



Potable Water and the Purpose for Flushing and Sampling



Overview of Kupferle Flushing & Sampling

Water Main Flushing

Bacteriological Sampling



The equipment standard for Water Distribution Systems
ECLIPSE™
I series

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MAINGUARD

MAINTENANCE
ECLIPSE
SERVICES

Corn King



“The Dead-End Danger Zone”

How Uncirculating Water in Distribution System
Dead-Ends Can Pose a Danger to Consumers



Presentation Overview

- Recognizing the dead-end threats
- Tools to identify hazardous dead-ends
- Solutions to address problems

Background Information

- Things that get better with age?
 - Wine
 - Cheese
 - Scotch
 - Leather



Background Information

- Things that get worse with age?
 - Health
 - Fresh foods
 - Automobiles
 - Potable water



Background Information

- What does age have to do with water quality?

Uncirculating water in distribution dead-ends can pose a serious health problem for consumers. As uncirculating water ages **disinfectant residuals decline** while at the same time **disinfectant byproducts increase**. Both of which can create consumer health issues for distribution and water quality managers.

Recognizing Dead-End Dangers

Dead-End Danger Zone Concern #1

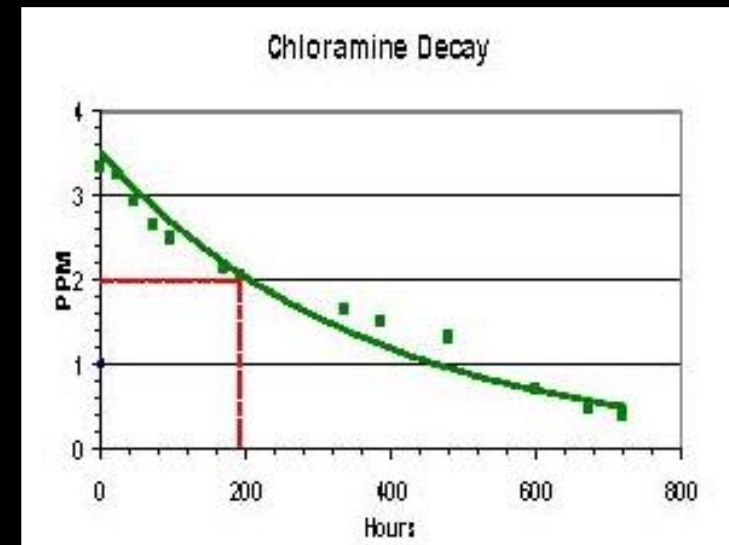
Falling Disinfectant
Residuals



Recognizing Dead-End Dangers

Maintaining Safe Disinfectant Residual Levels

As uncirculating water stands in water main dead-ends, disinfectant residual levels begin to fall within 200 hours (8.3 days). Depending on your initial disinfectant levels, water may become unsafe within 30 days or less.



Recognizing Dead-End Dangers

Maintaining Safe Chlorine Residual Levels, cont.

Once residuals fall below the minimum level they are unable to control the growth and spread of *microbial pathogens*. The EPA's recommended disinfectant residual levels for free chlorine and chloramines are:

- 0.5 mg/L minimum to 4.0 mg/L maximum

Recognizing Dead-End Dangers

What are *microbial pathogens*?

Simply put, they're **germs**

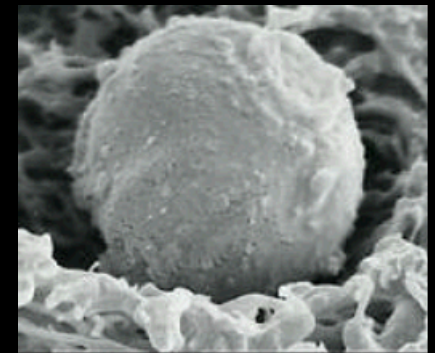
microorganisms such as virus, bacterium or fungus that causes disease in animal or plant hosts

Where do they come from?

Source water from lakes, rivers, reservoirs and ground water aquifers

How do they enter the system?

Fecal matter from sewage discharges, leaking septic tanks, runoff from animal feedlots



Cryptosporidium Oocyst



cholera

Recognizing Dead-End Dangers

Dead-End Danger Zone Concern #2

Rising Disinfectant
Byproducts



Recognizing Dead-End Dangers

Reducing the Amount of Contact Time

Although disinfectants help to eliminate and control the growth and spread of **microbial pathogens**, they do carry a serious side effect. When naturally occurring organic material in water comes into contact with disinfectants over a period of time, they can be transformed into **disinfectant byproducts (DBPs)** such as Trihalomethanes (TTHMs) and Haloacetic Acids (HAAs). These DBPs, when consumed, have been shown to cause health problems, such as, atherosclerosis (heart disease) and cancer.

THE LINK BETWEEN DBPs & ALZHEIMERS:

University of Illinois, Oct 2013



Tools to Detect Problem Dead-Ends

- Water Quality Spreadsheet Calculator
- Dead-End Analysis Report
- Portable Chlorine Analyzer Automatic Flushing Device



Tools to Detect Problem Dead-Ends

Determining the age of water in dead-ends

Amount of water in the pipeline:

- 4" one-mile pipe = 3,445 gallons
- 6" one-mile pipe = 7,751 gallons
- 8" one-mile pipe = 13,779 gallons
- 10" one mile pipe = 21,532 gallons

Average use per household = 320-400 gallons



Tools to Detect Problem Dead-Ends

Water Quality Spreadsheet Calculator

Input

- Pipe Size
- Dead-end Length
- # of service connects

Calculator provides

- Total water in pipe
- Amount of uncirculating water
- Flushing recommendation


Free download at
www.hydrants.com




How Safe is the Water on Your Dead-Ends?

Insert Information about Your Dead-End(s) Below in the YELLOW Cells to Find Out


Step One: Enter your pipe size in inches (2, 4, 6, 8, 10 or 12)	8
Step Two: Enter the length of your dead-end waterline in miles	2.10
Total Amount of Water in Pipe (in gallons)	28,953
Step Three: Enter the # of Service Connections on the waterline*	11
Amount of Uncirculated Water (in gallons)	25,103
# of Days to Consume Uncirculated Water (in gallons)	6
Estimated Water Tank Turnover (in days)	2
Automatic Flushing Solution (flushing minutes per day to keep water safe)**	12




Eclipse 9400 Series



Eclipse 9700 Series



Eclipse 9800 Series



www.hydrants.com
800-231-3990

*Avg household uses 350 gallons per day **based on 200 gpm flow rate Click on images for more information

FACTS ABOUT UNCIRCULATING WATER

- EPA recommended minimum disinfectant residual is .5 mg/L (level varies by state)
- Within 200 hours (8.3 days) disinfectant residuals begin to dissipate and drop
- Disinfectant byproducts (DBPs) can begin to form within 4-7 days. If the cell I22 is greater than 4, the water may begin to become unsafe for consumers
- Kupferle's EPA Approved Automatic Flushing Systems (AFS) keep residuals consistent and reduce the threat of DBPs forming by removing old water. AFS flush less water more often and help keep water safe for consumers.

How Safe is the Water on Your Dead-Ends?

