DEPARTMENT OF THE NAVY
ATLANTIC DIVISION
NAVAL FACILITIES ENGINEERING COMMAND
NORFOLK, VIRGINIA 23511

TELEPHONE NO
444-9557
IN REPLY REFER TO

LANTNAVFACENGCOMINST 11330.5B
114

13 SEP 1983

LANTNAVFACENGCOM INSTRUCTION 11330.5B

From: Commander, Atlantic Division, Naval Facilities Engineering Command

Subj: Cross-connection and Backflow Prevention Program for Navy Potable Water Systems in Virginia

Ref: (a) OPNAVINST 11330.2 of 10 Feb 1978
(b) LANTNAVFACENGCOM ltr of 31 Dec 1980 (Cross Connection and Backflow Prevention Program)
(c) LANTNAVFACENGCOM INSTRUCTION 11019.2C of 7 Jun 1977

Encl: (1) Revised Cross Connection and Backflow Protection Program
(2) Updated list of approved backflow prevention devices
(3) Example of letter to Virginia Department of Health

1. Purpose. To comply with policy set forth in reference (a) that requires the Navy to operate, construct and maintain naval water systems in accordance with the standards established by the Safe Drinking Water Act (SDWA) and any additional standards deemed necessary by the Bureau of Medicine and Surgery; and to update enclosures (1), and (2) of the Cross Connection and Backflow Prevention Program.

2. Cancellation. LANTDIVINST 11330.5A

3. Background. The provisions of the Safe Drinking Water Act mandate federal agencies to comply with the substantive and procedural water regulations of any State which has been granted primacy enforcement authority by the Environmental Protection Agency (EPA). The Commonwealth of Virginia, which has been granted this primacy, requires in Section 6.01 of the Virginia Department of Health Waterworks Regulations that "each owner of a waterworks establish and enforce a program of cross-connection and backflow prevention for each waterworks". The Navy has instructions and manuals which cover installation and maintenance of devices required by the program, and this instruction adds specific inspection guidance.

4. Discussion. Reference (b) contains a program especially adapted to Navy needs that is equivalent to those of the local civilian communities, and is acceptable to the Virginia Department of Health. Enclosure (1) is a revision of the program to make it conform with changes to the Virginia law. Enclosures (2) and (3) are an updated list of approved backflow preventers, and an example of the quarterly report required by the Virginia Department of Health.

5. Action. Activity Commanders should review their own programs and take measures to ensure that they are essentially equal to this instruction in performance and scope, initiate any required additions or changes, and make the required quarterly report, enclosure (3), to the Virginia Department of Health. Projects necessary to meet the requirements of the SDWA, including backflow prevention installation, are fundable as part of the Pollution Abatement Program. Projects should be submitted in accordance with reference (c).

A. S. POOLE
Vice Commander

Distribution: (5216.10G CH-1)
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CROSS-CONNECTION AND BACKFLOW PREVENTION PROGRAM FOR THE NAVAL ACTIVITIES IN THE STATE OF VIRGINIA

Section 6.00 of the State of Virginia Department of Health Waterworks Regulations requires that the owner of a waterworks establish and enforce a program of cross-connection and backflow prevention for each waterworks. One person at each activity should be delegated the responsibility and authority for maintaining the program. Water systems can become contaminated by a reversal of flow caused by a higher pressure in the demand side of a connection than in the supply. This can be caused by raising the pressure of the demand side (back pressure) or lowering the supply side (back siphonage).

The program is continuous and can be subdivided into four concurrent parts.

I. Initial Building Survey

II. Installation of Required Devices

III. Scheduled Periodic Inspections of the Building to Ensure Proper Installation of Backflow Prevention Devices and Identification of any New Hazardous Conditions.

IV. Scheduled Annual Periodic Testing of the Backflow Prevention Devices

PART I. INITIAL BUILDING SURVEY

The building surveys are on-site inspections conducted in the company of a knowledgeable representative of the building who can furnish the needed information. Attachment I contains an example of the type of form that should be used and filled out by hand during the inspections. Records are to be made for each building and kept until updated (a period of not more than ten years). They should contain the results of the building survey, describing and locating each potential cross-connection site, each nonpotable liquid system, and potable water system connection. Attachment II contains a list of industrial processes that normally require backflow preventers. The appropriate type of device depends upon the degree of hazard. Attachment III lists and describes the various backflow prevention devices. Attachment IV contains a guide that relates the type of process connection with the degree of hazard and the appropriate device.

Where there is a connection between a pressurized toxic or noxious substances and the potable water system, only air gaps and reduced pressure devices are appropriate. Vacuum breakers are acceptable when the substances are not under pressure. Where the contaminant is a food and will only affect the esthetics of the water, double check valves are permissible. Barometric loops are not acceptable.

Interchangeable or change-over connections to auxiliary supplies are not permited where:

o Backpressure is present or may occur;

o The auxiliary supply is not approved; or

o The waterworks line pressure is less than 20 psig.

The interchangeable or change-over connection is restricted to a temporary and continuously supervised arrangement.

Where industrial processes such as those listed on Attachment V exist, a device is required on the service line to the processing area. An example would be a plating shop in an industrial building where the installation of preventers on the individual water connections to the processes would be impractical. In this case, a preventer on the line to the shop is needed. Again, if approved preventers cannot be placed on a pier where ships connect to the potable system, then the device must be placed on the service line to the pier head.

An acceptable alternative to permanently installed preventers at the ships' connections is a portable double check valve assembly. If the portable system is adopted, a reduced pressure device must be installed at the pier head (Attachment VIII). If pressure boosting is required, the pump should discharge into the double check valve assembly, and be provided with a pressure cut-off switch to prevent the supply pressure from falling below 10 psig.

An approved backflow preventer is also required on the service line to a building or area where:

o There exists an auxiliary water system that has not been accepted by the State Health Department as an additional source;

o There exists a substance or process that is handled in a manner that creates an actual or potential hazard to the waterworks;

o The internal plumbing of the building or area is so intricate that it is impractical or impossible to determine if a cross-connection exists, or to make corrections;

o Inspections are impractical or impossible because of security restrictions;

o A repeated history of cross-connection has been established;

o Where it can be shown that a potential cross-connection hazard does exist; or

o Fire protection systems exist that have anti-freeze or other chemicals, water storage, auxiliary sources, or sprinklers with openings that are subject to flooding.

Except where absolutely necessary, check valves, backflow preventers, or other pressure/flow attenuation devices should not be placed in the street mains or feeder lines. Not only do they reduce fire protection, but they increase the likelihood of back siphonage because they could restrict the water flow to parts of the system where low pressure may occur. In the case of a pipe rupture, these devices, by restricting the flow to the ruptured area, increase the rate of pressure drop and decrease the time available for repair or maintenance response before the threatened section loses all pressure, Attachment VI. When this happens, the lines without pressure must be considered contaminated because of the likelihood of surface or ground water intrusion through leaks. Then all parts of the system except those which are known to have kept sufficient pressure, are to be thoroughly flushed and chlorinated before being placed back into service.

It should always be borne in mind that a system's real protection is in it's own internal pressure. Except for the plumbing mishap of connecting a pressurized liquid process to the potable water system, the primary danger lies in a system pressure drop below that which is required to support the plumbing throughout a building. A pressure drop can be caused by a main rupture, a main being taken out of service, or water usage too large for the system to safely support.

As part of the inspection for larger buildings with intricate piping complexes, pressure recordings should be made. Two recorders, one installed in the street on a nearby fire hydrant, and one in the building on the top floor in the most remote part of the building plumbing system, will often give indications of a poor plumbing network within the building. Recorders should be operated for about a week when the building water system has its maximum usage. Poor plumbing would be indicated by a large drop in the building recorder without a comparable drop in the street recorder, Attachment VI. Assistance in evaluating the recordings can be obtained from the activities' Public Works Engineering Department or this Command via Engineering Service Requests (ESRs).

The recording charts should be identified with the dates and times of operation, building and hydrant numbers, elevations of the recorders, and the name of the person who conducted the test. Any other pertinent information can be noted on the back. These charts should be kept as part of the Backflow Prevention Program records.

