# This presentation premiered at WaterSmart Innovations

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# Understanding the Implications of Reduced Flows in Building Drains

## ~Phase 2~







# Why Drainline Transport?

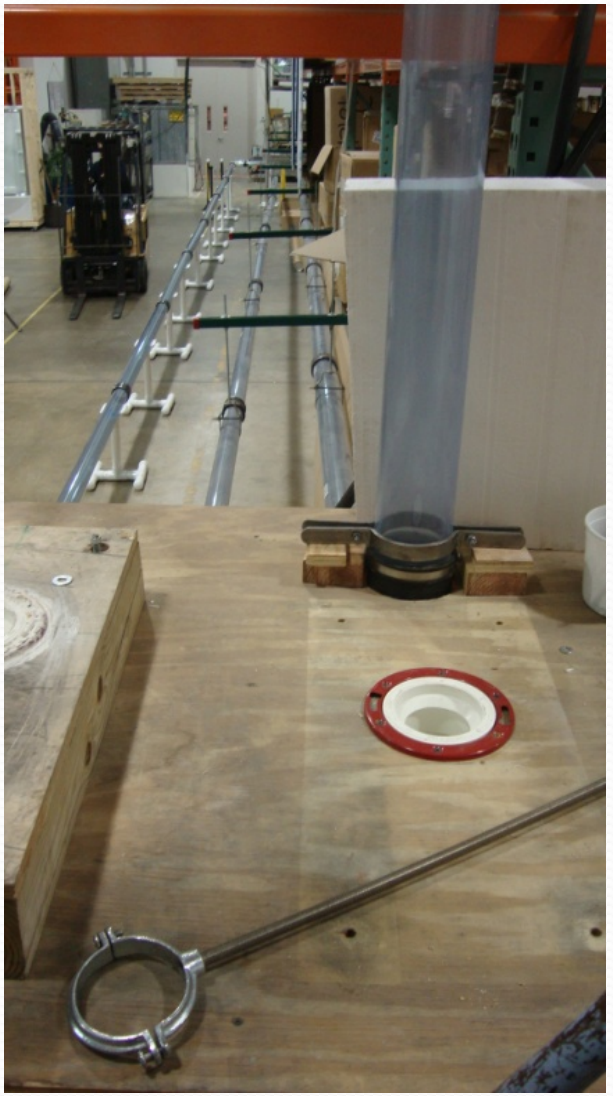
- Toilet consumption reduced 3.5 gpf → 1.6 gpf →1.28 gpf → ?
- Commercial installations
  - Isolated bathrooms
  - Long horizontal run building drains
  - Non-water consuming urinals, ultra low flow faucets (0.5 gpm)
  - Proliferation of other water efficient technologies; medical, food service, industrial and commercial processes
  - Toilets increasingly stressed
- Domestic installations
  - Reduced flow showerheads and appliances
  - Graywater reuse systems – long term potential to eliminate long duration flows

# The PERC Approach

- PERC Design of Experiment
  - The “Real World”: Too Variable to Duplicate / Characterize
  - Need to Understand What’s Really Important
  - Build a Perfect Drainline
- The Test Apparatus
  - 4” Clear PVC
  - 135 feet long (~41 M)
  - Slope Adjustable
- Why only 4-inch diameter? $
- Clearing Flush:  Low Cost Solution?
  - Past research (Swaffield) cited potential
  - Low cost solution using flushometer-valves?

# The PERC Approach

Test Apparatus viewed from Flush Stand

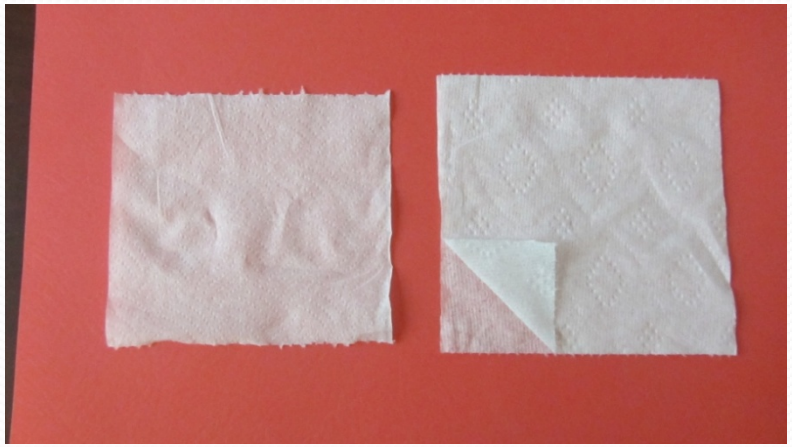


Two 90 - Wide Sweep Bends at Far End

# Test Media

- Uncased “MaP” Test Media
  - Proven “Realistic” in Toilet Testing
  - Deformable, “breaks down”

