Prepared for:

Client Name
(client address)

POTABLE WATER PROTECTION PROGRAM
CROSS CONNECTION CONTROL SURVEY

for

(Sample – Paper Mill)

Site Review: (Date)
Report Generation: (Date)

Prepared by:

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TABLE OF CONTENTS

1.0 GENERAL

1.1 INTRODUCTION

This project addresses some of the requirements of a Potable Water Protection Program. A comprehensive Potable Water Protection Program consists of the following elements:

- Survey of the potable water distribution system
- Current drawings of the potable water distribution system
- Testing and maintenance of backflow prevention devices
- Education of those responsible for maintenance and decisions pertaining to the potable water distribution system
- Analysis of water quality within the potable water distribution system

HydroCorp, Inc. (HCI) was requested to survey and report on the status of the Potable Water Protection Program at (Client) located in (location)I. A Cross Connection Control Program is in the process of being established at the facility.

HDI has had considerable experience with cross connection control and potable water system surveys. HDI has performed cross connection control work in 26 states, as well as Canada, Puerto Rico and Mexico. HDI is an active member of several organizations regarding cross connection control including the American Backflow Prevention Association, the American Water Works Association, and the USC Foundation for Cross Connection Control and Hydraulic Research.

1.1.1 PURPOSE

The purpose of HDI's involvement is to review in-field the following items:

- Survey the facility for existing and/or potential cross connections
- Review and verify the proper installation of existing backflow prevention devices
- Generate the facility Potable Water Piping Drawings
- Review the status of the facility's internal cross connection control program

In addition, HDI was to generate a report outlining the findings and recommending future efforts required to properly maintain the Potable Water Protection Program.

This report consists of survey information concerning existing backflow prevention devices, piping configurations, and the internal Cross Connection Control Program employed at the (Client), and may assist plant personnel with determining a cost for implementation of recommendations. Also, some of the rules and codes outlining requirements for proper cross connection control have been included as part of this report.

1.1.2 INTENT

It is the intention of this survey to identify the requirements and general concerns throughout the facility, and make recommendations for the on-going Potable Water Protection Program. This work provides specific listings of both existing backflow prevention devices, and questionable areas/installations with recommendations for correction.

HDI remains available to assist (Client) personnel and Owner in any capacity required to address their requirements.

1.2 EXECUTIVE SUMMARY

XXXX monitors the Potable Water Protection Program at the (Client). This report will be used as a guide for the facility to determine how it will operate the program. The review of the potable water system was completed (date). Drawings of the piping system were updated during the review. Information contained in this report is as was determined by HDI Field Manager Eric Vonhatten.

Both "isolation" and "containment" hazards have been addressed by this report. "Containment" is the installation of a backflow prevention device between the facility and public distribution system. Containment assures there is no chance for water of questionable quality to leave the facility and to enter the public distribution system. "Isolation" refers to point of use protection within a facility that is necessary to ensure the facility's potable water distribution system is protected against backflow.

There are three- (3) city water main inlets to the (client). The one 8" city water main inlet to the facility originating from the public main at (name) Road is properly isolated by an existing Reduced Pressure Backflow Preventer (RPBP). Containment devices were not identified on the 1" city water main originating from (name) Road or the 1.5" city water main originating from (name) Road. See Section 2.0, Potable Water Piping System Analysis for a detailed description of the main inlets.

The existing backflow prevention devices and potable water uses have been evaluated for the (Client). Some architectural and layout drawings provided by facility personnel were used as a guide for conducting the study. The present situation requires modification to properly protect the (Client) from possible backflow contamination within the facility.

There are 125 recommendations for the facility noted in Section 4.1 of this report. The retail list price for the required backflow prevention devices is $38,043.25 and is detailed in Section 7.0 of this report. This amount does not include labor or additional materials required for installation. Expected costs are given in order to provide an indication of the scope of required work.

The following table summarizes recommendations made during the survey.

Recommendation Type	**Total**
Backflow Prevention Devices to be installed	100
• *Testable Devices – PVB, RPBP, DCV and SVB*	(32)
• *Non-Testable Devices – AG, AVB, HBVB, AFHBVB, VMBP, LFDC, LFVB, and VDCV*	(68)
Recommendations for the removal of abandoned piping	11
Additional required modifications	14
TOTAL RECOMMENDATIONS	**125**

In order to achieve an effective backflow prevention program, a formal program must be established and maintained by the (Client), and should consist of providing education and an on-going maintenance procedure.

HydroCorp, Inc. is grateful for the support from all parties that enabled the completion of this project, especially (client contact name).

1.3 RELEVANT RULES AND LAWS – BACKFLOW PREVENTION

Effective May 1, 2003, the State of Wisconsin utilizes the Department of Commerce, Chapter Comm 82 *Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing* as the State Plumbing Code.

The following rules are used in evaluation for any items of concern for backflow prevention at the (client) facility:

1.3.1 **Containment requirements are detailed in:**

- Department of Commerce, Chapter Comm 82 *Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing*

1.3.2 **Containment of the city water supply may be required on the main inlet to any fire system as detailed by:**

- Department of Commerce, Chapter Comm 82 *Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing*

1.3.3 **Pipe labeling or identification of piping systems is required by:**

- Department of Commerce, Chapter Comm 32 *Public Employee Safety and Health*
- Department of Commerce, Chapter Comm 82, Subchapter IV, Comm 82.40
- U.S. Department of Labor, OSHA Standard 1910.141
- ANSI Specifications

1.3.4 **Testing and tester requirements are detailed in:**

- Department of Commerce, Chapter Comm 82, sub Chapter II, Comm 82.21 (3)

1.3.5 **Survey and inspection requirements of potable water systems for cross connections are detailed in:**

- Department of Commerce, Chapter Comm 82, Subchapter IV, Comm 82.41

1.3.6 **Protection requirements on heat exchangers are detailed in:**

- Department of Commerce, Chapter Comm 82, sub Chapter IV, Comm 82.40

1.3.7 **Water supplies to boilers are to be protected as detailed in:**

- Department of Commerce, Chapter Comm 82, sub Chapter IV, Comm 82.40

1.3.8. **Lawn sprinkler protection is a requirement as detailed in:**

- Department of Commerce, Chapter Comm 82, sub Chapter IV, Comm 82.40

1.3.9 **All water uses and piping connections are required to conform to applicable codes. The codes that have been referenced to this point identify some of the specific areas of application. In any of these specific areas, the most stringent code will be applicable. The above noted items, as well as any other cross connection concerns must conform to:**

- Department of Commerce, Chapter Comm 32 *Public Employee Safety and Health*
- Department of Commerce, Chapter Comm 82 *Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing*
- U.S. Department of Labor, OSHA Standard 1910-141
- ANSI Specifications

2.0 POTABLE WATER PIPING SYSTEM ANALYSIS

The (client) is an industrial site comprised of multiple buildings. The three- (3) city water feeds to the complex are detailed under "Main Inlet(s)". Following the "Main Inlet(s)" is a list of various buildings and detailed descriptions of the points of entry and origin for the water supplies.

