**COUNCIL BILL NO. 99-** 007

**ORDINANCE NO.** 1694

**AN ORDINANCE REPEALING ORDINANCE NO. 783 AND ADOPTING A NEW BACKFLOW PREVENTION AND CONTROL ORDINANCE FOR THE MUNICIPAL WATER SUPPLY SYSTEM**

The City Council of the City of Las Cruces is informed that:

**WHEREAS**, in 1986, the City Council adopted Ordinance No. 783 codified in the 1998 Municipal Code as LCNM Section 31-1 through 31-4 in order to protect the safety of the municipal water supply;

**WHEREAS**, the 1986 Ordinance sought to prevent the backflow or back siphonage when a cross connection exists between the municipal water supply and another source of non-potable liquids without backflow protection. Such backflow can allow contaminated or polluted liquids to flow into the municipal water supply system;

**WHEREAS**, with twelve (12) years of experience implementing Ordinance No. 783, City staff recommends that the 1986 Ordinance be substantially revised although the basic requirements are not being changed;

**WHEREAS**, the proposed Ordinance clarifies the responsibilities of City staff and the City water customer; simplifies the certification and re-certification of certified backflow testers; eliminates technical specifications which will be separately set forth in a program manual to be reviewed and approved by a separate City Council resolution; separately addresses fire protection systems; and authorizes inspection of water customer premises to ensure compliance;

**WHEREAS**, the City Council will consider adopting by separate City Council resolution an accompanying Backflow Prevention and Control Manual which contains detailed technical regulations concerning backflow prevention devices;

**WHEREAS**, the Ordinance will not affect private residential water customers, which residences are addressed in the Uniform Plumbing Code previously adopted by the City Council.

**NOW, THEREFORE**, be it ordained by the governing body of the City of Las Cruces:

**(I)**

**THAT** Ordinance No. 783 is hereby repealed and in its place, this Ordinance, as set forth on Exhibit "A" attached hereto, is hereby adopted.

**(II)**

**THAT** City staff is hereby authorized to do all deeds necessary to accomplish the intent of this Ordinance.

**DONE AND APPROVED** this 3rd day of August, 1998.

Mayor

ATTEST:

City Clerk

{SEAL}

| | |
|---|---|
| Mayor Ruben A. Smith: | Aye |
| Councillor Frietze: | Aye |
| Councillor Gustafson: | Aye |
| Councillor Valencia: | Aye |
| Councillor Stevens: | Absent |
| Councillor Tomlin: | Aye |
| Councillor Haltom: | Aye |

Moved by: Valencia

Seconded by: Haltom

APPROVED:

Marcia B. Driggers, Utilities Attorney

City of Las Cruces

# AN ORDINANCE PROVIDING BACKFLOW PREVENTION AND CONTROL FOR THE MUNICIPAL WATER SUPPLY SYSTEM

## SECTION I -- PURPOSE

1. The City as owner and operator of a regulated water supply system has responsibility under the Federal Safe Drinking Water Act and amendments to provide drinking water which is free from contaminants in excess of maximum contaminant levels as specified by state and federal regulations.

2. The drinking water regulations adopted by the New Mexico Environment Department and amendments prohibit physical connections between a water supply system and any unregulated water source that is not protected from backflow.

3. This Ordinance adopts new backflow prevention controls and repeals the previous backflow Ordinance No. 783, enacted 18th August 1986, and supersedes any conflicting cross-connection control standards in the currently approved Uniform Plumbing Code.

4. This Ordinance prohibits and controls connections to the water supply system owned and operated by the City through which a backward flow of gases, liquids, or solids could occur and contaminate the municipal water supply system.

5. This Ordinance establishes a continuing program for backflow prevention and control which will systematically and effectively protect the municipal water supply system. Practical information, measures, and specifications shall be contained in the Backflow Prevention and Control Manual (Manual), which is available from the City's Director of Water Resources.

## SECTION II -- APPLICABILITY

This Ordinance applies to all commercial, industrial and institutional water supply systems. Compliance with this ordinance is a precondition to receiving water service from the City.

## SECTION III -- DEFINITIONS

**Approved**- The term approved refers to a specific size, model and make of backflow prevention assembly that is currently listed by the University of Southern California Foundation for Cross-Connection Control and Hydraulic Research.

**Backflow**- The reversal of the normal flow of water caused by a drop in pressure within the water supply system (backsiphonage), or by greater pressure outside the water supply system (backpressure).

**Backflow Prevention and Control by Containment**- The installation of an approved backflow prevention device at the service connection, or on the downstream side of the water meter before the first diversion of water within the customer's piping system. This approach prevents backflow by separating the municipal water supply system from the customer's piping system and from all use(s)/application(s) at the premises.

**Backflow Prevention and Control by Isolation**- The installation of an approved backflow prevention device within the customer's premise.

**Backflow Prevention Device**- An approved assembly designed to prevent a backward or reversal of the normal flow of water. A list of approved backflow prevention devices is available from the Director of Water Resources.

**Certified Backflow Tester** - A person deemed knowledgeable and competent in the installation, testing, maintenance, and repair of backflow prevention devices as determined by successful completion of written and practical examinations that the Director of Utilities through the Director of Water Resources has approved or established for the purpose of training, certification, and periodic re-certification.

**Contaminant/Contamination**- Any unregulated gas, liquid, or solid substance which the City does not or cannot control at the point of entry to the municipal water supply system.

**Customer**- The person who is assessed charges for water service from the municipal water system by the City.

**Maximum Contaminant Levels**- The maximum amount of a listed hazardous substance which is permitted to be in water provided by a regulated water supply system as specified by the Safe Drinking Water Act and NM Drinking Water Regulations.

**Plumbing Code**- Uniform Plumbing Code adopted by the City.

**Service Connection**- The service connection is the terminal end of the municipal water supply system where the customer's water piping system is connected. The service connection for metered water services is attached at the customer's (downstream) side of

the water meter. The service connection for the use of a fire hydrant and all other temporary or emergency water services is located at the point of entry to the municipal water supply system.

## SECTION IV -- RESPONSIBILITY

It is the general duty of both water provider and water user to prevent and control contamination of the water supply system. Prevention and control of backflow to the municipal water supply system and within the customer's premises requires cooperation between the City and the customer. The City's responsibility extends from the source of water through its treatment and delivery to its terminus at the customer's service connection. The customer's responsibility extends from the service connection to within and from his/her premises.

1. The **Director of Utilities** shall act on behalf of the City, and be responsible for protecting the municipal water supply system from contamination caused by backflow. To this end, and through the Director of Water Resources and designated agents, he/she shall develop, implement, and direct a systematic and effective program. All practical information, measures, and specifications of the program shall be published in the Manual, which will be updated periodically under his/her authority.

2. The **Director of Water Resources** and designated agents shall act on behalf of the Director of Utilities and be responsible for implementing the Backflow Prevention and Control Program. Responsibilities include, but are not limited to survey of system customers, customer notification, approval of installation design plans where appropriate, preliminary and detailed premise inspections, premises re-inspection, preparation of inspection reports, noncompliance evaluation, water shut-off notifications, maintain backflow prevention assembly records, and maintain lists of approved backflow prevention assemblies and certified testers.