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Eclipse 9400 Series



Eclipse 9700 Series



Eclipse 9800 Series

Automatic Flushing Solution (flushing minutes per day to keep water safe)**

12



*Avg household uses 350 gallons per day

**based on 200 gpm flow rate

Click on images for more information



www.hydrants.com

800-231-3990

Tools to Detect Problem Dead-Ends

Dead-End Analysis Report (no cost)

Information Required:

- Pipe Size
- Dead-End Length
- # Service Connections

Report provides:

- Total water in pipe
- Amount of uncirculating water
- Flushing recommendation
- Dead-end ranking based on water age

ABC Water Company										
Map Page	Location	Pipe Size	Dead-End Length in Miles	Total Water Volume	# of Service Connections	Total Uncirculated Water	# Days for Water Replacement	Recommended Daily Flush Times in Minutes	Tank Turnover + Travel Time in Days	Revised Daily Flush Times in Minutes
CRITICAL										
2075-426	6300 NE Loop 820	6	0.12	930	0	930	0	4	0	0
2081-426	6720 NE Loop 820	8	0.15	2,067	0	2,067	0	9	0	0
2078-426	5036 Rufe Snow	8	0.05	689	0	689	0	3	0	0
2075-416	3325 Willowcrest Dr	6	0.06	465	0	465	0	2	0	0
2087-430	5832 Davis Blvd	8	0.03	413	0	413	0	2	0	0
2087-430	7800 Mockingbird	6	0.01	78	0	78	0	0	0	0
2093-430	9001 Blvd 26	8	0.009	124	0	124	0	1	0	0
2090-426	8500 Harwood Rd	6	0.05	388	0	388	0	2	0	0
2093-426	1513 Weyland	6	0.02	155	0	155	0	1	0	0
2093-426	1537 Weyland	6	0.03	233	0	233	0	1	0	0
2093-426	1645 Weyland	6	0.08	620	0	620	0	3	0	0
2093-426	1569 Weyland	6	0.04	310	0	310	0	1	0	0
2087-424	7769 Blvd 26/Bankston	8	0.12	1,653	0	1,653	0	7	0	0
2087-424	4808 Davis Blvd/Nw E	8	0.04	551	0	551	0	2	0	0
2090-426	8224 Blvd 26	8	0.04	551	0	551	0	2	0	0
2087-420	7501 Glenview/Nurse	6	0.06	465	0	465	0	2	0	0
2090-422	4401 NE Loop 820	6	0.14	1,085	0	1,085	0	5	0	0
2075-424	5000 Meadow Lakes Dr	8	0.03	413	0	413	0	2	0	0
2087-442	7469 Timberhill	6	0.03	233	0	233	0	1	0	0
2081-432	7200A Dick Fisher Dr S	6	0.03	233	0	233	0	1	0	0
2084-448	7200 Tarrant Pkwy	8	0.28	3,858	1	3,538	11	9	0	9
HIGH										
2093-430	8855 Blvd 26	8	0.15	2,067	1	1,747	5	2	0	0
2084-434	8240 Middities/Insur	10	0.08	1,723	1	1,403	4	1	0	0
MODERATE										
2075-422	6100 Glenview	8	0.1	1,378	1	1,058	3	-1	0	0
2093-434	8801 Mid Cities/Church	8	0.09	1,240	1	920	3	0	0	0
2087-436	6433 Davis BN/Bates	8	0.08	1,102	1	782	2	0	0	0
2075-420	6228 Glenview/Wtr Apt	8	0.07	965	1	645	2	0	0	0
2078-430	5755 Carlisle Ct	8	0.06	827	1	507	2	0	0	0
SAFE										
2075-426	6300 NE Loop 820	6	0.08	620	1	300	1	0	0	0
2087-420	7601 Glenview Dr	8	0.06	827	2	187	0	0	0	0
2078-428	6631 Browning	8	0.04	551	1	231	1	0	0	0
2090-430	9105 Emerald Hills Way	8	0.05	689	1	369	1	0	0	0
2087-436	6724 Smithfield Rd	6	0.05	388	1	68	0	0	0	0
2090-426	8150 Blvd 26	8	0.09	1,240	2	600	1	0	0	0
2084-424	7630 Loop 820 Place	8	0.03	413	1	93	0	0	0	0
2093-452	8617 Davis Blvd	8	0.08	1,102	2	462	1	0	0	0
2078-436	6712 Rufe Snow	8	0.07	965	2	325	1	0	0	0
2087-436	6709 Smithfield Rd	6	0.05	388	1	68	0	0	0	0
2090-452	8500 Clay Hibbons Rd.	6	0.11	853	2	213	0	0	0	0
2084-446	7300 Continental Tr.	8	0.16	2,205	6	285	0	0	0	0
2093-430	9001 Blvd 26	8	0.3	4,134	10	934	0	0	0	0
2084-434	6319 Mark Ct	6	0.04	310	24	-7,370	-1	0	0	0
2084-420	7291 Glenview/William	8	0.08	1,102	3	142	0	0	0	0



Tools to Detect Problem Dead-Ends

Portable Automatic Flusher w/ Chlorine Analyzer

Features:

- Attaches to existing fire hydrant (2½" NST)
- Analyzes residuals flushes to maintain safe prescribed levels
- Maximizes conservation of flushed water
- Captures all Cl and flushing data on micro SD card
- Data can be imported into pre-formatted Excel worksheets including tables, charts and graphs
- Data can be used to calibrate controllers on Kupferle Automatic Flushing Devices (9-volt battery powered)



Eclipse i-Series #9700i Rental Program

Rent Me!

Only \$825 per month with 3 month minimum rental and security deposit

Analyze dead-ends easily and capture critical residual and flushing data with this portable intelligent automatic flushing unit that features a built-in chlorine analyzer and programmable logic control (PLC)

Patented # 6,820,835 # 6,940,519

THE KUPFERLE FOUNDRY COMPANY

Solutions to Address Problems

Flushing dead-ends is one of the easiest and best methods for improving and maintaining water quality as it keeps residuals at consistently safe levels while removing water before disinfectant byproducts can begin to form. A comprehensive approach to improving water quality should include the following:

- flushing
- tank turnover strategies
- source water treatment
- booster disinfection
- valve exercising
- pipe cleaning/lining
- corrosion control

“Flushing is common method of reducing water age”

Jeff Cruickshank, Senior Associate, Hazen and Sawyer

Source: “Optimizing Distribution System Water Quality”, an AWWA Webcast, 2010



Purpose and Benefits of Implementing a Flushing Program

Flushing Methods and Strategies

There are three distinct flushing methods that can be used to address issues with residual levels, DBPs on your distribution dead-ends. These include:

- **Intelligent Flushing**
- **Automatic Flushing**
- **Conventional (Manual) Flushing**

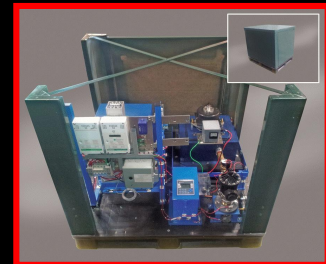
Purpose and Benefits of Implementing a Flushing Program

Intelligent Flushing Stations (IFS)

Intelligent flushing stations (IFS) incorporate a built-in chlorine analyzer and PLC that automatically maintain safe residuals with maximizing water flushing conservation. Additionally, they capture and provide a multitude of data including beginning and ending residual levels, flush times, etc. that can be collected or transmitted via SCADA.

