

Restroom Renovations at Philadelphia Int'l and Baltimore/Washington Int'l Focus on Smart Features and Passenger Satisfaction

BY JENNIFER DAACK WOOLSON



Baltimore/Washington Int'l



FACTS & FIGURES

Project: Restroom Renovations

Location: Philadelphia Int'l Airport

Program Scope: 9 phases; 48 sets of restrooms; total cost estimated at \$145 million

Work Scope: Complete demolition & reconstruction; each set typically includes men's restroom, women's restroom, gender-neutral companion care restroom & janitor closet; several also include assisted change facilities, lactation suite and/or service animal relief area

Construction: Phases 1-3 are complete; Phase 4 scheduled to end in June 2023; Phases 5-9 slated for Dec. 2022 thru fall 2026

Phases 1-3: 14 restrooms

Cost: \$28.29 million

Phase 4: 5 restrooms

Est. Cost: \$15.5 million

Funding: Airlines; airport

Architect of Record: Kelly Maiello (phases 1 & 2); CDA&I (phases 3 & 4)

Construction Management: Arora Engineers Inc. (MEP)

Air Quality Monitoring: Ventilation airflow sensors, space ionization concentration sensors, smoke sensors

Air Flow System: Energy recovery unit with supplemental hot water heating & chilled water cooling

Sensor-Operated Soap Dispensers: TOTO USA

Faucets: Chicago Faucet

Toilets: American Standard, with Sloan Flush Valves

Urinals: Toto-UT, with Sloan Flush Valves

Pending Projects: Phases 5-9 will update 30 sets of restrooms & add 2 new sets, with HDR as architect of record

In surveys, the No. 1 thing that affects passenger satisfaction isn't weather delays or how many Starbucks locations an airport has. Time and time again, it all comes down to the restrooms.

Dissatisfaction can stem from several places. Often, it's a simple matter of age. Restrooms that were designed and constructed before most passengers rolled carryon bags behind them like a caboose consistently get panned. And the current COVID pandemic has definitely hammered home the advantages of touchless technology and smart systems.

Two airports that were due for major restroom overhauls—Baltimore/Washington International Thurgood Marshall Airport (BWI) and Philadelphia International Airport (PHL)—are undertaking large multiphase projects to update and upgrade their facilities.

Improving the Passenger Journey

At PHL, a nine-phase restroom renovation program kicked off in 2012 and is expected to

wrap up in 2026. The long-term initiative was triggered by escalating maintenance issues associated with outdated plumbing, and fixtures and finishes becoming more difficult to maintain. In all, PHL is modernizing 48 sets of restrooms and constructing two new sets.

"Things weren't functioning the way that they needed to anymore," explains Julie Coyle, a project manager in HNTB's engineering/design and construction group. "It was making it harder to keep up with cleaning. Plus, the restrooms were looking older and were feeling older."

A spike in maintenance calls was also a telling sign. Toilets were clogging more often, pipes were cracking or leaking, and some components were starting to fail.

Coyle, who helped develop the final plans for phases 3 and 4, says the main design

goal was to ensure that PHL's restrooms are clean, safe and large enough to accommodate passengers of all abilities. Designers also focused on modernizing the facilities in ways that would satisfy passengers *and* maintenance staff. As with other airport projects, increasing capacity and implementing sustainability measures were other key priorities.

"Restrooms are such an integral part of a passenger's journey through the airport," emphasizes Api Appulingam, P.E., PHL's deputy director of aviation, capital development. "We had an evolution in our thought process about restrooms when the expectations of our guests began to change."

The entire airport experience from door to door is just as important to passengers as their in-flight experience, she adds. Because restrooms are often the first place passengers visit after entering an airport, PHL wanted to create a good impression. "That mindset, I think, has been a game changer for the restroom program," says Appulingam. "There isn't really any second guessing when we say we need to spend money—in this case \$145 million—for this restroom program."