3. The **Codes Enforcement Division** , acting in accordance with the Ordinance, program, and related laws, shall enforce measures recommended and referred to them by the Director of Water Resources or his/her staff.

4. The **Planning Department** is responsible for reviewing and approving plans, issuing plumbing permits, and conducting and enforcing inspections of backflow prevention assembly installations for new and remodeled structures in accordance with the Ordinance, Program, and plumbing codes.

5. The **Customer** shall be responsible for preventing contaminants from entering the municipal water supply system from customer's water system. Customers shall provide backflow prevention assembly(s) or air-gap(s) as required by plumbing codes, Ordinance, Manual, and comply with laws, rules, and regulations pertaining to backflow prevention. This responsibility starts at the point of delivery from the municipal water

supply system (the customer's service connection) and includes any and all water piping within or extending from the premises. The customer, at his or her own expense and in accordance with this Ordinance and Manual, shall install, operate, have tested, and maintain approved backflow prevention device(s). Accurate records of inspections, tests, repairs, and replacements of backflow prevention devices(s) or air-gap(s) shall be maintained by the customer for a period of at least three years.

6. The **Certified Backflow Tester** shall inspect, repair and test backflow prevention devices in accordance with the Manual, and approved methods and procedures. The tester must not change the design, or material and operational characteristics of an approved backflow device during installation, maintenance, or repair. The tester must report to the customer and to the Director of Water Resources any irregularities discovered in an existing backflow prevention device or its installation, and submit test reports in a timely matter as specified in the Manual. To acquire and maintain certification testers must demonstrate knowledge and competence as specified in this ordinance, **Section VII – Certification and Re-certification**. The Director of Water Resources shall maintain a current list of Certified Backflow Testers.

## SECTION V -- REQUIREMENTS

1. Backflow prevention must be provided where a potential of contamination of the municipal water supply system could occur as determined by the Director of Water Resources or his/her staff, the Manual, or plumbing code. Protection may be achieved through isolation or containment by using an approved backflow prevention device of appropriate type and size, or by an appropriate air gap as approved by the Director of Water Resources or his/her staff.

2. Determination of the requirements for a backflow prevention device(s) shall be as specified by the Director of Water Resources or his/her staff, the Manual, or plumbing code. Notifications requiring customers to install and maintain a backflow prevention device(s) shall be issued by the Director of Water Resources or his/her staff based on the findings of their inspection(s), requirements of the Manual, and plumbing code.

3. The following premises present sufficient or potential threat for backflow contamination to require mandatory backflow prevention and control by containment as specified by the Director of Water Resources or his/her staff, Manual, or plumbing code:

hospitals and clinics, nursing and convalescent homes, dental offices, laboratories, mortuaries and cemeteries, sewage and storm water pumping and treatment plants, radiator shops, car and truck washes, commercial laundries, photographic film processing facilities, metal plating industries, veterinary and animal grooming clinics, taxidermists, food and beverage processing plants, premises where inspections are restricted, ready-mix concrete, sand and gravel plants, schools and colleges with

laboratories, water services dedicated for landscape irrigation systems and fire protection systems, greenhouses, premises with auxiliary water supplies, water tank trucks or water tanks filled from fire hydrants and buildings with a height greater than thirty feet. The type and size of backflow prevention device required for containment shall be determined by the Director of Water Resources or his/her staff based on inspections, the situation, and conditions at the premises.

## SECTION VI – FIRE PROTECTION SYSTEMS

New construction including fire sprinkler systems require the installation of an approved Reduced Pressure Principle Detector Assembly (RPPDA) device. Existing fire sprinkler system will be approved if a UL (Underwriters Laboratories) listed alarm check is properly installed and maintained.

## SECTION VII – TESTER CERTIFICATION & RE-CERTIFICATION

1. Individuals shall complete and pass a 40 hour backflow prevention tester course approved by the Director of Water Resources in order to be recognized as a Certified Backflow Tester. Proof of successful completion must be submitted to the Director of Water Resources. Certifications will be recognized for a period of three years from completion date of course.

2. Certified Backflow Testers shall maintain certification by completing and passing an 8-16 hour re-certification course approved by the Director of Water Resources every three years. Proof of successful completion must be submitted to the Director of Water Resources.

3. Certifications may be revoked by the Director of Water Resources for failure to follow provisions of this Ordinance and/or the Manual.

## SECTION VIII – INSPECTION / TERMINATION OF SERVICE

1. The Director of Water Resources or his/her designated agent is authorized to conduct inspections or surveys of premises, or portions thereof, to determine compliance with the provisions of this Ordinance and the Program.

2. Entry to premises to perform an inspection may occur at any reasonable time with reasonable notice. The Director of Water Resources or his/her designated agent

shall present proper identification when requesting entry. If entry is refused, the matter may be referred to Codes Enforcement.

3. In order to protect the municipal water supply system from probable contamination, the Director of Water Resources or his/her designated agent is authorized to terminate water service to the premises.

## SECTION IX -- APPROVED BACKFLOW PREVENTION DEVICES

1. Backflow prevention devices required by this Ordinance and the Program shall be a model and size approved by the Director of Water Resources. Approved backflow prevention devices must conform to manufacturing specifications and laboratory and field performance standards established by the **University of Southern California Foundation for Cross Connection Control and Hydraulic Research: List of Approved Backflow Prevention Assemblies.**

2. The Director of Water Resources and his/her staff shall keep a current list of approved backflow prevention devices. The list shall be available at the Department of Water Resources.

3. Existing backflow prevention assembly(s) shall be accepted for continued use unless a higher degree of protection is required, as may be the case when there is a change in occupancy or water use. Although no longer on the current list of approved devices, continued use of existing backflow prevention devices will be allowed if the device can be properly tested and maintained (e.g. repair parts available from the manufacturer).