Applications for implementing an IFS include:

- Large mains with problems maintaining residual levels
- Long mains with few service connections (rural/military bases)
- Sentry points for those purchasing water from others
- Transmission lines covering vast distances



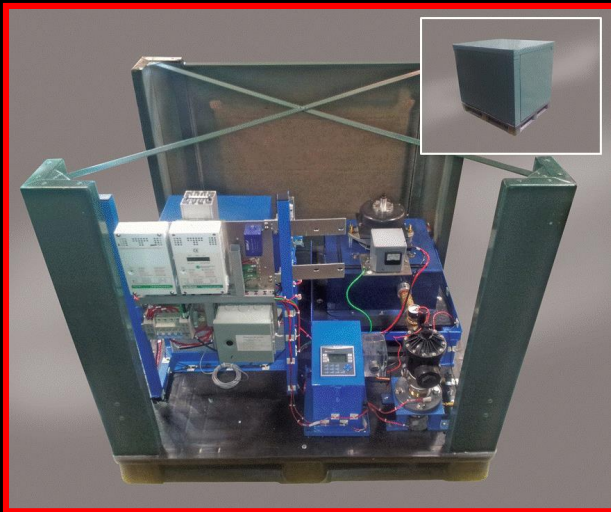
Kupferle Flushing Products

Intelligent Flushing & Monitoring Stations

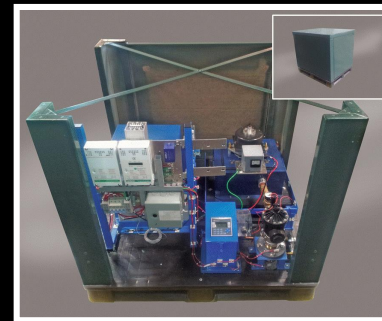
The Intelligent Solution for Water Distribution Systems

ECLIPSE™

i series

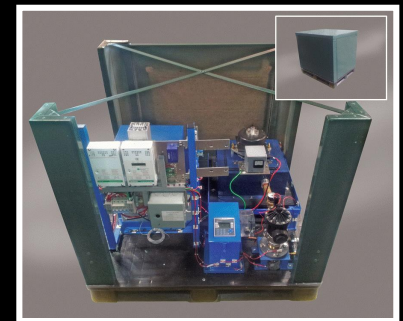


**Eclipse i-Series
#9800i GENESIS
Intelligent Flushing &
Monitoring Station**



**Eclipse i-Series
#9800Wci GENESIS
Intelligent Flushing &
Monitoring Station for
Warm Climates**

**Eclipse i-Series
#9800Wci-R9 GENESIS
Intelligent Flushing &
Monitoring Station for
Moderate Climates**



Green Project Reserve Funding

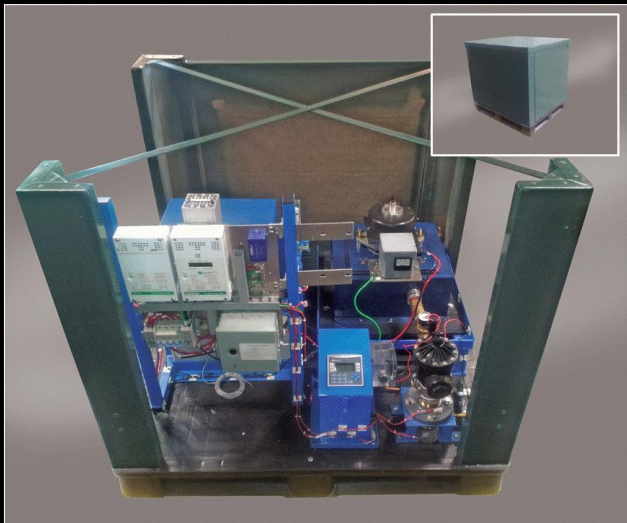


Eclipse #9800i GENESIS

Intelligent Permanent Flushing & Monitoring Station

FEATURES

Dead-End Status: **Critical**



Additional analyzer/sensors

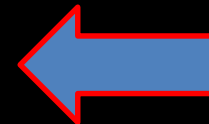
- Temperature
- Turbidity
- Conductivity
- psi
- pH
- ORP

- Designed to keep water on dead-end mains safe by maintaining consistent CI residual levels and removing old water before DBPs form
- 250 watt high efficiency heater with fan
- Self-powered by water turbine and 24VDC battery bank
- Includes built-in CI analyzer and PLC (programmable logic control)
- Automatically analyzes residuals and compares to programmed minimal levels
- Automatically flushes when residuals are below programmed minimal levels
- Flushes *exact* amount of water needed to reach programmed desired levels
- Records all flushing and residual activity to micro SD card or can transmit to SCADA
- Import data into a pre-formatted Excel file that includes color-coded tables charts and graphs



The Intelligent Solution for Water Distribution Systems
ECLIPSE
i series

The Kupferle Foundry Company 2015



SPEC



Video

Kupferle Flushing Products

Intelligent Flushing & Monitoring Stations

The Intelligent Solution for Water Distribution Systems

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**Eclipse i-Series
#9700i Intelligent
Portable Flushing Station**



**Eclipse i-Series
#9800i Intelligent
Permanent Flushing Station
for Freezing Climates**



**Eclipse i-Series
#9800WCi-R9 Intelligent
Permanent Flushing Station
for Moderate Climates**



**Eclipse i-Series
#9800WC-i Intelligent
Permanent Flushing
Station for Warm
Climates**



Automatic flushing

Eclipse #9700i Intelligent Portable Flushing Station

**Analytical Diagnostic
Portable Station**



**Eclipse i-Series #9700i
Rental Program**

Rent Me!

Only \$825 per month with 3 month minimum rental and security deposit

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ECLIPSE

Patented # 6,820,835 # 6,940,516

THE KUPFERLE FOUNDRY COMPANY

Available for Rental

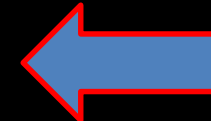
FEATURES

- Attaches to existing fire hydrant (2½” NST)
- Analyzes residuals flushes to maintain safe prescribed levels
- Maximizes conservation of flushed water
- Captures all CI and flushing data on micro SD card or transmitted to SCADA
- Data can be imported into pre-formatted Excel worksheets including tables, charts and graphs
- Data can be used to calibrate controllers on Kupferle Automatic Flushing Stations (9-volt battery powered)



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Video

Eclipse #9800i

Intelligent Permanent Flushing Station

FEATURES

Dead-End Status: **Critical**

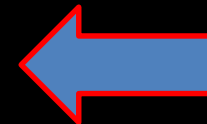


- Designed to keep water on dead-end mains safe by maintaining consistent CI residual levels and removing old water before DBPs form
- Install directly onto dead-end water main
- Requires 120VAC power
- Includes built-in CI analyzer and PLC (programmable logic control)
- Automatically analyzes residuals and compares to programmed minimal levels
- Automatically flushes when residuals are below programmed minimal levels
- Flushes exact amount of water to reach programmed desired levels
- Records all flushing and residual activity to micro SD card or can transmit to SCADA
- Import data into a pre-formatted Excel file that includes color-coded tables charts and graphs



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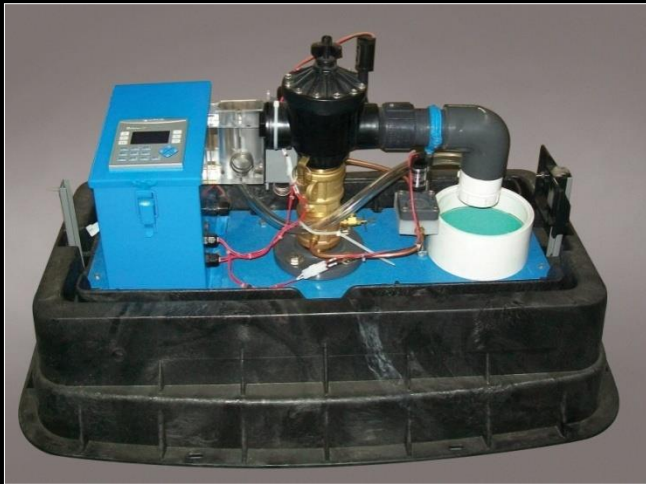
SPEC



Video

Eclipse #9800WC-i Intelligent Permanent Flushing Station

Dead-End Status: **Critical**



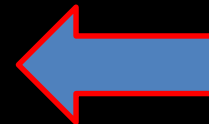
FEATURES

- Designed to keep water on dead-end mains safe by maintaining consistent CI residual levels and removing old water before DBPs form
- Install directly onto dead-end water main
- Requires line or solar/battery power
- Includes built-in CI analyzer and PLC (programmable logic control)
- Automatically analyzes residuals and compares to programmed minimal levels
- Automatically flushes when residuals are below programmed minimal levels
- Flushes exact amount of water to reach programmed desired levels
- Records all flushing and residual activity to micro SD card
- Import data into a pre-formatted Excel file that includes color-coded tables charts and graphs



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Video

Purpose and Benefits of Implementing a Flushing Program

Automatic Flushing (AFS)

An automatic flushing stations (AFS) can be used for periodic or continuous flushing generally on distribution system dead-ends. Advantages of implementing an AFS include:

- maintain consistent disinfectant residual levels and steadily remove DBPs from the system by flushing less water more often
- Can be programmed to operate in “off-peak” hours minimizing the reduced pressure that occurs with flushing
- Labor and water costs are greatly reduced when using an AFS.
- AFS devices have been approved by the EPA for their Green Project Reserve Funding program.



