LFE Protect provides an extensive array of health and safety solutions to help protect your people, property, and business. These products utilize a wide variety of sophisticated technologies to sanitize and disinfect your environment and promote health and wellness for employees and customers.

For more info, contact Keith Pierce, 617.697.8777 or keith@lfesolutions.com
RECEIVE 1 CEU FOR THIS COURSE

Please Contact Nina Kogan for documentation.

Nina.Kogan@naesco.org
UV-C AND VISIBLE LIGHT DISINFECTION
# UV-C VS VISIBLE LIGHT DISINFECTION

<table>
<thead>
<tr>
<th>Disinfection Method</th>
<th>Primary Wavelength</th>
<th>Safe to Use with Humans Present</th>
<th>Kills Bacteria</th>
<th>Kills Viruses</th>
</tr>
</thead>
<tbody>
<tr>
<td>UV-C</td>
<td>254 nm</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Visible</td>
<td>405 nm</td>
<td>Yes</td>
<td>Yes</td>
<td>No</td>
</tr>
</tbody>
</table>
VISIBLE LIGHT DISINFECTION

- 4-6 weeks to dramatically lower surface area bacteria levels

Clean with White

Clean-Only Mode
Disinfection Efficacy

Germs Visible Light Disinfection is Able to Kill

- Gram Positive Bacteria
- Gram Negative Bacteria
- Yeast
- Fungi

Such as: Staphylococcus aureus (incl. MRSA), Clostridium difficile (C. diff), Listeria, E.coli, Salmonella, Aspergillus
Set a New Disinfection Standard

Comparison of disinfection efficacy:
- **Hourly or Daily Cleaning Only**
  - High bacteria levels that remain constant over time.
- **Hourly or Daily Cleaning + VLD**
  - Initial high bacteria levels, followed by a rapid decline due to VLD impact.
VISIBLE LIGHT DISINFECTION
SUMMARY

Offers supplemental method of lowering amount of bacteria
Contributes to best practices in infection control
Not designed to replace current methods of cleaning
ELECTROMAGNETIC SPECTRUM
ULTRAVIOLET CATEGORIES

- **UV-A: 315 - 400nm**
  - E.g. Insect traps
  - 1,000x less effective than UV-C

- **UV-B: 280 - 315nm**
  - Penetrates skin more deeply
  - Sunburn; skin cancer

- **UV-C: 200 - 280 nm**
  - Photokeratitis (welder’s flash), Erythema (skin redness)

- **Far-UVC: 207 & 222nm**
  - Excimer lamps
UV-C EFFECTIVENESS

Based on e. coli bacteria action
UV LAMP TYPES

Today
Low and medium pressure mercury
since 1930’s
ambient temp, on/off

Xenon Arc
Continuous & Pulsed operation
Expensive

Looking Ahead
Halogen Excimer
Far UV-C (222nm)
Potential for skin/eye safety improvements

LED
Expensive, lower efficiency
Germicidal UV (GUV)

- short-wavelength ultraviolet “light” (radiant energy) that has been shown to kill bacteria and spores and to inactivate viruses.

Inactivation

- photons photochemically interact with the RNA and DNA molecules in a virus or bacterium to render these microbes non-infectious.
KILL RATE

Logarithmic Scale:

each step requires doubling time
or intensity

1-log: 90%

2-log: 99%

3-log: 99.9%
FACTORS THAT AFFECT UV-C DOSAGE

- Pathogen type
- Pathogen environment (particle, aerosol)
- Distance from the light source
- Light source wavelength
- Light source intensity
- Materials in the room
UV IRRADIATION DOSAGE TABLE

UV dose = UV intensity x time (sec)

Example:
XXX lamp produces 800µW/cm² @ 1’

For 90% kill factor of Bacillus subtilis spores:
11,600 divided by 800 = 14.5 seconds.

