Appendix C.1

Case Studies—Restrooms

C.1.1 Process

An important aspect of the research was to conduct several case studies of recent restroom work at a variety of airports to get firsthand from the planning and operations managers their perspectives about the planning, design, and maintenance of airport terminal restrooms. The original proposal listed eight airports known by our team members to have a recent restroom project, including one international location - Schiphol in Amsterdam. Upon further consideration, the research team realized a more systematic investigation was in order to insure a representative mix of case studies.

In the new selection of candidates, the team determined that a sampling was needed of each of the four FAA hub-size classifications – large, medium, small, and non-hub. Two of each seemed reasonable given our budget. We also felt that the locations should be somewhat spread out across the country to avoid a regional skew. The last, but most important criterion was that the airports had recently completed a significant restroom project within the last few years. The project could be new or a renovation, but had to be more than a cosmetic facelift. The timing was important in that the restrooms were not so old to be out of date but be completed for a long enough period that the airport was able to evaluate how well their initiatives worked.

The research team began by charting the US airports that received AIP Grants from the FAA for terminal projects in 2010 and 2012. These were ranked by the 2013 enplanement levels and categorized by hub size (see Exhibit 5-1). Also noted were the year the project was completed; whether it was new, expanded, or renovated; and the scope of work. The 30 airports were located on a map (see Exhibit 5-2) to show their distribution. Through research and communication with contacts at various airports, we narrowed our selection to the following eight airports for the rationale stated:

**Large Hub**

- Atlanta Hartsfield-Jackson International Airport (ATL)
  - New international terminal
  - Largest airport on list

- Dallas/Ft. Worth International Airport (DFW)
  - Major renovation of terminals A, B, C, E
  - Has restroom guidelines
  - Responded to our airport manager’s survey

**Medium Hub**

- Sacramento International Airport (SMF)
  - New terminal

- John Wayne Airport (SNA)
  - New terminal and restroom renovations

**Small Hub**

- Long Beach Airport (LGB)
  - New concourse

- Blue Grass Airport (LEX)
  - Restroom renovations
  - Responded to survey

**Non-hub**

- Jackson Hole Airport (JAC)
  - Terminal expansion including restrooms

- Duluth International Airport (DLH)
  - New terminal including restrooms
  - Smallest airport on list
  - Close proximity to team

The team added two more airports, both large hubs, with special attributes that would round out the study: (LAX) Los Angeles International Airport and (MSP) Minneapolis-St. Paul International Airport. A number of our team members had participated in the master planning and renovation of their restrooms, including numerous initiatives intended to push the “state of the art.” The feedback would be valuable both for the lessons learned and as a comparison to the other airports on our list. In the course designing the MSP restrooms, one of the few available resources our team
found was the Los Angeles World Airport (LAWA) Design and Construction Handbook, which included a comprehensive section on restroom standards. Learning how the standard has served LAX would be insightful. In addition, two of the airports on our initial list were in the Los Angeles area so it would be an easy addition to our visit. One more location for each hub size was identified (see Exhibit 5-2) in case any proposed locations did not work out.

We set about scheduling our visits and were able to group the airports in two trips for the out-of-state locations. LEX, ATL, and DFW in one three day trip then JAC, LGB, SNA, LAX, and SMF in a four day trip two weeks later. Local airports DLH and MSP were visited in the interim. Jens Rothausen-Vange and Rose Agnew conducted the case studies for the large and some medium hubs. The remaining studies were conducted by Jens. Our case study structure was as follows:

1. **Situation, Background or Introduction** The reason for the case study and profile of the airport, including special considerations, size (large, medium, small hub, non-hub), background on business decisions, and the drivers (e.g. change in air service, carrier relocations between concourses, increase in capacity due to new entrants, daily flights, de-hubbing, maintenance challenges, etc.) for determining whether to undergo airport restroom renovation or new construction.

2. **Problem** The main problem needing resolution (e.g. failure of the current restroom layout, inadequate service life, excessive operation costs, airport design criteria and its impact, etc.). Previous attempts at failed solutions would also be addressed here.