Kupferle Flushing Products

Automatic Flushing Stations

ECLIPSE™



**Eclipse
#9700 Series
Portable Automatic
Flushing Station**



**Eclipse
#9400 Series Automatic
Flushing Devices for
Warm & Cold Climates**



**Eclipse
#9800 Series Automatic
Flushing Devices for
Warm & Cold Climates**

Green Project Reserve Funding



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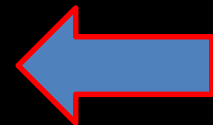
Eclipse #9700 Series Portable Automatic Flushing Devices



Model 9700 (2")



Model 9700A (1")



Eclipse #9700

Portable 2" Automatic Flushing Device

Dead-End Status: **High**



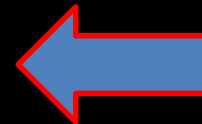
FEATURES

- Attaches to any fire or flushing hydrant (2 ½" NST)
- Portable, easily moved from site to site
- Easy-to program controller / multiple flushing times
- Operates on a 9-volt battery up to one year
- Flush to ground, add diffuser or attach bib with hose
- Adjustable valve from 1 to 200 gpm
- 30-day no cost, no obligation pilot program
- Diffuser, collar-lock, sample bib and dechlorination options available
- Entry level device for permanents!



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CALC



OPTIONS



VIDEO

Eclipse #9700A Portable 1" Automatic Flushing Device

Dead-End Status: **Critical** / **High**



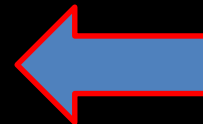
FEATURES

- Attaches to any fire or flushing hydrant (2 ½" NST)
- Portable, easily moved from site to site
- Easy-to program controller / multiple flushing times
- Operates on a 9-volt battery up to one year
- Flush to ground, add diffuser or attach bib with hose
- Adjustable valve from 1 to 60 gpm
- 30-day no cost, no obligation pilot program
- Diffuser, collar-lock, sample bib and dechlorination options available



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CALC



OPTIONS



VIDEO

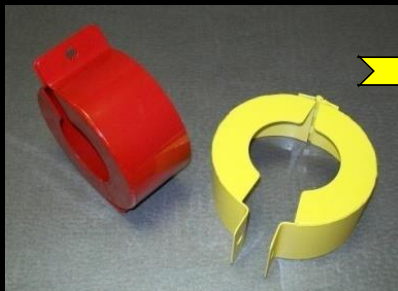
Eclipse #9700A Portable 1" Automatic Flushing Device Accessories



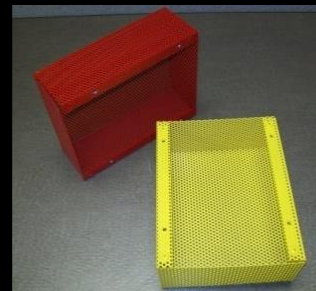
Multi-Directional Diverter



Water Meter Stand



Security Collar Lock

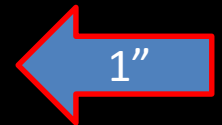
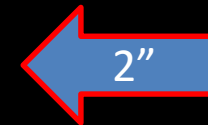


Dechlorination
Basket



Sampling Bibb

ECLIPSE[™]



Purpose and Benefits of Implementing a Flushing Program

Conventional (Manual) Flushing

Conventional flushing usually consists of opening fire and/or flushing hydrants and allowing them to flow until the water appears “clear”. Advantages of using conventional flushing include:

- Flushing to scour bio-film on interior walls of pipes
- Primarily promotes replacing “old” water with new in order to raise residual levels and remove DBPs



Kupferle Flushing Products

Manual Flushing



ECLIPSE™

Eclipse
Post /Box
Hydrant Series
for Warm &
Cold Climates



MAINGUARD™

MainGuard
4" Blowoff
Series for
Warm & Cold
Climates

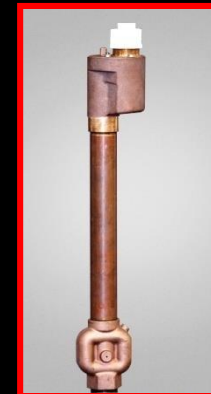
MAINGUARD™

MainGuard
2" Blowoff Series
for Warm &
Cold Climates



TRUFLO

Truflo
Blowoff
Series for
Warm & Cold
Climates



Main Menu

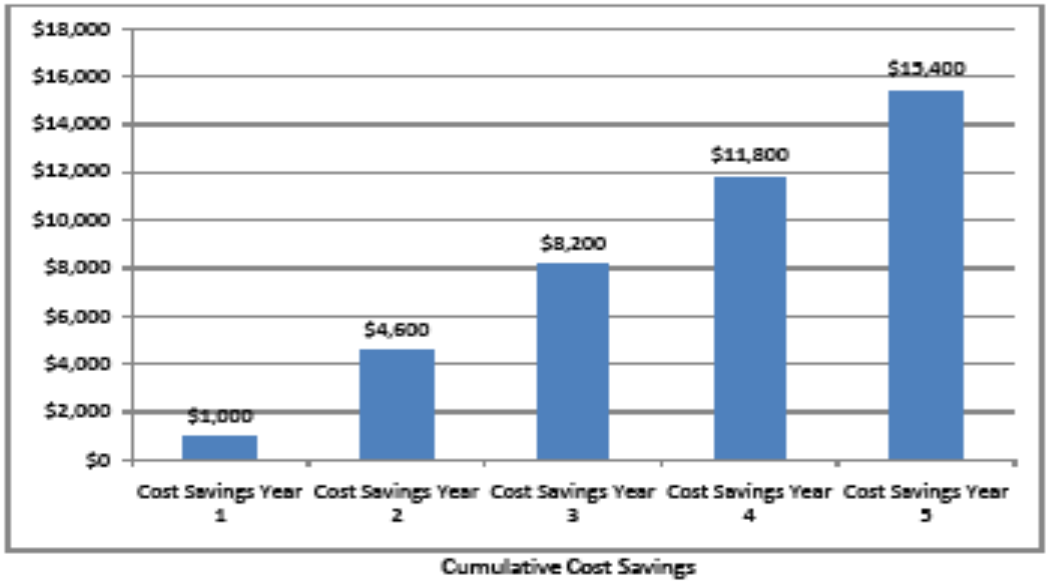
Kupferle Automatic Flushing Devices - Cost Savings

#9400
 #9400WC
 #9700
 #9700A
 #9700i
 #9800
 #9800WC
 #9800WCi

		Cost	
Manual Flushing	Manual Flushings per month per site (fire hydrant)	1	
	Duration (minutes per flushing)	45	
	Water outflow per month (gallons)	67,500	1500 gpm @ 75 psi
	Total Cost of Flushed Water (monthly) per site	\$405	0.006 per gallon
	Total Cost of Flushed Water (annual) per site	\$4,860	
versus	Estimated Cost Labor/Transportation (annual) per site	\$900	\$50.00 per hour @ 1.5 hours per site
	TOTAL COST OF FLUSHING PER SITE (annual)	\$5,760	
Kupferle Eclipse Automatics	Automatic Flushings per month per site	15	
	Duration (minutes per flushing)	10	
	Water outflow per month (gallons)	30,000	200 gpm @ 75 psi
	Total Cost for Flushing (monthly)	\$180.00	0.006 per gallon
	TOTAL COST OF FLUSHING PER SITE (annual)	\$2,160	
Improved Water Quality for less!		37,500	Water savings (gallons)
	TOTAL ANNUAL SAVINGS PER SITE	\$3,600	
	Cost of Automatic Flusher (average list price. Price will vary based on model purchased)	\$2,600	
	NET GAIN FIRST YEAR (per site total savings less cost of unit)	\$1,000	Unit pays for itself - and more!

