Welcome! We Will Begin Shortly.

- **Login or Audio Troubles**
  - Please type questions in chat window for help.
  - If you cannot hear the audio through the computer, you can listen in by calling:

Dial in by phone

+1 202-991-0477,,687235905# United States, Washington

Find a local number

Phone conference ID: 687 235 905#

- **Questions**
  - There will be a Q&A session at the end of the presentation.
  - Submit questions to the organizer and panelists via the chat window
- **Presentation Slides & Recording**
  - Presentation slides will be sent to all participants.
  - This session will be recorded.
- **Notes**
  - To improve audio quality, all attendees are muted upon entry.

Saving Water and Costs in Restrooms with WaterSense

Kersey Manliclic, EPA WaterSense

Robbie Pickering, ERG

Allen Evans, Henderson Engineers

EPA WaterSense

May 28, 2025

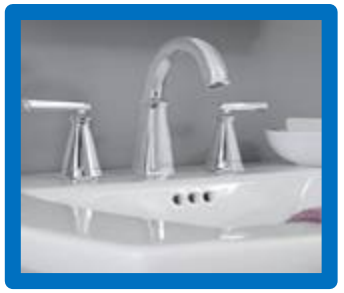
What is WaterSense?

- WaterSense is a voluntary program launched by EPA in 2006 that provides a simple way to identify water-efficient:
  - Products
  - Programs
  - Practices
  - Homes
- Products are independently certified for water efficiency **and** performance

WaterSense Labeled Products

Indoor products

Showerheads



Lavatory Faucets

NEW Point-of-use Reverse Osmosis Systems

Tank-Type Toilets

Flushometer Valve Toilets

Flushing Urinals

Outdoor products

Spray Sprinkler Bodies

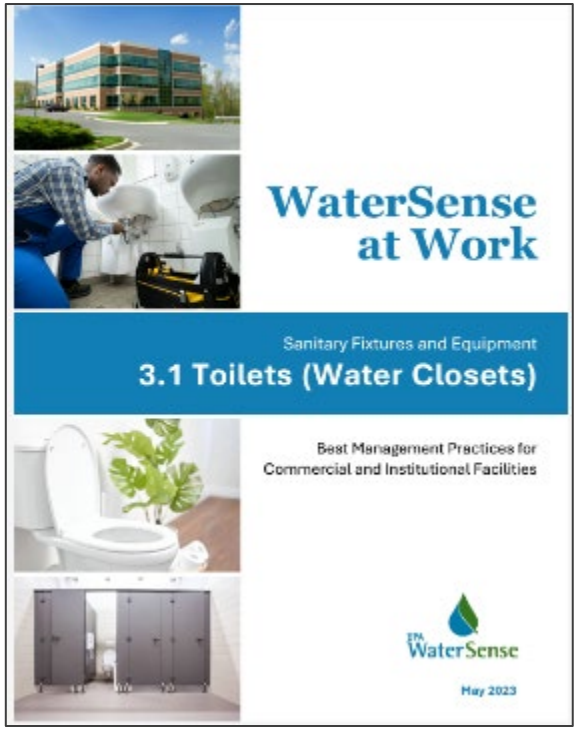
Weather-based

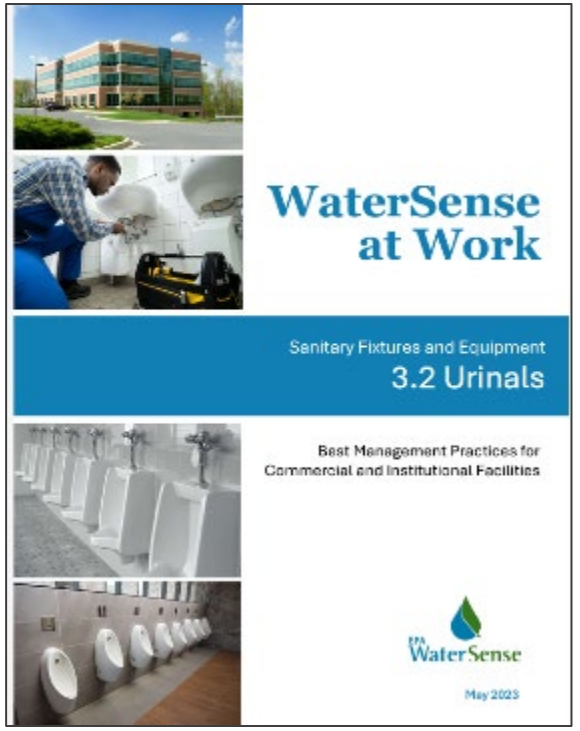
Soil Moisture-based

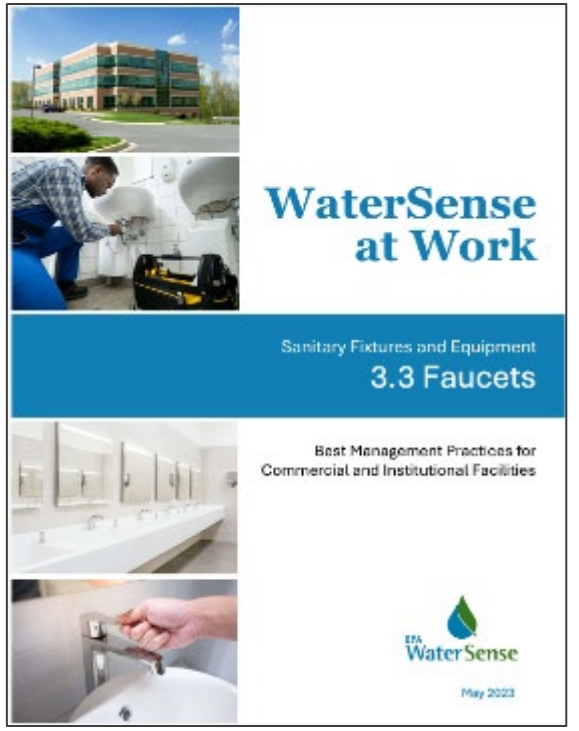
Irrigation Controllers

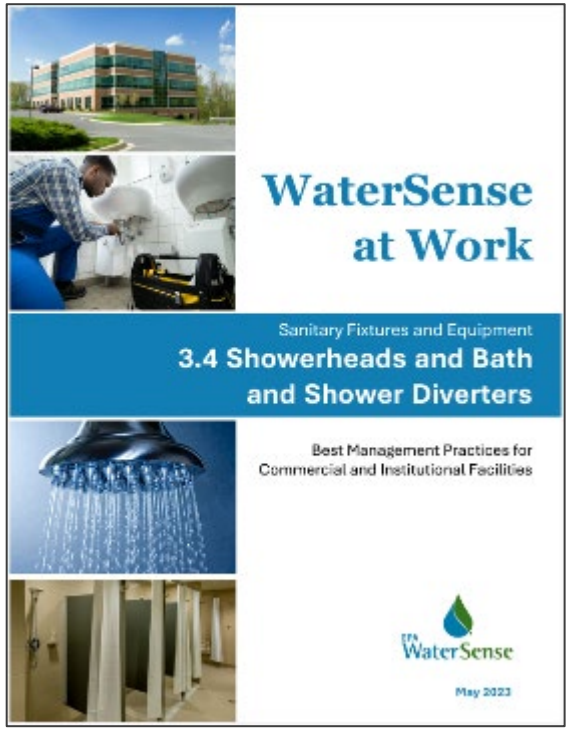
More than **45,000** product models have earned the label.