<table>
<thead>
<tr>
<th>Organisms</th>
<th>90% (1 log reduction)</th>
<th>99% (2 log reduction)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Bacteria</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacillus anthracis - Anthrax</td>
<td>4,520</td>
<td>8,700</td>
</tr>
<tr>
<td>Bacillus anthracis spores - Anthrax spores</td>
<td>24,320</td>
<td>46,200</td>
</tr>
<tr>
<td>Bacillus magaterium sp. (spores)</td>
<td>2,730</td>
<td>5,200</td>
</tr>
<tr>
<td>Bacillus magaterium sp. (veg.)</td>
<td>1,300</td>
<td>2,500</td>
</tr>
<tr>
<td>Bacillus paratyphusus</td>
<td>3,200</td>
<td>6,100</td>
</tr>
<tr>
<td>Bacillus subtilis spores</td>
<td>11,600</td>
<td>22,000</td>
</tr>
<tr>
<td>Bacillus subtilis</td>
<td>5,800</td>
<td>11,000</td>
</tr>
<tr>
<td>Clostridium tetani</td>
<td>13,000</td>
<td>22,000</td>
</tr>
<tr>
<td>Corynebacterium diphtheriae</td>
<td>3,370</td>
<td>6,510</td>
</tr>
<tr>
<td><strong>Virus</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bacterioplaage - E. Coli</td>
<td>2,600</td>
<td>6,600</td>
</tr>
<tr>
<td>Infectious Hepatitis</td>
<td>5,800</td>
<td>8,000</td>
</tr>
<tr>
<td>Influenza</td>
<td>3,400</td>
<td>6,600</td>
</tr>
<tr>
<td>Poliovirus - Poliomyelitis</td>
<td>3,150</td>
<td>6,600</td>
</tr>
<tr>
<td>Tobacco mosaic</td>
<td>240,000</td>
<td>440,000</td>
</tr>
<tr>
<td><strong>Yeast</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Brewers yeast</td>
<td>3,300</td>
<td>6,600</td>
</tr>
<tr>
<td>Common yeast cake</td>
<td>6,000</td>
<td>13,200</td>
</tr>
<tr>
<td>Saccharomyces carevisiae</td>
<td>6,000</td>
<td>13,200</td>
</tr>
<tr>
<td>Saccharomyces ellipsoideus</td>
<td>6,000</td>
<td>13,200</td>
</tr>
<tr>
<td>Saccharomyces spores</td>
<td>8,000</td>
<td>17,600</td>
</tr>
</tbody>
</table>
UVC DOSE DOSIMETER

Dosimeter center circle changes to ORANGE to show that a level of energy lethal to MRSA has been delivered.
Deactivation Testing – Delivering the UVC to the DNA

SARS-CoV2 inactivation in clinical specimen 254 nm (1.9 mW/cm²)

- Poor UVC Penetration
- Good UVC Penetration

- 254 nm is quite effective for SARS-CoV-2 deactivation
- Further testing confirms Log 4 reduction at a dose of 1.5 J/cm² in N95 mask material
- Exploring FDA Emergency Use Authorization

Effect of environment on UVC penetration and germicidal efficacy

Unpublished data, R. Rathnasignhe, M. Schotsaert, T. Aydillo, R. Camping, A. Garcia-Sastre, A. Costa, Mt. Sinai Icahn School of Medicine
USING GUV

Upper-room GUV fixtures with air mixing
  • airborne pathogens in an occupied space

Mobile GUV units
  • high-touch surfaces

HVAC air handling units
  • treat recirculated air
DISINFECTING ROOM AIR WITH GUV

UV-C fixtures that irradiate only the air above 2.1 meters (7 feet) constantly disinfect the upper air volume.

Most effective when there is constantly mixed air by fans and HVAC ventilation.
DISINFECTING SURFACES, MASKS, AND INSTRUMENTS WITH GUV

Excellent surface disinfectant, it does not penetrate surfaces and cannot disinfect soiled surfaces.