3. **Solution and/or what did not work** The solution in detail, focusing on how the airport solved the problem(s), what changes were made to account for the planning, design, and maintenance of the restrooms, budget impacts, end use of the products, methodologies and other factors that contributed to the overall implementation/installation.

4. **Evaluation** Main benefits of the approach/restroom solution and its impact on the airport’s customer service. Provide details on any of the following project results:
   - Lessons Learned
   - Airport Design Criteria and/or Ratings
   - Awards
   - Publishing

**C.1.2 Findings**

We used the agenda shown in Exhibit 5-3 as a guide for each session. However, we also allowed the discussion to focus on where the energy was. There was an overwhelming consistency between the airport restrooms we visited, for all hub sizes, what might be called the “State of the Industry.” Viewed as a package, this would include:

- Large format floor and wall tiles with tight joints and gray grout
- Solid surface counters with oval sinks and a hole cut in the top between each pair of sinks for trash
- Touchless paper towel dispensers with large rolls that are mounted between the mirrors above the trash opening
- Concealed trash container stands below the counter
- Faucets and foam soap dispensers are touchless
- A diaper changing table is located on a counter near the sinks
- Longer and/or wider toilet stalls
- Toilet stall and urinal stalls are stainless steel with a diamond texture
- Toilet paper dispensers have at least one extra roll in reserve
- Other accessories in the stall include a toilet seat cover dispenser and a coat hook
- Toilets and urinals are touchless and low flow
- A Family Room adjacent to the Men’s and Women’s with toilet, sink, and diaper changing

The planning for restroom locations and fixture counts seems to remain a seat-of-the-pants exercise. The smaller airports generally found the building code minimums to be adequate whereas many of the larger airports based their decision on what they had seen at other airports or what had worked for them in the past. More often than not, we were told that the solution was to squeeze as many fixtures into the spaces that were
left over after the revenue-generating spaces like hold rooms and concessions were planned out. Two big drivers for change were making older facilities ADA compliant and, post 9/11, providing space within reach of the passengers for their carry-ons and other belongings.

A feature that is becoming more common in these airport restrooms was shelves behind and above toilets and urinals. A few had shelves at the sinks as well. Some of the larger airports had pet relief areas on both land- and airside. Lactation and/or nursing rooms were rare and, especially at the smaller airports, rarely requested by travelers. Most of the airports provided receptacles in the Family Rooms so a pump could be used.

Standardization of products was a common frustration. Open bidding requirements often allowed substitutions resulting in the airport having to manage and stock multiple versions of the same product. Similarly, vendors for the paper and soap products provide their own dispensers. One airport bemoaned that they are required to rebid vendors every year so products and dispensers are constantly changing. This created a condition at one airport where there were four different types of dispensers in one restroom.

The managers at the airports with multiple terminals and complex operations highly recommended assembling a “Restroom Team” with all the stakeholders to work with the planners and designers to ensure that everyone’s needs have been addressed. It was generally agreed that the biggest challenge is balancing aesthetics with maintenance. Other observations / comments from the sessions included the following:

- Automatic flush valves do not really save money. They are activated several times while a person is in the stall. Water usage has actually gone up.
- People generally avoid the dryers that you slide your hands into, primarily for fear of contacting other users’ germs. Operations staff found them to be high maintenance. Only a few airports provided them.
- The name for Family Rooms varied including Companion Care and Assisted Care.
- The first stall is typically the cleanest because most people seek privacy and go to the most remote.
- The California airports use code required sign shapes for the restroom genders: a triangle for Men and circle for Women.
- All the airports had three cleaning shifts. The two day time shifts primarily cleaned spills, restocked paper and soap, and did spot cleaning. The evening shift does the deep cleaning. Some airports have even more thorough monthly or quarterly cleaning where the restrooms are sprayed down. Most of the airports used green cleaning products but admitted they often need to use more because the solutions are weaker.
- The life span of an airport restroom that is used 24/7 has a lifespan that’s one third of the equivalent office restroom. So a 15-year commercial restroom would last five years in an airport environment.