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June 1998

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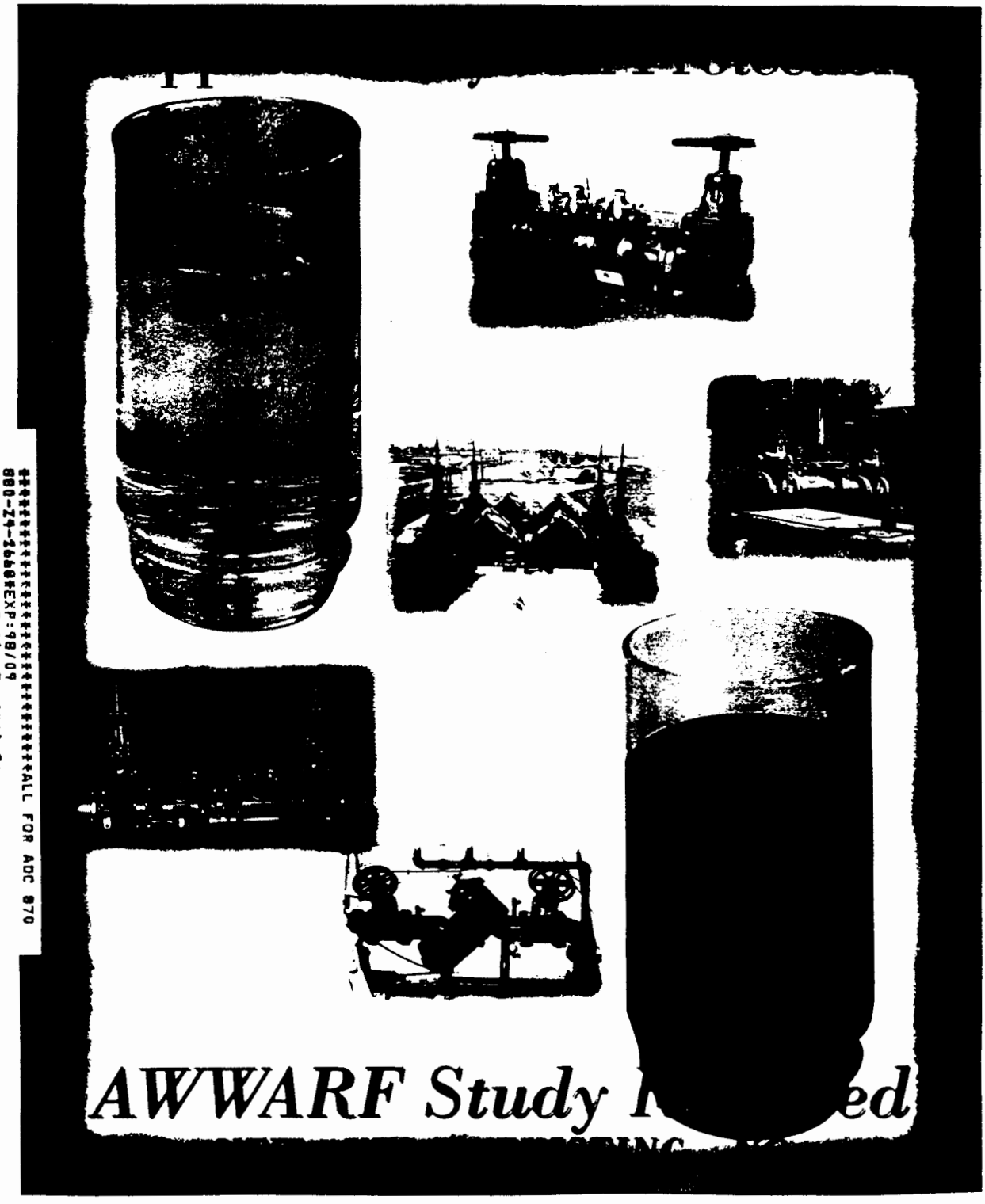
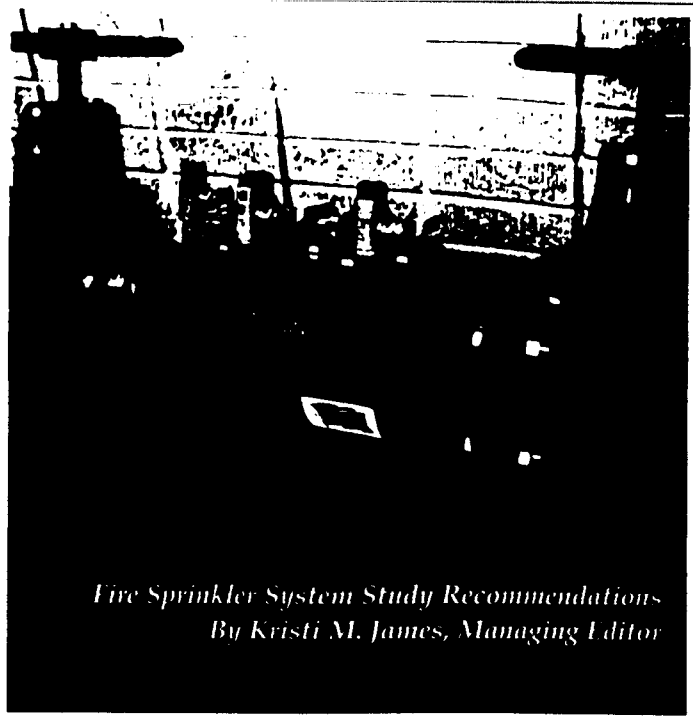


**AWWARF Study ed**

# AWWARF Study Released



*Fire Sprinkler System Study Recommendations*
*By Kristi M. James, Managing Editor*

After more than four years, the much-discussed study sponsored by the American Water Works Association Research Foundation (AWWARF) titled, *The Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality* has been released. The study recommends backflow prevention protection for new installations and no additional backflow prevention on specific existing systems.

There have been many debates over the last decade about the degree of backflow protection on Class 1 and Class 2 wet-pipe fire sprinkler systems connected to potable distribution mains. Most of the controversy centers on the water quality in a wet-pipe fire sprinkler system, and if it poses a potential health hazard if backflow were to occur. The fire protection industry has expressed concern with installing a backflow preventer because of the possible hydraulic problems associated with retrofitting existing Class 1 and Class 2 wet-pipe fire sprinkler systems.

**The study recommends backflow prevention protection for new installations and no additional backflow prevention on specific exising systems.**

To address this issue, AWWARF funded this study to "evaluate the water quality in Class 1 and Class 2 wet-pipe fire sprinkler systems, to determine if a public health hazard exists, and to identify methods to effectively safeguard the public in such a case. This report represents the results of an 18-month study that was performed with the participation of twenty-six (26) U.S. and four (4) Canadian water purveyors."

The study was prepared by Steven J. Duranceau, P.E., and Jacquline V. Foster, P.E., of Boyle Engineering, and Jack Poole, P.E., Poole Fire Protection.

This project was specifically designed to determine the quality of water within Class 1 and Class 2 wet-pipe fire sprinkler systems. Class 1 and Class 2 are defined in accordance with AWWA *M14 Manual, Recommended Practice for Backflow Prevention and Cross-Connection Control.*

Class 1 – Direct connections from public water mains only; no pumps, tanks, or reservoirs, no physical connection from other water suppliers; no antifreeze or other additives of any kind; all sprinkler drains discharge to atmosphere, dry wells, or other safe outlets.

Class 2 – Same as Class 1 except that booster pumps may be installed in the connections from the street mains (booster pumps do not affect the potability of the system). It is necessary, however, to avoid drawing so much water that pressure in the water mains is reduced below 10 psi.

The study notes that typical industry practice is not to reduce the pressure in the mains to less than 20 psi, which is also referenced in the AWWA *M31 Manual – Distribution System Requirements for Fire Protection.*

There were six (6) key objectives of the study:

1) Evaluate current information available in the literature relative to the impact of wet-pipe fire sprinkler systems on drinking water quality.
2) Develop a water utility and fire department questionnaire and perform a survey of a significant num-

ber of geographically distributed water utilities across the North American continent to assess the current level of knowledge and understanding regarding the impacts of wet-pipe fire sprinkler systems on drinking water quality.

3) Determine the potential degree, type, and sources of potable water contamination as a result of wet-pipe fire sprinkler systems backflowing into the distribution system and determine if alternative materials or modifications could mitigate the severity of a potential hazard.
4) Evaluate the relationship between chemical and microbiological water quality, health effects information, and regulatory standards in order to determine the potential exposure and compliance with the provisions of the *Safe Drinking Water Act* (SDWA).
5) Conduct limited backflow simulations of Class 1 and Class 2 wet-pipe fire sprinkler systems under actual "in-field" conditions to monitor flow patterns and determine backflow discharge water volumes.
6) Provide guidance recommendations to mitigate potential negative impacts of wet-pipe fire sprinkler system connections to the drinking water distribution systems.