With phases 1 through 3 already complete, Coyle reports that PHL's 14 new sets of restrooms are satisfying passenger

expectations. They also meet updated planning and design standards from the Airport Cooperative Research Program (ACRP), she adds.

As the long-term program progresses, PHL is incorporating more technology-driven components. Phase 4, which is currently underway, will test a number of smart systems while updating five sets of restrooms. Upcoming phases 5 to 9, which will overhaul 32 sets, are expected to include even more high-tech features.

Planning for Construction Impact

Lessons learned in earlier phases are helping the current project teams incorporate new ways to plan and coordinate construction. "One of the key things when I came in during Phase 2 was that there were a lot of unforeseen conditions that probably could have been captured if there had been a more in-depth survey conducted," Coyle relates.

When planning for Phase 3 kicked off, the design team and members of PHL's Capital Development Team consequently performed an extensive field survey of the existing facilities. In addition to studying the restroom space that was going to be demoed, they also assessed all the adjacent spaces as well as areas above and below the affected restrooms to determine what kind of impact construction might have on occupants and tenants.



JULIE COYLE



API APPULINGAM

Coyle says the typical challenges associated with construction in a 24-hour facility were escalated because it was vital to always provide passengers with access to a restroom close to their gate. "Shutting down a restroom is a huge deal because you only have so many of them," she remarks. "If you're shutting it down, you're really putting the passengers out."

Appulingam adds that PHL's sweeping restroom program requires input from many departments: Guest Experience, Facilities and Maintenance, IT, Revenue and Capital Development. "It basically brings all the stakeholders at the airport together for one common cause, which is to modernize our restrooms and make it a barrier-free place that anyone can utilize as they're making their way through our facility," she explains. "We want everybody to be on board and to be invested in that so they can see the end goal and don't get frustrated."

Each Phase Gets Progressively Smarter

Feedback after Phase 1 led to the use of darker grout and larger format tiles to make cleaning easier. Designers also specified trough-style sinks instead of individual bowls to prevent water from pooling on countertops and floors. Newer versions of energy recovery units for the HVAC system are now easier to maintain.

Interior finishes for the restrooms include stainless steel partitions, and glass and stone tile. Each restroom set has a new dedicated electrical panel to support LED lighting, equipment and convenience outlets. The existing fire suppression systems were

re-configured for the new floor plans; and modifications were made to fire alarm and special systems.

Phase 4 will include the pilot installation of a monitoring and notification system in two of the five restrooms being renovated. The system includes smart, touchless flushometers, towel dispensers, toilet paper dispensers, faucets and soap dispensers, as well as flush meters, stall occupancy lights, monitors at the entrance to track usage and an integrative system to gather customer feedback. The new system will provide detailed information to the facility maintenance and custodian groups about restroom use and replenishment intervals for soap and paper products. It will also alert personnel about plumbing problems, device failures, system malfunctions and periodic maintenance tasks. Data will help identify peak demand for restroom service, so the Facilities Group can dedicate labor accordingly.

The overall restroom renovation program is also addressing adult changing facilities, lactation suites, janitor closets and storage, service animal relief areas, benches with device-charging equipment and assisted-care spaces.

Funding for the 19 restrooms already completed or currently under construction came from capital funding. Appulingam notes that the airport's latest use and lease agreement with its airlines included approval for more than \$100 million in restroom renovations.

A portion of the budget for each phase is earmarked for artwork. PHL's curator is working with the Philadelphia Art Department to build display walls and cases outside restrooms for commissioned pieces from local artists. Some will be permanent installations; other works will rotate.

Given the scope and importance of restroom renovations at PHL, projects are ongoing and often overlap. Phase 1, completed in 2012, is already in planning to be refreshed. Phase 2 was completed in 2017 and Phase 3, which included five restrooms, wrapped up last summer. The airport started construction of Phase 4 in April 2021 and expects to finish in June 2023. Phases 5 through 9 are scheduled to run from December 2022 through fall 2026.

Appulingam reports that the airport has received positive feedback from passengers and airline partners about many of the upgrades. The new trough sinks, improved lighting and larger, open entrances are proving particularly popular.