Many of the case study participants offered the “one thing” that is most important in airport restrooms. The following is a snapshot of the responses:

- Customer service
- Design washing and drying in one place
- Standardization
- Cleaning of floor, counter tops, tile, and grout
- Consistency with paper products
- Space and capacity
- Where to put my bag? I don’t want to put anything on the floor!
- What about names of spaces
- Proprietary requirements – legal issues – items that are unique to this airport with justification
- Usability and ergonomics
- Tests and standards
- Relationships with procurement - vendors
- A chapter on Uric acid – and its special impacts on the floor and facility and equipment
- Reliable equipment that is practical, inexpensive and cheap
- Establish a ‘strike team’ when you have a passenger surge.
- Floaters for cleaning
- Get the designer to do a practical dollar estimate – cost benefit and lifecycle.
- A blended approach including design and maintenance
• Cleanliness – how do you design and build and maintain for cleanliness?
• Importance of collaboration with team – all members – finance, operations, maintenance, - all team members have ownership – the ownership in the project makes the difference.
• Operational efficiency
• Where do you put the restrooms? Will they use it?

Note that each of the studies includes a floor plan of a restroom visited. All the drawings are at the same scale for comparison.
<table>
<thead>
<tr>
<th>Rank</th>
<th>Loc ID</th>
<th>Airport</th>
<th>Hub Type</th>
<th>Proposed Visits</th>
<th>Current Enplanements</th>
<th>Construction Type</th>
<th>Year Completed</th>
<th>Consideration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>ATL</td>
<td>Atlanta</td>
<td>L</td>
<td>43,130,585</td>
<td>New/Renovation</td>
<td>2012 &amp; 2014</td>
<td>New International Terminal - Concourse D modernization</td>
<td></td>
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<tr>
<td>2</td>
<td>LAX</td>
<td>Los Angeles</td>
<td>L</td>
<td>28,857,755</td>
<td>New/Expansion</td>
<td>2010-2014</td>
<td>Renovation of the Tom Bradley International Terminal (TBIT) and includes a development program for new gates and concourse areas of TBIT.</td>
<td></td>
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<tr>
<td>3</td>
<td>DFW</td>
<td>Dallas/Ft. Worth</td>
<td>L</td>
<td>27,100,656</td>
<td>Renovation</td>
<td>2011-2017</td>
<td>$1.3 billion terminal renewal and improvement program, including bathroom renovations in Terminals A, B, C and E.</td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>SFO</td>
<td>San Francisco</td>
<td>L</td>
<td>19,359,003</td>
<td>Renovation</td>
<td>2011</td>
<td>Terminal 2 renovation (Formerly the International Terminal)</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>LAS</td>
<td>Las Vegas</td>
<td>L</td>
<td>18,966,738</td>
<td>New</td>
<td>2012</td>
<td>New International Terminal 3</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>MIA</td>
<td>Miami</td>
<td>L</td>
<td>17,017,654</td>
<td>Expansion</td>
<td>2007-2013</td>
<td>North Terminal D Expansion</td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>MSP</td>
<td>Minneapolis/ St. Paul</td>
<td>L</td>
<td>15,517,487</td>
<td>Renovation/Expansion</td>
<td>2017</td>
<td>New Restroom and prototype program</td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>SAN</td>
<td>San Diego</td>
<td>L</td>
<td>8,430,509</td>
<td>Renovation/Expansion</td>
<td>Aug. 2013</td>
<td>The Green Build, 10 gate expansion, includes renovation of bathrooms in Terminal 2</td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>TPA</td>
<td>Tampa</td>
<td>L</td>
<td>8,137,222</td>
<td>Expansion/Renovation</td>
<td>2014</td>
<td>Main Terminal Transfer Level expansion, concessions expansions</td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>DDU</td>
<td>Raleigh-Durham</td>
<td>M</td>
<td>4,466,736</td>
<td>Expansion</td>
<td>2009</td>
<td>Terminal C expansion</td>