Main Inlet(s):

Three- (3) city water mains supply the complex and a description of each main is as follows:

- An 8” city water main originating from (name) Drive enters the Maintenance Warehouse in the southeast corner of the building. The 8” main along with a 4” by-pass are both routed through a meter and existing RPBP before supplying the potable water to the Main Plant. The 8” main exits the north end of the building and enters the Main Plant in the basement near column #C29 on drawing sheet M-39.

- A 1” city water main originating from (name) Drive enters the northwest corner of the White House. The 1” main is routed through a meter before supply potable water to the building.

- A 1.5” city water main originating from (name) Drive enters the north side of the Core Shed and is routed through a meter before supplying the building.

Main Plant

Potable water and process uses are supplied to the facility by an 8" main that exits the Maintenance Warehouse and travels underground before entering the Main Plant near column #C29. The Main Plant loop also supplies the PSK Building, Wood Chipper Building and Filter Plant.

Core Shed

Potable water is supplied to the building by a 1.5" main originating from the city water main and enters the north side of the building. This main also supplies the Security Building.

Security Building

Potable water is supplied to the facility by a 1.5" main that exits the east wall of the Core Shed. The main is routed underground and supplies the buildings restroom.

PSK Building

Potable water and process uses are supplied to the facility by a 2" main that exits the south end of the Main Plant near column #T67 and travels over a pipe trestle before entering the building in the northwest corner.

Filter Plant

Potable water and process uses are supplied to the facility by a 1.25" main that exits the north end of the Grinder Room and travels through the Power House before entering the south end of the building.

Wood Chipper Building

Potable water and process uses are supplied to the facility by a 1" main that exits the east end of the Main Plant and travels through the conveyor before entering the northeast end of the building near column #A2.

Containment:

"Containment" is the installation of a backflow prevention device between the facility and public distribution systems. Containment assures there is no chance for water of questionable quality to leave the facility and to enter the public distribution system.

Three- (3) city water mains from the public distribution system supply the facility. A description/containment status of each is as follows:

- The 8" city water main entering the Maintenance Warehouse is properly contained by an existing RPBP.

- Containment devices were not located on the 1" city water main entering the White House or the 1.5" city water main entering the Core Shed.

Existing backflow prevention devices are detailed in Section 2.1 and summarized in Section 2.2. See Relevant Rules and Laws, Section 1.3 for additional information on containment requirements.

Fire Protection (FP) Systems:

City water supplies to the FP System were not identified during the survey. It was to HDI's understanding that the FP system was supplied from river water and would not be a backflow concern for the facility. HDI has assumed that the FP System was inspected and approved at the time of installation. Present Code may require installation of a RPBP on the city water supply if modifications are made at a later date. **No corrective action is presently required.**

Isolation:

There is a concern that the internal potable water supply may not be adequately protected against potential backflow. Both specific and general recommendations contained in this report address items that are either required by code, and/or required to ensure the protection of the potable water distribution system. General recommendations detailed in Section 4.0 are broader in scope and may have several alternatives listed. There may be additional alternatives still to be determined by plant personnel following review of this report and/or drawings. **Facility personnel must make the final decision on any recommendations.**

HDI makes all backflow prevention device recommendations based on full line size with no evaluation for parallel device installations, or possibility of a reduction in the actual size of the backflow prevention device. Further evaluation by facility personnel may identify a more cost effective method(s) and/or the requirement(s) for additional alternatives. See Section 7.0 for a list of the required backflow prevention devices and Appendix A for additional information.

Specific recommendations for installation of backflow prevention devices and/or corrective action are detailed in Section 4.1 of this report. Existing backflow prevention devices are detailed in Section 2.1 and are summarized in Section 2.2 of this report. See Appendix A for "general" backflow prevention device and program information. **Corrective action may be required.**

Zone Isolation:

The facility presently installs individual backflow prevention devices at each cross connection. This method of backflow prevention is termed “isolation”. There are presently 5 existing testable backflow prevention devices requiring regular testing and/or repair (see “Testing”, Section 3.0 for additional information). Several areas in the plant are predominantly for process use with little to no potable water points of use. Such areas are prime candidates for zone isolation. Zone isolation utilizes single (or parallel devices) in the common feed to multiple points of use. All water downstream of zone isolation devices is considered non-potable water. Any fixtures requiring potable water would have to be removed from the non-potable water system. See Recommendations and Alternatives, Section 4.0 with respect to “zone isolation”.

Cooling Towers:

Cooling towers utilizing city water were not identified during the survey and are not a backflow concern for the facility. **No corrective action is required.**

Heat Exchangers:

Steam heat exchangers supplying domestic hot water do not exist and are not a backflow concern for the facility. Process use heat exchangers, in use throughout the plant, are supplied from process water piping and are not a backflow concern for the facility. **No corrective action is required.**

Lawn Sprinklers:

Lawn sprinkler systems utilizing city water were not identified during the survey and are not a backflow concern for the facility. **No corrective action is required.**

Boilers:

The boilers identified during the survey are located in the Boiler House and are supplied from the filtered water system. Two spool connections on the city water supply to supply back-up water to the boilers on an emergency basis were identified during the survey. The spool connections are used on a temporary basis but when connected, the city water would have direct contact with the existing filtered water piping. Recommendations to install an RPBP prior to the spool connections were made to properly isolate the city water from the filtered water system piping. Recommendations for corrective action are detailed in Section 4.0 of this report. **Corrective action is recommended.**

Air Conditioning Units:

Four- (4) air conditioning units using city water were identified during the survey and may not be properly isolated. Recommendations for corrective action are detailed in Section 4.0 of this report. **Corrective action is recommended.**

Coffee Vending Machines:

Six- (6) stand alone coffee vending machines identified during the survey may not be properly isolated. Recommendations for corrective action are detailed in Section 4.0 of this report. **Corrective action is recommended.**

LFDC’s may have been recommended on coffee vending machines and/or coffeepots with hot water dispensers. Due to the low flow and volume requirements for this equipment, fouling of the LFDC check members is possible. To minimize fouling potential, HDI recommends installation of a plastic 100 mesh “Y” strainer before the LFDC. Strainer quantities have been included in the Cost Analysis, Section 7.0 of this report.

Carbonated Beverage Equipment:

Six- (6) stand alone carbonated vending machines were identified during the survey and may not be properly isolated. Recommendations for corrective action are detailed in Section 4.0 of this report. **Corrective action is recommended.**

Soda fountain carbonators were not identified during the survey and are not a backflow concern for the facility. **No corrective action is required.**

Piping Visibility:

The majority of piping throughout the facility is easily visible and readily followed. Piping in the Administration Building, and in-plant offices is mostly concealed within finished floors and walls and was not traced. A water use inventory was conducted in these areas to identify potential or actual cross connections and evaluate existing backflow prevention devices. See Section 3.0, Piping Identification for additional information.