Cells in RED can be varied to generate alternate scenarios

Cost Savings Year 1	\$1,000
Cost Savings Year 2	\$4,600
Cost Savings Year 3	\$8,200
Cost Savings Year 4	\$11,800
Cost Savings Year 5	\$15,400



Contact Us
 Toll Free: 1-800-231-3990
 Fax: 314-231-2820
info@hydrants.com
www.hydrants.com



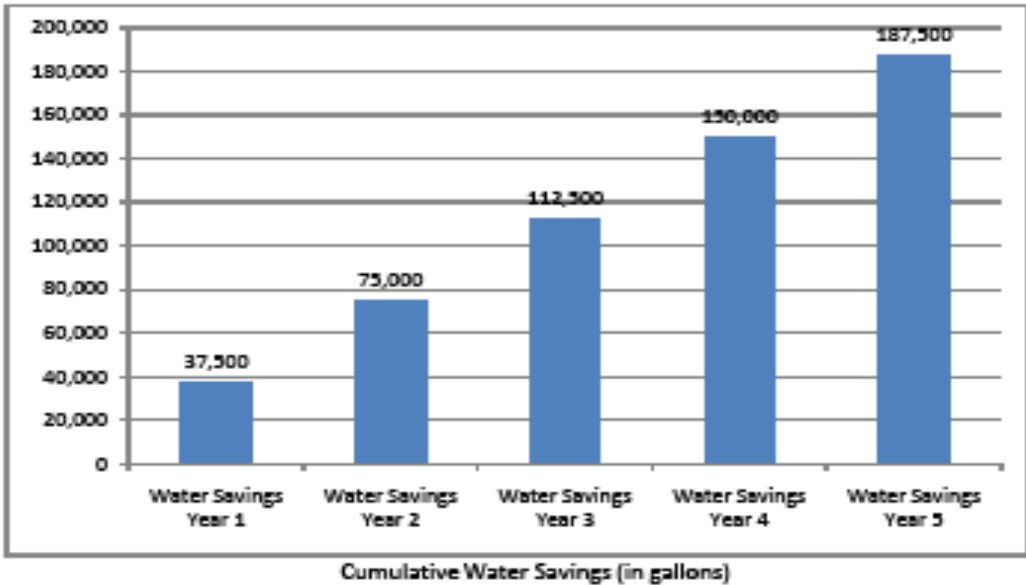


Kupferle Automatic Flushing Devices - Water Savings

		Cost	
Manual Flushing	Manual Flushings per month per site (fire hydrant)	1	
	Duration (minutes per flushing)	45	
	Water outflow per month (gallons)	67,500	1500 gpm @ 75 psi
	Total Cost of Flushed Water (monthly) per site	\$405	0.006 per gallon
	Total Cost of Flushed Water (annual) per site	\$4,860	
	Estimated Cost Labor/Transportation (annual) per site	\$900	\$50.00 per hour @ 1.5 hours per site
versus	TOTAL COST OF FLUSHING PER SITE (annual)	\$5,760	
Kupferle Eclipse Automatics	Automatic Flushings per month per site	15	
	Duration (minutes per flushing)	10	
	Water outflow per month (gallons)	30,000	200 gpm @ 75 psi
	Total Cost for Flushing (monthly)	\$180.00	0.006 per gallon
TOTAL COST OF FLUSHING PER SITE (annual)	\$2,160		
Improved Water Quality for less!	TOTAL ANNUAL SAVINGS PER SITE	\$3,600	Water savings (gallons)
	Cost of Automatic Flusher (average list price. Price will vary based on model purchased)	\$2,600	
	NET GAIN FIRST YEAR (per site total savings less cost of unit)	\$1,000	Unit pays for itself - and more!

Cells in RED can be varied to generate alternate scenarios

Water Savings Year 1	37,500
Water Savings Year 2	75,000
Water Savings Year 3	112,500
Water Savings Year 4	150,000
Water Savings Year 5	187,500



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Kupferle Manual Flushing Hydrants versus Fire Hydrants - Cost Savings

#7500
#7600

Fire Hydrant

versus

Kupferle
Manual
Hydrants

Better
Solutions
for less!

Savings over
5 years /
15 projects

Cost of Fire Hydrant (list price)	1	Cost	\$1,800
Number of Dead-ends per project	15		\$27,000
TOTAL COST OF HYDRANTS PER PROJECT			\$27,000

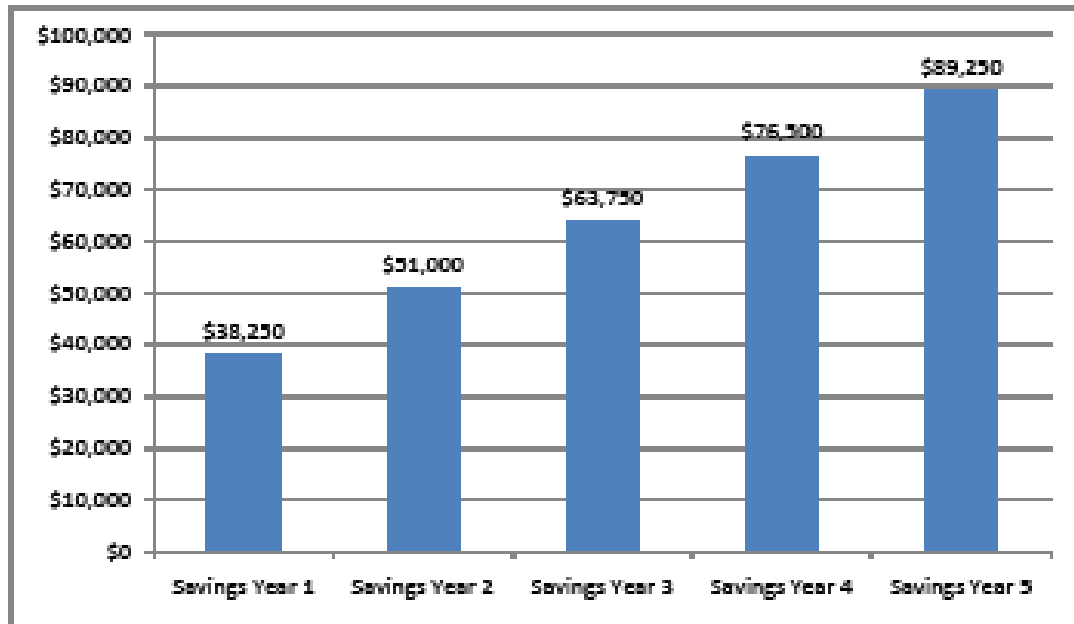
Cost of MainGuard #7500 Flushing Hydrant (list price)	1	\$950
Number of Dead-ends per project	15	\$14,250
TOTAL COST OF FLUSHING PER SITE (annual)		\$14,250