PART II. INSTALLATION OF REQUIRED DEVICES

Recommendations of the inspector should be forwarded to the Public Works Office for implementation either in-house or by contract. Prior to the installation of a device that will reduce the pressure, the occupants of the building should be notified sufficiently in advance so they may determine the effect lower pressure may have on any process within the building, and make any required adjustments to the process or the building system pressure. Approximate pressure losses for the various devices are included in Attachment III.

PART III. SCHEDULED PERIODIC INSPECTIONS

Reinspections of the installed devices should be scheduled to determine if they were installed and are functioning properly. The inspection program is continuous, and the buildings are to be reinspected periodically for any cross-connections that may have been previously missed, updating of the building survey forms, or any new cross-connections that may have been created by plumbing additions or changes.

PART IV. SCHEDULED ANNUAL PERIODIC TESTING

The Virginia Department of Health Waterworks Regulations require annual testing of backflow preventers and low pressure pump cutoff switches. Courses for testing are available from the City of Norfolk. Those who successfully complete the course are certified. Arrangement will be made to have naval persons attend these or similar courses when required.

Questions regarding the Cross Connection and Backflow Prevention Program should be directed to Mr. J. J. Harwood, Code 114, Atlantic Division, Naval Facilities Engineering Command, Norfolk, Virginia 23511, phone (804) 444-9557, AUTOVON 690-9557.

ACTIVITY _____; Bldg. No. _____ El. _____ Stories _____

Person in charge _____, phone _____

BFP at service entrance req? _____, type _____, size _____
Urinals__/__; W.C.(tank)__/__, (F.V.)__/__; Utility sinks__/__; Hose Libs__/__

1. Purpose of occupancy _____
   Story _____; Floor area (Sq. Ft.) _____
   Max. Number Persons _____; Avg. Number Persons _____
   Water Use Processes;
   a. Describe _____
   b. Location _____
   c. Chemical Additions type & Amt. _____
   d. Pressurized? _____, B.F.P. Req.? _____, Type _____
   e. GPM if over 50 _____, gpd if over 1000 _____

   a. Describe _____
   b. Location _____
   c. Chemical Additions type & Amt. _____
   d. Pressurized? _____, B.F.P. Req.? _____, Type _____
   e. GPM if over 50 _____, gpd if over 1000 _____

   a. Describe _____
   b. Location _____
   c. Chemical Additions type & Amt. _____
   d. Pressurized? _____, B.F.P. Req.? _____, Type _____
   e. GPM if over 50 _____, gpd of over 1000 _____

2. Purpose of occupancy _____
   Story _____; Floor area (Sq. Ft.)
   Max. Number Persons _____; Avg. Number Persons _____
   Water Use Processes;
   a. Describe _____
   b. Location _____
   c. Chemical Additions type & Amt. _____
   d. Pressurized? _____, B.F.P. Req.? _____, Type _____
   e. GPM if over 50 _____, gpd if over 1000 _____

   a. Describe _____
   b. Location _____
   c. Chemical Additions type & Amt. _____
   d. Pressurized? _____, B.F.P. Req.? _____, Type _____
   e. GPM if over 50 _____, gpd if over 1000 _____

   a. Describe _____
   b. Location _____
   c. Chemical Additions type & Amt. _____
   d. Pressurized? _____, B.F.P. Req.? _____, Type _____
   e. GPM if over 50 _____, gpd if over 1000 _____

   a. Describe _____
   b. Location _____
   c. Chemical Additions type & Amt. _____
   d. Pressurized? _____, B.F.P. Req.? _____, Type _____
   e. GPM if ver 50 _____, gpd if over 1000 _____

Survey date _____, Surveyer _____
Insp. Date _____, Inspector _____
_____, _____
_____, _____
_____, _____

Use reverse side for comments:
Use additional sheets if required.

ATTACHMENT I

EXAMPLE

ACTIVITY FCTCA - DAM NICK ; Bldg. No. 502 El. 135' Stories 2.

Person in charge JAMES HOUSE, phone 435-9289

BFP at service entrance req? NO, type —, size —
Urinals 1/OK; W.C.(tank) 8/OK, (F.V.) —; Utility sinks 2/OK; Hose bibs 2/RCP

1. Purpose of occupancy OFFICES
   Story 2; Floor area (Sq. Ft.) 2050
   Max. Number Persons 18; Avg. Number Persons 12
   Water Use Processes;
   a. Describe COOLING TOWER - A/C - 17 TON
   b. Location ROOF
   c. Chemical Additions type & Amt. BIOKIL-V - 1 GAL/MO.
   d. Pressurized? YES, B.F.P. Req.? YES, Type R.P. (REDUCED)
   e. GPM if over 50 —, gpd if over 1000 —

   a. Describe
   b. Location
   c. Chemical Additions type & Amt.
   d. Pressurized? ____, B.F.P. Req.? ____, Type
   e. GPM if over 50 ____, gpd if over 1000

   a. Describe
   b. Location
   c. Chemical Additions type & Amt.
   d. Pressurized? ____, B.F.P. Req.? ____, Type
   e. GPM if over 50 ____, gpd of over 1000

2. Purpose of occupancy WAREHOUSE - VEHICLE SUPPLIES
   Story 1; Floor area (Sq. Ft.) 2050
   Max. Number Persons 8; Avg. Number Persons 4
   Water Use Processes;
   a. Describe HEATING BOILER - 4 h.p.
   b. Location N.E. CORNER
   c. Chemical Additions type & Amt. NONE
   d. Pressurized? YES, B.F.P. Req.? YES, Type AIR GAP
   e. GPM if over 50 —, gpd if over 1000 —

   a. Describe
   b. Location
   c. Chemical Additions type & Amt.
   d. Pressurized? ____, B.F.P. Req.? ____, Type
   e. GPM if over 50 ____, gpd if over 1000

   a. Describe
   b. Location
   c. Chemical Additions type & Amt.
   d. Pressurized? ____, B.F.P. Req.? ____, Type
   e. GPM if over 50 ____, gpd if over 1000

   a. Describe
   b. Location
   c. Chemical Additions type & Amt.
   d. Pressurized? ____, B.F.P. Req.? ____, Type
   e. GPM if ver 50 ____, gpd if over 1000

Survey date 6/2/80, Surveyer John Smith
Insp. Date ____, Inspector ____
____, ____
____, ____
____, ____

Use reverse side for comments:
Use additional sheets if required.

ATTACHMENT I

INSPECTION CHECK LIST

.ir Conditioning _____
.ir Washers _____
.ir Conditioned Chilwater _____
.ir Conditioned Condenser Water _____
.ir Conditioned Cooling Towers _____
.ir Compressors _____
utopsy Tables _____
spirator, Medical _____
spirator Weedicide and Root Feeders _____
utoclave & Sterilizer _____
oiler Feed Line _____
aptismal Fount _____
athtub Selow Rim Filler _____
edpan Washer; Flushing Rim _____
idet _____
ine Tank _____
ottle Washer _____
hemical Feeder Tanks _____
ibrinator _____
offee Urn _____
uspidor, Dental _____
iller Tanks _____
ooking Kettles _____
ondensate Tank _____
emineralized System _____
shwasher _____
rinking Fountain _____
greasing Equipment _____
e Vats & Tanks _____
eveloping Tanks _____
iry Barn Equipment _____
ching Tanks _____
ilis _____
arch Tanks _____
z Bath _____
rinkler System, Fire Protection _____
ampoo Basin Hose Rinse, Beauty Shop _____
ks, Wash-up _____
rated Faucets _____
ing Vats & Boxes _____
lution Tanks _____
nal, Siphon Jet Blow-out _____
nal, Trough _____

Fountain, Ornamental _____
Detergent Dispenser _____
Floor Drains Flushing _____
Garbage Can Washer _____
Garbage Disposers _____
Hydro-Therapy Baths _____
Humidifier Tank & Boxes _____
Hose Faucets _____
Hot Water Heater & Tanks _____
Ice Maker _____
Janitor Closets _____
Lab Equipment _____
Laundry Machine _____
Lavatory _____
Lawn Sprinkler _____
Boat, Marina _____
Make-up Tank _____
Pump, Prime Lines _____
Pump, Water Oper Eject _____
Photo Lab Sinks _____
Photostat Equipment _____
Pump Pneumatic Eject _____
Pipette Washer _____
Potato Peeler _____
Processing Tanks _____
Re-circulated Water _____
Sewer, Sanitary _____
Sewer, Storm _____
Swimming Pool _____
Sewer, Flushing Manhole _____
Steam Cleaner _____
Steam Table _____
Digesters, Hospital _____
Ultrasonic Baths _____
Vats _____
Telephone, Showers _____
Water Closets, Tank _____
Water Closets, Flush _____
Water for Cooling _____
Water Oper Equipment _____
Water Treatment Tanks _____
Water Well Secondary System _____
Wash Tanks _____

MARKS:

TYPES OF DEVICES

1. Air Gap - physically separates the system from the process and gives the highest degree of protection against back pressure and back siphonage. It is not usable where the process depends upon the supply pressure. All pressure is lost.