The project included an information gathering phase, field and laboratory testing, and limited conceptual risk assessment. The information-gathering phase included a literature review and collection of utility and fire authority internal documents. The utility information was collected by surveys, on-site interviews, and by sampling the water quality. Water samples were taken from wet-pipe fire sprinkler systems by the utilities that agreed to participate in the research project.

## Study Conclusions

The majority of the wet-pipe fire sprinkler systems that were sampled for water quality in this investigation were constructed of black-steel piping and were supplied from combination (domestic/fire) water distribution systems. None of the wet-pipe fire sprinkler systems sampled were constructed of copper and plastic piping; however, some were constructed of galvanized black-steel pipe.

Conclusions formulated include the following:

- Water quality within existing wet-pipe fire sprinkler systems exceeds the [US EPA] primary standard for lead and cadmium and secondary standards for iron, manganese, total dissolved solids, sulfate, color, and odor. Soluble lead appeared to be originating from check valves that had lead-weighted clappers, leaded fittings, machined leaded brass valve bodies, and other accessories.
- Metal (lead) and total organic carbon concentrations were found to be highest in the proximity of the fire sprinkler check valve on the high-pressure side of the valve and tended to decrease with horizontal pipe distance within fire sprinkler pipe.
- Total coliform (an indication of pathogens, that is,

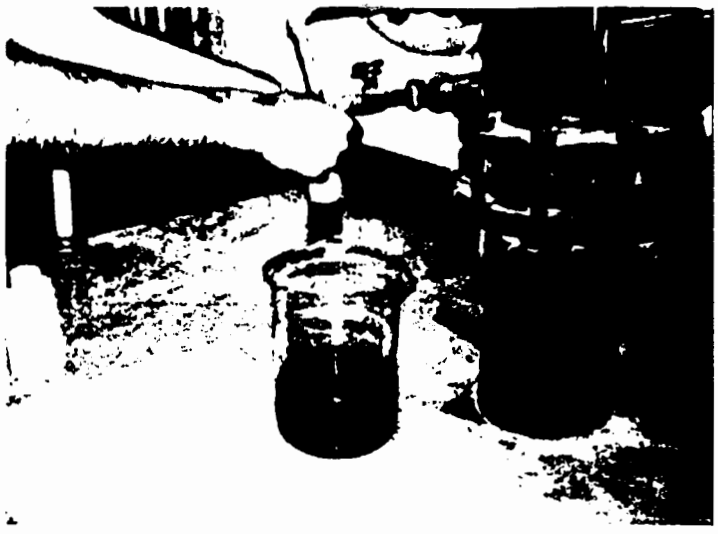
disease causing organisms) was predominantly absent in wet-pipe fire sprinkler systems, however, heterotrophic plate count bacteria were detected in a majority of the fire sprinkler systems sampled. Of the eighty-four (84) wet-pipe fire sprinkler systems evaluated, total coliform was found to be present in 4.8% percent of the sprinkler systems and was attributed to construction activities recently performed on the sprinkler systems.

- Wet-pipe fire sprinkler systems contain water that can be aerobic and anaerobic. Dissolved oxygen concentrations were observed to decrease with horizontal pipe distance, with the highest concentrations in the proximity of the sprinkler valve and the lowest concentrations in the proximity of the remote portion of the sprinkler system.
- The predominant cause for backflow of water within a dedicated wet-pipe fire sprinkler system is related to the failure of check valves that have failed in the open or partially open position. Based upon conversations with participating utilities and fire sprinkler personnel and available data, the majority of the backflow incidents involving wet-pipe fire sprinkler systems utilized standard swing check valves and not UL [standard] 193 listed alarm check valves.
- Cost-benefit and conceptual risk evaluations indicate that the retrofit installation of a backflow prevention assembly on existing Class 1 and Class 2 wet-pipe fire sprinkler systems have functioning, non-lead containing alarm check valves is not recommended. The relative risk from dying in a fire in non-residential structures is half the relative risk of becoming ill as a result of waterborne disease. However, the relative risk of being injured in nonresidential fires is thirty-three (33) times greater than the increased risk of contracting a waterborne illness.
- Limited simulated backflow evaluations indicate that approximately 100 gallons of water backflowed from a wet-pipe fire sprinkler system when the check valve failed in the open position during an average 3-minute hydrant flow test.

## Recommendations

The study makes six recommendations.

1. Cross-connection control for Class 1 and Class 2 wet-pipe fire sprinkler systems using approved backflow prevention assemblies on new construction is recommended based on the following findings:
   a) water quality within the black steel Class 1 and Class 2 wet-pipe fire sprinkler system exceeds national primary and secondary drinking water standards;
   b) for new construction, the pressure loss related to the installation of a backflow prevention assembly can be engineered into the design of the new sprinkler system; and
   c) the cost of the backflow prevention assembly when included in new construction cost is low because the backflow preventer is a minor cost when compared to the cost of the non-residential structure within which the sprinkler is to be installed. For new sprinkler systems, approved backflow prevention assemblies must be installed to meet the requirements of the SDWA. The use of approved backflow prevention assemblies on wet-pipe fire sprinkler systems should be enforced.
2. Lead containing valves should be prohibited from use in new construction of wet-pipe fire sprinkler systems, cross-connection control devices, and potable water connections with wet-pipe fire sprinkler systems. Lead water quality could be monitored at the fire sprinkler control valve to ascertain if leaded components are present.
3. It is acknowledged that an alarm check does not provide the same level of protection as a double check backflow prevention assembly. However, due to the operation principles of the alarm check valve and the economical cost burden to retrofit backflow prevention assemblies, the following recommendations with respect to existing Class 1 and Class 2 wet-pipe fire sprinkler systems are provided.
   - If the wet-sprinkler system does not contain a check valve, a standard swing check valve or an alarm check valve, the system should be provided with a UL listed alarm check valve with the standard alarm pressure switch trim package or with a backflow prevention assembly.



*Orange County Utilities chemist collects sample in Orlando, Florida.*

- All standard swing check valves that serve as the main method of preventing the reverse flow of water in the wet-pipe sprinkler rise should be replaced with a UL listed alarm check valve with the standard alarm pressure switch trim package.
- If the sprinkler system consists of a lead-containing alarm check valve, then the valve should be replaced with a UL listed alarm check valve with the standard alarm pressure switch trim package.
- If the sprinkler system consists of a UL listed alarm check valve that is properly maintained in accordance with NFPA 25 (NFPA 1995b), the alarm check valve does not have to be replaced or a backflow prevention assembly does not have to be installed.
- Should a water purveyor chose to install a backflow preventer on an existing wet-pipe fire sprinkler system, then a comprehensive hydraulic analysis and evaluation should be performed by a qualified professional engineer on a case-by-case basis prior to the addition of a backflow preventer in order to determine the level of hazard, the cost to retrofit the system, and the impact on system hydraulics and performance in order to meet the requirements of NFPA 13 (NFPA 1996a).

