



# *The Dead-End Danger Zone*

**How Uncirculating Water in Distribution System  
Dead-Ends Can Pose a Health Threat to Consumers**



**THE KUPFERLE FOUNDRY COMPANY**

*Since 1857*

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# STEP ONE: Recognizing the Threats

## Dead-End Danger Zone Concern #1

### Falling Disinfectant Residuals



- Disinfectant residuals can begin to drop within 200 hours (8.3 days) in uncirculating water\*
- Depending on initial disinfectant residual levels, uncirculating water can become unsafe in 28 days or less\*
- Once disinfectant residuals fall below minimum levels, they become ineffective in controlling the growth and spread of microbial pathogens\*\*

## Dead-End Danger Zone Concern #2

### Rising Disinfectant Byproducts



- Disinfectant Byproducts (DBPs) form when naturally occurring organic material in water comes in contact with disinfectants and transform into TTHMs and HAAs<sup>†</sup>
- DBPs, when consumed, have been shown to cause health related issues, such as, atherosclerosis (heart disease) and kidney and/or liver cancers
- DBPs can begin to form in water in as little as 4-7 days<sup>††</sup>

\* "Optimizing Distribution System Water Quality", an AWWA Webcast – January 2010

\*\* EPA Guidelines for residual levels are 4.0 mg/L (ppm) maximum, .5 mg/L (ppm) minimum

† EPA Guidelines for DBPs is .080 mg/L (ppm) for Trihalomethanes (TTHMs) and .060 mg/L (ppm) for Haloacetic Acids (HAAs)

†† *How Old Is Too Old for Distribution System Water?*, Opflow, March 2011

# STEP TWO: Identifying Hazardous Dead-Ends

## Water Quality Spreadsheet Calculator

- Easy to use, just input data
  - Pipe Size
  - Dead-End Length
  - # of service connections
- Automatically calculates results
  - Total amount of water in dead-end
  - Total amount of uncirculated water
  - # of days for excess water to be drawn off
  - Flushing minutes per day, based on needs analysis
- Assist in identifying problem dead-ends

FREE download at  
[www.hydrants.com](http://www.hydrants.com)

**How Safe is the Water on Your Dead-Ends?**  
 Insert Information about Your Dead-End(s) Below 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 → **6.11**

**Total Amount of Water in Pipe** (in gallons) → **84,239**

**Step Three:** Enter the # of Service Connections on the waterline\* → **22**

**Amount of Uncirculated Water** (in gallons) → **76,319**

**# of Days to Consume Uncirculated Water** (in gallons) → **10**

**Automatic Flushing Solution** (flushing minutes per day to keep water safe)\*\* → **15**

**FACTS ABOUT UNCIRCULATING WATER**

- EPA recommended minimum disinfectant residual is .5 mg/L
- 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 (22 is greater than 7), 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.

\*Based on 200 gpm flow rate. \*\*Based on 200 gpm flow rate.

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## Complete Distribution Dead-End Analysis

- Complete distribution dead-end analysis
- Report sorts dead-ends based on water age
  - Identifies high risk dead-ends for DBPs
  - Identifies potential for low residuals
- Includes recommendations to address issues
- Assists in management of allocating resources

For a FREE complete analysis of your distribution system dead-ends contact

us at:  
[analysis@hydrants.com](mailto:analysis@hydrants.com)