Finding Ways to "Be Better"

To be or not to be? is often considered the ultimate question. But at BWI, another question is equally weighty. It's Question 9 on the passenger satisfaction survey: What was your WORST experience at the airport today?

Throughout the years, BWI's restrooms have been the topic of many emphatic answers. The negative comments were not a surprise—more than half of the restrooms are 20 to 40 years old. The volume, however, inspired MDOT Maryland Aviation Administration, which owns and operates BWI, to invest in major changes.

"Some airports don't want to ask the question because they don't like the bad press that it brings," says Paul L. Shank, P.E., C.M., chief engineer of the Division of Planning and Engineering for MDOT Maryland Aviation Administration.



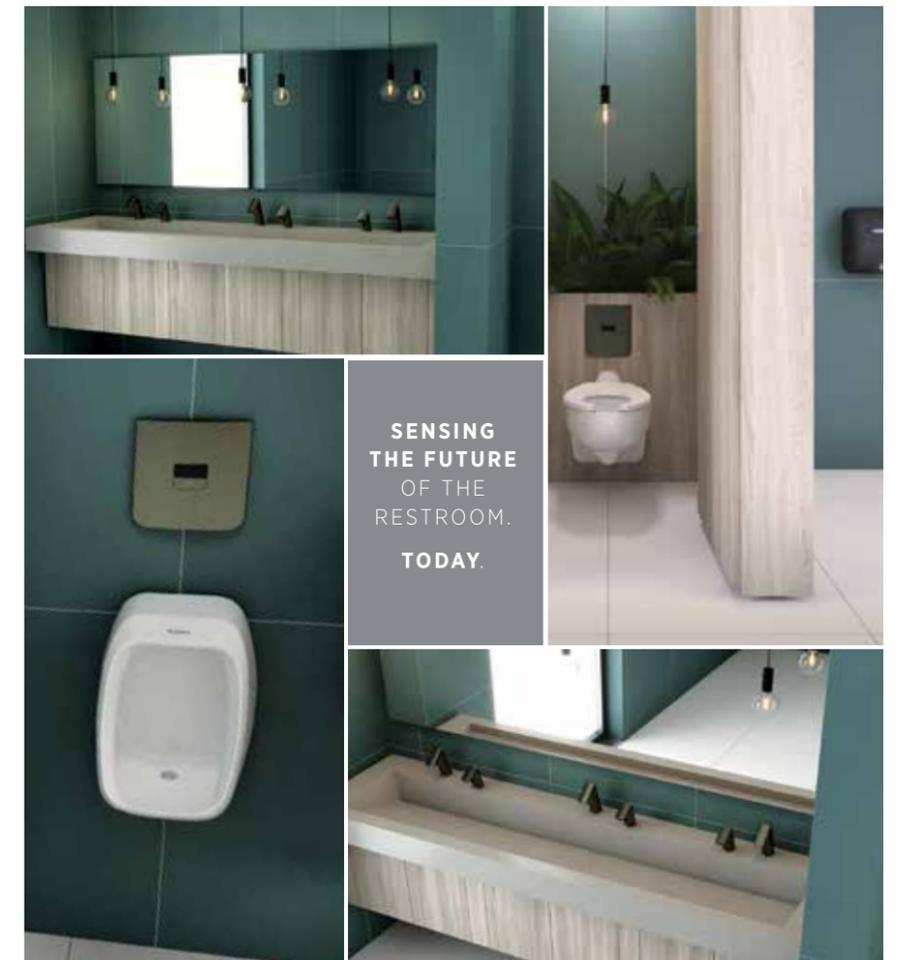
PAUL L. SHANK

But *not* asking would be counter to BWI's corporate motto: "Be better."

Shank has personally known airport directors who prefer to avoid negative feedback altogether, and he considers that approach unproductive. "Our executive director and CEO, Ricky Smith, wants the input and is very supportive of the Planning and Engineering Division," he remarks.