4. Class 1 and Class 2 wet-pipe fire sprinkler alarm check valves should be required to be maintained in accordance with NFPA 25, *Standard for the Inspection, Testing, and Maintenance of Water-Based Fire Protection Systems*. It is further recommended that an annual leak confidence test be developed, similar to the test performed on a backflow preventer, to document that the main clapper will hold pressure.
5. A full flow test shall be conducted during the annual maintenance of all backflow prevention assemblies to verify that the assembly will open properly and allow adequate flow to pass through the assembly.
6. The fire industry, water utility community, and building code developers should work together in order to verify that the codes and standards from these various industries are not contradictory and to create more constructive avenues of communication between the groups to resolve common problems.

## Research Needs

After reviewing the information gathered during this research project, the authors formulated ideas regarding research needs. Recommended future research includes the following:

1. Additional backflow simulations under field conditions should be performed. Based on the limited simulations performed in this project, results indicated that independent of the backflow simulation method or event, a certain volume of water will backflow regardless of fire sprinkler system configuration. The total volume and backflow rate is primarily a function of the differential pressure drop over a specific period of time and the fire sprinkler riser diameter.
2. Although results of this investigation have shown the alarm check valves are reliable devices, further research directed at determining the number of alarm check valve failures and false alarms is recommended.
3. Based on the research performed and interpretations made in this project, there exists a need for developing and creating an alarm cross-connection assembly that can be specifically used for Class 1 and Class 2 wet-pipe fire sprinkler systems. The features of this new and unique backflow prevention alarm assembly are based on the inventive ideas developed by the authors. These devices shall have similar operating features to that of an alarm check valve and be equipped with an alarm feature that would indicate when the main clapper is in the open position. But the device shall be provided with test cocks for testing purposes, and the check valve in the bypass line shall be replaced with a rubber seated check valve. The tolerances of the main check should be similar to the tolerances of a check valve in a backflow preventer. This device will provide an acceptable level of safety against backflow, as well as meet the needs of the fire protection community.
4. A standardized cross-connection control testing protocol for wet-pipe fire sprinkler alarm check valves does not currently exist but is essential for monitoring the performance of alarm check valves and hence should be developed. This standard protocol should be similar to the testing protocol of a backflow preventer, except that it should involve the testing of a single check valve device and not a double check valve device. Leak confidence testing could easily be accomplished by testing the fire sprinkler system control valve to confirm that single alarm check valve seats properly against system pressure. The leak confidence testing could then be used to supplement NFPA's test and inspection guidelines, and the information could be used by water purveyors to

identify malfunctioning or suspect systems.

5. Existing wet pipe fire sprinkler systems that utilize copper or plastic piping materials should be investigated to determine impacts on drinking water quality. In addition, the use of newer or alternative piping materials should be investigated for impacts on water quality in wet-pipe fire sprinkler systems.
6. Results of the study indicated that standard swing check valves on wet-pipe fire sprinkler systems are susceptible to failure in the open position, and hence contaminated water has on occasion entered an unknown number of distribution systems in the past. Taste, odor, loss of disinfectant residual, and poorer water quality that may be the result of some prior wet-pipe fire sprinkler backflow event may not be immediately recognizable. But only occur after the distribution system has been contaminated over a period of time in the zone of influence near the faulty wet-pipe fire sprinkler check valve. Consequently, further research is recommended to ascertain the secondary impacts of wet-pipe fire sprinkler system backflow on the microbiological stability of drinking water in distribution systems.

## Survey

The participating cities were sent surveys. Seventy-eight (78%) percent of responding utilities are regulated by state cross-connection laws regarding fire suppression systems. Eighty-nine (89%) of the municipalities reported having local cross-connection ordinances regulating fire sprinkler systems. Only twelve (12%) percent of local ordinances apply to commercial fire suppression systems compared with eighty-eight (88%) percent that apply to both commercial and residential systems.

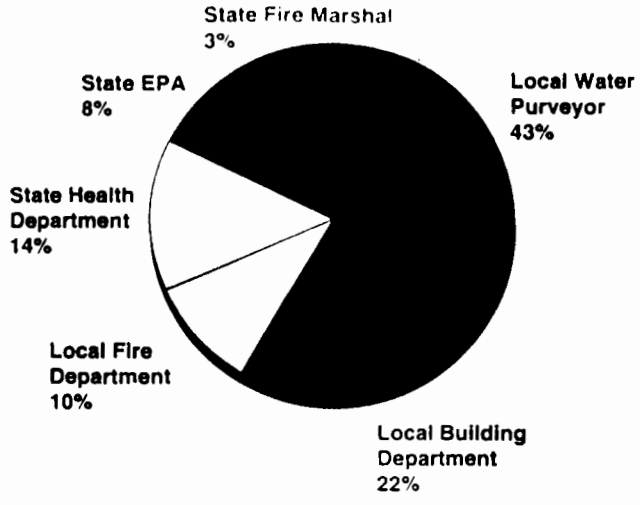
The jurisdictional backflow prevention laws and regulations are reportedly enforced by a variety of local government agencies. Seventy-five (75%) percent of questionnaire participants utilize the local agencies as their enforcement authority. In comparison, twenty-five (25%) percent reported using a state agency as the enforcer. (See Figure 1 on next page.)

One purpose of the questionnaire was to compile a database of any drinking water incidents that the utilities documented. It was found that eleven (11%) percent of the utilities were aware of some drinking water contamination incidents that were caused by unprotected fire sprinkler systems. In addition, eleven (11%) percent reported that they were aware of drinking water conta-

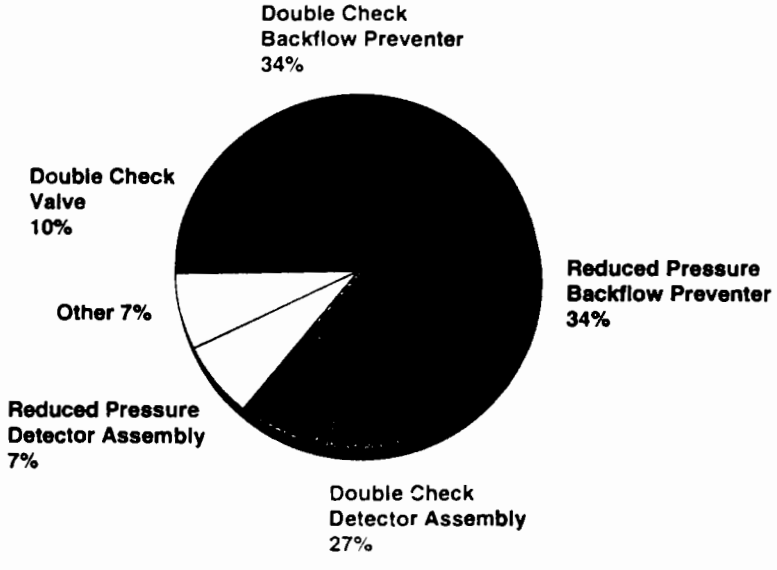
## Participating Utility Information and Statistics

The following is a list of participating utilities, population served (x1000), number of connections (x1000), and age water production (mgd).