Report Notes:

Plant I.D. #'s

The Plant I.D. #'s detailed in this report have a specific meaning and are to be used in locating recommendations and existing devices. The Plant I.D. #'s are derived from the closest column numbers and letters. **See Recommendations and Alternatives Section 4.1.** See Appendix A, Section A.2.1.2 and A.2.3.1 for additional device list format information. Areas on drawings that did not have column number designations received plant I.D. number prefixes as follows:

- PSK Building - PSK
- Maintenance Warehouse - MW
- White House - WH
- Security Building - SB
- Core Shed - CS
- Filter Plant - FP
- Garage - MWG

Underground Piping

All underground piping locations shown on drawings are based on information obtained from plant drawing files and/or interviews with plant personnel. Actual locations and configurations must be field verified.

Pipe Sizes

HDI has attempted to be as accurate as possible with respect to pipe sizes noted on both the Potable Water Piping Drawings and on device lists. It is not always possible to be 100% accurate due to inaccessibility of piping, pipe insulation, or poor lighting conditions. Wherever possible, HDI verifies pipe sizes by physical measurement, or manufacturer's size markings on valves and other fittings. Pipe sizes may be based on plant reference drawings, physical observation, or "best estimate". It is the installer's responsibility for final verification of pipe size, and should be considered prior to ordering backflow prevention devices and/or other installation materials.

Fixture Vacuum Breakers (FVB's)

A number of toilets and urinals were identified with vacuum breakers that do not meet present code requirements of a minimum distance of 6" from the "critical level" of the vacuum breaker to the top of the fixture being served. Fixtures that do not meet the required height specifications are shown on the drawings and are shaded red. Fixtures with properly installed vacuum breakers are shaded green. A drawing with examples of proper installations is included in Appendix B of this report. HDI has assumed existing installations were inspected and approved at the time of installation. **See Recommendations and Alternatives, Section 4.0.**

LFDC's

LFDC's may have been recommended on some vending equipment, hose connections, or other such low flow/volume fixtures. To minimize fouling LFDC check members, HDI recommends installation of a 100 mesh plastic "Y" strainer before the LFDC. Strainer quantities have been included in the Cost Analysis, Section 7.0 of this report.

3.0 POTABLE WATER PROTECTION PROGRAM SURVEY

Program Status:

A formal backflow prevention and Potable Water Program is in the process of being established at the (Client). After review of this report, the long-term action plan will need to be reviewed and maintained.

Program Manager:

(client contact name) will monitor the cross connection control program at the (Client).

Testing:

Reduced pressure principle backflow preventers (RPBP's), pressure vacuum breakers (PVB's), spill resistant vacuum breakers (SVB's), and double check valve assemblies (DCV's) require testing on an annual basis. There are presently 5 existing backflow prevention devices that require testing.

A formal testing program has not been developed. The facility must implement and maintain a program for testing of all testable backflow prevention devices. It should also be noted that backflow prevention devices are to be tested immediately upon installation **before** resuming service to the fixture being served. Code and/or Corporate requirements for backflow prevention device testing and tester qualifications are identified in the Relevant Rules, Section 1.3 of this report.

Testers:

It is HDI's understanding that person(s) employed at the facility have not been properly instructed and/or certified to test backflow prevention devices. Only employees who have obtained instruction on proper backflow prevention device test and installation procedures should be used. Backflow prevention device tester qualifications must also be accepted by local jurisdiction, or an approved outside contractor may be required to ensure proper testing and operation of backflow prevention devices. Code and/or Corporate requirements for backflow prevention device testing and tester qualifications are identified in Relevant Rules, Section 1.3 of this report.

Pipe Identification:

Most of the piping in the facility is not properly labeled. Correct labeling and color coding of piping systems is a Code requirement, as detailed in Relevant Rules and Laws, Section 1.3, of this report. A standard should be developed so that piping before backflow prevention devices is identified as either "CITY WATER" or "POTABLE WATER", and that piping after backflow prevention devices is identified as "NON-POTABLE WATER", "PROCESS WATER", "SERVICE WATER", etc. in order to differentiate it from the potable water distribution system. Improper/inadequate piping identification can lead to problems and hazards within the facility unless it is addressed.

HDI has indicated on the potable water piping drawings where existing pipe markers have been installed. The drawings can be used by facility personnel as a guide for identifying areas of the potable water distribution system requiring additional labeling.

3.1 WATER SYSTEM FLOW/VELOCITY AND VOLUME ANALYSIS

HDI has identified piping systems and sections of piping within the potable water system no longer in use. HDI's "standard method" for identification of piping typically recommended for removal is: any piping attached to the active potable water distribution system that is longer than 3' in length. There may be instances when no isolation valve is available at the main due to plumbing installation design. In such instances, a portion of the distribution system may need to be temporarily taken out of service to achieve removal of abandoned piping. In addition, HDI does not intend that all abandoned piping be removed in its entirety, but rather that it is disconnected from the active potable water distribution system. Disconnecting and abandoning piping in-place may be advantageous in instances where access to the piping is limited, and/or if asbestos abatement is required.

Piping that is no longer in service can result in taste and odor problems, as well as elevated levels of metals, and organic and microbiological material. HDI recommends removal of all piping no longer in use to minimize this potential.

4.0 RECOMMENDATIONS AND ALTERNATIVES

The recommendations/alternatives listed below may require additional analysis if selected for implementation. HDI is available to discuss in detail, any alternative that may be considered for possible implementation.

1. **Further evaluate cross connections between the "City Water" and "Non-Potable Water" systems.** During the survey HDI identified direct cross connections between the city water and process water systems (labeled as: Filtered Water, River Water or Raw Water). The typical connection found during the survey would be a hose connecting a quick disconnect on the "City Water" supply to a quick disconnect on the "Non-Potable Water" supply. Plant personnel should evaluate each of the connections to determine whether or not the connection is needed. If it is decided that the connection is not needed, then plant personnel would need to remove the hose and quick disconnect on the "City Water" supply and cap the piping at the main. If plant personnel decides that the connection is necessary then the installation of an RPBP would have to be installed prior to the quick disconnect on the "City Water" supply. Note: even if the connection is determined to be one for temporary uses, plant personnel would still need to implement the RPBP recommendation.

2. **Determine uses for quick disconnects located through the facility.** During the survey, several quick disconnects were identified throughout the facility. Although the majority of the quick disconnects were not in use and were just open ended, the quick disconnects that were in use during the survey were used to supply power washers and various process water systems for back-up. Since the quick disconnects are used in high hazard situations, HDI has recommended the installation of a RPBP. The other option that plant personal could do is to evaluate each of the quick disconnects and determine their necessity. Then plant personnel could remove the quick disconnects that are no longer needed and only install a backflow preventer prior to the quick disconnects that are necessary for operation.

3. **Address spool connections in the Boiler House.** Two spool connections were identified in the Boiler House and are used as a back-up supply to the process system which supplies the boilers. Although plant personnel stated that the normal working procedure is to connect the systems on a temporary basis in case of an emergency the potable water does have direct connection to the process water system piping when connected. HDI has recommended the installation of an RPBP prior to each of the spool connections. Plant personnel may configure a set-up to incorporate one RPBP to be installed prior to both of the spool connections. Further research may be required.

4. **Address installation requirements for fixture vacuum breakers (FVB's) on toilets and urinals.** Many of the vacuum breakers on plumbing fixtures in restrooms do not meet the present State Plumbing Code installation requirements. See Section 2.0, Report Notes for a more detailed description and Appendix B for a sample installation drawing.