In an effort to "Be better," Shank and his team sought input about BWI's restrooms from a wide range of internal stakeholders—Operations, Maintenance, Finance, Concessions, Security and the Fire

PHL is incorporating more smart features during its nine-phase program to update restrooms.

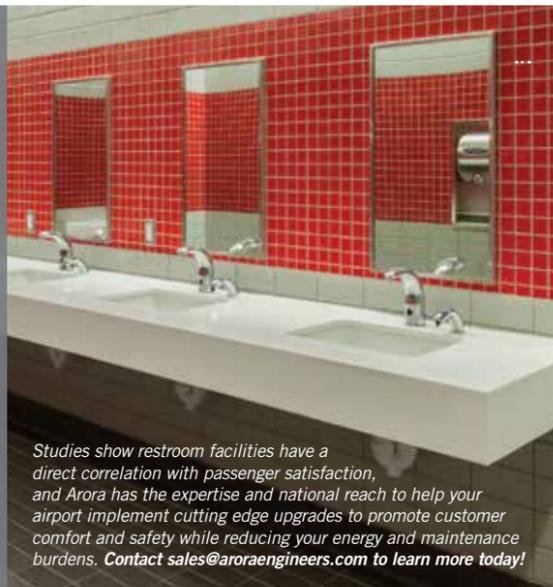


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FACTS&FIGURES

Project: Restroom Prototype Development
Location: Baltimore/Washington Int'l Thurgood Marshall Airport
Concourse: A
Facility Owner/Operator/Project Manager: MDOT Maryland Aviation Administration
Cost: \$8 million
Funding: MDOT Maryland Aviation Administration; passenger facility charges
Construction: Feb. 2019 – Aug. 2020
Program Manager: Airport Design Consultants Inc.
Architect of Record: WSP; The Sheward Partnership
Construction Manager: Parsons Transportation Group
Contractor: Hensel Phelps
Smart Restroom System: TRAX Analytics
Lavatories & Toilets: TOTO
Urinals: Kohler
Faucets: Sloan
Stall Occupancy Lights: Tooshlights, by Modus Systems
Digital Feedback System: Slice Wireless; TRAX Analytics

Project: Restroom Improvements Phase 1
Location: Concourses B, C & DX-DY
Scope: Expanding & upgrading 6 sets of restrooms; each set includes 2-story building expansion & creation of men's, women's, family-assist, adult change & lactation rooms
Cost: \$54.9 million
Funding: Passenger facility charge bonds
Construction: Nov. 3, 2021 thru March 11, 2024
Program Manager: Jacobs & Johnson, Mirmiran & Thompson
Construction Manager: Johnson, Mirmiran & Thompson
Architect of Record: AECOM
Systems Design: Arora Engineers, Inc.
Smart Restroom System: TRAX Analytics
Contractor: Whiting-Turner
Toilet Partitions: Carvart
Digital Feedback System: Slice Wireless; TRAX Analytics
Pending Items: Product selection is ongoing for smart restroom system, lavatories, urinals, faucets, stall occupancy lights & signage/wayfinding

Department. Shank notes that personnel from the Maintenance Department, in particular, provided essential insight.

The project team also consulted counterparts at Heathrow Airport (LHR) in London and Minneapolis-St. Paul International Airport (MSP) about their recent restroom renovations.

That combined intelligence led to the development of a prototype restroom design for Concourse A when it was being expanded in 2019. David A. Lookenbill, P.E., senior vice president and program manager with Johnson, Mirmiran and Thompson, explains that the prototype provided the opportunity to test concepts in a working environment.



DAVID LOOKENBILL

Lookenbill reports that the prototype was a success, and BWI is now carrying over

the general design to other areas of the airport while incorporating lessons learned. For instance, passengers using the prototype restrooms during the COVID-19 pandemic prompted project designers to reduce or eliminate grout joints where microbes can hide. They also prioritized using easier-to-clean, impermeable materials and added more robust ventilation systems.

