User premises with fire protection systems connected to the PWS's distribution system are not required to install the same level of protection as the other service connections on the user's premise. For example, at a pet groomer facility that has two connections from the PWS's distribution system, one for the main facility and the one for a low hazard fire sprinkler system, the main facility connection would require an RP or AG whereas the fire sprinkler connection would be allowed to have a DC. If instead the pet groomer facility only has one service connection that feeds both the main facility and the fire sprinkler system, then the connection would need an RP or AG to protect against the highest level of hazard present.

Following State Water Board review and approval, a PWS may implement an alternate method of premises protection in lieu of an AG provided that the proposed alternative

does not increase the level of risk to protection of public health. A number of possible alternatives have been proposed, such as 2 RPs in series, although there are very few in existence. A PWS would start with an AG. If less protection is considered, the hazard assessment and other information would need to be considered to document no increased risk with lower protection.

Swivel-Ell

As required by AB 1180, provisions for the use a of swivel-ell in lieu of an AG are specified in the CCCPH. The CCCPH includes requirements for the use of a swivel-ell, testing frequencies and inspection requirements of the RP used for premise isolation; and notification and reporting requirements on the use of a swivel-ell to both the State Water Board and the PWS. Installation criteria for a swivel-ell arrangement are included in Appendix C of the CCCPH. Prior to the installation of a swivel-ell, there must be approvals received from the PWS and the State Water Board that all elements of the CCCPH have been addressed. State Water Board notification of swivel-ell switchover is needed early but in emergencies may be received after the switchover has occurred. The CCCPH specifies notification within 24 hours, before or after the switchover. There is also a requirement to have a trained representative of the PWS to supervise the switchover. The PWS needs to be aware a switchover has occurred and the PWS representative that is present needs to know what they are seeing. This representative does not need to be a specialist but should recognize a swivel-ell. A PWS can indicate in their CCC Plan who the representative can be.

Fire Sprinklers

This section of the CCCPH also includes specific requirements for fire protection systems based on the degree of hazard.

Health and Safety Code section 13114.7 on fire sprinklers prohibits requiring backflow prevention assemblies, other than those required by NFPA Pamphlet No. 13, 1980 edition, on class 1 and 2 fire sprinklers as defined by AWWA M14 at the time of the 1987 regulations (1973 edition). Class 1 were direct connections from domestic water mains with no pumps or reservoir, anti-freeze, or other additives, and all sprinkler drains discharge to atmosphere. Class 2 are the same as class 1, except that booster pumps may be installed in the connections from the public supply mains (CA-DHS, 1988, p. V-25). The 1980 edition of NFPA-13 allowed check valves when there were multiple sources of supply connections or fire department connections (NFPA, 1980, pp. 47-48).

A 1998 study by the American Water Works Association Research Foundation (AwwaRF) evaluated the water quality of Class 1 and 2 wet-pipe fire sprinkler systems to determine if a public health hazard exists and to identify methods to safeguard the public in such a case. The majority of the wet-pipe systems were constructed of black steel piping and some galvanized black steel piping. No wet-pipe fire sprinklers of copper or plastic were studied. The study found that lead and cadmium exceeded their primary standards and iron, manganese, total dissolved solids, sulfate, color, and odor

exceeded their secondary standards (Duranceau et al, 1998, p. 143). Backflow protection was recommended for Class 1 and 2 fire sprinklers based on black steel pipe water quality and concerns on fire flow should be addressed (Duranceau et al, 1998, p. 145).

The third edition of AWWA M14 eliminates defining fire systems by class and states the following (AWWA, 2004, p. 79):

“Wet pipe fire sprinkler systems contain water that is connected to the potable water system. It has been shown that water contained in closed or nonflow-through fire systems may be stagnant or contaminated beyond acceptable drinking water standards. Some of the contaminants found in fire sprinkler systems are antifreeze, chemicals used for corrosion control or as wetting agents, oil, lead, cadmium, and iron.”

The manual recommends RPs or AGs for high hazards and DCs or AGs for all other closed or non-flow through systems. This guidance remains in the current fourth edition of AWWA M14 (AWWA, 2015a, p. 79).

From these references and studies, the public health concerns with fire sprinklers that previously were classified as class 1 and 2 are that they may be constructed with non-potable piping, contain stagnant water with elevated concentrations of heavy metals, and experience pressure loss due to the use of backflow preventers. Protection from fire systems was not adopted by the State Fire Marshall in the 2019 California Plumbing Code, section 603.5.14, due to Health and Safety Code section 13114.7. Health and Safety Code section 13114.7, citing AWWA M14, has contradictory requirements. The CCCPH addresses these hazards by specifying the requirement for a DC on all fire sprinkler systems unless they meet the exemption criteria in 3.2.2(e)(3). The exemption criteria is for residential fire sprinklers that are “flow through” type. These sprinkler systems are piped to a home outlet, like toilet or sink, so that water flows constant and is not stagnant. If a residential fire system is not flow through or a system cannot install a DC with 10 years, there are options in 3.2.2(e)(2) – one is a PWS can ask for an alternative date to comply and two is they can propose an alternative that provides the same level of public health protection. An RP is still required for high hazards. The alternative date does not need to be a blanket date but can be tailored to needs and risk for different types of connections or fire sprinkler system types.