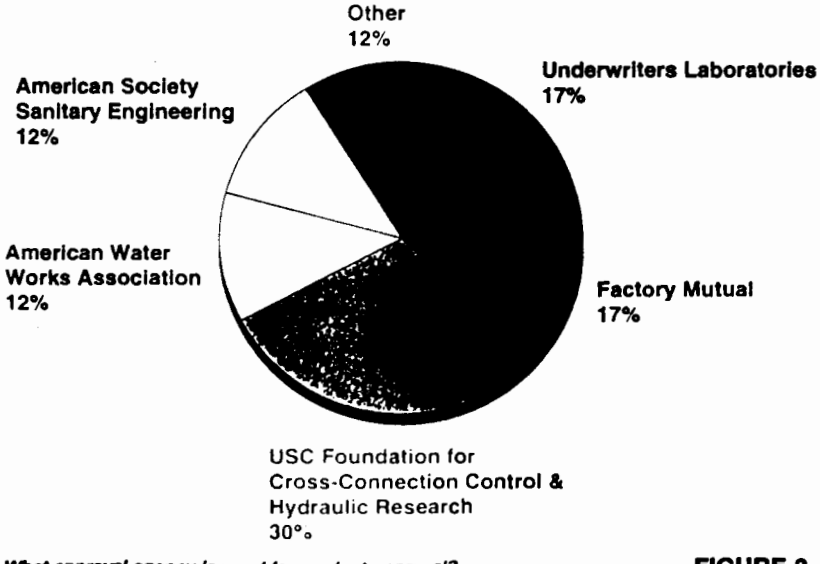
| Utility Name, State | Population | Connections | Avg. |
|---|---|---|---|
| Boston Water and Sewer Commission, Massachusetts | 574 | 93 | 122 |
| Charlotte-Mecklenburg Utility Commission | 450 | 136 | 62 |
| City of Arcadia, California | 41 | 13 | 2 |
| City of Boulder, Colorado | n/a | n/a | n/a |
| City of Edmonton Public Works, Alberta | 783 | 176 | 87 |
| City of Kissimmee, Florida | 90 | 17 | 11 |
| City of Mesa, Arizona | 340 | 85 | 70 |
| City of Portland, Oregon | 720 | 145 | 120 |
| City of Philadelphia, Pennsylvania | 1,860 | 539 | |
| City of Saint John, New Brunswick | 80 | 20 | |
| City of St. Louis, Missouri | 510 | 120 | |
| City of Westminster, Colorado | 86 | 23 | |
| City of Winnipeg, Manitoba | 617 | 76 | 68 |
| Denver Water, Colorado | 1,004 | 195 | 215 |
| Des Moines Water Works, Iowa | 260 | 69 | 40 |
| Fort Worth Water Department, Texas | 650 | 134 | 132 |
| Halifax Water Commission, Nova Scotia | 212 | 25 | 27 |
| Irvine Ranch Water District, California | 100 | 20 | 12 |
| Lockheed Idaho Technologies Company, Idaho | n/a | n/a | n/a |
| Metropolitan Utilities District, Nebraska | 450 | 137 | 97 |
| Miami-Dade Water and Sewer Authority, Florida | 1,500 | 316 | 300 |
| Orange County Utilities, Florida | 220 | 63 | 29 |
| Pinellas County Utilities, Florida | 502 | 94 | 73 |
| St. Paul Water Utility, Minnesota | 383 | 90 | 122 |
| Seattle Water, Washington | 1,131 | 171 | 165 |
| Southern States Utilities, Florida | 160 | n/a | n/a |
| Springfield Utility Board, Oregon | 31 | 11 | 5 |
| Tualatin Valley Water District, Oregon | 127 | 25 | 13 |
| Water District No. 1 of Johnson County, Kansas | 343 | 90 | 48 |




*Who in your jurisdiction enforces backflow prevention laws and regulations?* **FIGURE 1**




*What level of protection is required for wet-pipe fire sprinkler systems?* **FIGURE 2**




*What approval agency is used for product approval?* **FIGURE 3**

mination incidents caused by a fire sprinkler system with a single check valve or alarm check valve installed. Of those utilities responding to the survey, sixty-three (63%) percent believe backflow prevention is a high priority on wet-pipe fire sprinkler systems.

Thirty-four (34%) percent of the utilities responding to the survey required a double check backflow prevention assembly for protection, and twenty-seven (27%) percent required a double check detector assembly. (See Figure 2.) Thirty (30%) percent of the utilities required a University of Southern California (USC) Foundation for Cross-Connection Control and Hydraulic Research product approval. (See Figure 3.)

The survey indicated that 93% percent of the responding utilities do not consider two approved check valves to be an effective means for backflow prevention on a fire sprinkler system. With respect to dry-pipe fire sprinkler systems, only thirty (30%) percent of the utilities report having a high priority need for backflow prevention. With forty-two (42%) percent using a double check backflow preventer as their level of protection.

## SAMPLING

The majority of wet-pipe systems sampled were constructed of black-steel piping and were supplied from a combination (domestic/fire water) distribution system. None of the wet-pipe systems sampled were constructed of copper or plastic piping. However, some were constructed of galvanized steel piping. Eighty-five (85) wet-pipe sprinkler systems were sampled using established written and video protocols. Each participating utility was supplied with observation data forms. Sample collection and analysis covered three types of analytical samples: 1) metals, 2) general water quality parameters, and 3) microbiological parameters.

The average lead concentration levels ranged from 0.52 mg/L on the fire sprinkler side of the riser control valve to 0.007 mg/L at the potable water main. The average copper concentration levels ranged from 0.287 mg/L at the fire sprinkler side of the backflow preventer to 0.016 mg/L after the systems had drained for 120 seconds. The survey also reported average levels of: zinc, manganese, cadmium, chromium, iron, calcium, and sodium. The general water quality parameters included: pH, temperature, conductivity, oil, grease, total dissolved solids, total suspended solids, turbidity, sulfate, total organic carbon, and alkalinity. The only microbiological parameter was the heterotropic plate count (HPC). A maximum

of 500 colony-forming units (CFUs) per mL is suggested for potable water before corrective action should take place. The average HPC at the potable water main measured 103 CFU/mL, the highest average of 6,200 CFU/mL was taken on the fire sprinkler side of the backflow preventer. The study states, "It can be seen that the many locations were found on average to exceed drinking water standards."

Another component of the sampling process included collection of the fire sprinkler system hydraulic design information and dates of the last testing and flushing. Water age ranged from 3,115 days to four (4) days.

Limited backflow simulations were performed for identifying accurate backflow volumes to determine impacts of dilution of the contaminant mass in the water main. This testing was intended to simulate fire sprinkler valve failure in the open position and a backflow event occurring.