- Toilet Paper
  - Two US Brands
    - Low Tensile Strength
    - High Tensile Strength

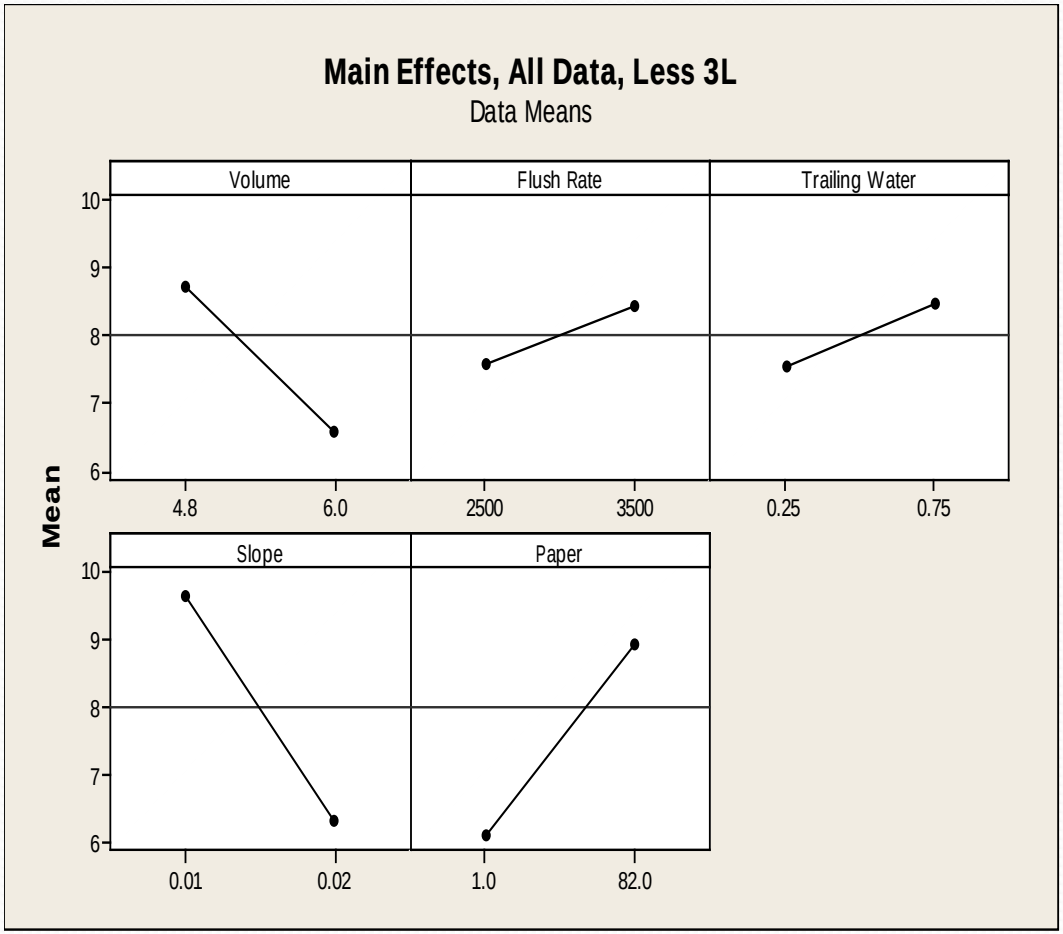


# The PERC Test Plan

Test variables

- ✓ *1 Diameter: 4-inch / ~100* mm
- ✓ *2 Pitches: 1.00%; 2.00%*
- ✓ *3 Flush Volumes: 6.0/1.6; 4.8/1.3; 3.0/0.8 (Lpf / gpf)*
- ✓ *2 Flush Rates: 3500; 2500 (ml/sec –peak flow)*
- ✓ *2 Percent Trailing Water Levels: 75%; 25%*
- ✓ *2 Toilet Paper Tensile Strengths: High; Low*