User Supervisor

The existing Title 17, section 7586, allows a health agency and PWS to require an industrial water user with multi-piping systems to designate a user supervisor to be responsible for the avoidance of cross-connections during operation and maintenance of the water user’s pipelines or equipment. Due to the complexity of such systems and the possibility of frequent changes in piping, a PWS may require a user supervisor (CA-DHS, 1988, p. VI-1). Due to limitations with on-site access, user supervisors are a method to limit the creation of cross-connections (Ritland & O’Brien, 2019, pp. 41-42).

This supervisor is called “user,” “site,” or “water” supervisor (CA-NV AWWA, 1992, p. 7; Carlson, 2001, p. 55; FCCCHR, 2009, p. 14) interchangeably.

In comments received from the February 20, 2020 workshop it was recommended that training and duties be specified for user supervisors. This was added in section 3.2.2 (g).

Applying the multiple barrier approach to public health, a user supervisor is an additional administrative control for protection against cross-connections. A user supervisor “must be familiar with practice and regulations regarding cross connection control and plumbing and must be intimately familiar with the water use practices within the customer’s facility” (CA-DHS, 1988, p. VI-2). These supervisors maintain records of signage and testing, accompany water agency staff during site inspections, alert of changes in piping, review plans, and maintain contact information with a PWS among several activities (CA-NV AWWA, 1997, p. 30; CA-NV AWWA, 1992, pp. 41-42; Carlson, 2001, p. 55).

As recycled water use has greatly expanded in California since 1987 and elsewhere, user supervisors have been used in recycled water use sites (CA-NV AWWA, 1997, p. 30; Carlson, 2001, p. 55; CDM Smith, 2012, pp. 2-9; LACWRA, 2014, p. 15).

The CCCPH will continue to allow a user supervisor, but minimum requirements will be specified for implementation. A user supervisor is not required to be specified for individual premises, but if required by a PWS, the PWS’s CCC plan will need to include specific information on the premises designated for user supervisors, and details on the records to be maintained by the user supervisor.

Water Treatment/Storage/Distribution and Water Recycling Facilities

All facilities owned and operated by a PWS to either treat, store, pump, or distribute a potable water supply and those operated to produce an alternative/recycled water supply must be protected from cross-connections to protect the customers/staff of the facility. Protection is generally provided by internal assemblies; however, most chemical feed facilities have an AG on the potable water supply to prevent back siphonage.

5. JUSTIFICATION AND RATIONALE FOR CHAPTER 3 ARTICLE 3

5.1. Standards for Types of Backflow Protection

The existing Title 17 regulations include requirements on backflow preventer assembly construction in section 7602 and on the approval of backflow preventers in section 7601. Some of these requirements are now outdated. The CCCPH will continue to include construction criteria with updated information.

This section is applicable for PWS’s that are replacing or installing new backflow preventors. The PWS’s can also set their own requirements that are more restrictive than the standards that are listed in this section, but not less restrictive. The references included in the CCCPH are from specific industry standards and are referenced by their date or version. The CCCPH uses specific versions so that the State Water Board can

control and review future references to maintain appropriateness for the CCCPH sections during any future update of the handbook. The State Water Board also wants to continue to ensure that the backflow preventers are approved through both laboratory and field evaluation tests. However, the State Water Board will not be determining the competency of specific backflow devices, as these standards have already been established. Future editions of standards or new standards can be reviewed and approved in updates to the CCCPH.

The approved BPAs should not be modified, even by the PWS. PWS's must require backflow prevention assembly testers to notify the PWS if a water user or PWS-owned BPA has been modified. This section does not apply to repairs of BPA to bring them back to the standard of this section.

There will be no anticipated changes to operating costs for PWS's from existing Title 17 regulations, as the proposed CCCPH criteria will not change significantly from current requirements. Backflow prevention assemblies that meet minimum requirements provide performance assurance for protection of PWS's and the public from cross-connection control hazards.

5.2. Installation Criteria for Backflow Protection

The existing Title 17, section 7603, specifies installation criteria for backflow prevention assemblies. The CCCPH continues to include installation criteria with some additions and clarifications regarding installation requirements. Additional installation criteria are needed to ensure that a backflow prevention assembly can operate correctly, and that required testing can be performed. State Water Board experience has found that double check valve type backflow prevention assemblies installed below grade have at times not allowed sufficient access for proper testing. Access to perform a field test and use required equipment allows the field test to be performed correctly. For example, when performing a USC 10th Edition field test on the first check valve and there is a leaking shutoff valve and water is receding from the No. 3 test cock, a tester is required to adjust the field test kit height to the centerline of the assembly (FCCCHR, 2009, p. 286). An assembly that is below grade or in an inaccessible location may not allow the tester to correctly perform the field test.