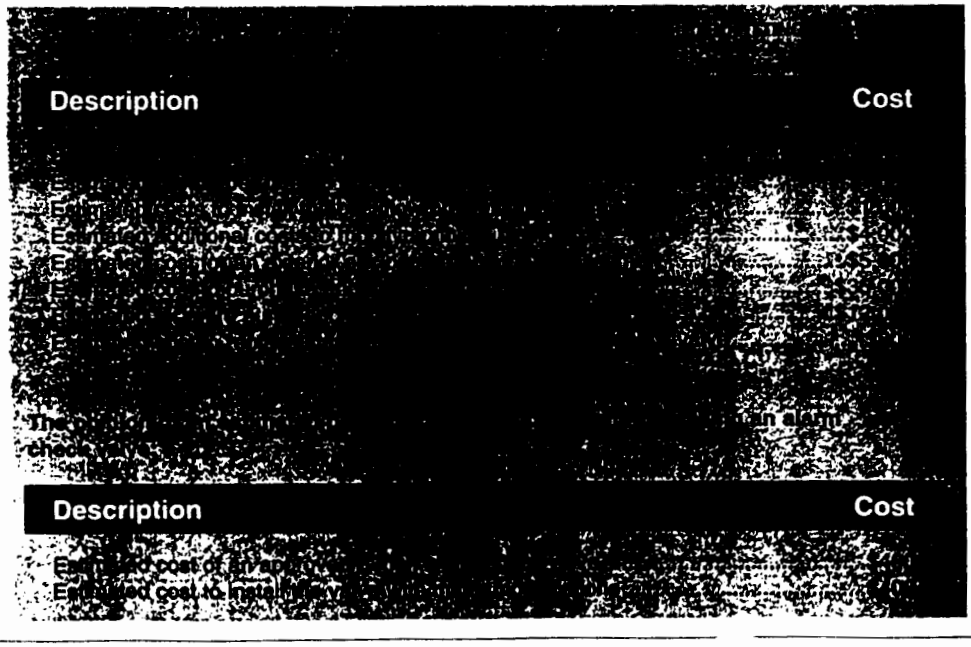
## Economic Burden

According to the survey, "there is significant cost associated with retrofitting a backflow prevention assembly on an existing wet-pipe sprinkler system. The actual up-front capital costs for the installation of the backflow prevention assembly is expected to be a greater burden than the annual testing and maintenance costs of the assembly."

Opinion of estimated costs associated with retrofitting wet-pipe fire sprinkler systems with BPs. [Note: These opinions represent the survey author's judgments as design professionals and are supplied for general guidance. These opinions are not intended to be guarantees as compared to actual costs.]

The survey stated, "It should be noted that cost estimates are site specific. Some sites may require the installation of a fire booster pump and a pump enclosure, which may increase the cost approximately two to five times. Each wet-pipe system that is to be retrofitted with a backflow prevention assembly will involve different cost factors. The cost factor of the installation should be considered and evaluated to determine if the risk is significant enough to require the installation of a backflow prevention assembly."

The survey included information from two water districts on costs of retrofitting. Mesa Consolidated Water District, California, completed a backflow prevention assembly retrofit program on wet-pipe fire sprinkler systems having no backflow protection. Of a total number of 558 wet-pipe fire systems in the district, MCWD identified 237 wet-pipe fire sprinkler systems that required retrofit because those systems were not protected with backflow prevention assemblies. Based on a served population of 103,823 persons, this would equate to retrofitting 0.0023 fire sprinkler systems per customer, or an equivalent of $23 per capita based on a $10,000 per unit cost.




The city of El Torro, California provides water to approximately 56,000 persons and retrofitted 93 of 117 fire sprinkler systems, which equates to 0.0017 fire sprinkler systems per customer, or $17 per capita. This information for MCWD and the city of El Torro can be used to estimate total retrofit costs.

According to the survey, the cost of retrofitting existing wet-pipe fire sprinkler systems for the thirty (30) utilities evaluated would range between $231 million and $313 mil-

*A city of Kissimmee operator collecting a sample at a fire sprinkler riser in Kissimmee, Florida.*

lion. Based on this same approach, the cost to retrofit Class 1 and Class 2 wet-pipe fire sprinkler systems nationwide that do not currently have backflow prevention assemblies would approximate between $4.4 billion and $6.0 billion, assuming an affected population of 260 million persons.

## Conclusions

As stated above, the AWWARF research study made a number of recommendations and potential future research needs. The study recommends that the construction of new wet-pipe fire sprinkler systems include the use of a backflow prevention assembly. The three reasons are: 1) water quality within wet-pipe fire sprinkler systems exceeds recommended standards, 2) for new construction, the pressure loss of including a backflow prevention assembly can be engineered into the design of the new fire sprinkler system, and 3) the cost when included in new construction is low.

There are arguments against retrofitting:

- the existing system reliability may be diminished,
- the original design may be compromised,
- the specific pressure loss violates codes,
- increase the change of fire loss, and
- retrofitting will impose significant costs for owners and consumers.

"If a utility is to install a backflow prevention assembly on an existing Class 1 or Class 2 wet-pipe fire sprinkler system, careful and professional judgement must be exercised. The utility should coordinate with the fire marshal and require a site-by-site hydraulic evaluation be made on each system," according to the survey.

The design and production of a cross-connection con-

*The AWWARF study did not include fire suppression systems containing antifreeze — which usually requires an RP*

trol alarm assembly is suggested by the authors of the study. The device should be a testable, single check valve assembly equipped with an alarm feature that would indicate when the main clapper is in the open position.

This proposed valve is essentially an alarm check valve with the 3/4-inch bypass line modified so there is alarm verification of the bypass line and the main clapper. The valve would be provided with test cocks so backpressure and backsiphonage testing can be performed.

(Note: To order a copy of the study, contact the AWWA bookstore at 1.800.926.7337. The cost is $125 for AWWA members and $195 for non-members. *The Impact of Wet-Pipe Fire Sprinkler Systems on Drinking Water Quality* is Copyright ©1998 by the AWWA Research Foundation and AWWA.) ■



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**USC Foundation for Cross-Connection Control and Hydraulic Research - #135**
**Water Wiz - #103**
**Woodford Mfg. - #108**
**Zurn-Wilkins Industries - #112**

# CITY OF LAS CRUCES
# COUNCIL ACTION FORM

**FOR MEETING OF JULY 6, 1998**

**AGENDA ITEM TITLE:**

## AN ORDINANCE REPEALING ORDINANCE NO. 783 AND ADOPTING A NEW BACKFLOW PREVENTION AND CONTROL ORDINANCE FOR THE MUNICIPAL WATER SUPPLY SYSTEM

**BACKGROUND, SUPPORT INFORMATION, AND COUNCIL OPTIONS (in order):**

The Federal Safe Drinking Water Act and State of New Mexico Drinking Water Regulations require that the operator of a public water supply system prevent the contamination of the drinking water and control cross-connections between the public water supply. As a result of the federal statute and state regulations, the City adopted Ordinance No. 783 to protect from contamination of the City's water system by seeking to prevent the backflow or back siphonage when a cross connection exists between the City's water supply and another source of non-potable liquid without a backflow preventer. Such backflow can allow contaminated or polluted liquids to flow into the City's water supply system.

Based on twelve (12) years experience with implementing Ordinance No. 783, City staff recommends that Ordinance No. 783 be repealed and that a new Ordinance which substantially revises the old Ordinance be enacted even though the basic requirements are not being changed. City staff has worked on the proposed Ordinance and the accompanying Backflow Prevention and Control Manual for more than a year with input from the local plumbing and business community, as well as the Water Technology Program staff of the Doña Ana Branch Community College and Viking II, a private consulting firm in Albuquerque that certifies backflow inspectors.