Jo A. Schneider, AIA director of the Office of Architecture, Division of Planning and Engineering for MDOT Maryland Aviation Administration, says that when COVID hit, the restroom renovation team studied a wide variety of surfaces and materials to maximize cleanliness. "In places where we previously had more grout and tiles and wood surfaces, we switched to glass," explains Schneider. "With glass, you're creating a very clean, impervious material that is easier to keep clean and even feels cleaner to the public."

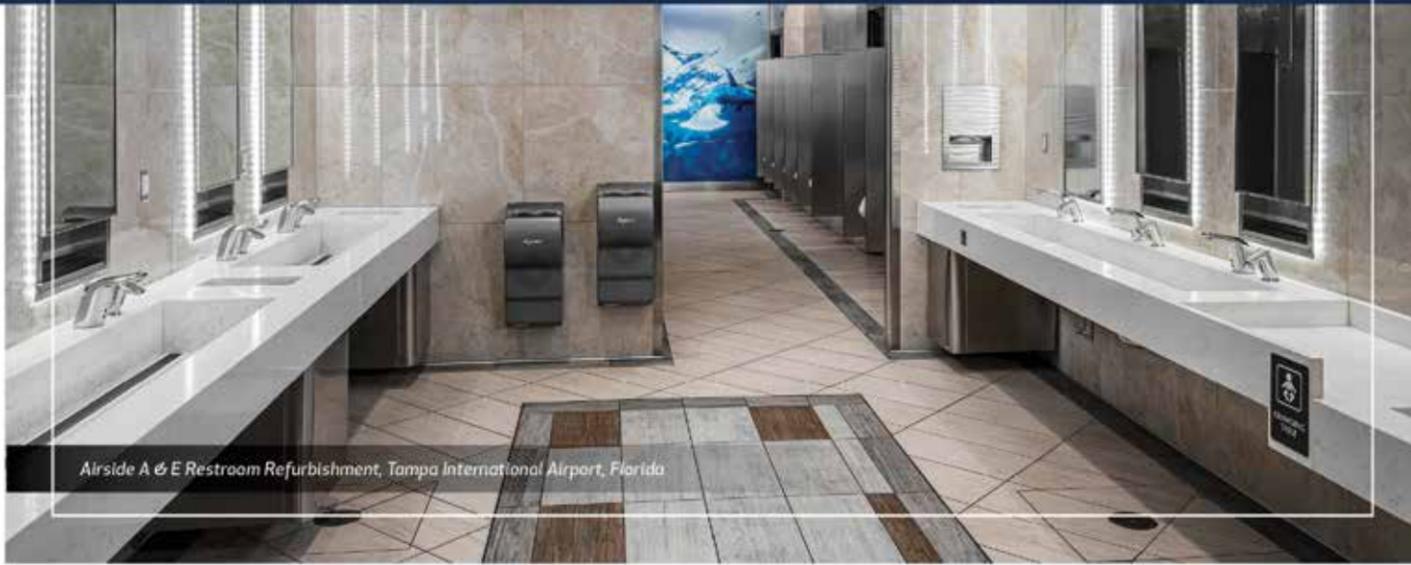


JO A. SCHNEIDER



Designers added touches such as dimmable lights to the new lactation rooms at BWI.

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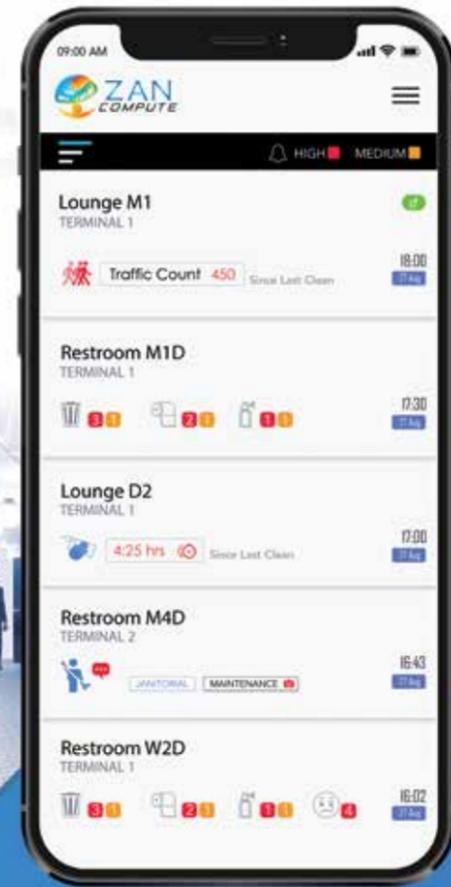
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Wall surfaces that are not glass are covered in large-format pieces of quartz or engineered stone, which provide similar cleaning benefits. The flooring is monolithic epoxy terrazzo.