Typically used as a supplemental control measure for disinfection

Glass windows block potentially hazardous UV-B and UV-C transmission
HVAC AIR HANDLING UNITS

Does relatively little to prevent person-to-person transmission

For effective interruption of transmission, air disinfection should take place in the same room where transmission is occurring
UV REGULATION

UV-A products being sold as germicidal

Some UV-C products are sold without adequate protections and warnings (wands)

Better long-term testing on 222nm excimer-based disinfection

Better understanding on long-term building materials exposure
THANK YOU FOR YOUR TIME

Frank Agraz, LC, IES
Senior Director of Strategic Initiatives
Eco Engineering

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281-513-7136
SAVING WATER DURING/AFTER COVID 19

Paul Bassett
Vice President - Water Efficiency
Envocore

- Water is a basic need, and in the current Covid-19 situation it assumes a critical role in ensuring recommended hygiene protocols related to hand wash and clean drinking water. This will create an additional demand for water and put pressure on the already scarce availability in some parts of the United States. This discussion will provide tips on saving water and maintaining recommended hygiene protocols in the bathroom.
Presentation Agenda

• How to establish water consumption baselines with nearly vacant buildings.
• Understand how to use new water measurement tools to assist in accurately establishing hourly/daily water usage profiles in buildings.
• Learn about the different methods to help reduce the spread of disease or viruses in the bathroom.
• Compare the different flow rates of restroom fixtures to determine the most efficient, and still maintaining proper hygiene.
# Water Balance

## Water Balance Table

<table>
<thead>
<tr>
<th></th>
<th>% of Total</th>
<th>Modeled Consumption (gal)</th>
<th>Modeled Consumption (kgal)</th>
<th>Modeled Savings (gal)</th>
<th>Modeled Savings (kgal)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Toilets</td>
<td>34%</td>
<td>3,584,369</td>
<td>3,584</td>
<td>1,379,364</td>
<td>1,379</td>
</tr>
<tr>
<td>Urinals</td>
<td>7%</td>
<td>789,743</td>
<td>790</td>
<td>544,885</td>
<td>545</td>
</tr>
<tr>
<td>Faucets</td>
<td>7%</td>
<td>716,748</td>
<td>717</td>
<td>443,285</td>
<td>443</td>
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<tr>
<td>Showers</td>
<td>6%</td>
<td>591,458</td>
<td>591</td>
<td>152,663</td>
<td>153</td>
</tr>
<tr>
<td>Ice Machines</td>
<td>1%</td>
<td>153,201</td>
<td>153</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Pre-Rinse Sprayers</td>
<td>7%</td>
<td>761,664</td>
<td>762</td>
<td>438,132</td>
<td>438</td>
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<tr>
<td>Garbage Disposals</td>
<td>8%</td>
<td>897,456</td>
<td>897</td>
<td>15,552</td>
<td>16</td>
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<tr>
<td>Convection Steamers</td>
<td>0.04%</td>
<td>4,536</td>
<td>5</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Steam Kettles</td>
<td>2%</td>
<td>171,952</td>
<td>172</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Dish Machines</td>
<td>5%</td>
<td>574,763</td>
<td>575</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Laundry</td>
<td>1%</td>
<td>87,492</td>
<td>87</td>
<td>22,120</td>
<td>22</td>
</tr>
<tr>
<td>Commercial Laundry</td>
<td>2%</td>
<td>181,608</td>
<td>182</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cooling Towers</td>
<td>16%</td>
<td>1,695,631</td>
<td>1,696</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Misc. and Unaccounted</td>
<td>5%</td>
<td>485,658</td>
<td>486</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>100%</td>
<td>10,696,278</td>
<td>10,696</td>
<td>2,996,001</td>
<td>2,996</td>
</tr>
</tbody>
</table>

| Actual Reported Consumption | 10,696,278 | 10,696 |
| % Accounted For             | 100.0%     | Overall Savings Percentage | 28.0% |
Toilets, 34%