The cost to implement this section may increase operational costs of PWS's. Backflow prevention assemblies are owned by the water user, however, so costs to modify the installation of an assembly will be the responsibility of the water user. Water system owned assemblies will also need to be modified if the new requirements in the CCCPH apply. A major change is the need to have double check valve type backflow prevention assemblies above grade. The CCCPH will allow existing double check valve assemblies to remain in place if they can pass a field test and be repaired. Double check valve backflow prevention assemblies that cannot be repaired or newly installed assemblies will be required to be installed above grade. This allows flexibility for operating cost increases.

5.3. Field Testing and Repair of Backflow Prevention Assemblies and Air Gap Inspection

The existing Title 17, section 7605 includes requirements on the frequency of backflow prevention assembly field testing, requirements for individuals conducting the field testing, the need to ensure that the assemblies operate correctly and are repaired as needed, noticing of customers when testing is required and the specific records that need to be maintained. This section of the CCCPH continues to include field testing requirements. Additional specificity on the criteria included for field testing of backflow prevention assemblies is to ensure that all devices function correctly to reliably protect the distribution system at all times. The visual inspection criteria for AGs ensures that no additional plumbing has been installed to prevent the functioning of the AG.

In Section 3.3.3 of the CCCPH add clarification and details on the requirements above. PWS in their Cross-Connection Control Plan may detail more information on the requirements of meeting the BPAs repair or replacement. For meeting the 30 days repaired or replaced of notification of a BPA failure, DDW understands that not all BPAs can be repaired or replaced in this time frame. However, the CCCPH allow PWS to specify situations that PWS may grant extension to users to the 30 days requirement in their Cross-Connection Control Plan. Most PWS have experience in timelines for replacement and include those in their plan. In this plan, PWS can also be more stringent. For example, if the PWS knows that immediate notification is better than the CCCPH's one day notification requirement of backflow incidences or an unprotected cross-connection is observed at the BPA or prior to the user premises. PWS may include in their Cross-Connection Control Plan to require field testers to notify them sooner when such incidences have occurred. More frequent testing of BPA may also be included in the PWS Cross-Connection Control Plan for devices they deem necessary.

Details regarding the necessary record keeping on testing and maintenance of each BPA is found in other chapters of the CCCPH.

6. JUSTIFICATION AND RATIONALE FOR CHAPTER 3 ARTICLE 4

6.1. Backflow Prevention Assembly Tester Certification

Title 17, section 7584, subdivision (e) regulations currently require that a PWS establish a procedure or system for testing backflow preventers. Title 17, section 7605, subdivision (b) requires that backflow preventers be tested by persons that have demonstrated their competency to the water supplier or health agency. The CCCPH continues this requirement and provides details on what constitutes a competent tester.

Testing of backflow assemblies only by a person who has demonstrated competency is generally accepted by states and PWS's. The use of certified backflow preventer testers is consistent with U.S. EPA recommendations (USEPA, 2006a). The U.S. EPA reviewed state programs and found that 26 out of 50 states require training, licensing, or certification of backflow prevention assembly testers (USEPA, 2001, p. 27). A 2003 report on North American cross-connection control programs found that 89% of 719

PWS's required assemblies to be field tested and 81% indicated that there was a means to determine who was qualified to perform such tests (Lee et al, 2003, p. 26). Of the PWS's surveyed, 70% indicated that they had a requirement for a specific acceptable method for testing the backflow preventers (Lee et al, 2003, p. 26). The field test procedures published in either the Eighth or Ninth Edition of the USC Manual of Cross-Connection Control were used by 74% of those responding to the survey. The ASSE Series 5000 was used by 9%; the New England Water Works Association method was used by 8%, and 19% indicated "other" (Lee et al, 2003, p. 26).

The State Water Board has been asked if certain programs and certifications are acceptable. Existing Title 17 regulations do not address requirements for certification of testers or provide criteria on what "competent" means for testing of backflow preventers.

The 1987 regulations require persons to demonstrate competency in testing backflow preventer assemblies. The previous edition of the regulations from 1953 required "competent inspections" of devices to determine if they are defective. The need to have persons adequately trained to perform testing was identified early on but requirements were not noted. In response to this need in California and other states, academia and industry developed training programs for testers. In guidance provided in the Green Book by the State Water Board at the time of the 1987 regulations, it noted:

> *A backflow prevention assembly tester is responsible for testing and/or repairing backflow prevention assemblies and providing the water user with a copy of the test results… The tester must have demonstrated [their] competence in testing these devices to the satisfaction of the water supplier. In addition, the tester should be certified under a program acceptable to water supplier that provide periodic reexamination to ensure [their] continued competence. Presently the AWWA, as well as a number of counties provide such certification program* (CA-DHS, 1988, p. VI-1).