2. Properly operating reduced pressure types of backflow preventers also protect against back pressure and back siphonage. They can be used where the process is dependent upon the supply pressure. Pressure loss is between 10 and 20 psig through the larger sizes (over 2") and between 10 and 30 psig through the smaller sizes.

3. Vacuum breakers protect against back siphonage but not back pressure. They can be used where the process is dependent upon the supply pressure. Pressure loss is between 5 and 7 psig.

4. Double check valve assemblies rely on flow reversal to close, and some backflow can occur. They protect against back pressure and back siphonage, and also can be used where the process is dependent upon supply pressure. Pressure loss is between 5 and 7 psig for 2" and larger sizes, and between 5 and 10 psig for small sizes.

NOTE: Pressure losses are approximate averages and will vary with different manufacturers and with water flowrates.

ATTACHMENT III

TABLE -

Cross-Connections, Hazards, and Recommended Minimum Types of Prevention Devices

TYPE OF CONNECTION	DEGREE OF HAZARD			RECOMMENDED MINIMUM DEVICE				
					For Backflow		For Backsiphonage	
	Severe	Moderate	Minor	*Air Gap	Reduced Pressure Device[3]	Double Check-Valve Assembly	Pressure Vacuum Breaker	Atmospher Vacuum Breaker
I. Direct water connection subject to backpressure from:								
A. Pumps, tanks and lines handling:								
1. Toxic substances[1]	x			x	x	x		
2. Nontoxic substances[2]		x						
B. Water connection to steam and steam boilers								
1. Boiler or steam connection to toxic substances[1]	x			x				
2. Boiler or steam connection to nontoxic substances[2] (boiler blowoff through approved gap)		x		x	x	x		
II. Inlet water connection not subject to backpressure:								
A. Sewer-connected waste line	x			x				
B. Inlets to receptacles containing toxic substances[1]	x			x	x		x	x
C. Inlets to receptacles containing nontoxic substances[2]		x		x	x	x	x	x
D. Inlets into domestic water tanks			x	Each case should be treated separately				

ATTACHMENT IV

TABLE 1
(Con't)

TYPE OF CONNECTION	DEGREE OF HAZARD			RECOMMENDED MINIMUM DEVICE				
	Severe	Moderate	Minor	*Air Gap	For Backflow		For Backsiphonage	
					Reduced Pressure Device[3]	Double Check-Valve Assembly	Pressure Vacuum Breaker	Atmosphe Vacuum Breaker
E. Coils or jackets used at heat exchangers in compressors, degreasers, etc.:								
1. In sewer lines	x			x	x			
2. In lines carrying toxic substances[1]	x			x	x			
3. In lines carrying non-toxic substances[2]		x		Each case should be treated separately				
F. Flush valve toilets	x			x	x			x
G. Toilet and urinal tanks		x		x				x
H. Trough urinals		x		x				x
I. Valved outlets or fixtures with hose attachments that may constitute a cross-connection to:								
1. Toxic substances[1]	x			x	x		x	x
2. Nontoxic substances[2]		x		x	x	x	x	x
J. Recirculating water in cooling towers	x	x	x	x				
K. Make-up tanks for sewage and process water	x			x				
III. Containment (P. 52 & 53 Reg)	BACKFLOW PREVENTER REQUIRED ON SERVICE LINE TO BUILDING							
A. Hospitals	x			x	x			
B. Mortuaries	x			Each case should be treated separately				
C. Clinics	x			x	x			
D. Nursing Homes	x			x	x			
E. Laboratories	x			x	x			

TABLE 1
(Con't)

TYPE OF CONNECTION	DEGREE OF HAZARD			RECOMMENDED MINIMUM DEVICE				
					For Backflow		For Backsiphonage	
	Severe	Moderate	Minor	*Air Gap	Reduced Pressure Device[3]	Double Check-Valve Assembly	Pressure Vacuum Breaker	Atmosphe Vacuum Breaker
F. Piers, docks, waterfront facilities	x			x	x			
G. Sewage treatment facilities	x			x	x			
H. Sewage pumping stations with water cooled pumps	x			x				
I. Sewage pumping stations, hose bibs, storm water pumping station	x	x	x	Each case should be treated separately				
J. Food and beverage processing plants								
1. Subject to back-pressure	x	x	x	x	x			
2. Not subject to back-pressure	x	x	x	x	x	x		
K. Chemical plants, dyeing plants								
1. Toxic[1]	x	x	x	x	x	x		
2. Nontoxic[2]	x			x				
L. Metal-plating industries	x			x				
M. Petroleum processing or storage plants	x			x				
N. Radioactive materials processing plants or nuclear reactors	x	x		x	x			
O. Car washes							x	
P. Lawn sprinkler systems, irrigation systems	x	x	x	x	x			
Q. Fire service	See Section 6.04.07 of the Commonwealth of Virginia Waterworks							

TABLE 1
(Con't)

TYPE OF CONNECTION	DEGREE OF HAZARD			RECOMMENDED MINIMUM DEVICE				
	Severe	Moderate	Minor	*Air Gap	For Backflow		For Backsiphonage	
					Reduced Pressure Device[3]	Double Check-Valve Assembly	Pressure Vacuum Breaker	Atmospher Vacuum Breaker
R. Slaughter house and poultry processing	x	x		x	x			
S. Farms	x	x	x	Each case should be treated separately				
T. Auxiliary sources (non-approved)	x	x	x	Each case should be treated separately				

*For backflow or backsiphonage
[1]Health Hazard - Hazard which presents danger to health and well-being of water consumer.
[2]Pollution Hazard - Hazard from aesthetically objectionable or degrading material.
[3]This device must be in an above ground location and provisions made to prevent freezing.

EXCERPT FROM VIRGINIA DEPARTMENT OF HEALTH REGULATIONS

6.03.03 An approved backflow prevention device shall be installed on each service line to a consumer's water system serving, but not necessarily limited to the following types of facilities:

a. Hospitals, mortuaries, clinics, nursing homes;

b. Laboratories;

c. Piers, docks, waterfront facilities

d. Sewage treatment plants, sewage pumping stations, or storm water pumping stations;

e. Food and beverage processing plants;

f. Chemical plants, dyeing plants;

g. Metal plating industries;

h. Petroleum processing or storage plants:

i. Radioactive materials processing plants or nuclear reactors;

j. Car washes;

k. Lawn sprinkler systems, irrigation systems;

l. Fire service systems;

m. Slaughter houses and poultry processing plants

n. Farms where the water is used for other than household purposes;

o. Other specified by the purveyor and/or the Bureau when reasonable cause can be shown for potential backflow or cross-connection hazard.

The Virginia regulations also require that booster pump connected to waterworks shall be equipped with a low pressure cut off device to shut off the booster pump when the pressure in the waterworks drops to a minimum of 10 psig.