TOTAL SAVINGS PER PROJECT **\$12,750**

NET GAIN (with 3 similar projects per year) **\$38,250**

Cells in **RED**
can be varied
to generate
alternate
scenarios

\$38,250
\$51,000
\$63,750
\$76,500
\$89,250



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THE KUPFERLE FOUNDRY COMPANY

THE KUPFERLE FOUNDRY COMPANY FLUSHING GUIDELINES*

		Inlet Pressure				Inlet Pressure				Inlet Pressure				Inlet Pressure			
		75	100	125	150	75	100	125	150	75	100	125	150	75	100	125	150
Eclipse # 2 Post Hydrant	Flow Rate (gpm)	675	742	800	856	675	742	800	856	675	742	800	856	675	742	800	856
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	5.10	4.64	4.31	4.02	11.48	10.45	9.69	9.05	20.41	18.57	17.22	16.10	31.90	29.02	26.91	25.15
Eclipse #85 Blowoff	Flow Rate (gpm)	608	668	720	770	608	668	720	770	608	668	720	770	608	668	720	770
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	5.67	5.16	4.78	4.47	12.75	11.60	10.77	10.07	22.66	20.63	19.14	17.90	35.41	32.23	29.91	27.96
MainGuard #77 Blowoff	Flow Rate (gpm)	380	435	488	527	380	435	488	527	380	435	488	527	380	435	488	527
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	9.07	7.92	7.06	6.54	20.40	17.82	15.88	14.71	36.26	31.68	28.24	26.15	56.66	49.50	44.12	40.86
MainGuard #78 Blowoff	Flow Rate (gpm)	380	435	488	527	380	435	488	527	380	435	488	527	380	435	488	527
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	9.07	7.92	7.06	6.54	20.40	17.82	15.88	14.71	36.26	31.68	28.24	26.15	56.66	49.50	44.12	40.86
Truflo #TF200 Blowoff	Flow Rate (gpm)	400	461	511	566	400	461	511	566	400	461	511	566	400	461	511	566
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	8.61	7.47	6.74	6.09	19.38	16.81	15.17	13.69	34.45	29.89	26.97	24.34	53.83	46.71	42.14	38.04
Truflo #TF500 Blowoff	Flow Rate (gpm)	400	461	511	566	400	461	511	566	400	461	511	566	400	461	511	566
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	8.61	7.47	6.74	6.09	19.38	16.81	15.17	13.69	34.45	29.89	26.97	24.34	53.83	46.71	42.14	38.04
MainGuard #7500 Blowoff	Flow Rate (gpm)	1346	1520	1694	1858	1346	1520	1694	1858	1346	1520	1694	1858	1346	1520	1694	1858
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	2.56	2.27	2.03	1.85	5.76	5.10	4.58	4.17	10.24	9.07	8.13	7.42	16.00	14.17	12.71	11.59
MainGuard #7600 Blowoff	Flow Rate (gpm)	1346	1520	1694	1858	1346	1520	1694	1858	1346	1520	1694	1858	1346	1520	1694	1858
	Pipe Size	4	4	4	4	6	6	6	6	8	8	8	8	10	10	10	10
	flush time per mile	2.56	2.27	2.03	1.85	5.76	5.10	4.58	4.17	10.24	9.07	8.13	7.42	16.00	14.17	12.71	11.59

#77 #78 #7500 #7600 TF500 TF550 #2Post #85



Green Project Reserve Funding



Kupferle's full line of automatic flushing devices have been categorically approved by the EPA for their **Green Project Reserve Funding** program. Public Water Systems can now access grants and low-interest loans to purchase automatic flushing devices to save time, water and money while keeping water safe for their consumers! Contact your local **Drinking Water State Revolving Fund** coordinator today for more details!



THE KUPFERLE FOUNDRY COMPANY

Since 1857

Collecting Quality Water Samples

Beverages in History



- Beer

- Started with earliest civilization in Mesopotamia



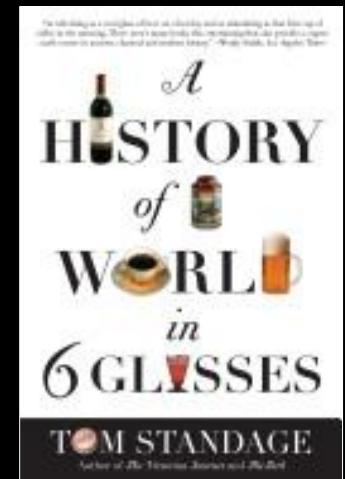
- Wine

- Cultivation of grapes for wine grew during the Greek and Roman Empire times
- Delineated social status



- Coffee

- Plant origins in Ethiopia, first brewed and consumed in Middle East before spreading during the Renaissance times



Beverages in History. Cont.

- Spirits



- More easily transportable, became a common drink in the 18th century
- Rum became the official drink of the British Royal Navy (“limey”)

- Tea

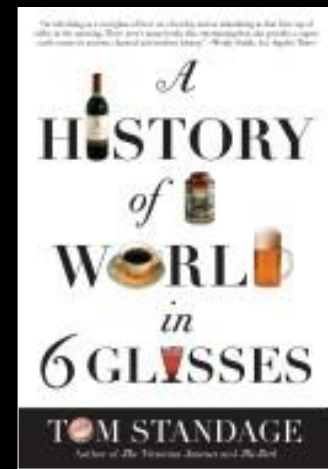


- Grown in India and China
- Became world-wide drink during the “Pax Britannica” 19th century

- Coca-Cola



- Began as a medicinal drink that turned into the most well known brand name of any product in the world



ST. JAMES, WESTMINSTER.

The GOVERNORS and DIRECTORS of the POOR

HEREBY GIVE NOTICE,

That, with the view of affording prompt and Gratuitous assistance to Poor Persons resident in this Parish, affected with Bowel Complaints and

CHOLERA,

The following Medical Gentlemen are appointed, either of whom may be immediately applied to for Medicine and Attendance, on the occurrence of those Complaints, viz.—

Mr. FRENCH, 41, Gt. Marlborough St.

(Opposite, Bowyer's Court, Broad St.)

Mr. HOUSLEY, 28, Broad Street.

Mr. WILSON, 16, Great Ryder St.

Mr. JAMES, - 49, Princes Street.

Mr. DAVIES, 25, Brewer Street.

SUGGESTIONS AS TO FOOD, CLOTHING, &c.

Regularity in the Hours of taking Meals, which should consist of any description of wholesome Food, with the moderate use of sound Beer.

Abstinence from Spirituous Liquors.

Warm Clothing and Cleanliness of Person.

The avoidance of unnecessary exposure to Cold and Wet, and the wearing of Damp Clothes, or Wet Shoes.

Regularity in obtaining sufficient Rest and Sleep.

Cleanliness of Rooms, which should be aired by opening the Windows in the middle of each day.

By Order of the Board,

GEORGE BUZZARD,

Clerk.

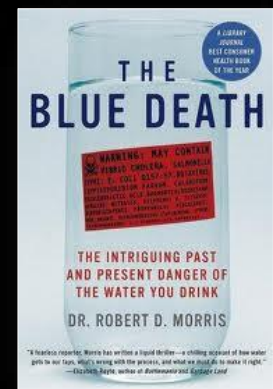
PARISH OFFICE, Palace Street,
St. James, Westminster, 1833.

It is requested that this Paper be taken care of, and placed where it can be easily referred to.

Printed and Published by G. B. BARNES, at the Office of the Standard, No. 1, Abchurch Lane, London.