Best Management Practices



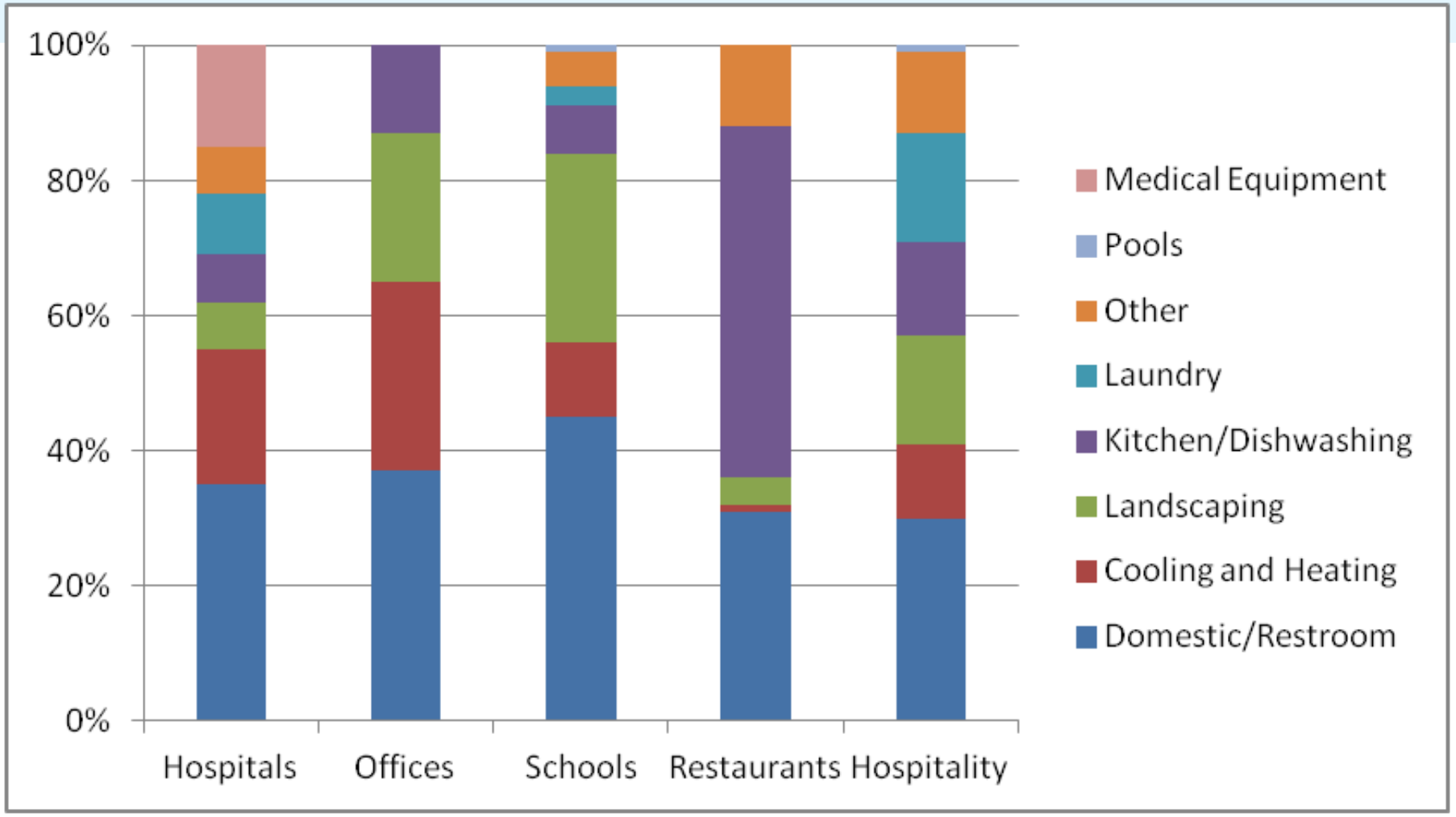






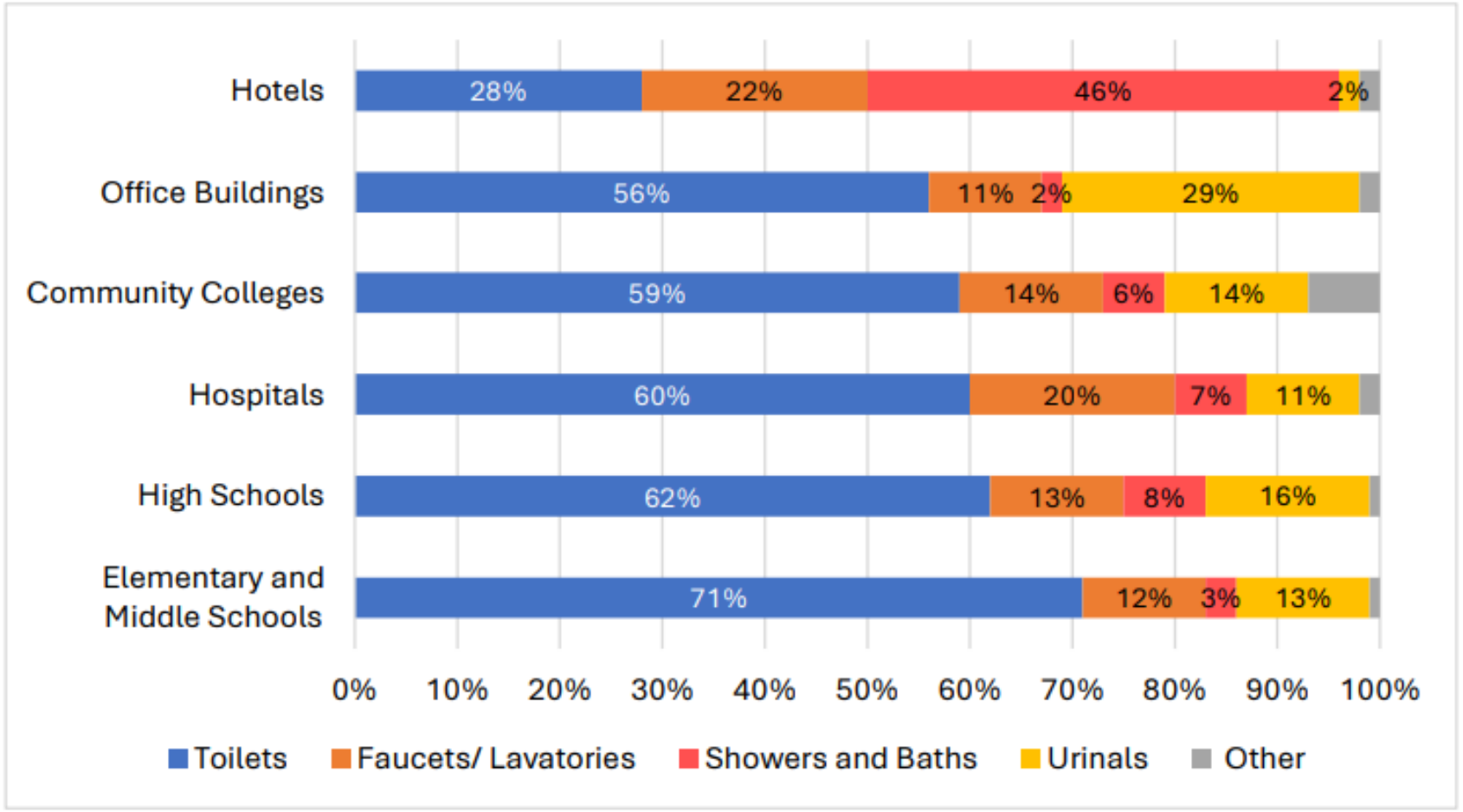
www.epa.gov/watersense/best-management-practices

Water Use Profiles of C&I Facilities



Created by analyzing data from: New Mexico Office of the State Engineer, American Water Works Association (AWWA), AWWA Research Foundation, and East Bay Municipal Utility District

Restroom Use by Facility Type



Created from data collected by HW (Bill) Hoffman & Associates, LLC from water assessments at 173 commercial and institutional buildings in Texas between 2011 and 2015.