ATTACHMENT V

ATTACHMENT VI

SHEET NO. _____ OF _____

JOB NO. _____

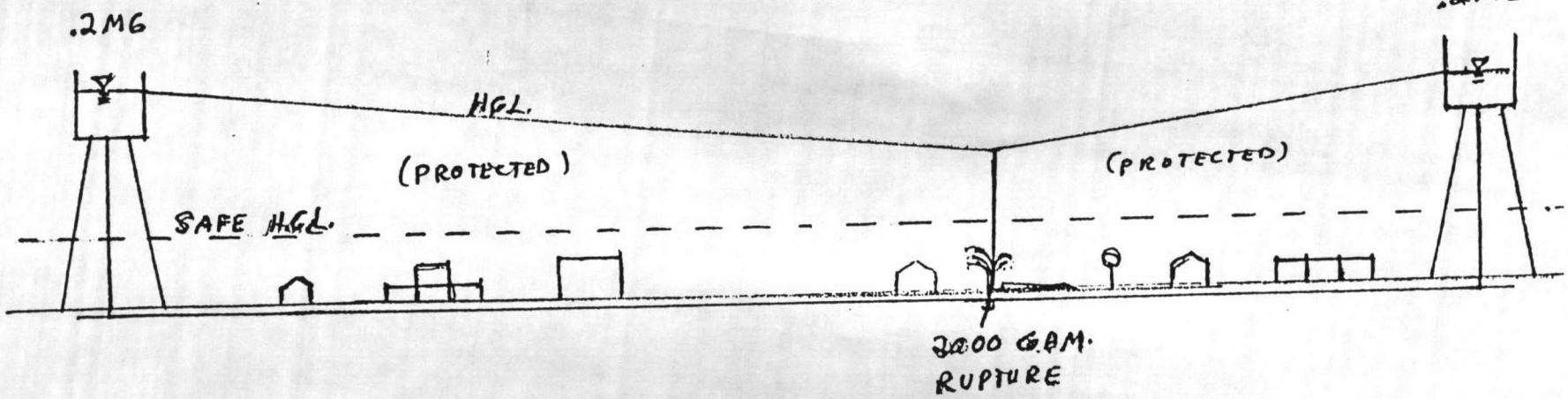
SUBJECT _____

BY _____ DATE _____

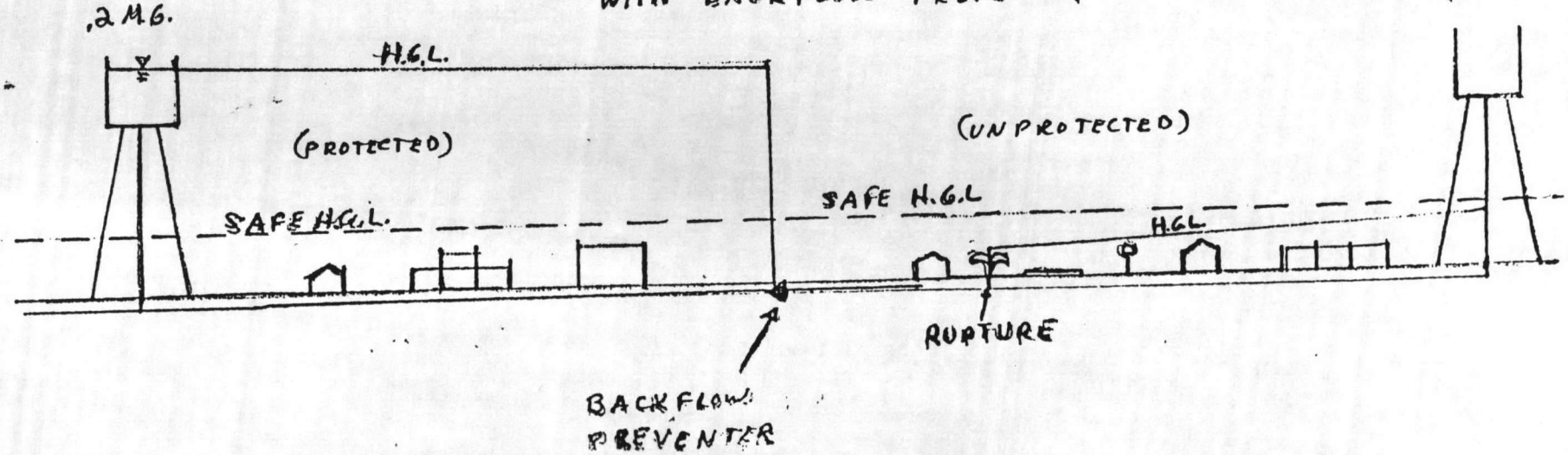
CHKD. BY _____ DATE _____

1 # -40 MIN. AFTER 2000 GPM RUPTURE

W/O BACK FLOW PREVENTER



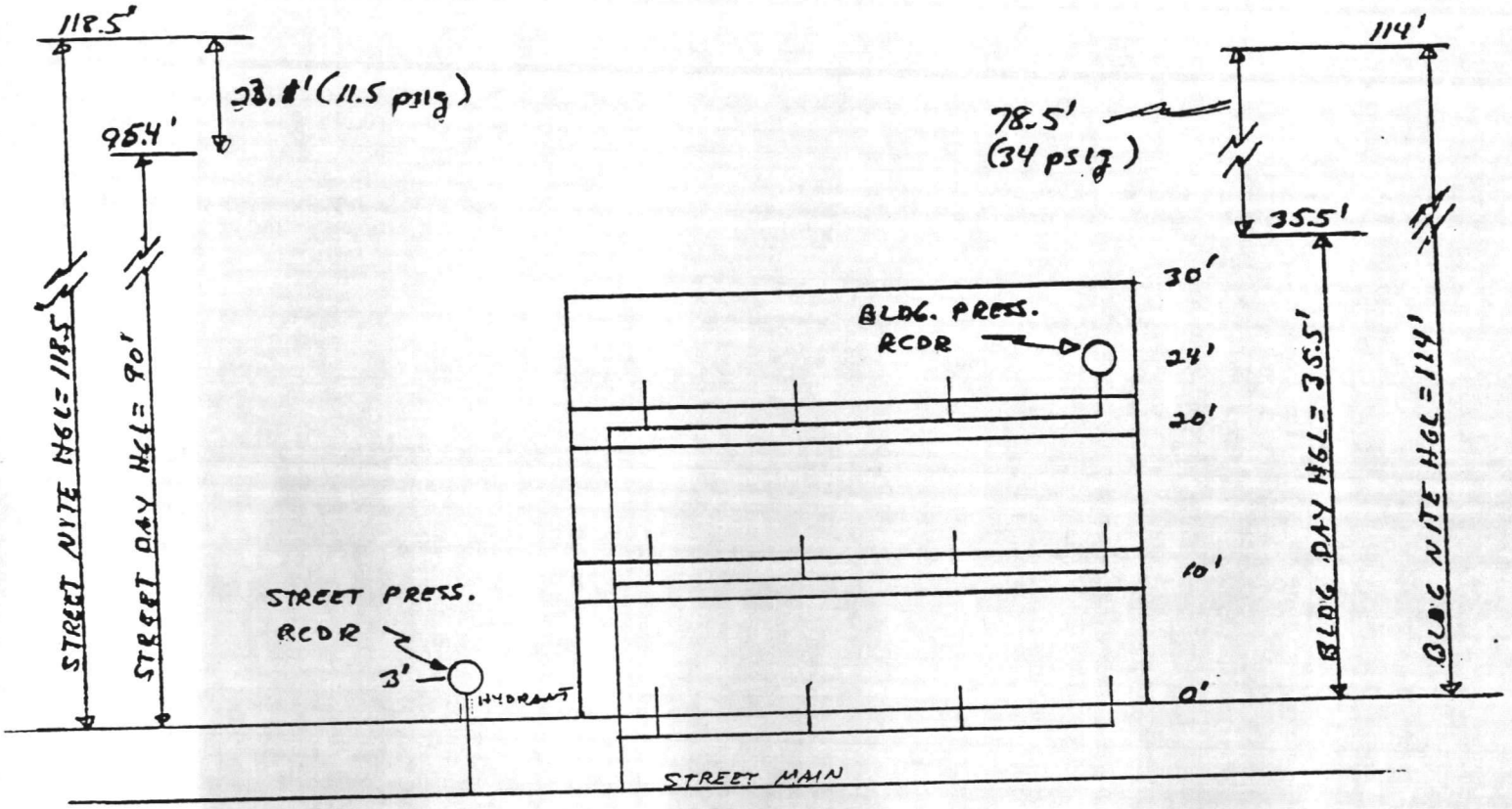
WITH BACKFLOW PREVENTER



BY ..... DATE .....
CHKD BY ..... DATE .....