**ABC Water Company**

CRITICAL						
Pipe Size	Dead-End Length in Miles	Total Water Volume	# of Service Connections	Total Uncirculated Water	# Days for Water Replacement	Recommended Daily Flush Times
10	9.8	324,886	36	132,446	9	94
12	8.9	321,079	38	107,399	8	87
8	5.7	44,181	14	39,141	8	17
8	5.4	74,407	18	67,927	10	36
8	8.3	114,366	21	106,806	14	60
HIGH						
Pipe Size	Dead-End Length in Miles	Total Water Volume	# of Service Connections	Total Uncirculated Water	# Days for Water Recycling	Recommended Flush Times
6	5.4	41,855	16	36,095	6	13
4	10.3	35,484	12	31,164	7	13
4	2.6	8,957	3	7,157	4	1
6	4.7	51,932	23	43,652	5	13
8	8.1	111,610	41	96,850	7	38
MODERATE						
Pipe Size	Dead-End Length in Miles	Total Water Volume	# of Service Connections	Total Uncirculated Water	# Days for Water Recycling	Recommended Flush Times
4	2.4	8,268	9	5,028	2	-3
6	3.8	29,454	19	22,614	3	1
4	5.1	17,570	12	13,250	3	0
4	4.7	16,192	11	12,232	3	0
6	6.2	48,056	41	33,296	2	-8
SAFE						
Pipe Size	Dead-End Length in Miles	Total Water Volume	# of Service Connections	Total Uncirculated Water	# Days for Water Recycling	Recommended Flush Times
4	4.3	14,814	33	2,934	0	-23
10	3.1	45,217	53	26,137	1	-22
6	5.7	44,181	88	12,501	0	-59
8	9.1	125,389	143	73,909	1	-58

## Portable Automatic Chlorine-Analyzer Flushing Device

- Attaches to existing fire hydrants or any 2½" NST blow-off
- Built-in Programmable Logic Control (PLC) and Chlorine Analyzer
- Analyzes residuals and compares to selected minimum level
- Automatically flushes when residuals are below minimum level
- Flushes exact amount of water needed to reach desired residual level
- Records data on residual levels and flushing times on micro SD card
- Data can be imported into a pre-formatted Excel file including tables, charts and graphs
- Can be used to calibrate Kupferle's Eclipse Automatics w/ hand-held controllers (9-volt battery powered)



Eclipse i-Series 9700i

# STEP THREE: Solutions To Address Problems

## Permanent Automatic Flushers w/ Chlorine Analyzer

- Designed for **critical** dead-ends that require constant residual /DBP maintenance
- Installs directly onto dead-end water main (requires line or solar power)
- Built-in Programmable Logic Control (PLC) and Chlorine Analyzer
- Analyzes residuals and compares to selected minimum level
- Automatically flushes when residuals are below minimum level
- Flushes exact amount of water needed to reach desired residual level
- Records data on residual levels and flushing times on micro SD card
- Import data into a pre-formatted spreadsheet that includes tables, charts and graphs
- Keeps water safe utilizing technology for the ultimate water flushing efficiency!



Eclipse i-Series 9800WCi

## Permanent Automatic Flushing Devices

- Designed for **critical** or **high** risk dead-ends requiring year-round residual/DBP maintenance
- Provides programmable flushing times to keep residuals consistent and remove DBPs
- Includes programmable hand-held controller (9-volt battery operated)
- Adjustable solenoid-valve flushes up to 200 gpm (1" and 2" models)
- Direct (sanitary/storm sewer) or diffused surface discharge models available
- Warm and freezing climates models, with lockable UV resistant enclosures
- Keeps water safe for consumers, while saving time, water and money!



Eclipse 9800WC



Eclipse 9400

## Portable Automatic Flushing Devices

- Designed for **high** or **moderate** risk dead-ends requiring periodic residual/DBP maintenance
- Attaches to existing fire hydrants or any 2½" NST blow-off
- Provides programmable flushing times to keep residuals consistent and remove DBPs
- Includes programmable hand-held controller (9-volt battery operated)
- Adjustable solenoid-valve flushes up to 200 gpm (1" and 2" models)
- Lockable powder-coated aluminum enclosure
- Keeps water safe for consumers, while saving time, water and money!



Eclipse 9700

## Manual Blow-Offs

- Designed for **moderate** or **safe** dead-ends requiring annual or infrequent residual/DBP maintenance
- Easy to operate and repairable/maintainable from above ground – no digging!
- 2" and 4" sizes, above and below ground, warm and cold (self-draining) models available for a variety of applications



Eclipse #2



TF #500



TF #200



MainGuard #7500



MainGuard #77