Toilets

3.5 to 7.0 gallons per flush (gpf)
(13 – 26 liters per flush lpf)
Models installed before 1994

1.6 gpf
(6 lpf)
EPAct 1992 requirement

≤ 1.28 gpf
(4.8 lpf)
WaterSense labeled models

Flushometer-valve toilets mostly found in public/ commercial building restrooms

Tank-type toilets mostly found in private restrooms

WaterSense labeled models

- Flush at 1.28 gpf or less
- Meet waste removal/flush performance requirements

look for WaterSense Meets EPA Criteria

Urinals

look for WaterSense Meets EPA Criteria

1.5 to 3.0 gpf
(5.7 – 11.4 lpf)
Models installed before 1994

1.0 gpf
(3.8 lpf)
EPAct 1992 requirement

≤ 0.5 gpf
(1.9 lpf)
WaterSense labeled models

Primarily found in public/commercial building restrooms

WaterSense labeled models

- Flush at 0.5 gpf or less
- Meet fixture and flushing device standards to ensure product performance

Public-Use Lavatory Faucets

- Most common in commercial facilities
- Primarily used for hand-washing so have lower maximum flow rate
- No WaterSense specification because national plumbing codes already require an efficient flow rate

2.5+ gallons per minute (gpm)
(9.5 lpm)
Models installed before 1994

2.2 gpm
(8.3 lpf)
Current Federal Standard

0.5 gpm
(1.9 lpm)
ASME/CSA standard, IPC, and UPC

Private-Use Lavatory Faucets

- Found in private restrooms
- Used for shaving, washing your face, brushing your teeth, and handwashing
- WaterSense labeled models
  - Flow at 1.5 gpm or less
  - Meet national standard requirements and minimum flow rate to ensure product performance

2.5+ gpm
(9.5 lpm)
Models installed before 1994

2.2 gpm
(8.3 lpm)
Current National Standard

≤ 1.5 gpm
(5.7 lpm)
WaterSense labeled models

look for WaterSense Meets EPA Criteria

Showerheads

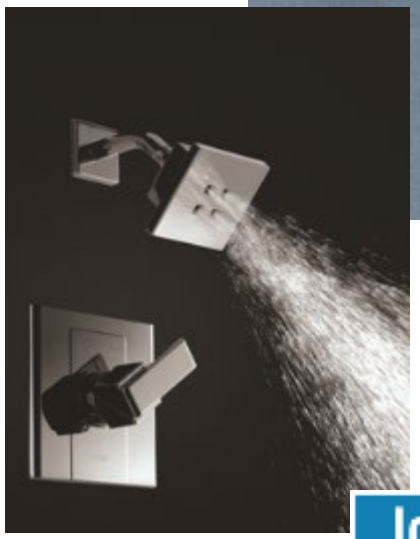
3.5 to 5.0 gpm
(13 – 18.9 lpm)
Models installed before 1994

2.5 gpm
(9.5 lpm)
EPAct 1992 requirement
Current Federal Standard

≤ 2.0 gpm
(7.8 lpm)
WaterSense labeled models

Showers are found in some commercial facilities:

- dormitories
- locker rooms
- fitness centers
- multi-family residential units
- office buildings



WaterSense labeled models

- Flow at 2.0 gpm or less
- Meet spray coverage/force requirements to ensure product performance

look for WaterSense Meets EPA Criteria

Water-Savings Hierarchy

1. Operations & Maintenance – Low level of effort, no/low capital expenditure

- Perform regular operations and maintenance on restroom fixtures
- Find and fix leaks

2. User Education

- Post signs to help building occupants use water efficiently and report leaks

3. Equipment Retrofits

- Retrofit plumbing products to save water (e.g., replace aerators, replace flush valve inserts) – Check manufacturer warranties!

4. Equipment Replacements

- Replace older, high-flowing fixtures and fittings with WaterSense labeled products

General Restroom Maintenance

Test

Test the water pressure serving each floor to achieve expected fixture performance – optimal pressure is between 20 and 80 psi

Inspect

Annually inspect valves and replace worn parts

Adjust automatic sensors on fixtures

Check

Check for tampering – dissatisfied users can disable sensors, remove aerators, or otherwise damage fixtures

Remove

Regularly inspect for and remove scale build-up and biofilm on all fixtures especially faucets and showerheads

Stop Running Toilets!

Periodically check tank-type toilet fill valves and tank water levels

- Adjust the float lower if the water level is set above the overflow tube.
- A constantly running fill valve can waste between 0.5 and 3 gpm, wasting up to 4,000 gallons of water per day.

Use dye tablets or food coloring to test toilet flappers for leaks annually

- Small leaks from worn toilet flappers may be hard to detect, but they can waste approximately 30 gallons per day, or 900 gallons per month.

Replacing fill valves or installing a new flapper will pay for itself in avoided water and wastewater costs in one to two months

A running toilet at 0.5 gpm can waste 21,600 gallons of water per month!

Leaky Loo McFlapper leading the race to catch leaks in AZ

Verifying Water Use Manually

Flushometer-Valve Toilets and Flushing Urinals – Timed Flush Test

- Count the number of seconds that elapse during flush cycle time
- Multiply seconds by 0.42 for flushometer-valve toilets and 0.25 for urinals to get gallons per flush*
- Some flushometer-valve toilets and urinals can run continuously if they have worn parts!

Flush Volume	Expected Flush Time
Toilets	
1.6 gpf	4 seconds
1.28 gpf	3 seconds
1.1 gpf or less	2 to 2.5 seconds
Urinals	
1.0 gpf	4 seconds
0.5 gpf	2 seconds
0.25 or less gpf	1 second

*South Florida Water Management District *Water Efficiency and Self-Conducted Water Audits at Commercial and Institutional Facilities Guide* https://www.sfwmd.gov/documents-by-tag/waterefficiency

Verifying Water Use Manually

Faucets and Showerheads – Timed Flow Test

- Use a flow-gauge bag or a measuring cup or pitcher of a known volume to measure volume of flow per unit of time

Automatic Sensors in Public Restrooms

- Automatic sensors are not intended for water efficiency; they are for hygiene
- Malfunctioning sensors can:
  - Flush toilets and urinals unnecessarily – known as double or phantom flushes
  - Run faucets longer than needed or cut off too early forcing users to use extra cycles
- Sensors can be disabled by dissatisfied users or cleaning staff
- **Calibrate sensors regularly** using the manufacturer's instructions

Fix Obvious Leaks

Check at each end-use on a regular basis to find leaks and water waste

- Plumbing products fail open and leak, unlike energy products that just stop working
- Users can leave water running
- Physical components break down over time - valves, flappers, and gaskets

A leaky faucet dripping at one drip per second can waste nearly **3,200 gallons of water per year**

Educate Building Occupants

Post signage in restrooms with:

- water saving factoid or call to action
- contact info for repairs

Post instructions with new technologies especially dual-flush fixtures

Post Signage to Educate Building Occupants

[WaterSense Fix a Leak Week Materials for the Workplace]

[ENERGY STAR Battle of the Building Activity Kits]

Retrofits

Product	Retrofit Option
Tank-type toilets	• **Generally none** – don't use displacement bags, early-closing flappers, or valves with other flush volumes

Flushometer-valve toilets	• For toilet bowls marked 1.6 gpf or less, **if the manufacturer allows**, consider:
	  • Valve inserts with lower flush volumes
	  • Dual-flush retrofit kits

Urinals	• For urinals marked 1.0 gpf or less, **if the manufacturer allows**, consider valve inserts with lower flush volumes
Private-use faucets	• WaterSense labeled faucet accessory
Public-use faucet	• 0.5 gpm faucet accessory
Showerheads	• Thermostatic shut-off valve

Faucet Accessories

Average cost = $5-10 each

Standard Aerator

Common in private-use faucets

Spray Aerator

Common in public-use settings

Laminar Flow Device

Common in commercial/high-use applications or healthcare facilities

Water-Efficient Restroom Product Replacements

	Private Restrooms	Public Restrooms
Toilets	Tank-type ≤ 1.28 gpf	Flushometer Valve ≤ 1.28 gpf
Faucets/Laminar Flow Devices	Lavatory ≤ 1.5 gpm	0.5 gpm OR 0.25 gpc
Showerheads	≤ 2.0 gpm	
Urinals	Flushing Urinals ≤ 0.5 gpf	

www.epa.gov/watersense/product-search

Calculating Potential Savings

Occupancy data (number of building occupants) is vital to accurate savings calculations – restrooms water consumption is based on usage, not the number of fixtures

Lots of other assumptions and data needed like:

- Product flush volume or flow rate
- Daily use time for faucets and showers
- Male/female ratio to calculate toilet vs urinal use
- Days of facility operation per year

WaterSense at Work best management practices includes detailed assumptions and calculations to help you.

Check with your utility for rebates!