SUBJECT LARGE BUILDING EVALUATION BY PRESSURE RECORDINGS

SHEET NO. ..... OF .....
JOB NO. .....



PRESSURE DATA FROM RECORDERS

	NITE LOW	GRADE FT.	ELEV FT.	H.G.L FT.	DAY HIGH	GRADE FT	ELEV FT.	H.G.L FT.	PRESSURE LOSS
STREET	50 psig	115.5	3	148.5	40 psig	92	3	95.4	28.8' (10 psig)
BLDG	39 psig	90	24	114	5 psig	11.5	24	35.5	78.5' (34 psig)

THE PRESSURE DROP BETWEEN LOW NIGHT AND HIGH DAY FOR THE STREET GUAGE OF 10 psig AND 34 psig FOR THE BUILDING INDICATES THAT A POOR PLUMBING SYSTEM EXISTS IN THE BUILDING

ALSO, THE BUILDING DAY H.G.L. IS ONLY ABOUT TEN FEET ABOVE THE THIRD FLOOR FIXTURES. IF THE STREET PRESSURE IS REDUCED DURING THE DAY, THERE IS A REAL DANGER THAT THE BUILDING H.G.L. WILL FALL BELOW THE FIXTURE LEVEL OF THE THIRD FLOOR, AND CAUSE BACK-SIPHONING FROM ANY THIRD FLOOR CROSS-CONNECTION THAT MAY EXIST.

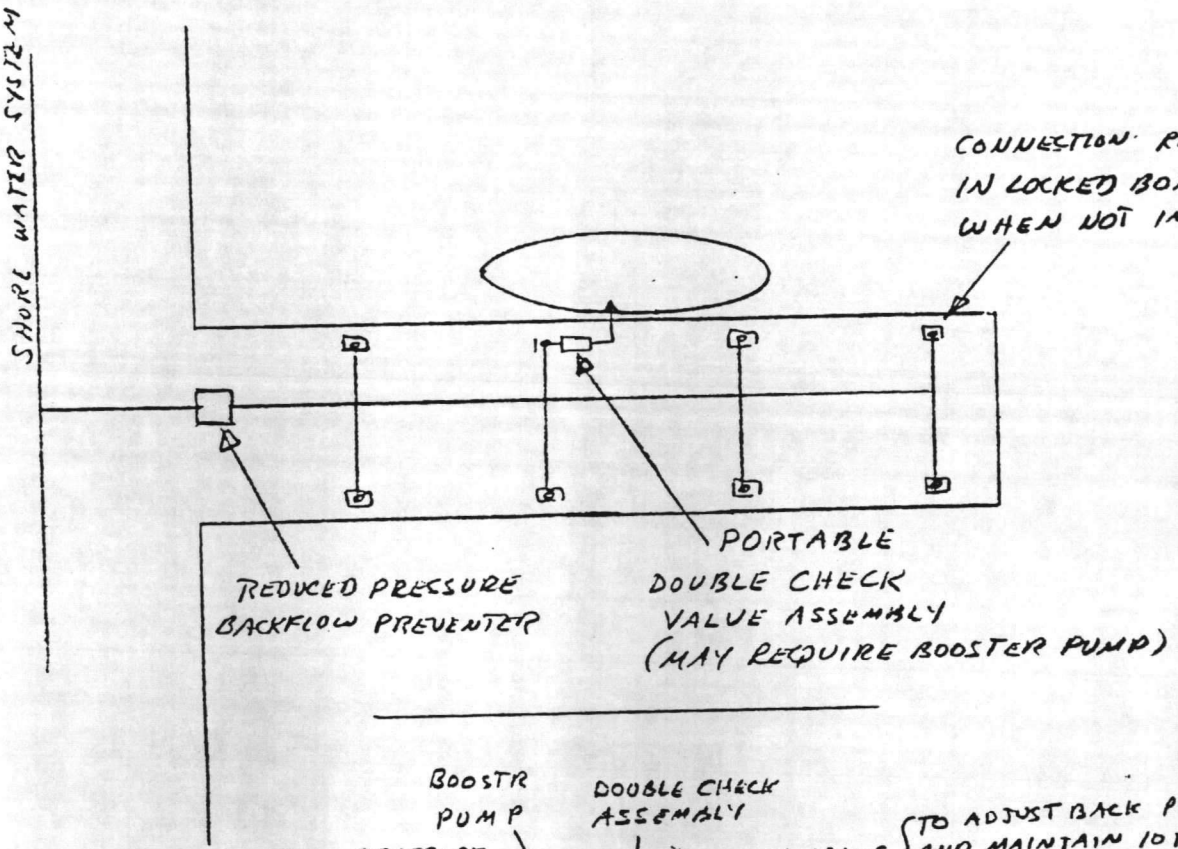
THE STREET PRESSURE REDUCTION CAN BE CAUSED BY SUCH OCCURRANCES AS A MAIN BEING TAKEN OUT OF SERVICE FOR REPAIRS, A LOWERING OF THE WATER LEVEL IN AN ELEVATED TANK FOR MAINTENANCE, A HIGH WATER DEMAND CAUSED BY A RUPTURE OR FIRE FIGHTING.

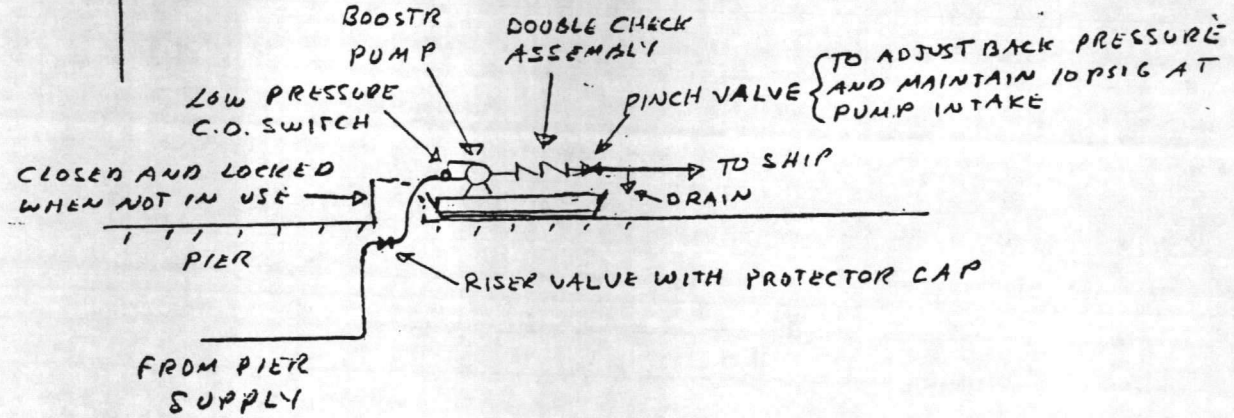
ATTACHMENT VII

BY ..... DATE ..... SUBJECT ..... SHEET NO. ..... OF .....

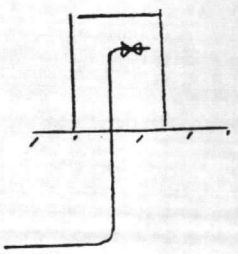
CHKD. BY ..... DATE ..... JOB NO. .....

ALTERNATE PORTABLE WATER CONNECTION FOR PIERS





RISER MAY BE SECURED IN LOCKED BOX WHEN NOT IN USE



ATTACHMENT VII

Approved Cross-Connection Control Devices

Below is a complete list of cross-connection and backflow prevention devices as approved by the Virginia Department of Health. This list has been compiled from such organizations as the University of Southern California (USC), American Society of Sanitary Engineers (ASSE), or National Science Foundation (NSF). In addition, several devices have been approved on a case-by-case basis using information provided by the manufacturer or from states active in testing cross-connection devices (Michigan, Tennessee, etc.). All approvals contained herein are totally dependent on the proper application of the particular device.