   HDI has assumed FVB's were inspected and approved at the time of installation. While HDI has not made recommendations for modifications, the facility must insure that all future modifications to restrooms incorporate installation requirements of FVB's in order to comply with State Code.

   If sanitizers are to be installed as part of future modifications, the point of connection to the FVB tailpiece must be a minimum of 6" below the "C-L" mark on the side of the FVB. See Appendix B for a sample installation drawing.

5. **Complete testing of the backflow prevention devices as required by Code.** Reduced pressure principle backflow preventers (RPBP's), pressure vacuum breakers (PVB's), spill resistant vacuum breakers (SVB's), and double check valve assemblies (DCV's) must be tested annually. Alternatives for this requirement are as follows:

   A. **Have facility personnel complete testing of backflow prevention devices.** Only personnel who have received training and certification should be used. Employee certification must also be accepted by local jurisdiction. Additional employee training (certification) may also be required in order to complete any necessary repairs of backflow prevention devices.

   B. **Have an outside contractor perform the testing.** An approved outside contractor will already have received training for backflow prevention device testing, and will have a good deal of experience with it. The tests can be completed quickly and with minimal cost. If repair work is required, the contractor will be trained, certified, and prepared to correct any device deficiencies.

6. **Implement a program to address remaining unprotected cross connections.** In order to comply with Corporate guidelines, and State and Local Codes, it is recommended that backflow prevention devices be installed at the isolation level. HDI recommends that steps be taken to conform to all applicable Codes. Backflow prevention devices required for installation are outlined in Recommendations and Alternatives, Section 4.1, of this report.

   To ensure proper installation and operation, only certified individuals should complete installation and testing of backflow prevention devices. RPBP's, PVB's, SVB's, and DCV's must be tested **immediately** upon installation. Devices must be properly tagged, and the appropriate test forms completed.

7. **Continue with the on-going program.** Responsibilities should be determined and delegated to ensure that 1) the recommendations are implemented, 2) that all testable backflow prevention devices are properly tested as required, and 3) that the Potable Water Protection Program is maintained on an on-going basis.

8. **Correct deficiencies in pipe labeling within the facility.** See "Pipe Identification", Section 3.0 for general description of present conditions. Options for completion of this requirement are as follows:

   A. **Have facility personnel complete application of all labels.** Facility personnel would be responsible for of all aspects of the project. This includes identifying areas needing labels, determining material and equipment requirements, ordering and tracking of labels, and application.

   B. **Have an outside contractor determine extent of labeling requirements and complete application of all labels.** Direct costs for the program would be incurred. A project would need to be generated to complete the labeling. The contractor would be responsible for all aspects of the project.

   C. **Use a combination of items A and B.** In order to minimize costs involved with items A and B, a contractor can be used to plan and manage the application of labels. In-house personnel would be responsible for application work. The contractor would track the project.

9. **Update the Potable Water Piping Drawings.** The drawings should reflect existing conditions within the facility to enable facility personnel to make proper connections to the potable water distribution system without creating a backflow hazard.

5.0 SUMMARY AND CERTIFICATION STATEMENT

SUMMARY

This report is the first step in annual maintenance requirements of an on going cross connection control program. Isolation and containment hazards have been addressed by this report. Containment protects the city from facility operations, and isolation protection will protect (Client) employees. The isolation issues should be addressed as soon as possible. An on-going testing program should be established and maintained as required by code to ensure that all devices are operating properly. An on-going organized program is needed to maintain a safe potable water system, and to protect individuals from possible water supply contamination.

CERTIFICATION STATEMENT

We certify that the data contained herein is factual. Any recommendations made are based upon our experience with cross connection control* and our interpretation of the following as they apply to the individual circumstances:

Department of Commerce, Chapter Comm 32 *Public Employee Safety and Health*
Department of Commerce, Chapter Comm 82 *Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing*
U.S. Department of Labor, OSHA Standard 1910-141
ANSI Specifications
AWWA Manual M-14 - *Recommended Practice for Backflow* Prevention and Cross Connection Control

Substantiation and further documentation for recommendations are available upon request.

Mark Shalawylo, Project Manager
Hydro Designs, Inc.

Patrick Freiha, Director of Operations
Hydro Designs, Inc.

* To HDI's knowledge, the information presented here is complete and accurate. Due to the inaccessible nature of the piping, 100% accurate data is not always available. In order to properly complete this project, HDI has attempted to obtain complete and accurate data through field review and personnel interviews.

6.0 SUGGESTED ACTION PLAN

The following suggested action plan is not all inclusive of steps required for implementing and maintaining a cross connection control program. The suggested action plan may used as a starting point, and should be further developed to ensure all requirements for protection of the potable water distribution system are met, and that a complete on-going cross connection control program is developed and/or maintained.

1. Plant Personnel must determine and verify final recommendations and action plan.

2. Develop schedule and delegate responsibilities.

3. Conduct research, including flow analysis where needed, to determine final recommendations and requirements.

4. Meet with the city authority to obtain approvals for device installations.

5. Test and repair, as required, all existing testable devices on-site. A table of existing testable devices has been included in Section 8.0 of this report.

6. Obtain the appropriate devices to be installed for isolation protection at unprotected locations.

7. Have required isolation devices installed at all unprotected locations.

8. Test all newly installed devices that require testing.

9. Generate potable piping drawings and backflow prevention device inventories when the installations have been completed.

10. Properly label piping systems within the facility.

11. Maintain an annual testing and maintenance program for backflow prevention devices.

7.0 COST ANALYSIS

DEVICE COST BREAKDOWN								
TYPE	**SIZE**	**QTY**	**Conbraco Part #**	**Conbraco Price**	**Conbraco Est. Total**	**Watts Part #**	**Watts Price**	**Watts Est. Total**
AFHBVB	0.75	2	38-401-01	20.02	40.04	NF8	35.60	71.20
AVB	0.5	3	38-203-01	28.08	84.24	288A	34.35	103.05
AVB	0.75	1	38-204-01	28.43	28.43	288A	41.90	41.90
HBVB	0.75	31	38-304-AS	9.91	307.21	8B	12.70	393.70
LFDC	0.375	9	Use Watts part #	51.75	465.75	N9	51.75	465.75
"Y" STRAINER	0.375	9	Use Watts part #	6.85	61.65	P 777-100	6.85	61.65
LFVB	0.375	1	38-502-01	39.75	39.75	NLF9	36.40	36.40
RPBP	0.5	6	40-213-A2	275.80	1654.80	009QT-S	342.30	2053.80
RPBP Relief Port Air Gap Kit	0.5	6	40-200-XA	40.22	241.32	909-AG-A	32.25	193.50
RPBP	0.75	13	40-214-A2	345.70	4494.10	909QT-S	718.80	9344.40
RPBP Relief Port Air Gap Kit	0.75	13	40-200-X1	52.82	686.66	909-AG-C	40.00	520.00
RPBP	1	2	40-215-A2	380.65	761.30	909QT-S	853.70	1707.40
RPBP Relief Port Air Gap Kit	1	2	40-200-X1	52.82	105.64	909-AG-C	40.00	80.00
RPBP	1.25	3	40-216-A2	629.25	1887.75	909QT-S	1319.85	3959.55
RPBP Relief Port Air Gap Kit	1.25	3	40-200-X1	52.82	158.46	909-AG-F	81.35	244.05
RPBP	1.5	6	40-217-A2	671.25	4027.50	909M1QT-S	1,439.10	8634.60
RPBP Relief Port Air Gap Kit	1.5	6	40-200-X1	52.82	316.92	909-AG-F	81.35	488.10
RPBP	3	2	40-210-02	2719.00	5438.00	909NRS-S-FDA	4341.45	8682.90
RPBP Relief Port Air Gap Kit	3	2	40-200-X2	112.37	224.74	909-AG-F	81.35	162.70
VMBP	0.375	6	4C-102-01	94.47	566.82	SD3-MF	133.10	798.60
			CONBRACO TOTAL		21591.08		**WATTS TOTAL**	38043.25

See COST ANALYSIS NOTES on next page.