Other Efficiency Related Topics

- Use of reclaimed/recycled water for toilets and urinals
  - Some manufacturers have developed equipment specifically for use with reclaimed water
  - Reclaimed water can have higher salinity and is not treated to drinking water quality
- Internet of Things (IoT) devices
  - Connected devices can offer insights on water usage, leaks, or maintenance needs
  - Helps with proactive maintenance
- Leak detection
  - Integral or after-market devices to monitor for water leaks

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HENDERSON BUILDING SOLUTIONS

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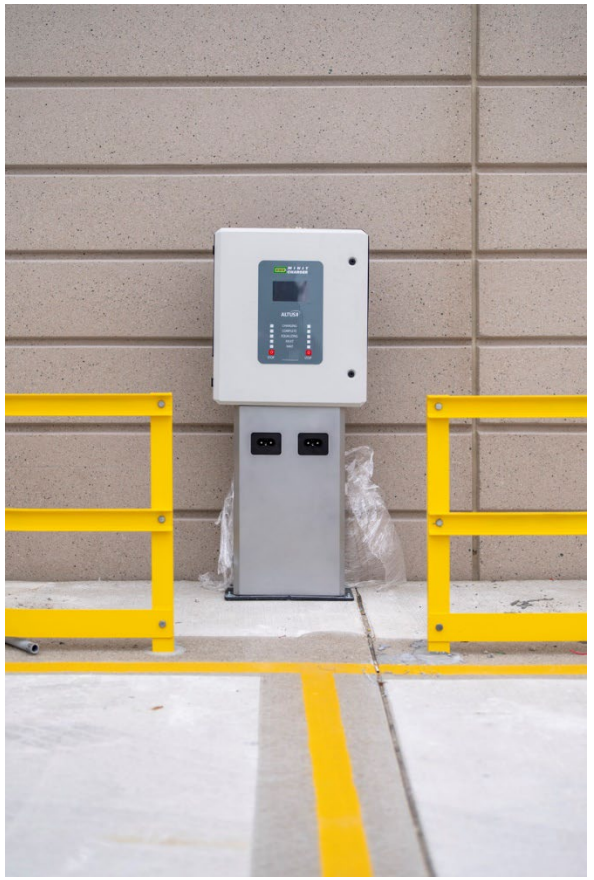
RESTROOM PLUMBING DESIGN FOR MCI AIRPORT

HENDERSON UNIVERSITY

LEED GOLD

- All-electric central plant and domestic water heating
- City and Aviation Department commitment to purchasing renewable energy
  - Significant reductions in greenhouse gas (GHG) emissions vs. traditional building with natural gas boilers/water heaters
- LED lighting in terminal and garage, using significantly less power than baseline
- PV array on south facing façade of garage, optimizing energy performance credits
- Used advance energy monitoring
- 30% domestic water savings
- Domestic water metering
- Heat recovery chillers
- Tied VAV boxes into the lighting occupancy sensors



HENDERSON DECARBONIZATION GOALS

- Water-related carbon emissions are approximately 5% of all U.S. carbon emissions
- Water heating is estimated to be about 70% of water-related carbon emissions
- Wastewater treatment is about 18% of water-related carbon emissions
- Water supply is about 8% of water-related carbon emissions
- Agricultural activities are about 6% of water-related carbon emissions

HENDERSON DECARBONIZATION GOALS

Henderson Engineers is committed to reduce operational, and embodied carbon across MEP systems on all projects, targeting zero by 2040.

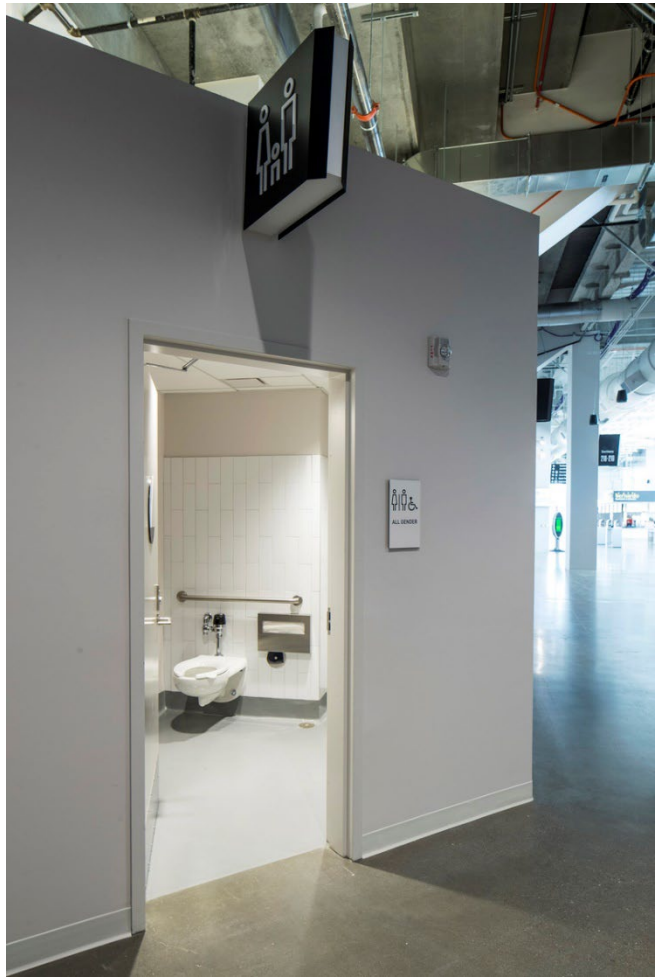
Execution Plan:

- Exceed WaterSense flow rates for all plumbing fixtures
  - Commercial grade fixtures meeting WaterSense are readily available at no extra cost
  - WaterSense is our baseline for specifying fixtures (water closets, urinals, faucets, and showerheads)
- Communicate Value Add – Building owners like plumbing fixtures/equipment that save water and water heating energy

HENDERSON DECARBONIZATION GOALS

Henderson uses these flow rates for the following fixtures:

- Water Closets = 1.28 GPF or dual flush closets
- Urinals = 0.125 GPF
- Public Lavatories = 0.5 GPM
  (0.125 gallons per fifteen second cycle)
- Kitchen Sinks = 1.5 GPM
- Showers = 1.75 GPM



HENDERSON DESIGNS PER THE INTERNATIONAL ENERGY CODE

C404.5.1 Maximum allowable pipe length method.

The maximum allowable piping length from the nearest source of heated water to the termination of the fixture supply pipe shall be in accordance with the following. Where the piping contains more than one size of pipe, the largest size of pipe within the piping shall be used for determining the maximum allowable length of the piping in Table C404.5.1.

1. For a public lavatory faucet, use the "Public lavatory faucets" column in Table C404.5.1.
2. For all other plumbing fixtures and plumbing appliances, use the "Other fixtures and appliances" column in Table C404.5.1.

TABLE C404.5.1PIPING VOLUME AND MAXIMUM PIPING LENGTHS

NOMINAL PIPE SIZE (inches)	VOLUME (liquid ounces per foot length)	MAXIMUM PIPING LENGTH (feet)	
		Public Lavatory Faucets	Other Fixtures and Appliances
1/4	0.33	6	50
5/16	0.5	4	50
3/8	0.75	3	50
1/2	1.5	2	43
5/8	2	1	32
3/4	3	0.5	21
7/8	4	0.5	16
1	5	0.5	13
1 1/4	8	0.5	8
1 1/2	11	0.5	6
2 or larger	18	0.5	4

FIXTURE TYPES

- Public wall mounted water closets with concealed “hydro power” flush valves
- Public wall mounted urinals with similar concealed “hydro power” flush valves
- Concealed flush valves were used for the public water closets and urinals and accessed from the plumbing chase

FIXTURE TYPES

- Sinks in staff areas have manual ADA gooseneck faucets with 1.5 gpm aerators
- Electric water coolers - wall mounted modular hi-low type with bottle filler. Several locations have remote chillers as required
- Hand washing stations are double or triple stations of solid surface construction for durability and maintainability

FIXTURE TYPES

ALL-GENDER RESTROOM VS. MEN'S & WOMEN'S

- All-Gender = all water closets
- Group lavatories for all users in common location
- Full height individual stalls with locking doors
- Doors have no cracks to see through
- No urinals in All-Gender restrooms

ALL-GENDER RESTROOMS

The airport was designed under the 2018 IBC.