<td></td>
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<tr>
<td>13</td>
<td>SMF</td>
<td>Sacramento</td>
<td>M</td>
<td>4,242,279</td>
<td>New Terminal</td>
<td>2011</td>
<td>$1 billion Big Build Terminal Program</td>
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<tr>
<td>15</td>
<td>CVG</td>
<td>Cincinnati</td>
<td>M</td>
<td>3,906,826</td>
<td>Renovations</td>
<td>2012</td>
<td>Recent Terminal Restroom renovations</td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>DAL</td>
<td>Dallas Love Field</td>
<td>M</td>
<td>3,783,407</td>
<td>New</td>
<td>2014</td>
<td>New Terminal</td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>IND</td>
<td>Indianapolis</td>
<td>M</td>
<td>3,726,698</td>
<td>New</td>
<td>Nov. 2008</td>
<td>New Terminal</td>
<td></td>
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<tr>
<td>18</td>
<td>PBI</td>
<td>Palm Beach</td>
<td>M</td>
<td>2,936,416</td>
<td>Renovations</td>
<td>2012</td>
<td>AIP Restroom Renovations</td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>BUF</td>
<td>Buffalo Niagara</td>
<td>M</td>
<td>2,692,908</td>
<td>Renovations</td>
<td>2012</td>
<td>AIP Restroom Renovations</td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>OMA</td>
<td>Easley Airfield</td>
<td>M</td>
<td>2,097,958</td>
<td></td>
<td></td>
<td>An assessment of this airport’s bathrooms can provide a baseline assessment of airport bathrooms located in similar aging terminal facilities, SWA Hub</td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>TUS</td>
<td>Tucson</td>
<td>M</td>
<td>1,844,228</td>
<td>Renovations</td>
<td>2013</td>
<td>Survey Recent Restroom Renovations</td>
<td></td>
</tr>
<tr>
<td>22</td>
<td>LGB</td>
<td>Long Beach</td>
<td>S</td>
<td>1,451,404</td>
<td>Renovations</td>
<td>2012</td>
<td>Main Terminal renovations</td>
<td></td>
</tr>
<tr>
<td>23</td>
<td>SAV</td>
<td>Savannah/Hilton Head</td>
<td>S</td>
<td>798,194</td>
<td>Renovations</td>
<td>2013</td>
<td>Survey Recent Restroom Renovations</td>
<td></td>
</tr>
<tr>
<td>24</td>
<td>MYR</td>
<td>Myrtle Beach</td>
<td>S</td>
<td>782,737</td>
<td>Expansion</td>
<td>2010/2012 AIP Terminal Expansions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>25</td>
<td>XNA</td>
<td>Northwest Arkansas Regional</td>
<td>S</td>
<td>549,199</td>
<td>Expansion</td>
<td>2010/2012 AIP Terminal Expansions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>LEX</td>
<td>Blue Grass</td>
<td>S</td>
<td>539,492</td>
<td>Renovations</td>
<td>2013</td>
<td>Survey Recent Restroom Renovations</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>AZA</td>
<td>Phoenix-Mesa Gateway</td>
<td>S</td>
<td>417,962</td>
<td>Renovations</td>
<td>2013</td>
<td>Survey Recent Restroom Renovations</td>
<td></td>
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<tr>
<td>28</td>
<td>BDA</td>
<td>Roanoke Regional</td>
<td>N</td>
<td>316,478</td>
<td>Renovations</td>
<td>2013</td>
<td>Survey Recent Restroom Renovations</td>
<td></td>
</tr>
<tr>
<td>29</td>
<td>JAC</td>
<td>Jackson Hole</td>
<td>N</td>
<td>288,325</td>
<td>Expansion</td>
<td>2010</td>
<td>Terminal Expansion including restrooms</td>
<td></td>
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<tr>
<td>30</td>
<td>DLH</td>
<td>Duluth</td>
<td>N</td>
<td>150,556</td>
<td>New</td>
<td>2013</td>
<td>New Terminal including restrooms</td>
<td></td>
</tr>
<tr>
<td>AMS</td>
<td>Amsterdam Airport Schiphol</td>
<td>INTL</td>
<td>22,608,875</td>
<td>Renovations</td>
<td>2013</td>
<td>Recent renovation showcasing artist-inspired bathrooms</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Figure C.1.1.** US Airports with FAA AIP Funding Showing 2013 Enplanements (Airports in Blue Indicate Originally Proposed Locations).
Figure C.1-2. Locations of US Airports with FAA AIP Funding (Solid Circles Indicate Case Study Locations. Dashed Circles Indicate Alternate Locations).
Discussion Topics for Hartsfield-Jackson Atlanta International Airport Case Study