# Data Review




| Factor | Type | Levels | Values |
|---|---|---|---|
| Volume | fixed | 2 | 4.8, 6.0 |
| Flush Rate | fixed | 2 | 2500, 3500 |
| Trailing Water | fixed | 2 | 0.25, 0.75 |
| Slope | fixed | 2 | 0.01, 0.02 |
| Paper | fixed | 2 | 1, 82 |

| Variable | P Value |
|---|---|
| Volume | 0.000* |
| Flush Rate | 0.216 |
| Trailing Water | 0.185 |
| Slope | 0.000* |
| Paper | 0.000* |

* P-values below 0.05 indicate significance of the test variable

R-Sq = 81.61percent

# PERC Phase 2 Focus Areas

- **Pipe Size Reduction** – Long a topic of debate at code hearings, the potential for reduced pipe size to improve drainline transport distances will be studied
  - A 3-inch test apparatus will be used in addition to the 4-inch diameter apparatus employed in Phase 1 to determine impact of reducing the pipe size
- **Additional Flush Volume Level –** Phase 1 results indicated a behavioral shift and a chaotic drainline performance condition resulted at the 3.0 Lpf / 0.8 gpf consumption level.
  - Phase 2 will investigate drainline transport performance at the 3.8 Lpf (1.0 gpf) volume level.
  - Many U.S. manufacturers are already producing toilets that flush at this consumption level for both commercial and residential applications.

# The PERC Test Plan

Test variables

- ✓ *1 Diameter: 4-inch / ~100* mm; ***3-inch / ~75 mm***
- ✓ *2 Pitches: 1.00%; 2.00%*
- ✓ *3 Flush Volumes: 6.0/1.6; 4.8/1.3;* ***3.8/1.0;*** *3.0/0.8 (Lpf / gpf)*
- ✓ *2 Flush Rates: 3500; 2500 (ml/sec –peak flow)*
- ✓ *2 Percent Trailing Water Levels: 75%; 25%*
- ✓ *2 Toilet Paper Tensile Strengths: High; Low*

# PERC Phase 2 - Deliverables

- **Deliverable 1 – Pipe Size Reduction**
  - Phase 2 of the PERC study will show how a commonly suggested pipe size reduction (going from 4-inch diameter pipe to 3-inch pipe) will impact drainline transport in a long horizontal run.
  - Further, it will rank the significance of reducing pipe diameter to flush consumption level reductions, slope, toilet paper wet tensile strength, and toilet discharge characteristics of flush rate and percent trailing water.
  - The results from Phase 2 will provide needed data in understanding the implications of pipe size reductions and may advise future considerations of pipe sizing requirements.

# PERC Phase 2 - Deliverables

- **Deliverable 2 – Added 1.0 gpf discharge level**
  - Evaluating a new flush discharge level at 3.8 Lpf (1.0 gpf) will provide for a better understanding of how the drainline performs at the critical consumption level between 4.8 Lpf (1.28 gpf) and 3.0 Lpf (0.8 gpf), where drainline performance in Phase 1 became chaotic.
  - This will provide additional insight into the “tipping point” flush volume level, below which chronic blockage problems are more likely to occur.

# PERC Phase 2 - Deliverables

- Considering the two deliverables together, Phase 2 will evaluate how pipe size reduction in a building drain might allow for the successful use of lower consumption toilets in new installations that employ smaller diameter drains.
- Phase 2 will also provide data to help illustrate if we are indeed reaching a tipping point where further toilet consumption level reductions are risky in installations that do not provide for significant additional flows into the building drain.

# PERC Phase 2 – Budget / Status

- Phase 2 of this research study will cost approximately $170,000.00
- A significant increase over the approximately $70,000.00 used to complete Phase 1.
- ~90% of the cost is related to labor.
- Phase 2 is a 35 + week testing program – currently 5 weeks into the program - work is underway at the American Standard Design Center in Piscataway, NJ
- Look for a full report on the Phase 2 Study here at WSI in 2015

**We thank all of the Utilities, Manufacturers and Associations that have chipped in to support this critical research!**

# THANK YOU

# QUESTIONS?

Part II

# World Plumbing Council Research Committee and Database Project

Presented by:
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# Database Functionality