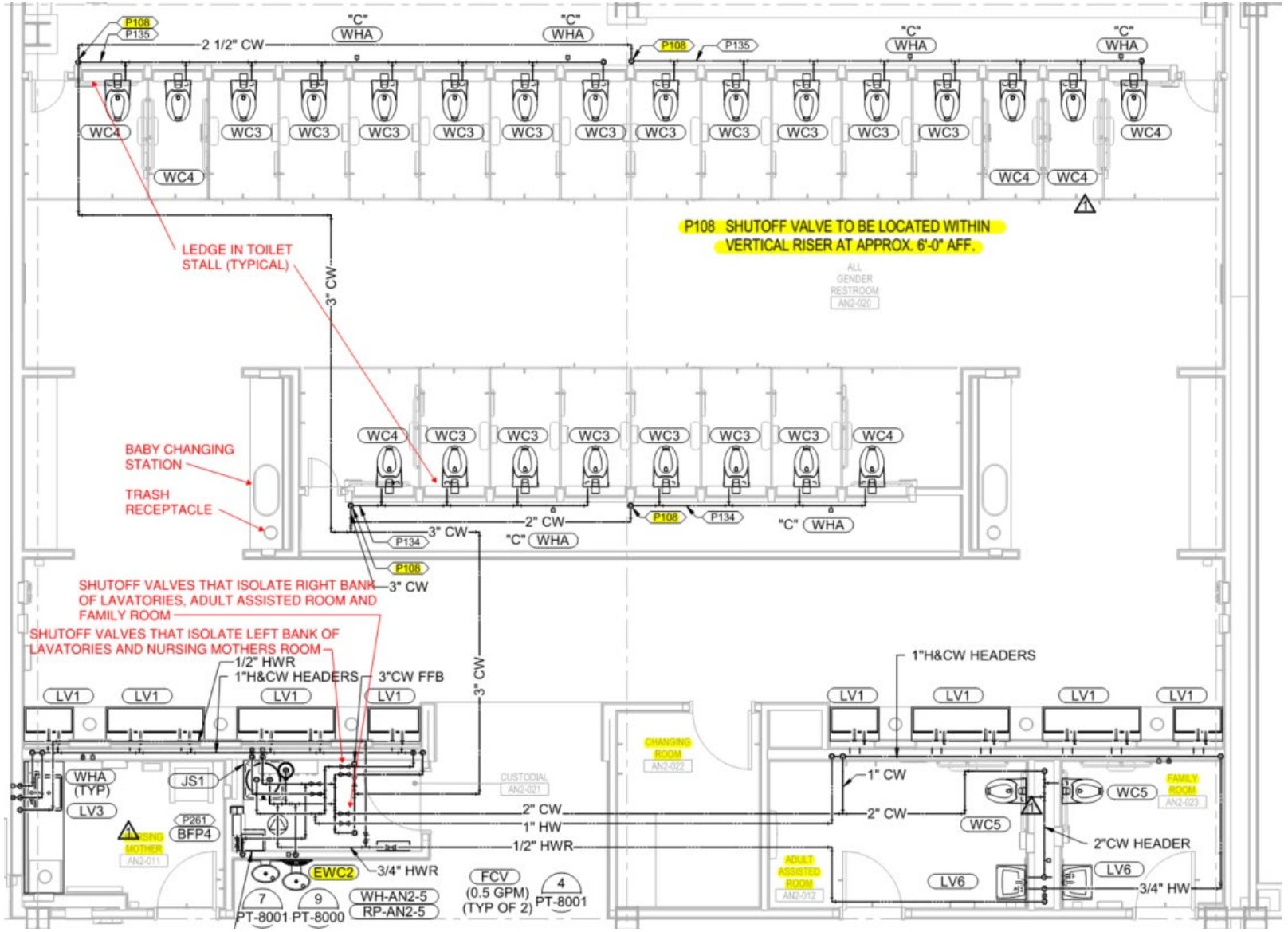
Exception #2 was added to the 2021 IBC and used with approval per below:

Where multiple-user facilities are designed to serve All-Genders, the maximum fixture count shall be calculated at 100 percent, based upon total occupant load. In such multiple-user facilities, each fixture type shall be in accordance with ICC 117.1 and each urinal that is provided shall be located in a stall.

2902.2.2 Fixture Calculations

To determine the occupant load of each sex, the total occupant load shall be divided in half. To determine the required number of fixture ratio or ratios for each fixtures type shall be applied to the occupant load of each sex in accordance with table 2902.1. Fractional numbers resulting from applying the fixture ratios of the Table 2902.1 shall be rounded up to the next whole number. For calculations involving multiple occupancies, such fractional numbers for each occupancy shall first be summed and then rounded up to the next whole number.

ALL-GENDER RESTROOM VS. MEN'S & WOMEN'S



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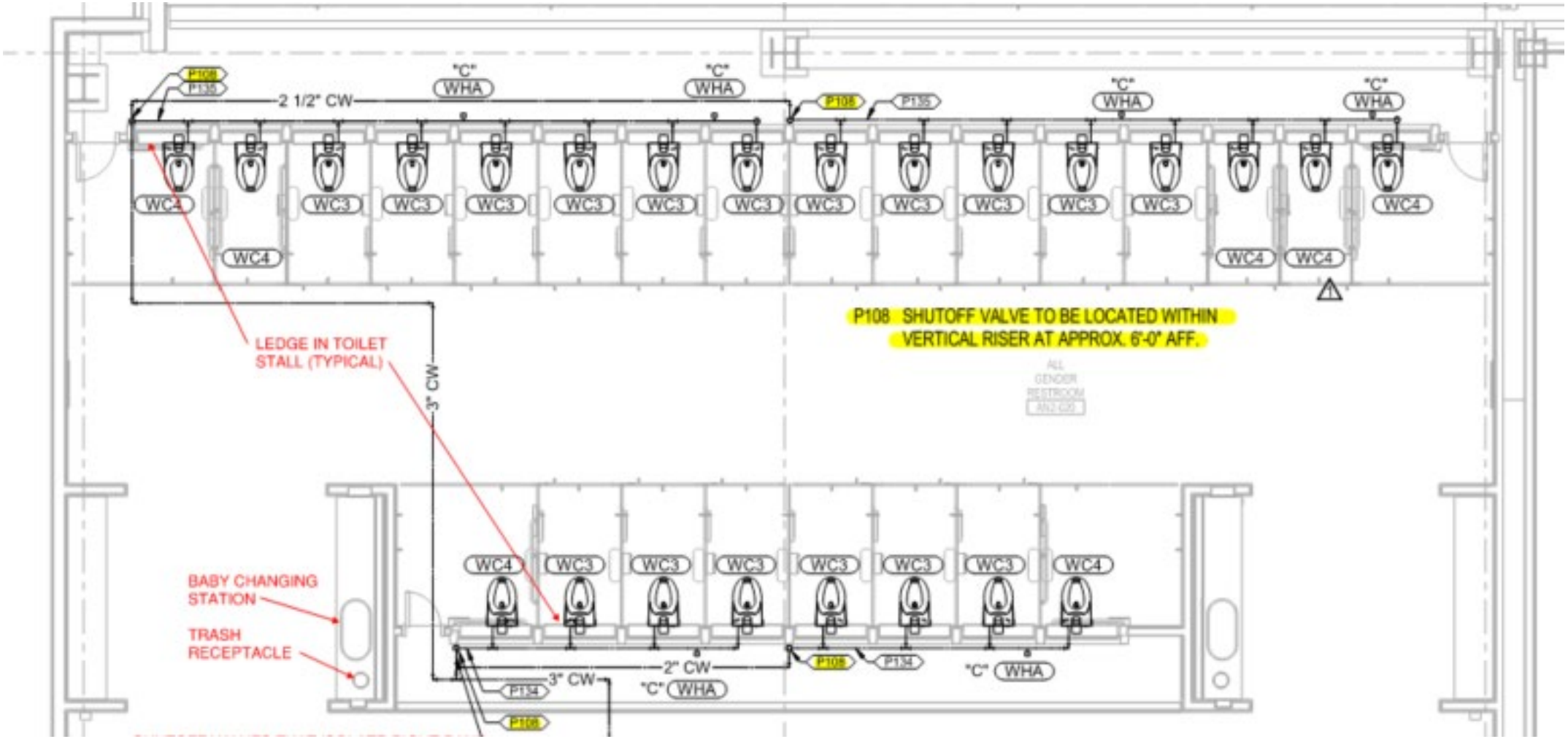
ALL-GENDER RESTROOM VS. MEN'S & WOMEN'S