1. Overall customer service goals (level of service):
   a) Did you have any specific business drivers for restroom renovation?

2. Restroom philosophy/goals (business operations drivers and logistics):
   a) Did you have a robust / usage goal? Other goal?
   b) What were your processes related to:
      i. New construction or renovation
      ii. Customer service requirements / metrics
      iii. Safety/ security audit
      iv. Disability/access audit
      v. Maintenance/sustainability standards/metrics
   c) Describe operations / logistics in terms of:
      i. Existing conditions assessment
      ii. Hours of operations
      iii. Practical maintenance and cleaning requirements and schedule/solutions
      iv. Cost benefit analysis (e.g. number of restrooms)
   d) Describe information and communication systems (e.g. wayfinding, signage, etc.)
   e) What products and systems were used and why?

3. Planning goals:
   a) Did you plan and design differently for the secure and non-secure areas? Any new insights?
   b) Feasibility study (e.g. future demand assessment)
      i. Number of locations required for airport for both the airside and landside areas
      ii. Number of toilets per location (square footage or passenger numbers, service level)
      iii. Rationale for selected locations (e.g. proximity to major concessions areas, reasonable walking distances, etc.)
   c) Passenger demographics (e.g. Female toilet increase factor)
   d) Describe your sustainable goals
   e) Describe your accessibility goals
   f) Describe your aesthetic goals (colors, contrasts, textures)
   g) What worked? What were your surprises?

4. Functional goals:
   a) Did you have a cost per square foot goal?
   b) Did you expand your footprint to address new passenger demographics?
   c) Describe comfort goals (e.g. ease of maneuvering, privacy/dignity, sensory experience)
   d) Describe fixtures and accessories goals (e.g. toilets, urinals, sinks, dispensers, waste, conveniences)
   e) Describe demographic needs (gender, age, companion):
   f) Describe systems goals (e.g. lighting, ventilation, temperature, wayfinding, emergency)
   g) Describe maintenance goals (e.g. clean, sturdy, in working order)
   h) What were your design parameters? (10-, 20-, 30-, 40-year horizon or other?)

5. Cost-effective / lifecycle cost parameters:
   a) Did your airline partners / stakeholders determine and/or impact your restroom decisions?

Figure C.1-3. Sample Agenda for Case Study Session.
THE CASE STUDY PROCESS FOR ACRP 07-12

Background on ACRP 7-12
- **Title:** Guidebook for Airport Terminal Restroom Planning and Design
- **Objective:** To create a user-friendly guidance manual to help determine the location, number, size, and configuration of airport terminal restroom facilities to meet various customer (e.g., passenger, employee, and family) needs.
- **Project Team:** A group of industry professionals, who bring a variety of knowledge and expertise to the task, including architectural and engineering consultants who have planned, designed and developed restroom renovations.
- **Sponsor:** ACRP (Airport Cooperative Research Program) is managed by the Transportation Research Board (TRB) of the National Academies and sponsored by the Federal Aviation Administration (FAA).

**Case Study Input Needed:** Your input is essential to help us develop a case study as part of the guidebook for airports that will:
- Provide restroom solutions for airports of all size considering upgrades, renovations or new construction through prototypical layouts;
- Enable airports to assess their restroom inventory based on changing demographics as well as develop and prioritize potential project lists and schedules;
- Consider all aspects of the customer experience at an airport, including how easy restrooms are to find and access, how appealing they are to the senses, and how well their location relates to other airport amenities.