I. REDUCED PRESSURE ZONE BACKFLOW PREVENTERS

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
Badger Meter Co. Milwaukee, WI	BP-1	3/4-2	Va.	1974
	BP-2	2 1/2-6	Va.	1974
	1	3/4, 1, 1 1/4, 1 1/2, 2	Mich/Tenn	79/78
BEECO	6	2, 2 1/2, 3, 4, 6, 8, 10	USC/FDA	82/71
Backflow Eng. & Equip. Div. (Hersey-Sparling Meter Co. Los Angeles, CA)	6C	1, 1 1/2, 2, 2 1/2, 3, 4, 6, 8, 10	USC/FDA	82/71
	6CM	3, 4, 6, 8, 10	USC	1982
	6CM-Bronze	2 1/2, 3, 4, 6	USC	1982
	10	1, 1 1/4, 2, 3, 4	USC/FDA	82/71
	10V	3	FDA	1971
	10L	2	USC	1982
	12	All sizes	FDA	1971
	14	3/4, 1, 1 1/2, 2, 2 1/2, 3, 4, 6	USC	1982
	FRP	3/4, 1	USC	1982
	FRP-2	3/4, 1, 1 1/4, 1 1/2, 2	USC	1982
	EC-6	2, 2 1/2, 3, 4, 6, 8	FDA	1971
Braukmann Controls Corp.	BF299	3/4, 1, 1 1/4	Mich.	1979
CLA-VAL Company Newport Beach, CA	RP	2, 2 1/2, 4, 6, 8, 10	USC	1982
	RP	3/4, 1	Mich/Tenn	79/75
	RP-1	2, 2 1/2, 3, 4, 6, 8, 10	USC	1982
	RP-2	3/4, 1, 1 1/4, 1 1/2	USC	1982
CRANELINE (Crane Company Chicago, IL)	A	1, 1 1/2, 2, 2 1/2, 3, 4, 6, 8, 10	USC	1982
FEBCO (Johns-Manville) Los Angeles, CA	825	1 1/2, 2, 2 1/2, 3, 4, 6, 8, 10	USC	1982
	825Y	3/4, 1	USC	1982
	835B	3/4, 1, 1 1/2, 2	USC	1982
General Sprinkler Corp. Fresno, CA	825	1 1/2, 2, 2 1/2, 3, 4, 6, 8	FDA	1973
Griswold-Richwell	BF	3/4, 1	Tenn.	1975
Lawler, I.T.T.	RZ3		FDA	1975
	RZ3S		FDA	1975
	RZ4		FDA	1975
	RZ4S		FDA	1975
	RZ5		FDA	1975
	RZ5S		FDA	1975
	RZ6		FDA	1975
	RZ6S		FDA	1975
	RZ7		FDA	1975
	RZ7S		FDA	1975
	RZ8		FDA	1975
	RZ8S		FDA	1975
	RZ12	3	USC/FDA	82/77
	RZ16	4	USC/FDA	82/77
	RZ24	6	USC/FDA	82/77
	RZ32	8	USC/FDA	82/77
	RZ40	10	USC/FDA	82/77
Neptune Water Meter Co.	575	3/4, 1, 1 1/4, 1 1/2, 2, 3, 4, 6	USC	1982
Rain Bird Sprinkler Mfg. Co.	RPA075	3/4	USC/Mich/Tenn	82/79/78
	RPA100	1	USC/Mich/Tenn	82/79/78
	RPA125	1 1/4	USC/Mich/Tenn	82/79/78
	RPA150	1 1/2	USC/Mich/Tenn	82/79/78
	RPA200	2	USC/Mich/Tenn	82/79/78
	RPA250	2 1/2	Mich.	1979
	RPA300	3	Mich.	1979
	RPA400	4	USC/Mich.	82/79
	RPA600	6	USC/Mich.	82/79
	RPA800	8	USC	1982
	RPA1000	10	USC	1982
Richwell Valve Company	BF	3/4, 1	Mich.	1979
Rockwell International	701	1 1/2, 2, 2 1/2, 3, 4, 6	VA/USC	74/82
	701RP	1 1/2, 2, 2 1/2, 3, 4, 6	Mich.	1979
R.P.V. Company	125	3/4, 1, 1 1/2, 2	ASSE	1981
Singer	53BP	1/2, 3/4, 2 1/2, 3, 4, 6, 8, 10	Mich.	1979

I. REDUCED PRESSURE ZONE BACKFLOW PREVENTERS (Continued)

Orion (Toro Technology, Inc. San Marcos, CA)	BRP	3/4, 1, 3, 4	USC	1982
	92770	1	USC	1982
	92929	2	USC	1982
	800059	3/4	USC	1982
	800069	1 1/2	USC	1982
Watts Regulator Company Lawrence, MA	900	3/4, 1, 1 1/4, 1 1/2, 2	FDA	1973
	900	2 1/2, 3, 4, 6	Mich/Tenn	79/78
	909	3/4, 1, 1 1/4, 1 1/2, 2, 4, 6, 8, 10	USC	1982
	909HW	3/4, 1, 1 1/4, 1 1/2, 2	USC	1982

II. ATMOSPHERIC-TYPE VACUUM BREAKER

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
A. W. Cash Mfg. Corp.	VBA	1/4, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2, 3	USC	1982
	VB-11	3/4	USC	1982
	VB-111	3/4	USC	1982
		Hose Outlet	Mich.	1974
		Cash-Acme	Mich.	1974
Aetna Porcelain Enameling Company	306-A	1/4	Mich.	1974
Alsons Products Corp.	4900	For use with Unica Adjustable Shower	Mich.	1974
American Coupling Corp.	59	3/4 Hose Threaded	Mich.	1974
	59-A	Hose Threaded	Mich.	1974
American Standard, Inc. New York, NY	HB		FDA	1971
	15755	1/2	FDA	1971
	VB-4	1/2	USC	1982
Aquaval Specialties, Inc.	62	3/4 Hose Threaded	Mich.	1974
	67	3/4 Hose Connected	Mich.	1974
Beaton & Caldwell Mfg. Co. New Brittain, CT	115	1/2, 8	FDA	1971
Belvedere Products, Inc.	403	1/4, 3/8	USC	1982
	404	1/4, 3/8	USC	1982
		Belvedere Vacuum Breaker	Mich.	1974
Bidoro Mfg. Company New York, NY	E-1	1/2, 3/4, 1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 4	FDA	1971
	F-1	2	Mich.	1974
C & T	CT-1	6	USC	1982
Champion Brass Mfg. Co. Los Angeles, CA	162	3/4, 1, 1 1/4, 1 1/2, 2 (Straight)	USC	1982
	262	3/4, 1, 1 1/4, 1 1/2, 2 (Angle)	USC	1982
	350AS		FDA	1971
	362	3/4, 1 (Angle With Union)	USC	1982
Chicago Faucet Company Des Plaines, IL	892	1/2	USC	1982
	893	3/8	USC/FDA	82/71
Clemar Mfg. Corporation (Rain Bird Models)	ASV75	3/4 Bottom inlet, side outlet angle type	Mich.	1974
	ASV100	1	Mich.	1974
Consolidated Brass Company (Conbraco)	38-103	1/2	USC	1982
	38-104	3/4	USC	1982
	38-105	1	USC	1982
Coyne & Delany Company Brooklyn, NY	VA-50		FDA	1971
Crane Company Chicago, IL	8H2849	3/8, 1/2	FDA	1971
	8H2850	3/4	FDA	1971
Delcor	7	1/2	Mich.	1974

ENCL (2)