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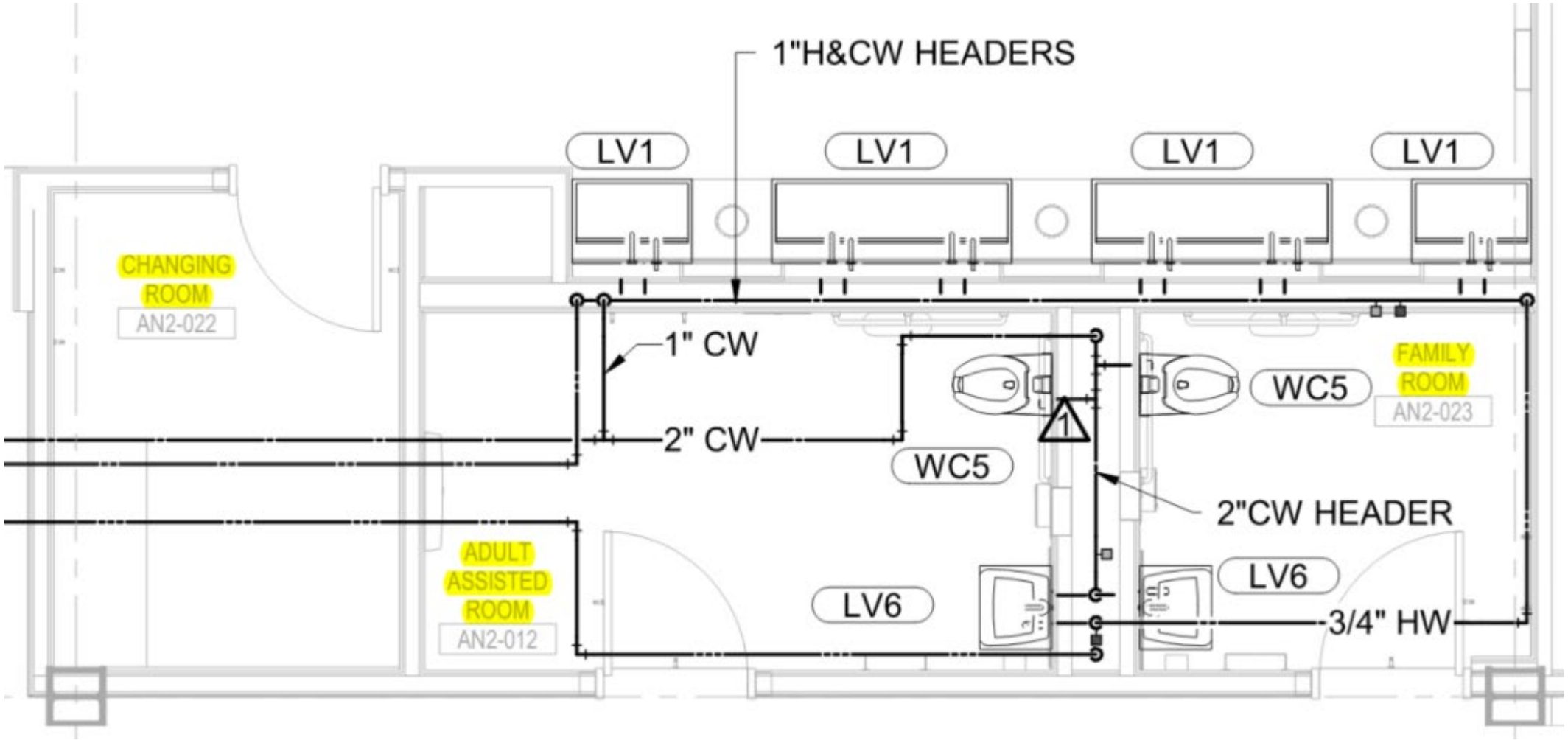
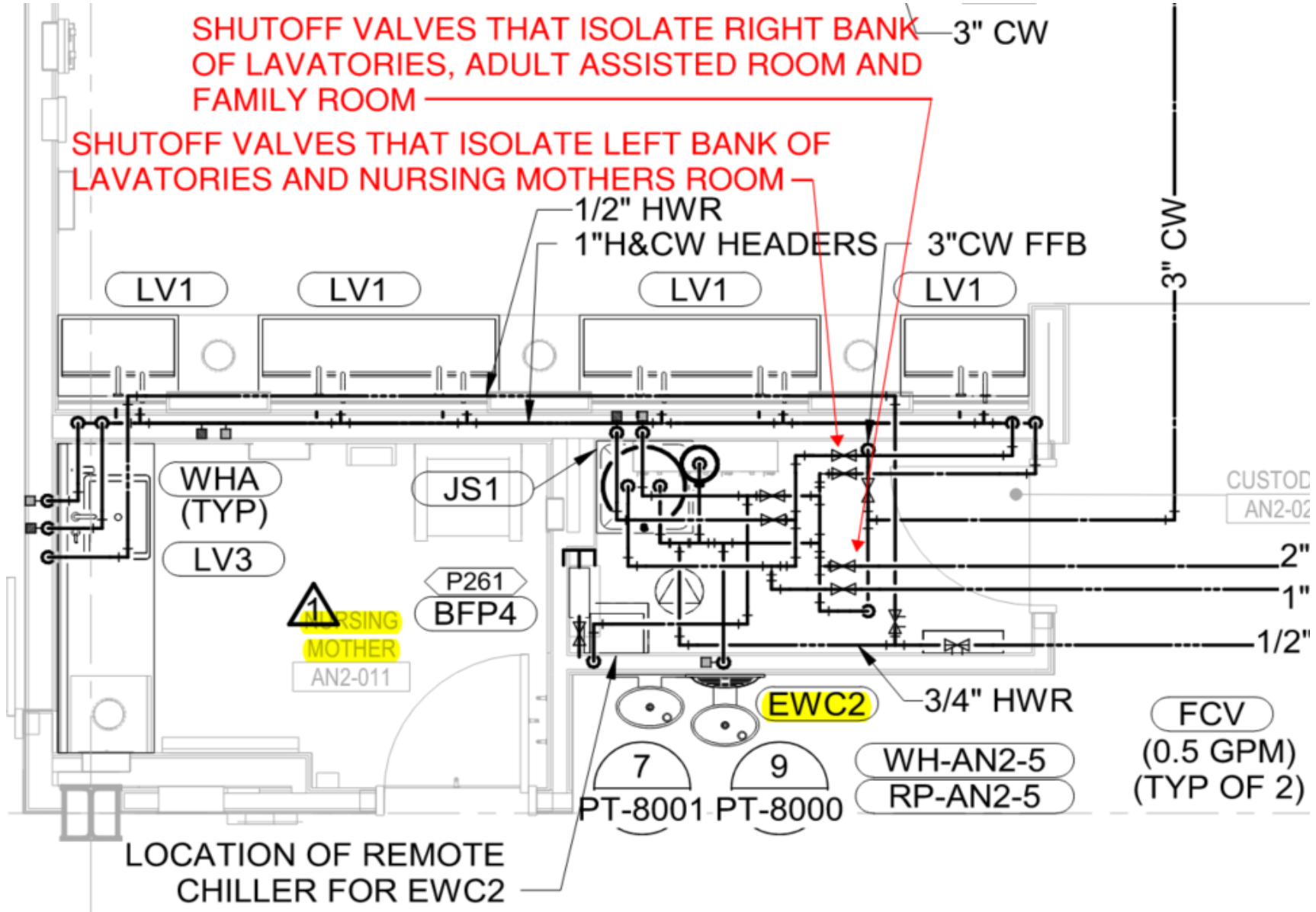
ALL-GENDER RESTROOM VS. MEN'S & WOMEN'S