Industry references for cross-connection control provide guidance on competent testers. The administrative authority "must be assured that testers in its jurisdiction can properly perform field-test procedures on backflow prevention assemblies. To provide this assurance, each tester must successfully complete a recognized examination process" (AWWA, 2015a, p. 63). Ideally, "a certification agency determines if a backflow prevention professional meets industry-accepted standards" (IAPMO & UA, 2016, p. 12-1). A certified tester is an individual who "has completed specialized training (usually at least 40 hours) and has acquired an understanding of hydraulics, cross-connection control programs, assembly design and function, and test procedures" (BMI, 2011, p. V-44).

Some certified testers are sent as contractors representing the local authority. One reference recommends that that the local authority create a Code of Conduct for these testers to sign to ensure good service to customers (Ritland & O'Brien, 2019, p. 46).

The USC FCCHR began teaching tester courses in the late 1960s (FCCHR, 2009, p. 29) but has not offered certification. Industry groups developed training programs and certifications and began offerings in the 1980s. Many community colleges and universities also offer training, but no certification.

Local health officers (counties) have statutory authority to implement internal cross-connection control programs in Health and Safety Code section 116800 and to certify backflow prevention assembly testers in Health and Safety Code section 116810. The statute to allow internal cross-connection control programs was originally approved in 1987 (1987 stat., ch. 1128, p. 3848) and to certify testers and enforce programs was approved in 1989 (1989 stat., ch. 956, p. 3367). In 1995 these sections were recodified to the sections that were in place until adoption of the CCCPH (1995 stat., ch. 415, p. 2936). Several counties have since adopted cross-connection tester programs, although some existed before 1987. The 1987 and 1989 statutes required that tester programs be "consistent" with regulations adopted by the State Water Board.

Counties like Los Angeles have required the approval of testers since 1964. Other counties have followed as noted in the table below. Some counties require proof certification or additional licenses to be placed on their list, but the counties listed below administer exams:

Table 2: County Backflow Assembly Tester Certification Programs (with Exams Administered) as of August 2020

Local Health Officer	Year Began	Citation
County of Los Angeles, Department of Public Health	1964	Code of Ordinances for Los Angeles County, title 8, Section 8.04.070 - Certified backflow prevention device tester (Ord. 12110 § 6, 1980: ord. 8609 art. 2 § 54, 1964.) 8.04.620 - Biennial certification examination fee (Ord. 12110 § 4, 1980: ord. 8609 art. 1 § 12.1, 1964.)
Orange County Health Care Agency, Division of Environmental Health.	1967	Orange County Earliest reference found in resolution no. 91-1446, 1991. No current reference found.
County of San Luis Obispo Environmental Health Services	1971	San Luis Obispo County Code, title 8, chapter 8, section 8.30.060

Local Health Officer	Year Began	Citation
		(Ord. 1175 (part), 1971)
Ventura County Environmental Health	1979	Code of Ordinances for Ventura County, division 4, chapter 6, article 4, sections 4693-4698 (Rep. Reen. ord. 3438—5/15/1979) (Ord. 4487, 2/23/2016)
City and County of San Francisco	1984	City and County of San Francisco Municipal Code, Health Code, article 12A, section 12A.7. (Ord. 356-84, app. 8/24/1984; repealed by ord. 100-16, file no. 160294, app. 6/17/2016, eff. 7/17/2016) San Francisco Public Utilities Commission, Rules and Regulations Governing Water Service to Customers, section G – Cross-Connection Control, rule 6.
San Bernardino County Environmental Health Services	1992	San Bernardino County Code, chapter 6, article 4, sections 33.0650-33.06535 (Ordinance 3512, passed 1992)
Riverside County Department of Environmental Health	1996	Code of Ordinances for Riverside County, title 13, chapter 13.08, sections 13.08.010-13.08.070 (Ord. 525.3 § 2, 1996)

Organizations that offer tester certification in California include the California-Nevada section, American Water Works Association (CA-NV AWWA) since 1981, the American Association of Sanitary Engineering (ASSE, now ASSE International) since 1991, the American Backflow Prevention Association (ABPA) since 1994, and the Northern California Backflow Prevention Association (NCBPA) since 2011. The California Rural Water Association (CRWA) offered certifications through Backflow Management, Inc (BMI) from about 2010 to 2011 when CRWA switched to certification through NCBPA. In 2013 BMI stopped offering certification. While many colleges and universities offer tester training, they do not offer certifications.

Training alone is insufficient for testers as content and rigorousness vary by training provider and is difficult to monitor. Testing of backflow preventers requires physical operation with hands-on procedures that must be verified through the visual observation by an evaluator. If we were to continue with the requirements of Title 17 by demonstrating competency to only the PWS, it would require ongoing testing on the part

of the PWS to ensure that the tester remains competent, which would be too time consuming for the PWS.

Certification requires that a person be trained and pass an examination with a third party. Certification must be maintained, meaning that verification that the person is still knowledgeable needs to be re-assessed, or a certification will lapse. Certification provides a means for PWS's to verify that a person continues to be knowledgeable and capable of performing tester activities required by the CCCPH.