LIFE *before* DISINFECTION

- Seven Cholera pandemics have killed over 10 million in the past 200 years (mostly in the 19th century)
- Thought to be an airborne disease, until Dr. Snow (c1830) proved otherwise
- First methods of wide-spread disinfection in Chicago 1908
- EPA – Safe Water Drinking Act 1974)
- Milwaukee (1993)
Katrina (2005)
Haiti (2010)



Sampling & Total Coliform Rule

The provisions of the federal Safe Drinking Water Act (1974) require public water suppliers to collect microbiological and chemical samples at various frequencies.

Water is tested for:

- Bacteriological Sample (BacT)

- Total coliform
- Fecal coliform

- Other elements tested for:

- Arsenic, Barium, Cadmium, Chromium, Mercury, Selenium, Beryllium, Nickel, Antimony, Thallium, Cyanide, Fluoride, Nitrite, Nitrate, Iron, Manganese, Silver, Chloride, Sulfate, Zinc



Sampling & Total Coliform Rule

- **Total Coliform Rule / What are Total Coliforms?**
 - Requires all public water systems (PWSs) to monitor for the presence of total coliforms in the distribution system.
 - Total coliforms are a group of closely related bacteria that are (with few exceptions) not harmful to humans. Origins of total coliform bacteria can include untreated surface and ground water, vegetation, soils, insects and animal and human fecal material.

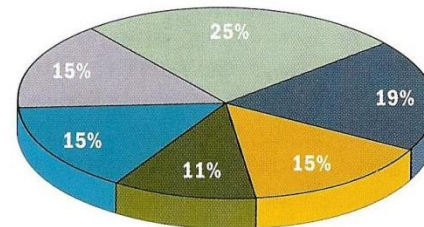


Sampling & Total Coliform Rule

- **How Total Coliforms Occur in Drinking Water**
 - Coliforms can break through the treatment process from source water
 - Coliforms regrow, typically in biofilms, from low initial levels
 - Organisms result from a recontamination of treated water within the distribution pipeline system

Distribution System Outbreaks

USEPA classified 27 waterborne disease outbreaks caused by distribution system deficiencies from 1974 to 2004.



Source: USEPA, 2007

Sampling & Total Coliform Rule

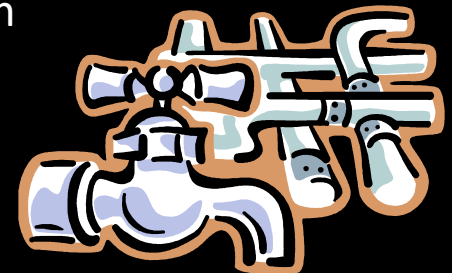
- **How Total Coliforms Grow in Drinking Water**
 - Most coliform growth is thought to occur in biofilms on distribution pipe surfaces and contribute to loss of distribution system disinfectant residuals, increase bacteria levels, reduced dissolved oxygen, taste-and-odor changes, red-or-black water problems, etc.
 - Temperature – on average coliform bacteria occurrences are significantly higher when water temperatures are $> 59^{\circ}\text{F}$
 - Maintaining residuals of .2 mg/L (ppm) free chlorine and .5 mg/L (ppm) chloramines can limit coliform occurrences
 - Researchers report the average density of coliform bacteria is 35 times higher in free chlorinated systems vs chloraminated systems

Sampling & Total Coliform Rule

Total Coliform Rule – Recent Updates

The TCR requires systems to monitor for total coliforms at a frequency proportional to the number of people served. If any sample tests positive for total coliforms, the system must perform the following additional tests:

- Further test that culture for the presence of either fecal coliforms or *Escherichia coli*;
- Take one set of 3-4 repeat samples at sites located within 5 or fewer sampling sites adjacent to the location of the routine positive sample within 24 hours
- Take at least 5 routine samples the next month of operation



EPA UPDATE

Revised Total Coliform Rule

(February 2013, Page 15)



Dedicated Sampling Stations

“...EPA is specifically allowing the use of dedicated sampling stations for the following reasons:

- To reduce potential contamination of the sampling taps. Utilities will have more control to prevent contamination of the sampling tap by preventing its use by unauthorized persons and allowing no routine use of the tap except for sampling.

EPA UPDATE

- To facilitate access to sampling taps. Currently systems may be constrained by where they sample, e.g., only at public buildings or in certain individual customer's house.
- To improve sampling representation of the distribution system. Allowing dedicated sampling taps in areas where systems have not been able to gain access will facilitate better sampling representation of the distribution system.”



Collecting Water Samples

Steps for taking a Total Coliform Water Sample

Collecting Water Samples

1. Hand Hygiene

- Latex gloves are the best method of hand hygiene
- If gloves are not available, then wash hands as thoroughly as possible with soap and water or use a hand sanitizer



Collecting Water Samples

2. Avoid Contact with unsterile objects

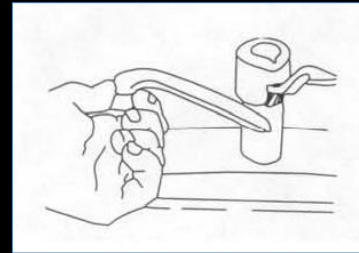
- Ensure your fingers, clothing or other unsterile objects don't touch the interior or mouth of the container, or the container cap



Collecting Water Samples

3. Remove the nozzle cap if using sample station or aerator if using sink faucet

- Avoid taking samples from swivel faucets
- Avoid faucets leaking at handle
- Avoid faucets with attachments (hose/aerator)
- Avoid faucets used for food preparation
- Avoid taking samples from threaded outlets
- Never take a sample from a fire or flushing hydrant or any unit that drains to ground



Collecting Water Samples

4. Sterilize the sampling outlet

- Flaming the tap is most effective method
 - Blow Torch or Cigarette Lighter
 - Heat the faucet, don't burn it
 - Run flame back and forth over faucet several times
- Chlorine bleach (strong solution)
 - Immerse the outlet for a couple of minutes
 - Spray or immersion method



Collecting Water Samples

5. Run water before taking sample

- If using home tap, run from 5-15 minutes to draw sample from main
- If using sample station, run from 2-5 minutes depending on how far the sampling site is from the main



Collecting Water Samples

6. Prepare to take a sample

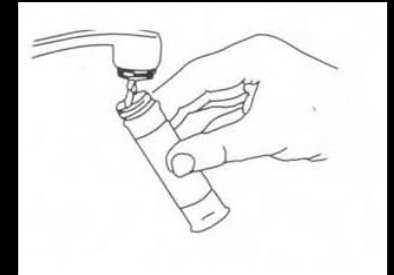
- Reduce the water flow to a ¼” stream in diameter with no air gaps
- Do not touch the inside edge and threads of either the bottle or the cap
- Do not rinse the bottle before taking sample because a chemical preservative is intentionally added (sodium thiosulfate)



Collecting Water Samples

7. Taking the sample

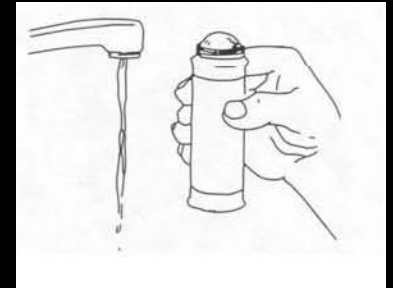
- Carefully unscrew cap , leaving it facing downward. Do not set the cap down.
- Do not breathe in the direction of the sample, turn head to side as sample is being collected
- Fill a prepared laboratory container as instructed by the lab. Hold the container at an angle to reduce aeration