ALL-GENDER RESTROOM VS. MEN'S & WOMEN'S



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NURSING MOTHER'S ROOM

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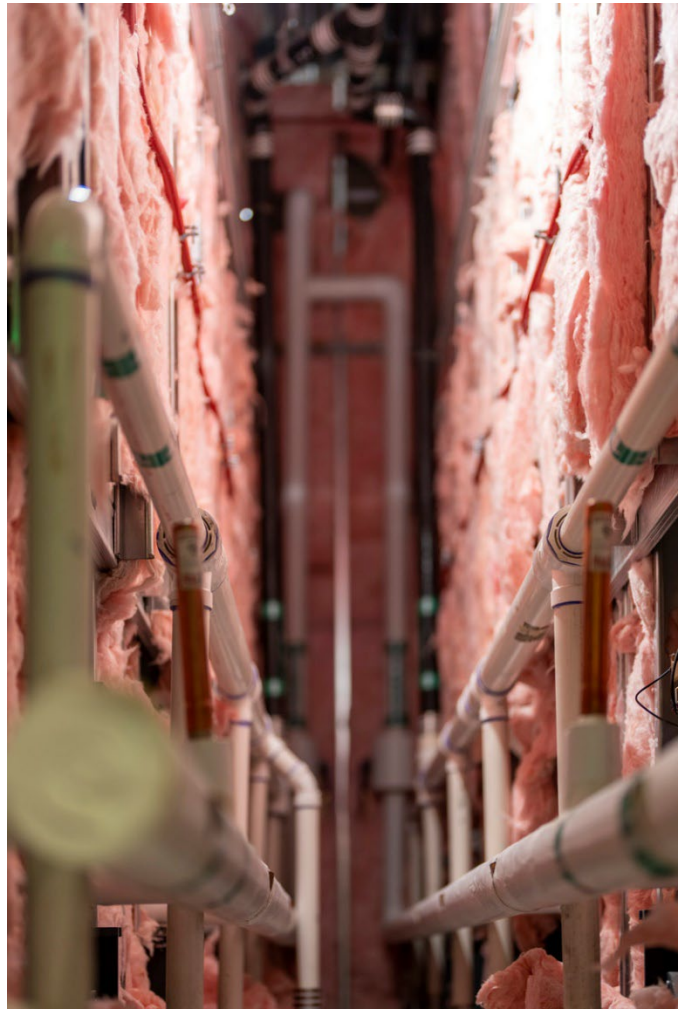
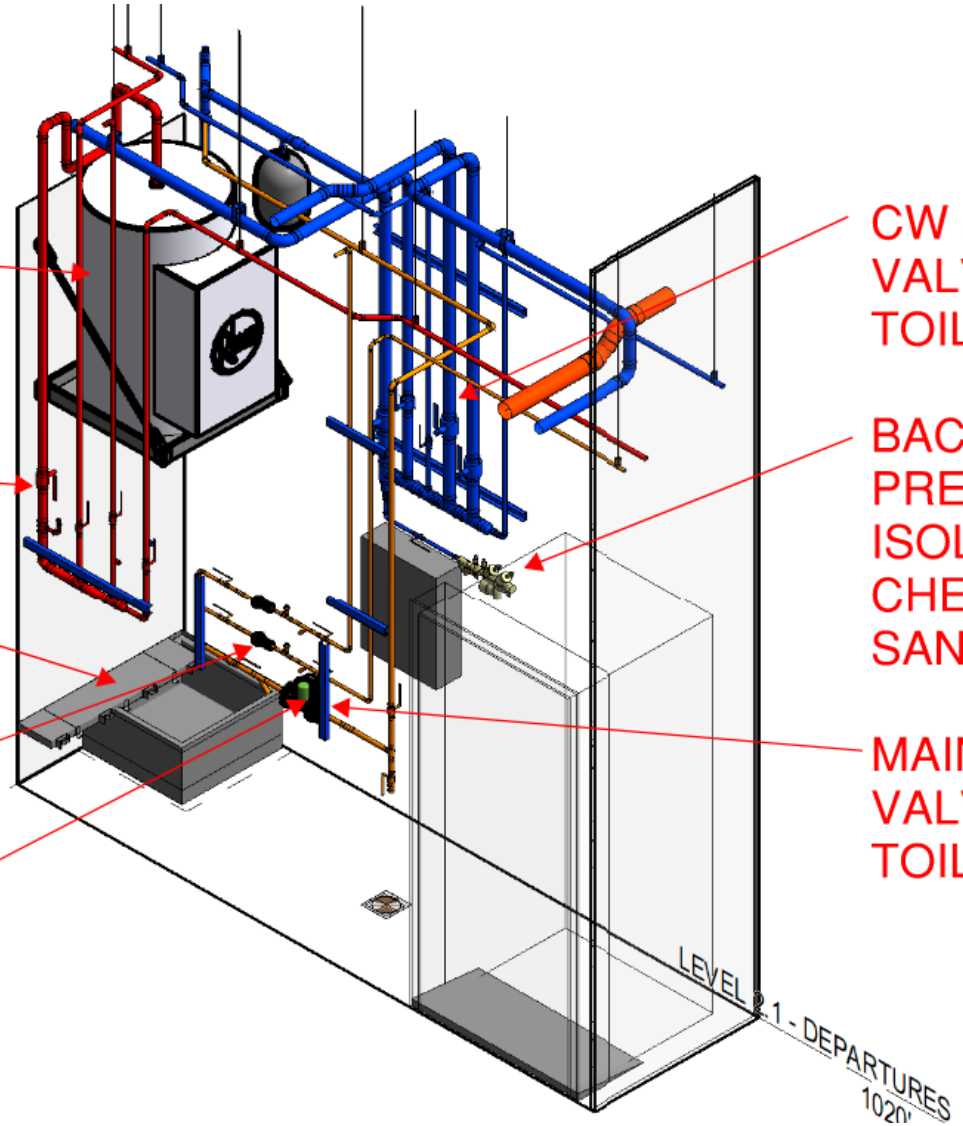
RESTROOM GENERAL CONFIGURATION

- Hot water fed with water heater(s) located in custodial room next to sinks/lavatories
- Accessible chase is minimum 30” wide for maintenance personnel access
- Master shutoff valve in custodial room to shutoff entire restroom
- Shutoff valve in accessible chases for isolating water closets and urinals
- Shutoff valves for isolating handwashing stations
- Flow control valves for the HWR system located in custodial room
- Floor drains in accessible chases for leaks



CUSTODIAL ROOMS



CUSTODIAL ROOMS

30 GALLON WATER HEATER HUNG FROM STRUCTURE

SHUTOFF VALVES FOR HAND WASHING STATIONS AND TOILET CHASES

MAIN SHUTOFF VALVE SERVING TOILET ROOM

BACKFLOW PREVENTER ISOLATING CHEMICAL SANITIZING SYSTEM

HWR FLOW CONTROL VALVES FROM HAND WASHING STATIONS

RECIRCULATION PUMP

JANITOR SINK

IOT PLUMBING FIXTURES

IoT stands for the "Internet of Things"

IOT PLUMBING FIXTURES

Connected products offerings:

- Notify of constant running water
- Fixture not flushed for # of days
- Perform line flushes to clean out systems
- Shows who is washing hands and who isn’t
- Inform of when bottle filling station filters need to be changed
- Informs when a backflow is discharging (currently one manufacturer)
- Grease interceptor levels (currently one manufacturer)
- Coming to roof and floor drains (currently one manufacturer)

UNIVERSITY OF KANSAS

Original Plan by the University

- Preventative Maintenance based on the # of buildings and # of fixtures
- Using the system instead of call tags and shutting down buildings or restrooms
- Does the fixture work or is it running all the time?