7.0 COST ANALYSIS NOTES

* Conbraco strainer comes standard with 50-mesh screen. A 100-mesh screen must be specified when ordering. A $2.00 extra charge has been included in the list price noted above.

** Faucets to be Chicago Faucet, Part Number 305 VB, or equal

*** Model number of required Fixture Vacuum Breaker Dependant on Manufacturer and Model of Flush Valve

NOTES:

1. Costs included here only provide estimates based on the backflow prevention device list price at the time the list is generated. Costs for labor, piping, fittings, labeling and other materials or equipment required to complete this project have not been included.

2. Non-rising stem valves are specified for RPBP's larger than 2.5" for use on other than fire protection systems.

3. Neither Watts nor Conbraco manufacture a FVB. However, there are many companies that do so (i.e. Sloan, Zurn, etc.). Costs, if included here, are based upon industry average.

4. The above Cost Analysis does not include cost for replacement of any single wall steam heat exchanger(s) supplying domestic hot water. See Section 2.0, "Heat Exchangers" for information regarding existence of any such heat exchanger(s) and/or recommendation(s).

5. HDI recommends SVB for .5" line sizes as standard. A PVB would also be acceptable. Part #'s and list prices are Conbraco 40-503-03, $135.95, and Watts 800M4QT, $104.75.

6. For some backflow prevention device "types" noted above, there is a wide range of ordering options available. Some such options are: type of isolation valves supplied, with or without strainer, materials of construction, available configuration (in-line, "N" or "V", etc). While devices specified are applicable for the hazard involved, there may be a different model number that may simplify the installation and/or be more cost effective. **It is recommended that the installer have a working knowledge of these other options, and that a field review of the location be completed prior to final order.**

7. HDI has attempted to be as accurate as possible with respect to pipe sizes noted on both the Potable Water Piping Drawings and on device lists. It is not always possible to be 100% accurate due to inaccessibility of piping, pipe insulation, or poor lighting conditions. Wherever possible, HDI verifies pipe sizes by physical measurement, or manufacturer's size markings on valves and other fittings. Pipe sizes may be based on plant reference drawings, physical observation, or "best estimate". **It is the installer's responsibility for final verification of pipe size, and should be considered prior to ordering backflow prevention devices and/or other installation materials.**

8.0 TEST FORMS

Reduced pressure principle backflow preventers (RPBP's), pressure vacuum breakers (PVB's), spill resistant vacuum breakers (SVB's), and double check valve assemblies (DCV's) require testing on an annual basis. This section is provided as a place to maintain completed test records as required by code.

If the facility chooses to maintain test records in a separate binder and/or location, it is recommended that a cover letter be placed in this section documenting the individuals name and/or department and location of records.

8.1 EXISTING TESTABLE DEVICE LIST

There are presently 5 existing backflow prevention devices that require testing. To assist facility personnel with identification of testable backflow prevention devices, an "Existing Testable Devices List" has been included noting device locations and information.

9.0 LAWS AND RULES

The following rules and regulations have been included:

Department of Commerce, Chapter Comm 32 *Public Employee Safety and Health*
Department of Commerce, Chapter Comm 81 *Definitions and Standards*
Department of Commerce, Chapter Comm 82 *Design, Construction, Installation, Supervision, Maintenance and Inspection of Plumbing*
Department of Commerce, Chapter Comm 82 Appendix (partial)
Department of Commerce, Chapter Comm 84 Plumbing Products (partial)
Department of Commerce, Chapter Comm 84 Appendix (partial)
Wisconsin Administrative Code, Chapter 145 *Plumbing and Fire Protection Systems and Swimming Pool Plan Review*
Wisconsin *Cross-Connection Control Manual*
U.S. Department of Labor, OSHA Standard 1910-141
ANSI Specifications

In addition to the above noted items, HDI has included a copy of an informational pamphlet from Watts Regulator titled *50 Cross-Connection Questions, Answers, & Illustrations Relating to Backflow Prevention Products and Protection of Safe Drinking Water Supply*.

Laws & Rules available upon request at the prevailing rate:

Environmental Protection Agency Cross Connection Control Manual
AWWA Manual M-14 - *Recommended Practice for Backflow Prevention and Cross Connection Control*

Additional resource information:

The following website addresses are provided to give additional information resources for manufacturer and governmental information.

http://www.wattsreg.com/pdf-files/default_frame.htm

http://www.FEBCOonline.com

http://www.conbraco.com

http://www.epa.gov/safewater/tcr/pdf/cross.pdf

http://www.epa.gov/safewater/crossconnection.html

APPENDIX A

A.1 GENERAL INFORMATION - PROGRAM IMPLEMENTATION

Pressure Loss

Pressure loss is inherent in the design of all backflow prevention devices. Prior to installation of any backflow prevention device, the water volume and pressures required to properly operate a system should be analyzed to ensure that problems would not be incurred from the installation of backflow prevention devices.

Thermal Expansion

Installation of backflow prevention devices will prevent release of increased pressure due to thermal expansion. It is important that temperature/pressure relief valves, expansion tanks, or other equipment be properly installed, and/or accommodations made where required, to relieve any increases in pressure within the piping system.

Installation Configuration - Assembly Valve Location

Shut off valves immediately adjacent to Reduced Pressure, Double Check, and Pressure Vacuum Breaker Devices are required as part of the assembly. Shut off valves are not to be placed downstream of Atmospheric or Hose Bibb type vacuum breakers. All manufacturer and authority rules regarding proper installation of devices must be followed to ensure proper operation. Typical backflow prevention device installation drawings have been provided in Appendix B of this report.

Authority Approvals

Permits will be required for installation of all backflow prevention devices, unless specifically noted by the local plumbing authority. Many states will require plan submission prior to installation and acceptance of backflow prevention devices. Local authorities should be consulted to verify the necessary approval procedures.

Tester Qualifications

Backflow prevention device testers must have attended and passed an approved tester course for his/her geographic area of operations. All testers should have applied to, and be recognized by, the state and/or local authority. State and local codes may also dictate other tester qualifications.