Urinals, 7%

Faucets, 7%

Showers, 6%

Pre-Rinse Sprayers, 7%

Ice Machines, 1%

Garbage Disposals, 8%

Steam Kettles, 2%

Convection Steamers, 0.04%

Dish Machines, 5%

Laundry, 1%

Commercial Laundry, 2%

Misc. and Unaccounted, 5%

Cooling Towers, 16%
## Water Utility Analysis

### Water Utility Analysis Summary for:

<table>
<thead>
<tr>
<th>Facility Name</th>
<th>Square Footage</th>
<th>Total # of FTE Occupants</th>
<th>Marginal Water Rate ($/kgal)</th>
<th>Marginal Sewer Rate ($/kgal)</th>
<th>Marginal Blended Rate ($/kgal)</th>
<th>Annual Domestic Meter Baseline Consumption (gal/yr)</th>
<th>Annual Irrigation Meter Baseline Consumption (gal/yr)</th>
<th>Total Annual Baseline Consumption (gal/yr)</th>
<th>Baseline GPPPD Benchmark Metric</th>
<th>Baseline GPSF Benchmark Metric</th>
</tr>
</thead>
<tbody>
<tr>
<td>AETC Technical Training Support (SCIF)</td>
<td>54,634</td>
<td>145.4</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>203,774</td>
<td>0</td>
<td>203,774</td>
<td>5.4</td>
<td>3.7</td>
</tr>
<tr>
<td>Airmen Dining Hall</td>
<td>21,030</td>
<td>1,038.8</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>2,869,175</td>
<td>0</td>
<td>2,869,175</td>
<td>10.6</td>
<td>136.4</td>
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<tr>
<td>Army Admin Office - Non AF</td>
<td>26,905</td>
<td>98.1</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>790,832</td>
<td>0</td>
<td>790,832</td>
<td>31.0</td>
<td>29.4</td>
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<tr>
<td>Base Engineer Administration Facility</td>
<td>14,993</td>
<td>19.4</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>41,450</td>
<td>0</td>
<td>41,450</td>
<td>8.2</td>
<td>2.8</td>
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<tr>
<td>Base Engineer Maintenance Shop</td>
<td>23,224</td>
<td>15.8</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>87,300</td>
<td>0</td>
<td>87,300</td>
<td>21.3</td>
<td>3.8</td>
</tr>
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<td>Base Library-Consolidated Learning Center</td>
<td>28,156</td>
<td>68.3</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>83,762</td>
<td>0</td>
<td>83,762</td>
<td>4.7</td>
<td>3.0</td>
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<tr>
<td>Bowling Center</td>
<td>9,139</td>
<td>21.8</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>40,150</td>
<td>0</td>
<td>40,150</td>
<td>7.1</td>
<td>4.4</td>
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<tr>
<td>Carswell Field House Gymnasium</td>
<td>20,110</td>
<td>11.9</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>64,744</td>
<td>0</td>
<td>64,744</td>
<td>21.0</td>
<td>3.2</td>
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<tr>
<td>Chapel Center</td>
<td>15,018</td>
<td>27.9</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>36,050</td>
<td>0</td>
<td>36,050</td>
<td>5.0</td>
<td>2.4</td>
</tr>
<tr>
<td>Communication Facility</td>
<td>25,677</td>
<td>146.6</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>279,009</td>
<td>0</td>
<td>279,009</td>
<td>7.3</td>
<td>10.9</td>
</tr>
<tr>
<td>Communication Facility-Post Office</td>
<td>14,874</td>
<td>216.6</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>416,783</td>
<td>0</td>
<td>416,783</td>
<td>7.4</td>
<td>28.0</td>
</tr>
<tr>
<td>Cressman Hall -Airmen Dining Hall</td>
<td>14,894</td>
<td>431.7</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>1,609,606</td>
<td>0</td>
<td>1,609,606</td>
<td>14.3</td>
<td>108.1</td>
</tr>
<tr>
<td>Headquarters Wing-Norma Brown Bldg</td>
<td>51,173</td>
<td>82.4</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>171,750</td>
<td>0</td>
<td>171,750</td>
<td>8.0</td>
<td>3.4</td>
</tr>
<tr>
<td>Mathis Fitness Center Gymnasium</td>
<td>48,187</td>
<td>44.1</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>219,492</td>
<td>0</td>
<td>219,492</td>
<td>19.1</td>
<td>4.6</td>
</tr>
<tr>
<td>MWR Sup/EQ/Rental/Vet</td>
<td>14,432</td>
<td>6.9</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>12,569</td>
<td>0</td>
<td>12,569</td>
<td>7.0</td>
<td>0.9</td>
</tr>
<tr>
<td>Recreation Center-Event Center</td>
<td>23,967</td>
<td>7.9</td>
<td>$6.45</td>
<td>$2.67</td>
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<td>233,950</td>
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<td>233,950</td>
<td>114.3</td>
<td>9.8</td>
</tr>
<tr>
<td>Security Police Operations</td>
<td>10,030</td>
<td>59.8</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>117,050</td>
<td>0</td>
<td>117,050</td>
<td>7.5</td>
<td>11.7</td>
</tr>
<tr>
<td>Technical Training Classroom-Fire School 345</td>
<td>9,329</td>
<td>22.7</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>1,923,350</td>
<td>0</td>
<td>1,923,350</td>
<td>326.3</td>
<td>206.2</td>
</tr>
<tr>
<td>Technical Training Classroom-Fire School 345</td>
<td>138,058</td>
<td>100.4</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>1,452,400</td>
<td>0</td>
<td>1,452,400</td>
<td>55.6</td>
<td>10.5</td>
</tr>
<tr>
<td>Vehicle Maintenance Shop-Water Valve</td>
<td>25,715</td>
<td>14.8</td>
<td>$6.45</td>
<td>$2.67</td>
<td>$9.12</td>
<td>43,085</td>
<td>0</td>
<td>43,085</td>
<td>11.2</td>
<td>1.7</td>
</tr>
</tbody>
</table>
Comprehensive water management requires an in-depth, real-time understanding of consumption. With shadow meter you can continuously monitor water usage of one site or across an entire portfolio from a single dashboard, including domestic water (bathrooms, kitchen, drinking fountains, etc.), cooling towers, irrigation systems and water-based fire suppression systems. It’s the ideal solution for property managers, facilities engineers and management and sustainability professionals to solve high water use and be warned of leaks.