Bigger and Smarter

The Maryland Aviation Administration plans to incorporate similar changes in six more sets of restrooms at BWI between 2021 and fall 2024. Each set includes a men's restroom, women's restroom, a family assist restroom, an adult change room and a lactation room. The restroom sets slated for updates are scattered throughout concourses B, C and D.

To improve traffic flow, the new restrooms have a circular design with no dead ends. Specific features include:

- enclosed glass stalls for enhanced privacy, with only small gaps under doors for air flow;
- stalls that are 20% longer and more than 40% wider than current stalls, with doors that swing out to minimize wrestling with carry-on bags;
- generously spaced urinals, with partitions for privacy;
- toiletry placed without any gap between the wall so it's easier for maintenance staff to clean;
- occupancy lights that indicate if individual stalls are available or already in use; (see sidebar on Page 15 for more information);

- display screens outside restrooms indicate how many stalls are available, so passengers can assess wait times before entering;
- low-flow toilets placed at the highest code-compliant height off the floor to accommodate aging users;
- handholds inside stalls, with space to add more as building codes change;
- in-stall shelves and hooks for passengers to safely stow their belongings;
- a variable-volume ventilation system that exchanges air in each stall; and
- touchless faucets and dispensers for soap, paper towels and hand sanitizer.

Data-driven smart devices are pervasive throughout the renovated spaces. For instance, the air systems that ventilate each stall are triggered by people-counters at the restroom entrances. The counters track both trends and real-time usage, which allows the system to automatically increase the speed and volume of air exchange during periods of high usage.

Customer feedback tablets posted at the entrance/exit areas provide information that will help BWI address issues and make improvements.

The high-tech product dispensers satisfy passengers' desire for a contactless experience, but also provide data to airport personnel via a central dashboard. "The smart technology informs the custodial group of when consumables need to be replaced and informs maintenance when repairs are needed," says Michael Mezzetti, AIA, design task manager, AECOM. "That means the



MICHAEL MEZZETTI

Shining a Light on Occupancy Analytics

Officially billed as a "restroom traffic management system," Tooshlights eliminates the need for passengers to stoop down and look under doors to find an unoccupied stall. A light above each stall shines red if it is already in use and green if it's available. Blue lights identify universally accessible stalls.



ALLEN KLEVENS

Allen Klevens launched the product in 2014 after waiting in long restroom lines at the Hollywood Bowl and later seeing indicator lights for spaces/"stalls" in a mall parking garage. When he had a prototype ready, Klevens returned to the Hollywood Bowl to test it. Subsequent installations at Dodger Stadium helped further refine the system, which he eventually named Tooshlights, a twist on his daughter's nickname and the Yiddish word for "bottom."

Pilot programs at Los Angeles International (LAX) and Hartsfield-Jackson Atlanta International (ATL) helped Klevens penetrate the airport industry. "We learned that we had to 'beef up' the product due to the high levels of traffic and how much 'pain' the restrooms get," he recalls. The company's first full-scale airport installations occurred at Dallas Fort Worth International (DFW), Boston Logan International Airport (BOS) and Seattle-Tacoma International Airport (SEA). The product has also been added in Concourse G of LaGuardia Airport.