Testing/Repair Requirements

Device testing certifies that a backflow prevention device in functioning properly. In most cases, device tests will be required immediately after installation, and at a minimum, on a yearly basis thereafter. Some state codes require testing on a more frequent basis, others less. If state and/or local codes or corporate guidelines do not specify a frequency for testing, HDI recommends that the applicable A.S.S.E. Standard be used as a guideline for testing frequency.

Pipe Labeling and Identification

All piping and outlets downstream of any isolation backflow prevention device must be appropriately labeled. Any water outlets downstream of a device must be identified to prevent individuals from using it as a potable source. Most plumbing codes and OSHA 1910.141 requires labeling of all piping systems to minimize the potential for backflow or backsiphonage into the potable water system. See “Typical Installation Drawings” in Appendix B of this report.

Critical Water Supplies

Normal backflow prevention device testing and repair work will require an interruption in the supply of water from the device. Where the water supply through a given device is critical to a facility or a process operation, it is recommended that devices be installed in a parallel configuration. Parallel installations will allow the continued flow of water to equipment during testing and/or repairs to one of the devices.

Strainers

Incoming water may possess debris or other foreign matter. Foreign matter may foul internal components of backflow prevention devices resulting in leaking and/or failure. It may be beneficial to install a strainer prior to devices to decrease the likelihood of failure. Note that the strainer causes additional pressure loss and will require regular maintenance. To complete maintenance, an additional valve prior to the strainer and a blowoff port may be needed. Since a blowoff port offers another cross connection hazard, proper precautions must be taken. See the typical installation drawings provided in Appendix B of this report.

Device Spitting

Spitting may occur on reduced pressure backflow preventers, pressure vacuum breakers and other devices with openings to the atmosphere. Devices must be installed so that spitting will not cause a hazard or damage to the facility. If spitting occurs, consult manufacturers troubleshooting procedures to try to determine cause. Testing and repair, or plumbing modifications may be required. See the typical installation drawings provided in Appendix B of this report.

Draining/Dumping

Drain piping and a funnel should be attached to the relief ports of reduced pressure backflow preventers. The drains must be appropriately sized to handle maximum flow. Drain outlets should be routed as required and as dictated by code. Devices should not be installed where excessive drainage or splashing will cause damage and/or a hazard. See the typical installation drawings provided in Appendix B of this report.

Device Locations

Devices are not to be installed in areas where they will be subjected to freezing or flooding, unless specifically accepted by code and manufacturer specification. Backflow prevention devices should never be installed over or near electrical panels, motors etc. All devices should be easily visible, and easily accessible for testing and maintenance. Applicable local codes and manufacturer guidelines will dictate acceptable installation locations. See the typical installation drawings provided in Appendix B of this report.

Fire Systems

Device installations and system alterations must be in accordance with applicable codes. O, S & Y gate valves must be used unless specifically accepted by code as otherwise. All fire system alterations must be reviewed and analyzed to ensure proper performance. All relevant insurance agencies and monitoring agencies must be notified, and approve of the alterations.

A.2 REPORT INFORMATION

A.2.1 POTABLE WATER SYSTEM ANALYSIS

Section 2.0 of the report details the Potable Water System Analysis in Backflow Prevention for the facility. Piping status and specific concerns are explained after bolded headings. Item headings and their descriptions are:

Main Inlet(s):

This item provides an overview of potable city water connections and supplies to the facility or complex. It documents the number of service connections, point(s) of origin, location of entry, sizes, and any other relevant information.

A.2.1 POTABLE WATER SYSTEM ANALYSIS (continued on next page)

Containment:

Containment refers to protection of the Public Water system from backflow by installation of appropriate backflow prevention devices at the service connection or point of entry to a facility or complex. Code references regarding containment are in Section 1.3 of this report. The containment status of the facility is outlined under this heading.

Fire Protection Systems:

This section describes the system and outlines the containment status of city water supplies to a fire system. Fire systems are a specific concern covered in cross connection control. Codes and requirements for the systems are outlined in Section 1.3 of this report.

Isolation:

Isolation refers to point-of-use protection within a facility. Point-of-use protection ensures the facilities potable water distribution system is protected against backflow, and that water supplied to facility employees and guests is protected. A general description of the isolation status is provided under this heading.

Zone Isolation:

Zone isolation refers to the use of single (or parallel devices) in the common feed to multiple points of use. All water downstream of zone isolation devices is considered non-potable water. Any fixtures requiring potable water would have to be removed from the non-potable water system. If zone isolation is a consideration, there will be a reference in Recommendations and Alternatives, Section 4.0 with respect to “zone isolation”.

Specific Concerns:

This report addresses some of the common cross connection concerns found at many facilities. These common cross connection concerns are of the type that a plumbing official would be looking for during an inspection. HDI evaluates these items and reports either that they do not exist, or if they do exist, what the present isolation status of the item is. The specific bullet point items reported on are:

Cooling Towers
Heat Exchangers
Lawn Sprinklers
Boilers
Air Conditioning Units
Coffee Vending Machines
Carbonated Beverage Equipment

Piping Visibility:

Describes in general terms to what piping is exposed, and any difficulties encountered while attempting to trace/follow piping.

Report Notes:

An explanation of plant identification numbers utilized on recommendation and existing device tables and drawings (if applicable) is given.

Also, any additional information not covered by one of the above headings may be noted here. Examples would be “unapproved devices”, “plant decisions” made during the survey, “areas requiring additional research”, etc.

A.2.1.1 DEVICE LEGENDS/ABBREVIATIONS

HYDRO DESIGNS, INCORPORATED DEVICE LEGEND/ABBREVIATIONS			
Acronym	Legend	A.S.S.E. Standard	Testable Device
AFHBVB	Anti-Frost Hose Bibb Vacuum Breaker	1019	No
AG	Air Gap	NA	No
AGD	Air Gap Device	NA	No
ASBC	Anti-Siphon Ball Cock	1002	No
AVB	Atmospheric Vacuum Breaker	1001	No
CAP	Device and/or piping requires a cap	NA	NA
DC	Dual Check	1024	No
DCV	Double Check Valve Assembly	1015	**Yes**
DDCV	Double Detector Check Valve	1048	**Yes**
ET	Expansion Tank	NA	NA
FAUCET	Faucet	NA	NA
FVB	Fixture Vacuum Breaker	1001	No
HA	Hammer Arrester	1010	NA
HB	Hose Bibb	NA	NA
HBIVB	Hose Bibb w/Integrated Vacuum Breaker	1011	No
HBVB	Hose Bibb Vacuum Breaker	1011	No
HCBP	Hose Connection Backflow Preventer	1052	**Yes**
LABEL	Pipe requires labeling	NA	NA
LFDC	Lab Faucet Dual Check	NA	No
LFVB	Lab Faucet Vacuum Breaker	1035	No
PLUG	Device and/or piping requires a plug	NA	NA
PVB	Pressure Vacuum Breaker	1020	**Yes**
REMOVE	Device removal required	NA	NA
REPAIR	Device is in need of repair	NA	NA
REPLACE	Requires replacement	NA	NA
REPLUMB	Requires relocation and/or new piping	NA	NA
RPBP	Reduced Pressure Backflow Preventer	1013	**Yes**
RPDA	Reduced Pressure Detector Assembly	1047	**Yes**
SC	Single Check Valve	NA	No
SVB	Spill Proof Vacuum Breaker	1056	**Yes**
VDCV	Vented Dual Check Valve	1012	No
VMBP	Vending Machine Backflow Preventer	1022	No
ABBREVIATIONS LEGEND			
ILGBLE	Illegible		
INACC	Inaccessible		
NA	Not Available		
OTHER	Other (Not a typical manufacturer)		

A.2.1.2 EXISTING DEVICES LIST INFORMATION

Tables in Section 2.1 of the report list all existing backflow prevention devices identified during the survey. See Section 8.1 for a listing of only testable backflow prevention devices. Various fields in the tables include the following information:

HEADING **FIELD INFORMATION**

DRW #:
Column notes the drawing number on which the existing device is found. "NA" will be entered if drawings were not prepared as part of initial job scope.