**The Case Study Roundtable Process:** Our research team believes that the most effective way to understand an airport’s experience designing and constructing major restroom projects is to gather a group and discuss project experiences in a roundtable format. The case study roundtable will take 60 minutes with an optional restroom tour. This interactive roundtable will specifically focus on: customer service, cost parameters, planning needs, operations and logistics requirements, and functional design requirements. If schedules permit, ideally we recommend the following attendees: Lead Planning & Engineering Manager, Customer Service Manager, Maintenance (include local plumber if possible), and IT-specific technologies (e.g., cleaning, drying, etc.).

**Contact for this ACRP Project**
- Jens H. Rothenaujen-Vange AIA, LEED AP, CDT
- Senior Associate
- Architectural Alliance
- 612-874-4124 or jrothenuvene-jange@archalliance.com

*Figure C.1-4. Back Page of Session Agenda.*
LARGE HUB

CASE STUDIES

Atlanta Hartsfield-Jackson International Airport (ATL)
Dallas/Ft. Worth International Airport (DFW)
Los Angeles International Airport (LAX)
Minneapolis-St. Paul International Airport (MSP)
Hartsfield-Jackson Atlanta International Airport (ATL)

“A Full-time Attendant in the Women’s Restrooms”

Overview
Hub Type: Large Hub
Hours of Operation: 24/7
Designed Life: 20 years
Annual Enplanements: 43,130,585
Airport Size: 6.8 million square feet
Number of Gates: 207
Number of Restrooms: 51 Women’s
49 Men’s
25 Family
Case Study Project: New International Terminal Restrooms opened in May, 2012
Date of Case Study: September 12, 2013

Background
In 2000, the Wall Street Journal documented their observations in an article about their visits to the 20 busiest airports in the nation. Hartsfield-Jackson Atlanta International Airport was among the five worst. A primary aspect of this distinction was their lack of restrooms. An airport spokesperson admitted that the shortage was the biggest of their complaints. This wake-up call set in motion master planning for the entire airport. Front and center was increasing the size and locations of their restrooms as well as address poor lighting, inadequate exhaust, and the perception of dirtiness. Now the airport has 51 restroom sets for Women, 49 for Men, and 25 Family Rooms, a noticeable jump from the 30 sets for men and Women in 2000.

A unique aspect of Atlanta airport is the management of airport operations by the Atlanta Airlines Terminal Corporation (AATC). Formed by several major airlines in 1979 to provide “World Class” performance in airport facility maintenance and operations, this group’s management scope includes the restrooms. As such, the airlines have significant influence in the planning and design of the airport restrooms.

The airport opened the new Maynard H. Jackson, Jr. International Terminal in May, 2012. This terminal has ten restroom sets spread over three levels to accommodate arrivals and departures for 12 gates in the 1.2 million square-foot facility.

Problems/Solutions
Customer service has been the driver for the Atlanta airport’s recent restroom upgrades. For the past seven years, the airport has been collecting data on various fronts including ASQ’s (Airport Service Quality) monthly interviews with departing passengers, staff impressions from weekly cleaning inspections, and through a phone number posted on a sign in each restroom.

The airport has a “restroom team” that represents the various airport departments involved with the restrooms and worked with their architects to determine the locations of the restrooms and quantities of fixtures. When planning and designing for the high usage of their restrooms, the airport staff follows this guiding principle: “Build it like a tank.” Learning from previous renovations, the restrooms in the terminal addressed the following issues:

- Small Toilet Stalls
  - Enlarged the standard stalls to 3’ wide by 5’-6” deep.
Hartsfield-Jackson Atlanta International Airport (ATL)

Water on Floors between Sinks and Paper Towels
- Installed paper towel dispensers at sinks directly above trash openings

Water Leaking Through Floor Tiles to Spaces Below
- Installed waterproofing under tile floors

Overflowing Trash
- Provide large capacity under-counter trash cans between each pair of sinks with hole in counter

Graffiti
- Installed graffiti film on mirrors that can be peeled off when marked
- Stall partitions are stainless steel with a diamond texture

