



# *The Dead-End Danger Zone*

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



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Kupferle  
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# STEP ONE: Recognizing the Threats

## Dead-End Danger Zone Concern #1



### Disinfectant Residuals Dissipation

- Disinfectant residuals can begin to dissipate within 200 hours in uncirculating water\*
- On average, free chlorine dissipates at a rate of 1.5 ppm per week, chloramines at a rate of .625 ppm per week (after the initial 200 hours)
- Other factors such as pH and temperature can accelerate this rate of dissipation
- Once disinfectant residuals fall below minimum levels (.2 ppm), 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 chlorine, transforming them into toxins such as TTHMs and HAAs<sup>†</sup>
- DBPs, when consumed, have been shown to cause health related issues, such as atherosclerosis (heart disease), kidney and/or liver cancers. Some recent studies have shown a connection with DBPs and Alzheimer's disease as well.
- 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)

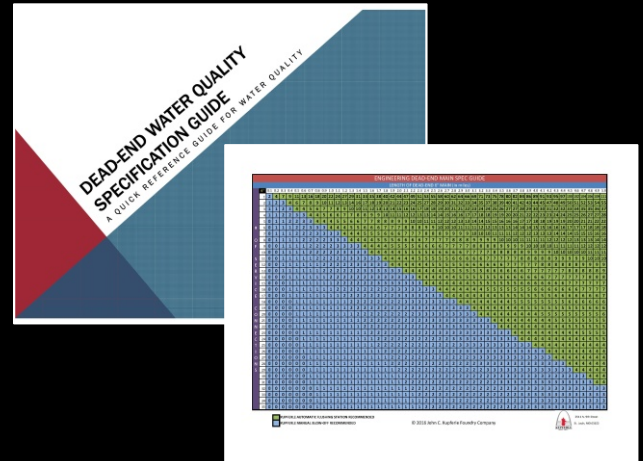
†† How Old Is Too Old for Distribution System Water?, Opflow, March 2011

# STEP TWO: Identifying Hazardous Dead-Ends

## Water Quality Analysis Tools

- **Dead-End Water Quality Specification Booklet**
  - Horizontal Axis = Length of dead-end main
  - Vertical Axis = Number of service connections
  - Worksheet Window = Number for water turnover in days
  - Color coded to easily identify water quality status

Provided upon request  
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- **Water Quality Spreadsheet Calculator**
  - Easy to use, just input data in color coded cells
  - Automatically calculates results for water age
  - Provides suggested flushing times for problem dead-ends

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

**How Safe is the Water on Your Dead-Ends?**  
Smart 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 (8-9 days) disinfectant residuals begin to dissipate and drop
- Disinfectant byproducts (DBPs) can begin to form within 8-7 days. If the cell (T) is greater than 7, the water may begin to become unsafe for consumers
- Kupferle's EPA Approved Automatic Flushing System (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.

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- **Complete Distribution Dead-End Analysis**
  - Customer provides information on distribution dead-ends
  - Kupferle provides a comprehensive distribution dead-end analysis
  - Color-coded report sorts dead-ends by water age/quality
  - Report includes recommendations for aging water issues

For a FREE comprehensive analysis of your distribution system dead-ends contact us at  
800-231-3990/info@hydrants.com

**ABC Water Company**

Pipe Size	Dead-End Length in Miles	Total Water Volume	CRITICAL # of Service Connections	Total Uncirculated Water	# Days for Water Replacement	Recommended Daily Flush Times
10	5.8	124,886	34	112,546	9	54
12	3.9	123,879	39	107,999	8	47
8	5.2	64,981	14	58,141	6	17
6	5.4	74,407	18	67,927	10	46
8	8.3	114,366	21	106,806	14	40

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	6,957	3	7,157	4	1
6	6.7	51,932	23	43,652	5	13
8	8.1	111,610	41	96,850	7	38

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	8,768	9	5,028	3	2
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

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	2,534	0	-23
10	2.1	45,217	34	24,137	1	-22
8	3.7	84,181	48	12,501	0	-39
8	9.1	125,389	145	73,909	1	-58

- **Portable Intelligent Monitoring and Flushing Station**
  - Attaches to an existing fire hydrant or blow-off using a 2½ NST connection
  - Amperometric chlorine analyzer and Programmable Logic Controller
  - Residual and flushing data retrieved manually or transmitted to SCADA
  - Analytic tool that can provide valuable data for addressing water quality issues



# STEP THREE: Solutions To Address Problems

## Intelligent Monitoring & Flushing Stations

- Designed for **critical** zones or areas that require constant residual /DBP maintenance
- Installs directly onto dead-end water main (line, solar and turbine power options)
- Built-in Programmable Logic Control (PLC) and Amperometric Chlorine Analyzer
- Analyzes residuals and compares to programmed minimum level
- Automatically flushes when residuals are below programmed minimum level
- Flushes exact amount of water needed to reach programmed desired residual level
- Residual and flushing data can be retrieved manually or transmitted to SCADA
- 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 9800i GENESIS

## Automatic Flushing Stations

- Designed for **critical** or **high** risk dead-ends requiring year-round residual/DBP maintenance
- Provides programmable flushing times to keep residuals consistent and remove aging water
- Includes programmable hand-held controller (9-volt battery operated)
- Adjustable solenoid-valve flushes up 150 to 200 gpm (1" and 2" models)
- Above or below grade 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 Stations

- 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 aging water
- 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 grade, warm and cold (self-draining) models available for a variety of applications



Eclipse #2



MainGuard #77



TF #200



TF #500



MainGuard #7500