Comments received from and during the February 20, 2020 public workshop addressed if the State Water Board would assume an accreditation or certification program for backflow preventer testers like the Environmental Laboratory Accreditation Program (ELAP) or the water operator certification program, respectively. Unlike the water operator certification program (Health & Saf. Code, § 106875) and laboratory accreditation (Health & Saf. Code, § 100827), the State Water Board does not have the authority to certify or accredit cross-connection control specialist and backflow preventer assembly tester organizations. Counties do have the authority (Health & Saf. Code, §§ 116800-116820) to adopt certification programs.

The CCCPH has developed minimum criteria for certification programs. A PWS will need to use backflow preventer testers that are certified by a recognized certifying organization that demonstrates they meet the minimum requirements.

Confidence in the certification body can be achieved by evaluation against a recognized standard. The State Water Board proposes to use the International Organization for Standardization and International Electrochemical Commission (ISO/IEC) Standard *ISO/IEC 17024: Conformity assessment – General requirements for bodies operating certifications of persons* to evaluate against. ISO is a recognized standard-making body and ISO/IEC 17024 is the applicable standard for certifying bodies.

Certifying organizations will be initially recognized by the State Water Board by providing documentation to the State Water Board that their certification process meets the minimum requirements.

Ongoing evaluation can best be provided for a certifying body by obtaining accreditation that recognizes that it meets a standard such as the American National Standards Institution (ANSI), which is proposed by the CCCPH. ANSI accreditation of a program would provide PWS's assurance that certifying programs continue to meet quality assurance requirements for the certification they offer. As some organizations that offer certification are outside of California, using a national accreditation program would better facilitate accreditation.

Criteria for certification was developed from industry references as well as a review of existing backflow assembly tester programs. A written exam is specified as this allows consistent administration and review of an exam. Written exams can be hardcopy or administered through electronic means. The need for impartiality and that no assistance

be provided is stressed. A minimum of 100 questions for initial certification and a minimum of 50 questions for recertification are specified. Additional questions can be provided by a certifying agency, as long as the minimum number are provided. As backflow testing requires hands-on procedures and as all certification programs require a hands-on component, the test needs to require a practical test component.

6.2. Cross-Connection Control Specialist Certification

The 1987 Cross-Connection Control regulations required people trained in cross-connection control to carry out the cross-connection control programs. The previous edition of regulations from 1953 did not specify a training requirement. In response to this need in California and other states, industry developed training programs and certification of cross-connection control specialists. Educational institutions also began to offer training on cross-connection control.

The State Water Board has been asked if certain programs and certifications are acceptable. Existing Title 17 regulations do not address requirements for certifications or provide criteria for what "trained in cross-connection control" means. In guidance provided by the State Water Board in 1988, the voluntary CA-NV AWWA cross-connection control specialist certification was noted as providing the qualifications required for program managers (CA-DHS, 1988, p. VI-1).

Certified cross-connection control specialists are currently required for conducting cross-connection inspections and tests of dual-plumbed recycled water facilities. These specialists must be certified by CA-NV AWWA or equivalent in California Code of Regulations, title 22, section 60316, subdivision (a). When the proposed recycled water (Wastewater Reclamation) regulations were promulgated in 1994, the Initial Statement of Reasons noted the following for this requirement:

> *The type of inspection and testing required by this section is complex and requires someone who has been trained to evaluate cross-connection hazards and conduct appropriate testing. The American Water Works Association tests and certifies cross connection control specialists on a voluntary basis. It is the only recognized certification program of this type conducted in the state and is widely used within the industry. The Department has determined that a specialist thus certified would constitute an acceptable trained individual* (CA-DHS, 22 Mar. 1994, p. 12).

Since 1987 additional organizations also began to offer certifications. The use of recycled water, gray water, and alternative water has greatly expanded throughout the state and presents new concerns for cross-connection control. In addition to new water sources, the use of new technologies and applications that use potable water has also expanded, presenting additional potential cross-connection concerns.

To address existing and emerging concerns, as described above, the CCCPH requires use of a cross-connection control specialist for evaluating hazards and a cross-connection control program coordinator to oversee and coordinate a water system's

program. A cross-connection control specialist can oversee a program but water systems with less than 3,000 service connections are not obligated to have a cross-connection control specialist on staff to oversee the water system's cross-connection control program. Specialist activities in the CCCPH can only be done or overseen by a certified specialist.

Training alone is insufficient for specialist activities in the CCCPH, as content and rigorousness varies by training provider and is difficult to track. Certification requires that a person be trained and pass an examination with a third party. Certification must be maintained, meaning that verification that a specialist is still knowledgeable needs to be re-assessed or a certification will lapse. Certification provides a means for PWS's to verify that a specialist continues to be knowledgeable and capable of performing specialist activities in the CCCPH.