Our non-invasive leak detection approaches accurately locate the origin of the leak without requiring us to drill through walls, flooring, slabs, and more. With technology such as thermal imaging cameras, snake cameras, acoustic sensor technology, and more, our technicians skillfully locate the problem, rather than guessing or utilizing the “search and destroy” approach.
1) Install the Shadow Meter technology at the source of measurement: The Water Meter.

2) Water Compass manually calibrates the device to ensure accuracy.

3) Data from the water meter is collected continuously in real-time.

4) Collected meter data is uploaded to a secure data center. All meter data is available 24/7 and is accessible through any internet connected device.

5) If a leak occurs, the Water Compass system will alert you via email and SMS text message indicating which water line ruptured as well as how much water was lost.
Measure and Verify

Non-Invasive Ultrasonic Meters

Model and Installation Photos

FM300 US Flow Monitor - Indoor - Pipe Sizes 1/4”-2”

FM300 US Flow Monitor - Indoor/Outdoor - Pipe Sizes 2”-4”

FM300 US Flow Monitor - Indoor/Outdoor - Pipe Sizes 4”-8”
Measure and Verify

Interactive Analytics

LOCATION

Site Groups
- All Sites (4 sites)

My Sites
- Joint Base Myers Henderson Hall (4 meters)

Water Meter
- JBMHH-Main Meter (FM200)