Collecting Water Samples

7. Taking the sample, cont.

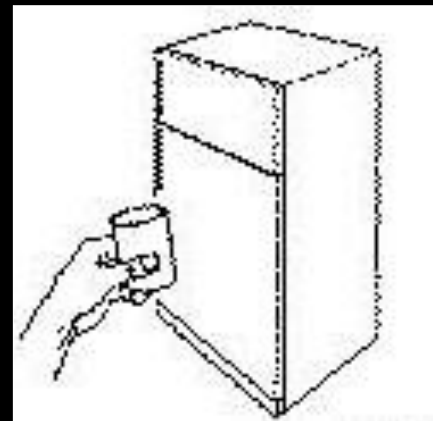
- Two methods of filling the container
 - Fill the container until there is a curved surface to the water top
 - Fill container leaving to fill line or $\frac{3}{4}$ " from the top to allow lab technician to adequately mix the sample
- Replace cap as quickly as possible



Collecting Water Samples

8. Storage and Shipping

- Place sample in a cooler with ice/ice packs when transporting, store in refrigerator
- Send sample to lab within 24-48 hours of collecting



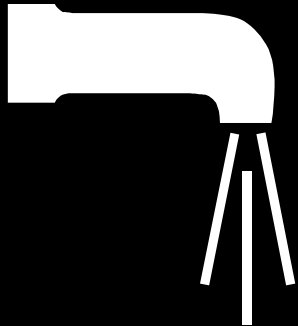
Selecting Sampling Sites

Dedicated Stations versus Private/Public Taps

Private/Public Taps –

Advantages

- No cost per site
- Positive PR with community (?)



Private/Public Taps –

Disadvantages

- Unsecured sites (multi use)
- Samples from site plumbing
- Increased liability issues
- Limited access
- Possible increased chance of false positives
- Higher chance of tap contamination
- Ever changing sampling sites and re-approval process

Selecting Sampling Sites

Dedicated Stations versus Private/Public Taps

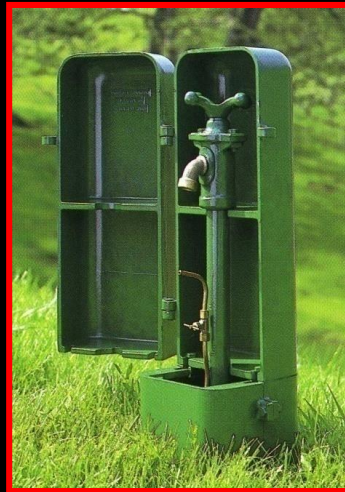
- Dedicated Stations - **Advantages**
 - Secure site (not shared)
 - Samples from water main
 - Reduced liability issues
 - 24/365 access
 - Reduced chance of false positives
 - No cross contamination issues
 - Easy above-grade maintenance
 - Set site approved plan that does not change
- Dedicated Stations - **Disadvantages**
 - Higher initial costs
 - Routine cost of maintenance



Kupferle Sampling Products

Eclipse

Eclipse #88 Series
Sampling Stations



Eclipse #82 Series
Sampling Stations

MainGuard

MainGuard #94WM
Sampling Station
(fits inside a water meter
box)



MainGuard #66
Series Sampling
Stations



ECLIPSE™

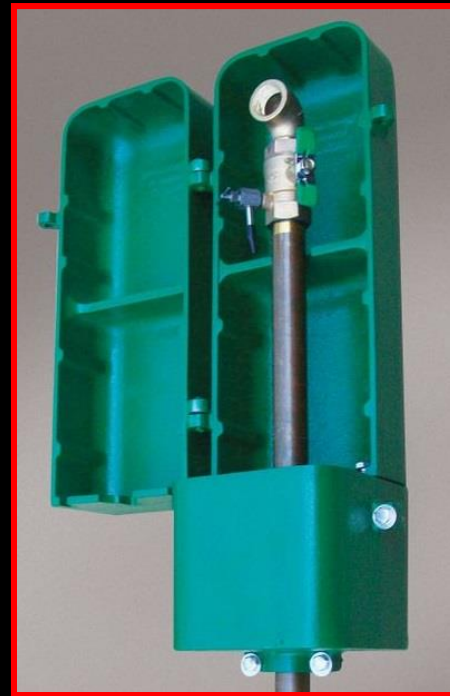
Eclipse #88 Series Water Sampling Stations



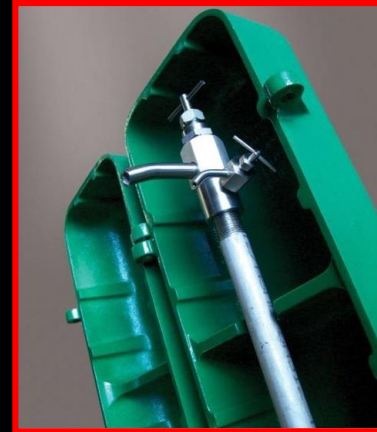
Model #88
(cold climate)



Model #88-SS
(cold climate)



Model #88WC
(warm climate)



Model #88WC-SS
(warm climate)



Eclipse #88 Sampling Station

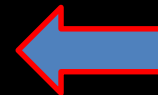
FEATURES

- Specifically designed and engineered for safe sampling
- Allows for sampling directly from your water main
- All brass waterway (no corrosion)
- Unthreaded sampling and nozzle with protective cap
- Secure, lockable aluminum-cast box (optional plastic casing)
- Any depth of bury available
- Brass siphoning vent-tube ensure no cross contamination
- Fully serviceable from above ground – no digging!



ECLIPSE™

The Kupferle Foundry Company 2015



Eclipse #88-SS Sampling Station

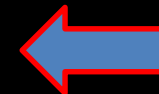
FEATURES

- Specifically designed and engineered for safe sampling
- Allows for sampling directly from your water main
- All surgical stainless steel waterway (no corrosion)
- Unthreaded sampling nozzle with protective cap
- Secure, lockable aluminum-cast box (optional plastic casing)
- Any depth of bury available
- Brass siphoning vent-tube ensure no cross contamination
- Fully serviceable from above ground – no digging!



ECLIPSE™

The Kupferle Foundry Company 2015



SPEC



VIDEO

MAINGUARD™

MainGuard #94WM Sampling Station

FEATURES

- Specifically designed and engineered for safe sampling
- All brass waterway (no corrosion)
- Fits into standard water meter box
- Spring loaded valve lets operator obtain sample standing up
- Custom-fitted O-ring PVC valve cover standard
- Threaded valve makes it easy to attach/detach sampling rod
- Water is pulled from the water main side of the meter
- All brass sampling rod and case for easy transport
- Standard dual-check valve
- Fully serviceable from above ground – no digging!



Sources:

EPA Websites

<http://water.epa.gov/lawsregs/rulesregs/sdwa/mdbp/index.cfm>
<http://water.epa.gov/lawsregs/rulesregs/sdwa/stage2/regulations.cfm>
<http://water.epa.gov/lawsregs/rulesregs/sdwa/tcr/regulation.cfm>
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AWWA

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Manual of Water Supply Practices M28: Rehabilitation of Water Mains, 2001
Water Supply Operations: Flushing and Cleaning DVD, 2006
AWWA Standard C651-05, Disinfecting Water Mains

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Prepare for the Revised Total Coliform Rule, Opflow, May 2014
How Important is a Systemwide Flushing Program?, Opflow, December 2010
How Old is Too Old for Distribution System Water?, Opflow, March 2013

Reports/Others

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<http://www.ces.purdue.edu/extmedia/WQ/WQ-3.html>
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<http://www.prairiewaternews.ca/water/vol110no2/story1a.html>
<http://www.epa.state.il.us/well-water/voc-testing-procedures.pdf>



The Kupferle Foundry Company

Serving Waterworks Industry for over 150 years!



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THE KUPFERLE FOUNDRY COMPANY

Since 1857

QUESTIONS?