Use of certified cross-connection control specialists for hazard assessment is not a new requirement; they have been required for dual-plumbed recycled water applications in California Code of Regulations, title 22, section 60316, subdivision (a). The required use of certified specialists has been expanded to include all hazard assessments with the CCCPH. The CCCPH includes minimum criteria for certification programs. A PWS will need to use cross-connection control specialists certified by a recognized certifying organization that demonstrates they meet the minimum requirements.

Confidence in the certification body can be achieved by evaluation against a recognized standard. The State Water Board proposes to use the International Organization for Standardization and International Electrochemical Commission (ISO/IEC) Standard *ISO/IEC 17024: Conformity assessment – General requirements for bodies operating certifications of persons* to evaluate against. ISO is a recognized standard-making body and ISO/IEC 17024 is the applicable standard for certifying bodies.

Certifying organizations will be initially recognized by the State Water Board by providing documentation to the State Water Board of their certification process and that they meet the minimum expected range of knowledge for specialists.

Ongoing evaluation can best be provided for a certifying body by obtaining accreditation that recognizes that it meets a standard such as the American National Standards Institution (ANSI), which is proposed by the CCCPH. ANSI accreditation of a program would provide PWS's assurance that certifying programs continue to meet quality assurance requirements for the certification they offer. As some organizations that offer certification are outside of California, using a national accreditation program would better facilitate accreditation.

Comments received for and during the February 20, 2020 public workshop asked if the State Water Board would assume an accreditation or certification program for cross-connection control specialists like the Environmental Laboratory Accreditation Program (ELAP) or the water operator certification, respectively. Unlike the water operator certification (Health & Saf. Code, section 106875) and laboratory certification

(Health & Saf. Code, section 100827), the State Water Board does not have the authority to certify or accredit cross-connection control specialist and backflow preventer assembly tester organizations. Counties do have authority (Health & Saf. Code, sections 116800-116820) to adopt certification programs.

In 2015 at least 65.4% of PWS serving 3,000 or more connections already reported having a certified cross-connection control specialist for program coordinators.

Public health benefits provided by a certified specialist are assurance to the public that personnel in cross-connection control oversight meet minimum knowledge requirements to identify cross-connection hazards and determine appropriate protection against backflow and back siphonage. Certified personnel will maintain ongoing verification that they are adequately knowledgeable of cross-connection control principles.

The CCCPH has established minimum requirements for certification programs. Criteria for certification was developed from industry references as well as a review of existing cross-connection control specialist programs. Knowledge criteria are referenced in Appendix E of the CCCPH. Background and rationale for knowledge criteria of Appendix E is discussed separately in this report for Appendix E. A written exam is specified as this allows for consistent administration and review of an exam. Written exams can be hardcopy or administered through electronic means. The need for impartiality and that no assistance is provided is stressed. A minimum of 100 questions for initial certification are specified. Additional questions can be provided by a certifying agency as long as the minimum number are provided.

As an option for recertification, continuing education courses and units (CEU) can be used. The State Water Board's Operator Certification Unit allows the use of CEUs to renew an operator certification. The continuing education courses and CEUs must include at least 12 hours from training courses covering material in Appendix E.

As a cross-connection control specialist determines the type of backflow preventer assembly required to provide adequate protection and can investigate incidents to determine causes of backflow, including a failing backflow preventer assembly. The State Water Board finds that a thorough understanding of backflow preventer operation and testing is needed. This is demonstrated by obtaining a backflow preventer tester certification before initial certification. This requirement is consistent with current industry practice. An option is allowed for certifying organizations to allow this through equivalent coursework. The certifying organization would need to provide coursework details before implementing this option.

The State Water Board recognizes that there are individuals who through apprenticeship and experience have acquired a thorough understanding of cross-connection control and backflow preventer operation and testing. An option is allowed for certifying organizations to allow an applicant to test for cross-connection control specialist certification using experience in lieu of tester certification to qualify for the

examination. The experience must include at least 5 years of documented experience performing cross-connection control specialist duties, as outlined in Appendix E.

7. JUSTIFICATION AND RATIONALE FOR CHAPTER 3 ARTICLE 5

7.1. Recordkeeping

To effectively manage a cross-connection control program a PWS must maintain up-to-date records. Records provide verification that requirements in the CCCPH are met. Records need to be maintained for a sufficient period of time in order to allow State Water Board review when completing audits, and must be detailed and defensible (FCCCHR, 2009, p. 93), as a lack of records or poorly organized records can inhibit corrective measures (EPA, 2001, p. 29). This section lists specific records to be maintained.

Generally, State Water Board staff reviews of cross-connection control programs during sanitary surveys have found that most PWS already maintain some amount of the records proposed in this section. Title 17, section 7584, subdivision (f), requires the maintenance of records for locations, tests, and repairs of backflow assemblies and section 7605, subdivision (f), requires that these be maintained for a minimum of three years. The CCCPH requires these and new types of records to be maintained. The new types of records should result in increased protection from backflow by providing a more comprehensive overview of a PWS's program.