- http://www.worldplumbing.org/research/tiki-index.php
- Use free and open source database application - Tiki Wiki http://info.tiki.org/Tiki+Wiki+CMS+Groupware
- Membership – anyone will be allowed to register and input information into the database
- The Research Committee co-chairs will have the ability to review and delete any content that is inappropriate
- Signing Up / Registering:
  - Email address
  - Password
- Once registered, instant access to the database will be granted

# Database Functionality

- Input fields for database entries:
  - Submitters name
  - Title(s)
  - Affiliation
  - Email address
  - Name / affiliation of other researchers involved (optional)
  - Title of research program (25 words max)
  - Scope (500 words max)
  - Key words (maximum of 8)
  - Status of research program (50 words max)
  - What is the goal of the research? (250 words max)
  - Link to completed published report / paper (optional)
  - How will the completed research benefit the public, the plumbing profession, or be implemented into the built environment? (250 words max)

# Database Functionality

- Pull down menu boxes:
  - Plumbing aspects (water supply, waste/drainage, water efficiency, water quality, sanitation, safe water access, alternate water sources (rainwater, storm water, gray water), irrigation landscape (allow to select all that apply)
  - Has the output (research paper or report) been Peer reviewed? (yes/no/pending)
  - Can other researchers contact you via email to discuss this research? (yes / no)
- We will be able to track usage
- Again, we seek your participation
- ***As a Wiki application, the success of the database and the usefulness to researchers and the plumbing industry depends on YOU!***

THANK YOU!

Part III

# THE ANSI STANDARDIZATION ROADMAP
## Energy Efficiency in the Built Environment

*Presented by:*
**Pete DeMarco, IAPMO**
**Lead facilitator for the ANSI Energy Efficiency Standardization Coordination Collaborative (EESCC)**

**Water Smart Innovations Conference**
**Las Vegas, 2014**

# ANSI Energy Efficiency Standardization Coordination Collaborative (EESCC)

- ***Standardization Roadmap: Energy Efficiency in the Built Environment***
  - **Released June 2014 I FREE DOWNLOAD:** www.ansi.org/eescc
- Developed by the Energy Efficiency Standardization Coordination Collaborative (EESCC), a cross-sector group of 160 experts
  - convened by the **American National Standards Institute (ANSI)**
  - chaired by representatives of the **U.S. Department of Energy** and **Schneider Electric**
  - involving more than 50 member organizations and 4 federal agencies from industry, standards and code developing organizations, energy efficiency-focused organizations, educational institutions, and other groups
- Establishes a national framework for action and coordination on energy efficiency standardization, and charts recommendations and timelines for action to advance energy efficiency within the built environment

# EESCC Standardization Roadmap Overview

- **The EESCC roadmap details 125 recommendations and timelines for action in five distinct yet interrelated areas of focus:**

  - **Chapter One: Building energy and water assessment and performance standards** outlines 46 recommendations to address identified standardization gaps in these areas
  - **Chapter Two: System integration and systems communications** details 9 recommendations examining how building sub-systems could be integrated in order to manage the energy use of a building or campus of buildings for maximum efficiency
  - **Chapter Three: Building energy rating, labeling, and simulation** outlines 22 recommendations to address identified standardization gaps
  - **Chapter Four: Evaluation, measurement, and verification (EM&V)** details 32 recommendations to advance the field of EM&V
  - **Chapter Five: Workforce credentialing** puts forth 16 overarching recommendations to advance workforce credentialing for the energy efficiency field

# Next Steps: Tracking Progress and Implementation of Roadmap Recommendations

- Looking forward, the EESCC will monitor implementation of the roadmap's recommendations, follow updates on work to close identified gaps, and create a mechanism by which this information can be broadly shared

- A future report will highlight progress to close gaps and provide an update on new developments and updates:

  - The EESCC will work with relevant groups, as appropriate, to ensure gaps are addressed, and facilitate coordination and collaboration among domestic, regional, and international standardization activities, as needed

# Call to Action: Closing the Gaps

- Organizations interested in carrying out standardization activities to close a gap identified in the roadmap – either working collaboratively or on their own – are asked to **notify the EESCC** so that the collaborative can monitor the roadmap's implementation and assist with coordination of standardization activities, as appropriate

- Complete the online **EESCC Standardization Action Form** at www.ansi.org/eescc with details on:
  - Gap to be addressed
  - Brief description of work to fill gap
  - Anticipated timeline

# Thank You!


Plumbing
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