II. ATMOSPHERIC-TYPE VACUUM BREAKER (Continued)

Febco, Incorporated (John-Manville) Los Angeles, CA	710	Globe Type	Mich.	1974
	710A	1/4, 3/8, 1, 1 1/4, 1 1/2, 2	USC/FDA	82/7
	710G	1, 1 1/4, 1 1/2, 2	USC	1982
	715	1/2, 3/4	FDA	1971
	715A	1/2, 3/4	USC	1982
	715G	1/2, 3/4	USC	1982
	740	All Sizes	FDA	1971
	730	3/4	USC	1982
Fluid Devices, Inc.	61	Provisional	Mich.	1974
	61-B	3/4	Mich.	1974
Gee Company, H.L. Beverley Hills, CA	B-305	1/2-2 (Angle)	FDA	1971
	B-315	1/2-2 (Straight)	FDA	1971
Haws Drinking Faucet Co.		1" Kramer Flush Valve	Mich.	1974
Jayco, Inc.	101	1 1/2	Mich.	1974
Josam Mfg. Company Michigan City, IN	2010	3/4, 1, 1 1/2, 2, 3, 4	FDA	1971
Kohler Company	77-B	1/4, 3/8, 1/2, 1	USC	1978
	K9448		Mich.	1974
	K9449		Mich.	1974
	K9450		Mich.	1974
		Flush Valve	Mich.	1974
Michigan Sprinkler Company	B	3/4, 1, 1 1/4, 1 1/2, 2	Mich.	1974
		Gee Angle Type	Mich.	1974
Modern Faucet	957	1/2	USC	1982
Mueller	Steam spec			
	77-B	1/4, 3/8, 1/2, 1	USC	1982
Neptune	55	1/4, 3/8, 1/2, 3/4, 1	USC	1982
Nidel Mfg. Company Grand Haven, MI	DF	3/8	Mich.	1974
	DF Mod	3/8	Mich.	1974
	DF2	3/8	Mich.	1974
	DF3	3/8	Mich.	1974
	H	3/4	Mich.	1974
	H Mod	3/4	Mich.	1974
	HD	3/4	Mich.	1974
	SF	3/8	Mich.	1974
	5SL	3/8 Use with Unica Adjustable Shower	Mich.	1974
	34H(A)(D)(F)(W)	3/4	USC	1982
	34HD		FDA	1971
	38DF		FDA	1971
Ormax Corporation Long Island City, NY	1-A	3/8 IPS, 3/4 IPS	FDA	1971
Ottawa Valve Company	20	3/4 Hose Threaded	Mich.	1974
Quaker Rubber Company		3/4 Hose Threaded	Mich.	1974
Rain Bird Sprinkler Mfg. Company	AVB	3/4, 1, 1 1/4, 1 1/2, 2, 2 1/2, 3	USC	1982
	HVB-8A	3/4	USC	1982
	APAS-075	3/4	USC	1981
	PAS-075	3/4	USC	1982
Sloan Valve Company Chicago, IL	V177A	3/4, 1, 1 1/4	FDA	1971
	V188A	1/2, 3/8, 3/4	FDA	1971
	V350A	1/2, 3/4	USC/FDA	82/71
		3/8	Mich.	1974
	V360A	1/4, 3/8, 1/2, 3/4	USC/FDA	82/71
	V370A	1/4, 3/8, 1/2, 3/4	USC/FDA	82/71
	V500A	3/4	FDA	1971
Speakman Company	K9195	Flushometer	Mich.	1974
	SVB18	3/4	Mich.	1974
Strahman	HS-Vertical	3/4	USC	1982
	HS-Horizonal	3/4	USC	1982
Surgical Mechanical Research, Inc. (SMR) Newport Beach, CA	H-400	1/2	USC/FDA	82/71
	H-403	3/4	USC	1982
Tempstat	VB-10	1/2, 3/4	USC	1982
Tube Turns Plastics, Inc.	ARC	3/8, 1/2	Mich.	1974
	ARC-1	1/2	Mich.	1974
	NBS	3/4	Mich.	1974
Water Saver Facuet Co.	L-100	3/8	USC	1982
	L-101	1/2	USC	1982

II. ATMOSPHERIC-TYPE VACUUM BREAKER (Continued)

Watts Regulator Company Lawrence, MA	8AC	3/4	USC	1982
	8	3/4	USC/FDA	82/73
	8A	3/4	USC/FDA	82/73
	8B	3/4	USC	
	8C	3/4	USC	
	NF8	3/4 Non-freeze	Mich/Va	
	S8	1/2	USC	1982
	9	1/2, 3/8	Mich.	1974
	9 Mod.	1/2	Mich.	1974
	9BD	3/8	Mich.	1974
	LF9	3/8	Mich.	1974
	N9	1/4, 3/8	Mich.	1974
	NFL9	3/8	USC	1982
	288	1/4, 3/8, 1/2	Mich.	1974
	288A	1/4, 3/8, 1/2, 3/4, 1, 1 1/4, 1 1/2, 2, 2 1/2, 3	USC/FDA	82/71

II. ATMOSPHERIC-TYPE VACUUM BREAKER

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
Wolverine Brass (Bal-Cam Models)	5	3/4	Mich.	1974
	5C	3/4	Mich.	1974
Zurn Industries, Inc.	Z1310	3/4, 1	Mich.	1974

III. PRESSURE-TYPE VACUUM BREAKERS

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
Bissell		3/4 P.V.B.	Mich.	1979
CLA-VAL Company Newport Beach, CA	27	2 1/2, 3, 4, 6, 8, 10	USC	1982
Febco, Incorporated (Johns-Manville) Los Angeles, CA	615	3/4	Mich.	1979
	760	1/2, 1 1/2, 2	Mich.	1979
	760-1	1	Mich.	1979
	765	1/2, 3/4, 1, 1 1/4, 1 1/2, 2	USC	1982
	775	2 Use only w/approved Double Check Valve Ass.	USC	
Hersey-Sparling Meter Co. Los Angeles, CA	VC/VB	3, 4 With SMR P-714	USC	1982
Rain Bird Sprinkler Mfg. Company	PVB075	3/4	Mich/USC	79/82
	PVB100	1	Mich/USC	79/82
	PVB125	1 1/4	Mich/USC	79/82
	PVB150	1 1/2	Mich/USC	79/82
	PVB200	2	Mich/USC	79/82
Neptune/SMR (Surgical Mechanical Research, Inc. (SMR) Newport Beach, CA)	P-701	1	Mich.	1979
	P-711	1 1/4, 1 1/2, 2	USC	1982
	P711S	1 1/4, 1 1/2, 2	USC	1982
	P714S	2 For use on approved Double Check Valve Ass.	USC	1982
	720	1/2, 3/4, 1, 1 1/4, 1 1/2, 2	USC	1982
	720A	1/2, 3/4, 1, 1 1/4, 1 1/2, 2	USC	1982
Watts Regulator Company Lawrence, MA	800	3/4, 1, 1 1/4, 1 1/2, 2	Mich.	1979

IV. DOUBLE CHECK DOUBLE GATE VALVE ASSEMBLY

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
BEECO (Hersey-Sparling Meter Co. Los Angeles, CA)	F-72	2, 3, 4, 6	USC	1982
	FDC	3/4, 1 1/2, 2	USC	1982
	VC	2, 3, 4	USC	1982
CLA-VAL Company Newport Beach, CA	D	2, 2 1/2, 3, 4, 6, 8, 10	USC	1982
	D2	3/4, 1, 1 1/4, 1 1/2	USC	1982
Febco, Incorporated (Johns-Manville) Los Angeles, CA)	805	3/4, 1, 1 1/2, 2, 3, 4	USC	
	805Y	6, 8, 10	USC	
Kennedy (Grinnell)	B-1	4, 6, 8	USC	1982
	B-2	4, 6, 8, 10	USC	1982

ENCL (2)

V. YARD HYDRANTS (FROST-PROOF)

Company	Model No.	Sizes (Inches)	Testing Authority	Date of List
American Foundry & Mfg. Co. 920 Palm Street St. Louis, MO 63160	126		Tenn.	1975
Clayton Mark	5440	Yard Hydrant	VA	1974
Josam Mfg. Co. Michigan City, IN	1445		Tenn.	1975
Ken-Ray Brass Products, Inc. Vermont, IL	840		Tenn.	1975
Murdock 2488 River Road Cincinnati, OH 45204	Expelo		Tenn.	1975
White Water Mfg. Co. Whitewater, WI 53190	256		Tenn.	1975