City Utilities Division staff conducted a well publicized public meeting on May 18, 1998. Some questions were raised at the meeting by fire sprinkler installers, who were concerned that backflow preventers could reduce water pressure thereby affecting fire sprinkler systems. City staff has subsequently received a report on the issue of backflow prevention on fire sprinkler systems. The research was sponsored by the American Water Works Association Research Foundations ("AWWARF") and was conducted by fire sprinkler systems and water supply system professionals. The study included issues of water system safety, fire system effectiveness, and costs. A copy of the findings of the study is included in the Council Action package.

(CONTINUED)

| Name of Drafter: | Department/Division: | Phone: |
|---|---|---|
| MARCIA B. DRIGGERS | LEGAL/ADMIN | 541-2128 |

STAFF COORDINATION

| Division/Department | Signature | Phone | Division/Department | Signature | Phone |
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| UTILITIES | | | | | |
| COMM FACIL | | | ASST CITY MGR | | |
| DEVEL SVCS | | | CITY MANAGER | | |

## BACKGROUND, SUPPORT INFORMATION, AND COUNCIL OPTIONS (in order): (Continued)

## BACKGROUND: (Continued)

The basic AWWARF recommendations are:

1. Require approved backflow prevention assemblies on all new construction:

2. Prohibit backflow valves containing lead.

3. Grandfather existing fire sprinkler systems if they have an Underwriters Laboratory ("UL") approved alarm check.

More detailed information is listed in the attached June 1998, report.

City staff will be submitting a separate Backflow Prevention and Control Manual which contains detailed technical regulations to implement the Ordinance. The proposed Ordinance will not affect private residential City water customers at this time.

## SUPPORT INFORMATION:

1. Ordinance with Exhibit "A" attached;

2. Ordinance No. 783 adopted in 1986 and codified as Municipal Code Section 31-1 through 31-4 entitled "Cross Connection Control";

3. June 1998, AWWARF study.

## COUNCIL OPTIONS:

1. Approve the ordinance as drafted;

2. Modify the proposed Ordinance as Council deems necessary;

3. Do not approve the proposed Ordinance thereby continuing Ordinance No. 783 in full force and effect.

Orig w/1692

## PROOF OF PUBLICATION

David E. McCollum, being duly sworn, deposes and says that he is the Publisher of the Las Cruces Sun-News, a newspaper published daily in the county of Dona Ana, State of New Mexico; that the notice Legal 20128 Notice per clipping attached was published once a ~~week~~/day in regular and entire issue of said newspaper and not in any supplement thereof for 1 ~~consecutive~~ days, the first publication was in the issue dated 8-9-98 and the last publication was 8-9-98.

Deponent further states this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Sec. Chapter 167, Laws of 1937.

Signed David E. McCollum

Publisher
Official Position

STATE OF NEW MEXICO
ss.
County of Dona Ana

Subscribed and sworn before me this 12th day of Aug. 98.

Robyn Quille

My Term Expires October 28, 2000.

Notary Public in and for
Dona Ana County, NM

### NOTICE OF ADOPTION

The City Council of the City of Las Cruces, New Mexico hereby gives notice of the adoption of the following Ordinances at the regular meeting of August 3, 1998:

1. Council Bill No. 99-005; Ordinance No. 1692: An Ordinance Repealing Las Cruces Municipal Code Section 19-332 (Formerly Section 21-254) and Enacting a New Section 19-334 Concerning the Presence of Minors in Liquor Establishments.

2. Council Bill No. 99-006; Ordinance No. 1693: An Ordinance Repealing Las Cruces Municipal Code Section 19-332 (Formerly Section 21-252) and Enacting a New Section 19-332 Concerning the Selling or Giving of Alcoholic Beverages to Minors, and Possession of Alcoholic Beverages by Minors.

3. Council Bill No. 99-007; Ordinance No. 1694: An Ordinance Repealing Ordinance No. 783 and Adopting a New Backflow Prevention and Control Ordinance for the Municipal Water Supply System.

4. Council Bill No. 99-008; Ordinance No. 1695: An Ordinance Establishing a High Load Factor General Services Rate for the Initial Electric System.

5. Council Bill No. 99-010; Ordinance No. 1697: An Ordinance Changing the Zoning from R-3 (High Density Residential) to O-1c (Office Conditional) on Approximately 4.5 Acres of Property Located West of Temple Street and Approximately 200 Feet North of North Main Street. Submitted by the Las Cruces Home Builders Association (Case Z2391).

Complete copies of the Ordinance are on file in the Office of the City Clerk and are available for public inspection during regular Office hours.

**WITNESS my hand and seal** of the City of Las Cruces on this 4th day of August, 1998.

/s/Carolyn J. Duran
Deputy City Clerk

Pub. No. 20128
Publish: August 9, 1998

Orig w
1Ce92

## PROOF OF PUBLICATION

David E. McCollum, being duly sworn, deposes and says that he is the Publisher of the Las Cruces Sun-News, a newspaper published daily in the county of Dona Ana, State of New Mexico; that the notice Legal 9977 Notice per clipping attached was published once a ~~week~~/day in regular and entire issue of said newspaper and not in any supplement thereof for 1 ~~consecutive~~ days, the first publication was in the issue dated 7-12-98 and the last publication was 7-12-98.

Deponent further states this newspaper is duly qualified to publish legal notices or advertisements within the meaning of Sec. Chapter 167, Laws of 1937.

Signed David E. McCollum

Publisher
Official Position

STATE OF NEW MEXICO
ss.
County of Dona Ana

Subscribed and sworn before me this 24th day of July 98.

Robyn Sullen

My Term Expires October 28, 2000.

Notary Public in and for
Dona Ana County, NM

City of Las Cruces

**NOTICE OF INTENT TO ADOPT**

The City Council of the City of Las Cruces, New Mexico, Hereby Gives Notice of its Intent to Adopt the following Ordinances at the Regular City Council Meeting, august 3, 1998:

1. Council Bill No. 99-005: Ordinance No. 1692: An Ordinance Repealing Las Cruces Municipal Code Section 19-332 (formerly Section 21-254) and enacting a New Section 19-334 Concerning the Presence of Minors in Liquor Establishments.

2. Council Bill No. 99-006: Ordinance No. 1693: An Ordinance Repealing Las Cruces Municipal Code Section 19-332 (Formerly Section 21-251) and Enacting a New Section 19-332 Concerning the Selling or Giving of Alcoholic Beverages to Minors, and Possession of Alcoholic Beverages by Minors.

3. Council Bill No. 99-007: Ordinance No. 1694: An Ordinance Repealing Ordinance No. 783 and Adopting a New Backflow Prevention and Control Ordinance for the Municipal Water Supply System.

4. Council Bill No. 99-008: Ordinance No. 1695: An Ordinance Establishing a High Load Factor General Services Rate for the Initial Electric System.

Complete Copies of the Ordinances Are on File in the Office of the City Clerk and Are Available for Public Inspection During Regular Office Hours.

Witness my hand and seal this 7th day of July, 1998.

/s/ Shirley Clark,
CMC/AAE
City Clerk

Pub. No. 19977
Publish: July 12, 1998