New Usage Plan (including Original plan)

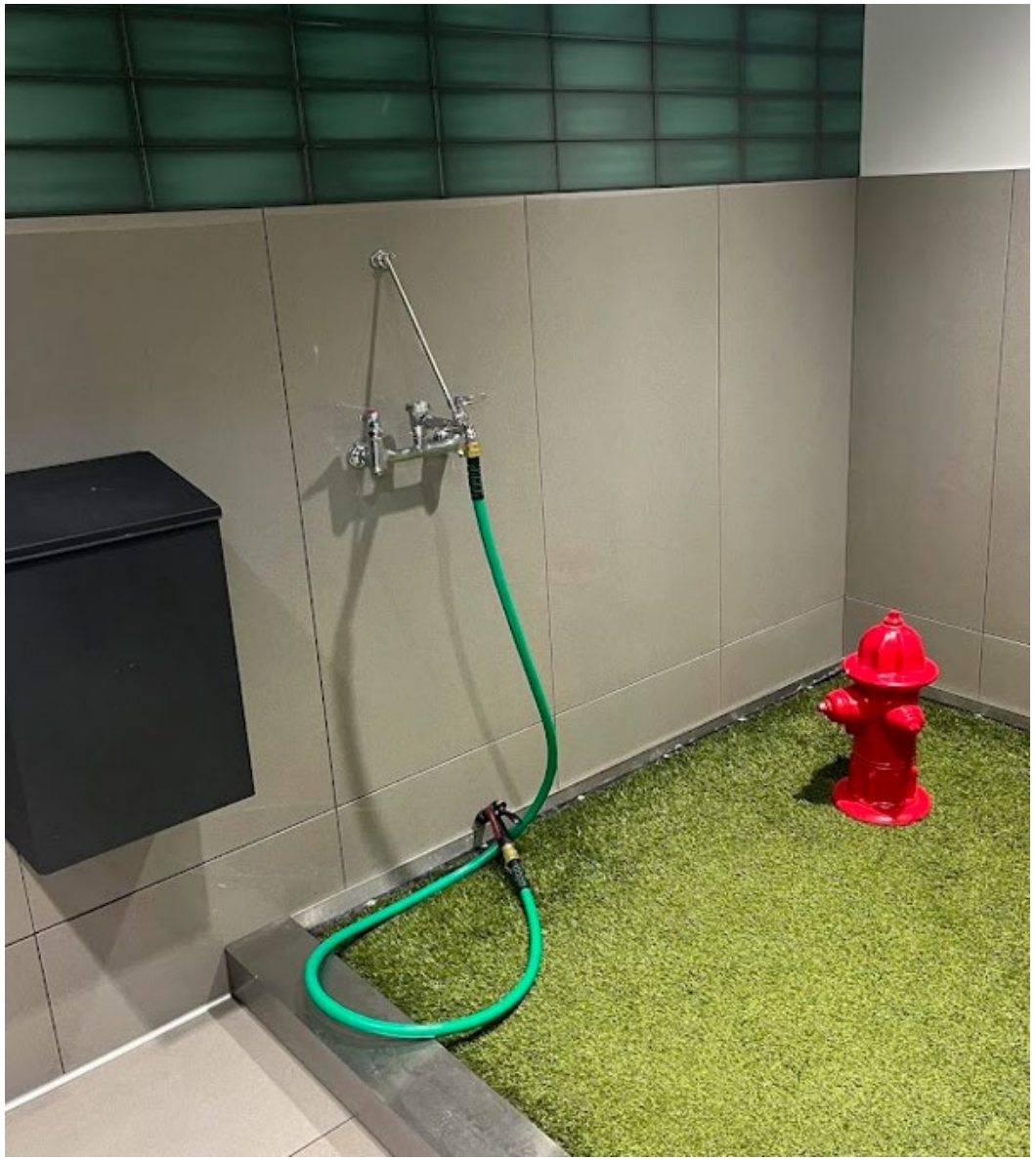
- Battery life (level)
- Line clean out
- Which fixtures get the most use
- Maintenance Staff can put in the work order themselves to have something fixed
- One person in charge of guiding others

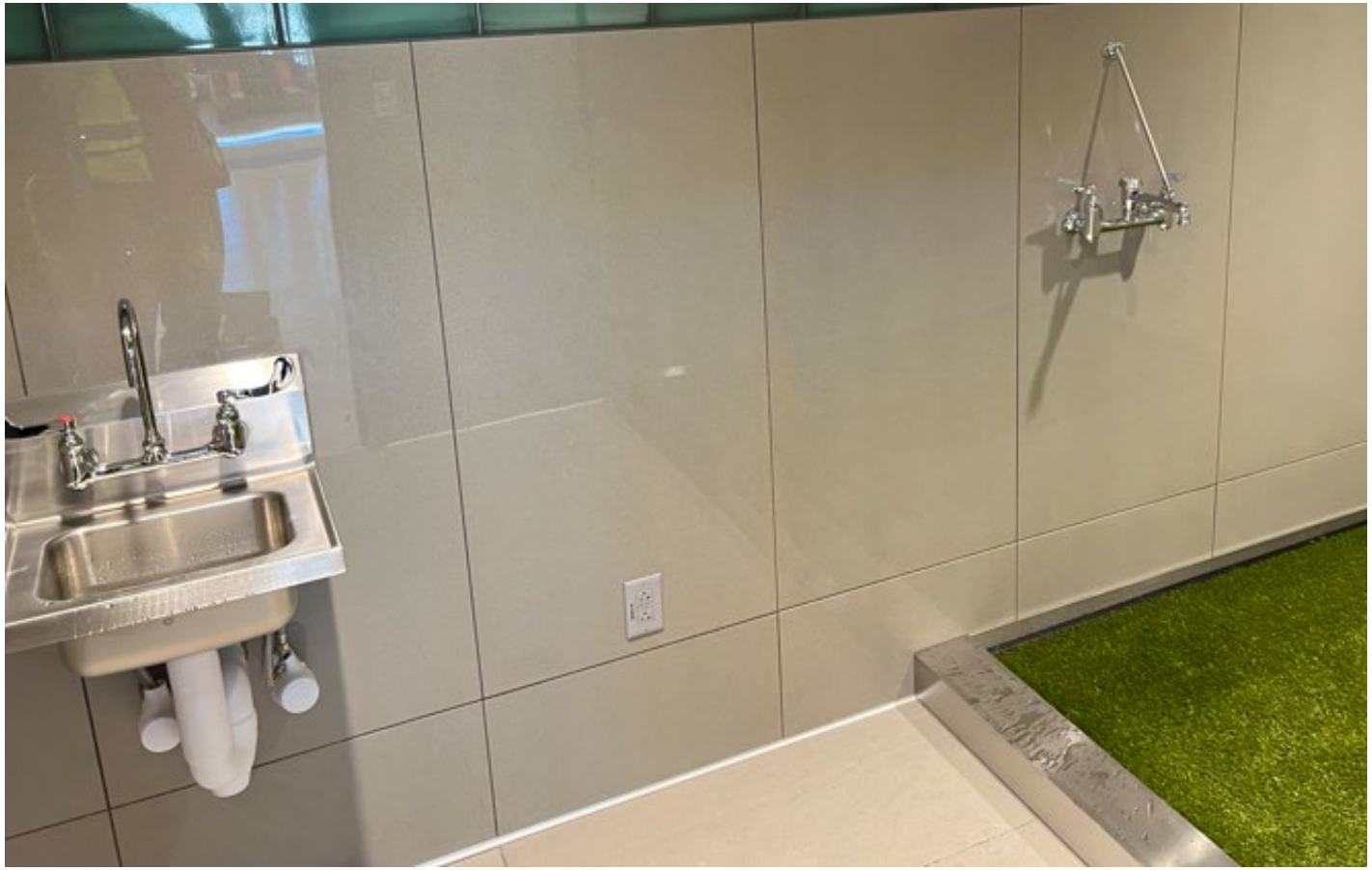
IOT PLUMBING FIXTURES

Connected products offerings:

- Maintenance staff can now plan maintenance vs. reacting to problems
- Fixtures with most use known
- Staff can focus on what needs to be done at hand, not spend time looking for problems
- If a leak occurs, maintenance is alerted faster, wasting less water

PET RELIEF AREAS





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QUESTIONS

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What You Can Do Right Now

- Incorporate restrooms into facility walk-throughs to check plumbing fixtures for leaks and malfunctions
- Post signage in restrooms to tell users how to save water and report leaks
- Contact utilities to see if rebates and incentives are available
- Use WaterSense resources to prioritize your retrofits and replacements
  - First, do projects that have rebates/incentives available
  - Next, consider faucets and showerheads
  - Next, toilets and urinals

WaterSense Resources

- Best management practices
- Resource guides
- Water assessment tools
- Worksheets and checklists to assess water use and find leaks
- Live and recorded training webinars
- Case studies and more!

www.epa.gov/watersense/commercial-buildings

Contact Us

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www.epa.gov/watersense
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