CCCPH section 3.5.1(a)(3) establishes requirements for AG installations, including the requirement that PWS have as-built plans for each approved AG. The State Water Board is aware that some PWS may not have current as-built plans for each AG installation. The State Water Board will likely consider as acceptable the use of pictures and drawings obtained by the PWS during routine inspections. This approach should also allow the inspector to compare existing installations against CCCPH requirements.

The impact to PWS with existing cross-connection control programs should be minimal; many of the elements are already recorded, and other elements are not anticipated to be burdensome. A PWS that does not currently have a program will see greater impacts, but increased impacts should be primarily managed during the development of the PWS's program.

7.2. Backflow Incident Response Procedure

PWS's are required to have backflow incident response procedures in their Cross-Connection Control Plans, as noted in section 3.1.4 of the CCCPH. Backflow incident response is a new requirement. This section is kept broad to allow PWS's to determine appropriate response to backflow incidents. Backflow incidents have long been recognized as significant contributors to waterborne disease (NRC, 2005, p. 11) and "because of inconsistent application of [cross-connection control] programs, cross connections and backflow events remain a significant potential cause of waterborne disease" (NRC, 2005, p. 12).

Written guidelines on how to respond to backflow incidents are recommended to be maintained by PWS's (AWWA, 2015a, p. 39; FCCCHR, 2009, p. 99; IAPMO & UA, 2016, pp. 16-9; PNWS AWWA, 2012, p. 97; Ritland & O'Brien, 2019, pp. 209-210). The 2019 California Plumbing Code also has cross-connection response procedures for recycled, graywater, and alternative water in Chapter 15 and for rainwater catchment systems in Chapter 16. Even though it is impossible to cover all water quality or operating scenarios (AWWA, 2015a, p. 39), the lack of a program may significantly increase the number of persons exposed to a health hazard, increase the PWS's efforts to contain and remove the hazard, and expose the PWS to increased liability from a claim for punitive damages for negligence (PNWS AWWA, 2012, p. 97).

The three elements of this section are the minimum components the State Water Board considers necessary for incident response. A USEPA white paper on cross-connections found that from available backflow incident reports, "the primary indicator of backflow has been customer complaints of odor, discoloration of the water, or direct physical harm from the contact with the water" (USEPA, 2001, pp. 18-19, 34). Asking a PWS to have a procedure in place to quickly begin evaluating potential backflow incidents at first notification will assist in detecting incidents. When complaints are made, the water supplier may not respond in a timely manner and may not have conclusive evidence that a backflow incident occurred (AWWA, 2015a, p. 39). Drops in operating pressure, drops in disinfectant residual, or total coliform and heterotrophic plate counts detections are possible indicators of backflow (USEPA, 2001, pp.18-19) and important to an investigation of a potential backflow incident. Finally, incident record keeping is already required by section 3.5.1 of the CCCPH and restated here for clarity.

7.3. Backflow Incident Notification

Section 3.5.3 of the CCCPH addresses notification requirements for backflow incidents. The State Water Board requires notification of known backflow events so that it can provide direction and assistance to the PWS regarding any required public notification and to ensure that the PWS is performing any necessary follow-up activities, including coordination between other state and local agencies.

Previous Title 17 regulations did not require PWS's to notify the State Water Board. Many PWS's have notified the State Water Board when there has been a possible health hazard that requires public notification. Backflow incidents with visible impacts to the public water supply (e.g., foul-smelling water, etc.) not reported to the State Water Board are generally brought to the State Water Board's attention through other routes, either by complaints from the general public or local news coverage. The inclusion of this requirement in the CCCPH formalizes the need to provide notification.

Documentation of backflow incidents is lacking (Fleming et al, 2006, p. 9; Lee et al, 2003, pp. 3, 71) and under reported, in part because incident notification has not been included in state or federal regulations (USEPA, 1995, pp. 3, 12; NRC, 2005, pp. 11-12). The requirements in CCCPH sections 3.5.2 and 3.5.3 should help ensure that PWS's adequately document backflow incidents, report the incidents to the State

Water Board, and sufficiently notify the public in the event of a risk to public health. PWS's and the State Water Board will also develop a better understanding of the conditions that lead to a backflow incident and have a reference for future investigations and prevention efforts.

A sample reporting form is provided in Appendix F of the CCCPH to assist PWS's.

8. JUSTIFICATION AND RATIONALE FOR APPENDICES

8.1. Appendix A: Assembly Bill 1671 (2017, Chapter 533)

This appendix is the text of Assembly Bill 1671 and is informational. It is included as a reference.

8.2. Appendix B: ASME A112.1.2-2012 (R2017) Table 1, Minimum Air Gaps for Generally used Plumbing Fixtures

This appendix is a copy of Table 1 of the standard ASME A112.1.2-2012(R2017) Minimum Air Gaps for Generally used Plumbing Fixtures and is informational. It is included as a reference.