CATEGORIES

Usage Category
- All Categories

KPI
- Usage (Gallons)

DATE & TIME

Date
- 09/01/2019

Target Hour
- 3:00 AM

Last 12 Months

JBMHH-Main Meter at Joint Base Myers Henderson Hall: Total Usage (Gallons)

Month by Day

for September 2019

Day by Hour

for Sunday, Sep 1 2019

Target Hour by Day of Month

3:00 AM for each day in September 2019
### Usage Heatmap - Sep 2019 for JBMHH-Main Meter at Joint Base Myers Henderson Hall

<table>
<thead>
<tr>
<th>Hour</th>
<th>Sunday</th>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
<th>Saturday</th>
</tr>
</thead>
<tbody>
<tr>
<td>Midnight</td>
<td>12102</td>
<td>10802</td>
<td>11885</td>
<td>8927</td>
<td>10841</td>
<td>11364</td>
<td>12413</td>
</tr>
<tr>
<td>1:00 AM</td>
<td>12600</td>
<td>10819</td>
<td>12197</td>
<td>9321</td>
<td>11076</td>
<td>12106</td>
<td>13508</td>
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<tr>
<td>2:00 AM</td>
<td>15264</td>
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What do you touch in a Public Restroom

1. Main Entrance Door
2. Stall Door
3. Toilet Seat
4. Toilet Paper Roll
5. Toilet Flush Valve-Manual
7. Soap Dispenser
9. Paper Towel Dispenser
"Your biggest risk is probably standing really close in line to somebody and not being social distanced while waiting," he said. "That's followed by the aerosol plumes, followed by touching something and then touching your face."

According to Peter Pitts, the president and co-founder of the Center for Medicine in the Public Interest in New York.
Advanced plumbing control systems are now available that can provide real-time operational details.

- Automated alarms/alerts to failed equipment
- Remote access to place equipment out of service
- Fine tuning of flush volumes, allowing for maximum savings generation
State-of-the-art, cloud based, real-time analytics, fixture control and more

- Water Usage Data
- Fixture Controls
- Maintenance Alerts
- Real-Time Activity Logs
- Pressure Data
- Temperature Data
- Rebuild Alerts
- Battery Alerts
- Obstruction Alerts
- Leak Detection
- Cap Removal Alerts
- Pressure Alerts
- Temperature Alerts
- Predictive Maintenance Scheduling
- Email Reporting
Advanced Plumbing Technology

Email Summary Reports

Maintenance Alerts
- Rebuild Required: Urinal 1 / Men’s Room
- Rebuild Required: Urinal 2 / Men’s Room
- Potential Leak: Stall 2 / Women’s Room
- High Temperature: Building 2 / Zone 1
- Low Pressure: Building 1 / Zone 3
- Replenish Paper: Lavatory 4 / Women’s Room
- Unused Fixture: Stall 1 / Men’s Room
- Obstructed IR: Lavatory 6 / Women’s Room

COBALT Connect™ CC3200, CC3000 and FXR-ACC-LAV-FCT Series

Activity Logs
- System Idle
- Activation
- Detection Paused
- Solenoid Off
- Solenoid On
- Presence Exited
- User Detected

Controls

Graphs
- Gallons Used by Fixture Type

NAESCO
A toilet plume is an airborne dispersal of microscopic particles created by the flush of a toilet — is a real phenomenon and, in some cases, a valid public health concern. Flushing a toilet produces both aerosol droplets that mix with the air in the room and larger droplets that land on and contaminate surrounding surfaces.

Because public toilets typically don’t have lids, there’s no way to contain the droplets that are expelled into the air with a flush (never a pleasant thought, but even more so now).
To lid or not to lid, that is the question.