TYPE:
Column notes the type of backflow prevention device installed at the location. There is insufficient space to spell out every backflow prevention device. Acronyms are used. A legend for acronyms used in this field is shown in the Section A.2.1.1 table (page iv) of this Appendix.

SIZE (in.):
Column notes the size of the device listed in inches (decimal equivalent). If device type is an "AG" (air gap), the size recorded will be the minimum air gap separation required. Example: a 1" pipe will have an AG size recorded as 2" (even if the actual measurement is 6").

MFR:
Column notes the device manufacturer. If the device is not accessible due to height or insulation, "INACC" (inaccessible) will be noted. If information is illegible due to age, or damaged or missing data plate, "ILGBLE" (illegible) will be noted in this column. "NA" is entered for all air gap separations (AG).

MODEL:
Column notes the manufacturer's model number. If the device is not accessible due to height, insulation or if data plate faces an obstruction, "INACC" (inaccessible) will be noted. If information is illegible due to age, or damaged or missing data plate, "ILGBLE" (illegible) will be noted in this column. "NA" is entered for all air gap separations (AG).

Note: The following "S", "V", and "T", fields are **completed for testable backflow prevention devices** only:

S (strainer):
A "Y" (yes) or "N" (no) indicates if there is a strainer on the device.

V (valve):
Column notes the type of device isolation valve. A single letter is used to designate valve types:

Q - Quarter turn ball valve
O - Outside screw & yoke
G - Gate valve
N - Non-rising stem
B - Butterfly

T (temperature):
Column notes the temperature of the piping system served and/or temperature rating of the device. "H" is entered for hot and "C" is entered for cold. The accepted standards agencies and the device manufacturer determine specific operational temperature ranges for backflow prevention devices.

A.2.1.2 EXISTING DEVICES LIST INFORMATION (continued on next page)

SERIAL #:

Column notes the serial number assigned to the device by the manufacturer. If the device is not accessible due to height or insulation, “INACC” will be noted. If information is illegible due to age, or damaged or missing data plate, “ILGBLE” (illegible) will be noted in this column. For devices that are not assigned serial numbers, “NA” will be entered.

PLANT ID#:

Column notes the plant identification number based on the year in which the device was first recorded, location based on the bay and/or columns within the facility (see “Report Notes” Section 2.0 of report for method used), the floor on which the device is located, and the quantity of devices at a location.

A table with Plant I.D. # examples and meanings follows.

Example	Meaning
00A1-1E	“00” notes the year in which the device was originally recorded at the present location. “A1” notes the device is in bay A1, or near column A1. “1E” notes this is the first existing device recorded at the location. The device is located on the main floor of the building.
99A1-1F2E	“99” notes the year in which the device was originally recorded at the present location. “A1” notes the device is in bay A1, or near column A1. “1” and “E” note this is the first existing device recorded at the location. “F2” notes the device is located on floor (“F”) two (“2”) of the building.
00A1-3FBE	“00” notes the year in which the device was originally recorded at the present location. “A1” notes the device is in bay A1, or near column A1. “3” and “E” note this is the third existing device recorded at the location. “FB” notes the device is located on floor (“F”) basement (“B”) of the building.

Plant I.D. #’s are unique to the particular year the survey was completed. Once an I.D. # is assigned, it will remain the same in subsequent surveys and will not change.

A.2.1.2 EXISTING DEVICES LIST INFORMATION (continued on next page)

All examples given above that do not have a floor (“F”) designation will be located on the main floor of the building.

Devices not on the main floor will be given a floor designation similar to those noted in the examples. If a floor or area is other than a second (2), third (3), fourth (4) floor etc., one of the following standard floor designations may be used:

Mezzanine – M Pit - P Roof – R Basement - B

If there are no bay or column designations for a particular building, or area, a building acronym will be assigned. Any building acronyms assigned will be noted in “Report Notes”, Section 2.0 of the report. Typical building acronyms are:

Powerhouse – PH	Fire Pump House – FPH
Waste Treatment – WT	Pump House – PH
Meter Pit – MP	Guard House – GH
Cooling Tower - CT	Boiler Room - BR

A.2.1.3 EXISTING BACKFLOW PREVENTION DEVICE SUMMARY

A summary of all existing backflow prevention devices (both testable and non-testable) is provided in Section 2.2 of this report (see Section 8.1 for "testable devices" only). The summary includes the following information:

TYPE:
Column notes the type of backflow prevention device installed. There is insufficient space to spell out every backflow prevention device. Acronyms are used. A legend for acronyms used in this field is shown in the Section A.2.1.1 table (page iv) of this Appendix.

MFR:
Column notes the manufacturer of the device. If the device is not accessible due to height or insulation, "INACC" (inaccessible) will be noted. If information is illegible due to age, or damaged or missing data plate, "ILGBLE" (illegible) will be noted in this column. "NA" is entered for all air gap separations (AG).

MODEL:
Column notes the manufacturer's model number. If the device is not accessible due to height or insulation, "INACC" (inaccessible) will be noted. If information is illegible due to age, or damaged or missing data plate, "ILGBLE" (illegible) will be noted in this column. "NA" is entered for all air gap separations (AG).

SIZE (in.):
Column notes the size of the device listed in inches (decimal equivalent). If device type is an "AG" (air gap), the size recorded will be the minimum air gap separation required. Example: a 1" pipe will have an AG size recorded as 2" (even if the actual measurement is 6").

QTY:
Column notes the total number for the given type of device by manufacturer, model and size.

A.2.2 POTABLE WATER PROTECTION PROGRAM

Potable Water Protection Program, Section 3.0 reports on some of the relevant issues pertaining to a backflow prevention program. Headings and descriptions of the items addressed are:

Program Status:
Describes the status of the program for each facility, and if applicable, identifies the various activities that are being completed for the Potable Water Protection Program.

Program Manager:
Item identifies the department and/or individual responsible for implementation, maintenance, and information for each facility's Potable Water Protection Program.

Testing:
Item notes the status of backflow prevention device testing, what devices are considered "testable", and the present quantity of testable devices. State and local testing requirement references are outlined in Section 1.3 of this report.

A.2.2.2 POTABLE WATER PROTECTION PROGRAM (continued on next page)

Testers:

Item provides status on individuals at the facility that have received the appropriate certifications to perform testing on backflow prevention devices. This section will either note that the facility has or has no personnel approved to complete device testing. Codes on tester requirements are outlined in Section 1.3.