8.3. Appendix C: Backflow Prevention Assembly Diagrams

Diagrams for DCDA, DCDA-II, DC, PVB, RP, RPDA, RPDA-II, and SVB are included as supplemental information. The diagrams are not needed to implement requirements in the CCCPH, and the definitions can stand alone.

Text of the installation criteria for a swivel-ell is included in this appendix and has the force of law along with section 3.2.2, subdivision (e), of the CCCPH. A photo and schematic diagram are included as supplemental information. The diagrams are not needed to implement the CCCPH.

8.4. Appendix D: High Hazard Premises

The previous Title 17, section 7585, required the degree of a potential health hazard to be determined by an evaluation of the hazard. Title 17, section 7604, required that the type of backflow protection provided be commensurate with the degree of hazard, and a table (Table 1) was provided for some select hazards. Section 3.2.1 of the CCCPH replaces Title 17, section 7585, and section 3.2.2, subdivision (c), of the handbook replaces Title 17, section 7604. Table 1 is being replaced with a list of example high hazard premises in Appendix D.

Appendix D is an effort to provide a consistent list of hazards determined to be serious enough that premise protection would require an air gap or RP. Additional facilities not included in Appendix D may also be classified as high hazards. Appendix D would be used with sections 3.2.1 and 3.2.2 of the CCCPH. Any premises currently protected by a DC may remain in place until replacement is needed. Replacement with an RP or AG may be warranted upon a new hazard assessment.

Auxiliary water supplies may consist of on-site private well(s); fire storage tanks; surface water supplies; rainwater collection facilities; greywater systems. This list is not a compilation of all possible types of auxiliary water supplies. The definition of auxiliary

water supplies is broad to allow case-by-case determination by the specialist and to avoid determinations to only those sources they are currently aware of.

The CCCPH requires that for premises that have more than one connection then all connections must receive the same level or protection, excluding fire connections. A hazard assessment can document that a domestic and fire connection have different type of backflow protection or the same. .

8.5. Appendix E: General Range of Knowledge for Cross-Connection Control Specialists

This appendix is intended to create a minimum standard for knowledge that cross-connection control specialists are expected to have when pursuing certification. PWS's are required to use cross-connection control specialists when performing certain required cross-connection control activities. Therefore, creating a minimum standard is necessary to ensure that a PWS can reliably assume that the required activities are performed correctly. Appendix E does not preclude or limit certifying entities from requiring instruction or knowledge of other subjects as part of their certification process.

The general range of knowledge in Appendix E was developed based on requirements within the CCCPH, State Water Board guidance and experience implementing cross-connection regulations, Federal guidance (USEPA, 2006a; USEPA, 2003), industry references (AWWA, 2015a; CA-NV AWWA, 1997; FCCCHR, 2015; IAPMO & UA, 2016; PNWS AWWA, 2012; Ritland & O'Brien, 2019), and industry standards (ASSE, 2015; AWWA, 2015b).

The State Water Board acknowledges that Appendix E may become unnecessary following the initiation of the American National Standards Institute (ANSI) accreditation process, as described in Article 4 of the CCCPH. Cross-connection control specialists will require certification prior to the ANSI accreditation of certifying entities, and until ANSI accreditation is available, the minimum standards in Appendix E will be necessary for the certifying entities to be recognized by the State Water Board. The State Water Board anticipates working with an external advisory group following CCCPH adoption to ensure that conflicts between Appendix E and the ANSI accreditation process are avoided.

8.6. Appendix F: Backflow Incident Form

Section 3.5.3, subdivision (b), of the CCCPH stipulates that if required by the State Water Board, a Backflow Incident report will need to be completed with the information found in Appendix F serving as a minimum requirement. Appendix F provides a sample form with fields determined to be the minimum to adequately document an incident.

Documentation of backflow incidents is lacking (Fleming et al, 2006, p. 9; Lee et al, 2003, pp. 3, 71) and under reported, in part because it has not been included in state or federal regulations (USEPA, 1995, pp. 3, 12; NRC, 20056, pp. 11-12). It is the intent that the information collected will be publicly shared to help public health officials, investigators, researchers, and PWS's increase knowledge on occurrence and causes

of backflow to help better prevent incidents. Collection of the information can also assist in future revisions of the handbook. Several comments were received by the State Water Board and brought up during the February 20, 2020 public workshop to include reporting of incidents and provide standardization for reporting.

Water supplier and water system number info is used by the State Water Board for identification of the PWS and for internal records. Other information requested is based on State Water Board experience and various recommended backflow incident reporting from references (AWWA, 2015a, pp. 39-40; Carlson 2001, pp. 60-61; FCCCHR, 2009, pp. 99-100; IAPMO & UA, 2015, pp. 16-9–16-20; PNWS AWWA, 2012, pp. 97-98; Ritland & O'Brien, 2019, pp. 209-212; Schneider et al, 2010, pp. 81-83; USEPA, 2006a).

8.7. Appendix G: Related Statutes and Regulations

This appendix is the text of various laws and regulations related to the CCCPH and is informational. It is included as a reference.

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