VI. OTHER

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
Cla-Val	16	4, 6, 8, 10—double check-detector check	USC	1982
Dema	153 154	Proportionator Proportionator	VA VA	1974 1974
Hersey	DDC II	4, 6, 8—double check-director check	USC	1982

(Continued)

Hersey-Sparling Meter Co. Los Angeles, CA	#1 #2 E-1	2, 3, 4, 6, 8, 10 3, 4, 6, 8, 10 4, 6	USC USC USC	1982 1982 1982
Lawler I.T.T.	DC-3 DC-3S DC-4 DC-4S DC-5 DC-5S DC-6 DC-6S DC-8 DC-8S DC-12 DC-16 DC-24 DC-32 DC-40	3/4	USC FDA FDA FDA FDA FDA FDA FDA FDA FDA FDA FDA FDA FDA FDA USC	1982 1975 1975 1975 1975 1975 1975 1975 1975 1975 1977 1977 1977 1977 1977 1982
Neptune Water Meter Co.	550	3/4, 1, 1 1/4, 1 1/2, 2, 3, 4, 6	USC	1982
Orion (Toro)	80-0060 9-2780 80-0070 9-2930 BDC	3/4 1 1 1/2 2 3/4, 1, 4	USC USC USC USC USC	1982 1982 1982 1982 1982
Rainbird	DC-250L DC-300L DCA-400 DCA-800	2 1/2 3 4 8	USC USC USC USC	1982 1982 1982 1982
Rockwell International	711	1 1/2, 2, 2 1/2, 3, 4, 6	USC	1982
R.P.V. Company	205	3/4, 1, 1 1/2, 2	ASSE	1981
Viking	A-1	4, 6, 8, 10	USC	1982
Watts	700 709	2 1/2, 3 4, 8	USC USC	1982 1982

Approved Cross Connection Control Devices Addendum

We have been notified that the following devices have been tested and approved since our list was published in UPDATE Volume 6.

I. REDUCED PRESSURE ZONE BACKFLOW PREVENTORS

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
FEBCO (John Manville) Los Angeles, CA	825Y	1 1/4, 1 1/2, 2	USC	1982

II. ATMOSPHERIC-TYPE VACUUM BREAKERS

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
ITT Hoffman	VB-1	1/4	USC	1982
	VB-1.5	3/8	USC	1982
	VB-2	1/2	USC	1982
	VB-3	3/4	USC	1982
	VB-4	1	USC	1982
	VB-5	1 1/4	USC	1982
	VB-6	1 1/2	USC	1982
	VB-8	2	USC	1982
	VB-10	2 1/2	USC	1982
	VB-12	3	USC	1982
Rainbird Sprinkler Mfg. Company	UPAS	3/4	USC	1982

IV. DOUBLE CHECK DOUBLE GATE VALVE ASSEMBLY

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
FEBCO (John Manville) Los Angeles, CA	805Y	3/4, 1, 3, 4	USC	1982
Rainbird Sprinkler Mfg. Company	DCA-075	3/4	USC	1982
	DCA-100	1	USC	1982
	DCA-125	1 1/4	USC	1982
	DCA-150	1 1/2	USC	1982
	DCA-200	2	USC	1982
	DCA-250	2 1/2	USC	1982
	DCA-300	3	USC	1982
	DCA-600	6	USC	1982
Watts Regulator Company Lawrence, MA	709	3/4, 1, 1 1/4, 1 1/2, 2, 2 1/2, 3, 6	USC	1982

VI. OTHER

Company	Model No.	Sizes (inches)	Testing Authority	Date of List
FEBCO (John Manville) Los Angeles, CA	806	4, 6, 8, 10-Double check-detector check assembly	USC	1982

ENCL (2)

EXAMPLE
(NAVAL ACTIVITY LETTERHEAD)

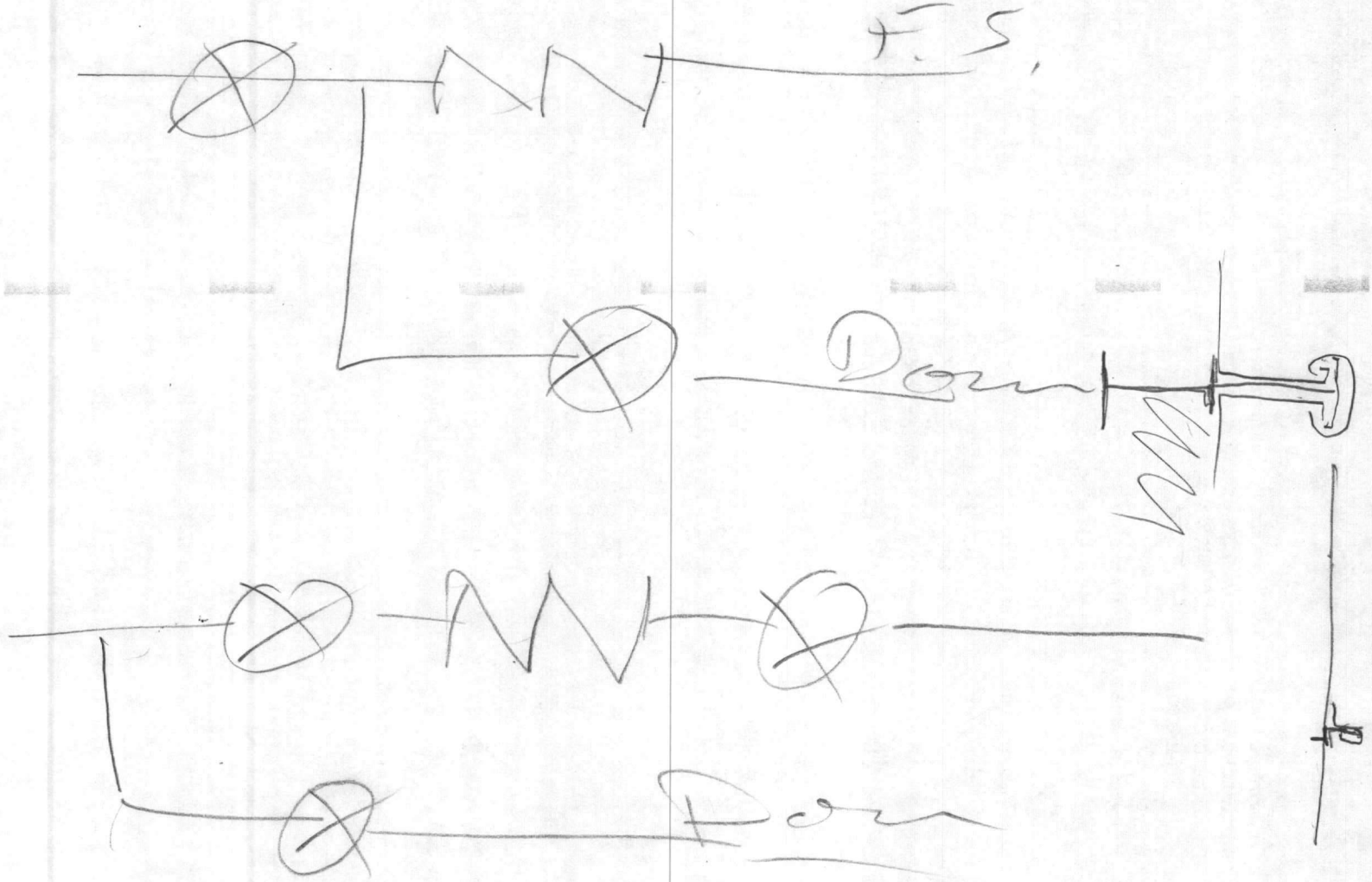
Commonwealth of Virginia
Department of Health
Division of Water Programs
5700 Thurston Avenue
Suite 203
Virginia Beach, Virginia 23455

Gentlemen:

Following is cross-connection backflow prevention report for the quarter ending August 1980.

Premises Inspected	Cross-connection Correction Required	Follow-up- for inspections	Corrected
Bldg. 402	NO	Bldg. 218	YES
Bldg. 512	NO	Bldg. 111	YES
Bldg. 500	YES		
Bldg. 101	NO		

ENCLOSURE (3)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