Pipe Labeling:

Item provides general conditions and status of labeling and/or color-coding of piping. Code requirement references are outlined in Section 1.3. See the "Potable Water Piping Drawings" (if provided in HDI job scope) for the predominant text used on existing pipe markers.

A.2.3 RECOMMENDATIONS AND ALTERNATIVES

General recommendations with a broader scope are detailed in Section 4.0, and address items that are either required by code, and/or items to be addressed to ensure protection of the potable water distribution system. Some items may have several alternatives. Alternatives identified by HDI will follow the recommendation. **Facility personnel must make the final decision on any recommendations.** Alternatives that are available, but not listed, may also need to be addressed.

A.2.3.1 BACKFLOW PREVENTION RECOMMENDATION LISTS

Tables in Section 4.1 of the report list specific recommendations for backflow prevention items identified during the survey. Various fields in the tables include the following information:

HEADING **FIELD INFORMATION**

DRW #:

Column notes the drawing number on which the existing device is found. "NA" will be entered if drawings were not prepared as part of initial job scope.

TYPE:

Column notes the type of backflow prevention device recommended for installation or piping change being recommended at the location. There is insufficient space to spell out every backflow prevention device. Acronyms are used. A legend for acronyms used in this field is shown in the Section A.2.1.1 table (page iv) of this Appendix.

"Type" may also refer to an action such as "Remove" or "Replumb". See Section A.2.1.1 table for an all inclusive list of items used in this column.

SIZE (in.):

Column notes the size of the recommended backflow prevention device, or piping modification listed in inches (decimal equivalent). **In some areas, pipe sizes may need to be verified due to inaccessibility, or insulation.** For an "AG" (air gap) recommendation, the size recorded will be the actual pipe size with the final desired air gap dimension noted in the "location description and remarks" column.

Pipe and device sizes are to be used for acquisition of parts. Backflow prevention device totals are listed in Cost Analysis, Section 7.0.

A.2.3.2 BACKFLOW PREVENTION LIST INFORMATION (continued on next page)

PLANT ID#:

Column notes the plant identification number based on the year in which the recommendation was first recorded, location based on the bay and/or columns within the facility (see “Report Notes” Section 2.0 of report for method used), the floor on which the recommendation is located, and the quantity of recommendations at a location.

The plant identification number denotes the year in which the recommendation was first recorded, location based on the bay and/or columns within the facility (see “Report Notes” Section 2.0 of report for method used), the floor on which the recommendation is located, and the quantity of recommendations at a location.

A table with Plant I.D. # examples and meanings follows.

Example	Meaning
00A1-1	“00” notes the year in which the recommendation was originally recorded at the present location. “A1” notes the recommendation is in bay A1, or near column A1. “1” notes this is the first recommendation recorded at the location. The recommendation is located on the main floor of the building.
99A1-1F2	“99” notes the year in which the recommendation was originally recorded at the present location. “A1” notes the recommendation is in bay A1, or near column A1. “1” notes this is the first recommendation recorded at the location. “F2” notes the recommendation is located on floor (“F”) two (“2”) of the building.
00A1-3FB	“00” notes the year in which the recommendation was originally recorded at the present location. “A1” notes the recommendation is in bay A1, or near column A1. “3” notes this is the third recommendation recorded at the location. “FB” notes the recommendation is located on floor (“F”) basement (“B”) of the building.

Plant I.D. #’s are unique to the particular year the survey was completed. Once an I.D. # is assigned, it will remain the same in subsequent surveys and will not change.

A.2.3.2 BACKFLOW PREVENTION LIST INFORMATION (continued on next page)

All examples given above that do not have a floor (“F”) designation will be located on the main floor of the building. Recommendations not on the main floor will be given a floor designation similar to those noted in the examples. If a floor or area is other than a second (2), third (3), fourth (4) floor etc., one of the following standard floor designations may be used:

Mezzanine – M Pit - P Roof – R Basement - B

If there are no bay or column designations for a particular building, or area, a building acronym will be assigned. Any building acronyms assigned will be noted in “Report Notes”, Section 2.0 of the report. Typical building acronyms are:

Powerhouse – PH
Waste Treatment – WT
Meter Pit – MP
Cooling Tower - CT
Fire Pump House – FPH
Pump House – PH
Guard House – GH
Boiler Room - BR

A.2.4 SUMMARY AND CERTIFICATION STATEMENT

The Summary in Section 5.0 is an overview of findings in the Potable Water Protection Program for the facility. The highlights and general application items are discussed.

The Certification Statement in Section 5.0 outlines materials interpreted in regards to the Potable Water Protection Program. Codes and/or guidelines used in the survey are referenced.

A.2.5 SUGGESTED ACTION PLAN

The Suggested Action Plan, Section 6.0, identifies the general items, and some specific duties that should be completed to ensure that the program is properly maintained and updated. **At a minimum for all facilities, the following items should be included when maintaining or updating a facility program:**

1. Conduct a post survey meeting to review and verify survey findings.
2. Conduct research, including flow analysis, at all device locations to ensure that operations will not be adversely impacted.
3. Obtain approvals, as required by code or regulating agencies, for any installations or changes.

A.2.6 BACKFLOW PREVENTION DEVICE COST ANALYSIS

The Cost Analysis, Section 7.0 provides the quantities and part numbers of the backflow prevention devices required for installation. The cost breakdown includes:

TYPE: Denotes the type of device required for installation.
SIZE: Size of the devices to be acquired.
PART#: Manufactures model number of device type to be acquired. Note there are many device manufacturers with quality devices that are also approved and accepted by state and local municipalities.
QTY.: Quantity of devices for that type and size.
LIST PRICE: The list price for the part, size and type of device.

There are Cost Analysis Notes following the Cost Analysis which are general statements on additional items that must be considered to determine a complete cost the project. Note that the manufacturer's retail list price was used in the Cost Analysis and should represent a worst case scenario. Purchase of devices from a contractor, an installing contractor, or direct from a supplier should yield a 30-40% discount. Also note the device costs given do not include additional pipe, fitting, materials, or labor required for installation.

A.2.7 TEST FORMS

Completed test forms should be maintained in Section 8.0, and can be used when the devices are tested as required by code.

If the facility maintains test records in a separate binder and/or location, it is recommended that a cover letter be placed in Section 8.0 documenting the individuals name and/or department and location of records.

A.2.7 Test Forms (continued on next page)

A.2.7.1 EXISTING TESTABLE BACKFLOW PREVENTION DEVICES

Section A.2.1.1 table (page iv) of this Appendix notes which backflow prevention devices are testable. The Existing Testable Device List, Section 8.1, includes only devices requiring annual or bi-annual testing.

Note that while the Hose Connection Backflow Preventer (HCBP) is listed as a testable device, most municipalities or jurisdictions do not require annual testing and/or certification. The HCBP is listed as a testable backflow prevention device because there is a recognized standard for testing of the device.

APPENDIX B

FIXTURE VACUUM BREAKER DRAWING AND TYPICAL INSTALLATION DRAWINGS