In much of the United States, public toilets don’t have lids. This is due to several reasons. First, toilet seats can be unhygienic. Each public toilet may be used by dozens of people any given day. Seats get soiled, splattered on, and handled by countless users in between cleanings. They’re simply a hotbed for microbes. It’s only logical for business owners and public administrators to do away with them to avoid the proliferation of germs.
Gravity Toilets create turbulence in the toilet bowl when flushed. As a result, water mist with millions of particles of bacteria is created and migrates out of the toilet bowl and onto the toilet seat and surrounding area.

Vacuum Toilets evacuate waste by pulling air into the toilet, eliminating all splash, mist and bacterial migration. The system claims it reduces any health risks associated with sewage waste line back up at the fixture, because toilets flush by drawing air into the toilet bowl, there is no splash during the flush cycle.
Vacuum Toilets

Vacuum plumbing systems are simple and viable alternatives to underground piping that uses the combined energies of vacuum pressure and gravity for the collection, conveyance and disposal of waste through a piping network that can be routed above ground. Vacuum drainage operates on the principal of having a majority of the plumbing system under a continuous vacuum. Hundreds of vacuum drainage systems are in operation around the world and are accepted by most code authorities. Vacuum systems are a viable drainage solution as noted in the latest edition of the IPC and UPC Codes. In addition, many local and state plumbing codes have also accepted vacuum plumbing as an approved alternative for a variety of waste types including condensate, grey water, sanitary waste and grease waste.

Reduces potable water consumption for toilets by as much as 68% and reduces sewage waste discharge with a ½ gallon toilet flush
Faucet Flow Restrictors

**Aerated stream (Comfort) 1.5 GPM**
Aerators introduce air into the water stream to produce a larger and whiter stream that is soft to the touch and non-splashing. Aerators are the usual choice for residential faucet applications.

**Laminar stream (Pure) 1.0 GPM**
Laminar stream straighteners produce a non-aerated water stream. Ideal for high-flow applications or health care facilities (no mix of water/air). NEOPERL® laminar spout-end devices deliver a crystal-clear and non-splashing stream.

**Spray stream .5 GPM**
When the flow rate is too low to produce an aerated or laminar stream, a spray device is used to produce a miniature shower pattern to provide full coverage of the hands during washing. Sprays are recommended for use in public lavatories.

**Rain Spray stream (Rain) 1.5 GPM**
Neoperl's Rain Spray offers a special washing experience. Numerous little nozzles join forces to produce an extensive, abundant and pleasantly effervescent stream of water – a shower sensation for your hands.
Automatic Sensor Faucets

Automatic faucets are common in public washrooms, particularly in airports and hotels, where they are supposed to reduce water consumption (however, some evidence to the contrary has been published) and reduce the transmission of disease-causing microbes. They can also be found in some kitchens and in the washrooms of some private residences. Other uses include providing drinking water to pets or livestock, whereby the presence of an animal allows water to flow into a watering trough or dish.
No. Hand dryers are not effective in killing the 2019-nCoV.
To protect yourself against the new coronavirus, you should frequently clean your hands with an alcohol-based hand rub or wash them with soap and water. Once your hands are cleaned, you should dry them thoroughly by using paper towels or a warm air dryer.

#2019nCoV
Architectural hardware purveyor ASSA ABLOY has introduced an entire suite of opening solutions that require little to no contact for improved hygiene. These include automated technologies like motion sensors and wave-to-open switches, as well as hand-free hardware like foot pedals and hip pulls.

“Hands-free solutions offer quick and easy retrofit opportunities. They offer a way to improve facility cleanliness by reducing touchpoints on highly trafficked openings,” said Stacey Callahan, vice president of ASSA ABLOY’s Door Group.
Conclusion

For manufacturers and architects, and building owners, restroom design will need to be seriously reconsidered. In both new designs and retrofits, a snafu of issues like gender diversity, accessibility, and prevention of virus spreading provide new opportunities to explore new, useful design solutions. Hopefully, this will be coupled with new building codes that will enforce hygiene measures, that, in turn, help the public to feel safer in the wake of COVID-19.

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