In addition to directing passengers to stalls, the system provides data to facility operators. "The Tooshlights system is able to show what usage is actually happening based on live data from the indicator lights over the stalls," Klevens explains. "We can tell how many people utilize the restroom, how many are using each stall by the hour, the number of uses per day and the busiest time periods. That information, in complement with the flight schedules, tells the cleaning staff what time makes the most sense for cleaning."

The system also provides data about how long each stall has been occupied. Airport operators can set thresholds that will trigger email and text alerts to staff if a light stays red for an extended time, because long periods of occupancy sometimes indicate a medical problem or other emergency. Each airport determines its preferred interval for alert messages.

"The data that we're collecting on the security aspect has been a game changer for us," Klevens comments.

On the flip side, if a stall's green light is on for an extended period of time, it could mean the toilet is clogged, the paper dispenser is empty, or the floor needs to be cleaned. Tooshlights works in concert with smart restroom systems like TRAX Analytics and KOLO® by Georgia Pacific to provide data about replenishing consumable supplies.

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custodial staff spends much less time checking the levels of consumables and can do more cleanings per day.”

The system also provides metrics on how much soap and paper products are being used to inform better purchasing decisions.

Patrick Trevino, vice president of sales and marketing at TRAX Analytics, explains that the company’s software collects data from the smart dispensers and compiles it into the TRAX Analytics platform through an application programming interface (API) to help feed the airport’s operational dashboard.



PATRICK TREVINO

Using Bluetooth beacons in the restrooms and throughput counters, TRAX Analytics monitors the zone for restroom usage and response time to maintenance issues. Trevino notes that this provides full transparency regarding response time to cleaning and other customer satisfaction issues.

The system also facilitates scheduling by providing real-time information about when each restroom was last cleaned, and allows airport operators to set their own thresholds. For instance, the Operations Department can automatically receive an email about cleaning after 200 customers enter and exit a specific restroom. In busier areas, the interval can be adjusted accordingly.

Some decisions, however, had nothing to do with technology. Case in point: The new restrooms require more square footage to accommodate the circular flow layout, larger stalls and outward-swinging stall doors. Rather than cut into revenue-producing concession space, BWI opted to bump out into the airside instead.

“That philosophical design change dramatically increased the cost of the restrooms,” Shank acknowledges.

Beyond preserving valuable concessions space, the new bump-outs are expected to deliver measurable enhancements to the passenger experience. In addition to facilitating the new and improved restroom layouts, they add natural lighting via windows onto the airfield. For privacy, the design team added directional screens in front of the glass that allow restroom patrons to see outside, but prevent anyone on the airfield from seeing inside.

Accommodating All Passengers

Adult changing rooms, lactation rooms and family-assist restrooms are part of every set of restrooms. “During design, we discussed whether every restroom had to have these three spaces associated with it,” Mezzetti says. “We decided that a nursing mother or someone who needs companion care shouldn’t have to walk all the way down the concourse to a farther away location. It became our policy because of equal treatment of all travelers that we would have the same concepts located throughout the terminal.”

In addition, these spaces do not open directly into the concourse. To provide more privacy, guests enter them from separate corridors that run perpendicular to the main concourse.

Mezzetti notes that the lactation rooms are designed to be comfortable, not restroom-like, and include controls that allow users to dim the lights.

Outside the restrooms, designers focused on facilitating flow in the concourse. Large entryways include recognizable architecture and iconography for intuitive wayfinding. “When a passenger is in the holdroom and looking for a restroom, everything’s designed so that it’s very obvious,” Mezzetti explains. “There’s a consistency of colors and artwork from one restroom to the next that establishes an architecturally repetitive pattern.”

Project designers also added seating areas between the men’s and women’s facilities to provide a comfortable place for people to wait while their companions use the restrooms. This also helps prevent them from impeding traffic directly outside the restrooms.

While airports cannot control weather delays, in-flight turbulence or overly talkative seatmates, they are actively addressing passenger satisfaction where they can: in the restroom. PHL and BWI are leading the way by using smart technology and strategic design choices to make this essential part of the passenger experience safe and pleasant.



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