Touching Fixtures and Surfaces
- Use hands-free dispensers for soap and paper towels, faucets, flushometers
- Eliminated entry doors

Paper Waste
- Use large roll paper towels that feed 8”-10” at a time
- Use single-ply toilet paper on coreless rolls
- The airport chose not to use hand dryers due to the noise and the aversion by many travelers to put their hands in an enclosure that may harbor other people’s germs

People Walking Into Wrong Restroom
- Installed an additional sign within entries to indicate gender of restroom one last time before person is inside restroom

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- Provide a Family Room with each restroom set

No Diaper Changing
- Dedicated area at end of lavatory counter with integral side walls

Not Enough Fixtures
- Building codes are not sufficient for the surges in an airport – provided more

High Water Consumption
- Installed low-flow fixtures
- Looked at waterless urinals but the low slope of the 1970s piping in the domestic terminals and concourses did not adequately flush out and created odors. They work well in the new International terminal.

Inadequate Chase Access for Plumbing Maintenance
- Installed surface mounted flushometers so repairs can be made within the restroom
- Provided 24” wide access doors for minimal access to chases.
Inadequate exhaust
- Increase exhaust rate and located diffusers over stalls in new terminal and F Concourse
- Also addressed smells with battery-powered air fresheners, but they were not as effective as hoped. Scented urinal strainers for urinals have worked well (need to be replaced every 4-6 weeks)

Poor Lighting
- Increase existing foot-candle levels by four
- Provided task lighting over stalls and sinks
- Added windows where possible for natural light.

Inefficient Cleaning
- Overhead-braced stall partitions
- Durable 12” x 12” quartz tile on floors and walls with 3/16” sealed epoxy grout joints
- Women’s restrooms have two entrances so one half can be shut down at a time for cleaning or repairs

Product Stacking
- Custom toilet paper towel enclosures contain the chassis of the dispenser that holds the paper roll and a back-up roll that drops down when the first runs out. There is also a shelf with storage for a third roll.
- The toilet paper dispenser has two rolls available for use and two in reserve above that drop down to ensure the dispenser never runs out
- Foam soap is plumbed from storage tanks in a cabinet below the counter to the dispensers at the sinks

A unique feature at Hartsfield-Jackson is that the Women’s restrooms each have a fulltime attendant who continually cleans up spills, check the paper supply, and provide assistance when needed. The airport has found that this person’s presence increases the perception of cleanliness. The airport currently feel an attendant is not necessary in the Men’s due to the lower dwell time and volume of traffic of the male travelers. Overall, the facility employs 780 cleaners including management teams.

Evaluation
With over a year in operation, the staff at the Atlanta airport is happy with the restrooms in the new International Terminal. The following positives and negatives have been observed that either remain or have developed as a result of their initiatives and will be considered in future restroom work:

- Reflectivity of porcelain tile in certain locations provides a sightline into the restroom from the concourse.
- The stainless steel trash cans below the counters are heavy to lift out to empty. Office grade plastic containers are being considered for replacement.
- There are still lines at some Women’s restrooms, especially from March to August when families tend to travel more. Large restrooms for Women or additional sets for Women are being considered.
- The Janitor’s Closets are often too small. Should be sized to store a minimum of 24-hour’s worth of supplies.
- Bottle fillers on drinking fountains are very popular.
- The stainless steel textured partitions are good at hiding fingerprints and preventing graffiti.
- Overhead braced stalls require frequent re-tightening of fasteners due to racking when doors swing.
- Considering epoxy terrazzo flooring to eliminate joints, but have found that coved base corners are difficult to clean.
- Older concourses rely on in-draft from the concourse which often does not provide enough exhaust
- Have found that the natural tile on the walls is absorptive and can “cloud” with dirt.

One case study participant closed the meeting by suggesting, “Build the restrooms for volume of traffic and ease of maintenance with the durability of a prison.”
Restroom Entrance with overhead, ADA, and Entry Signs

Restroom Set – Blue for Men, Pink for Women, Family and Family Room between Women Entrances

Family Room Overhead Sign

Drinking Fountains with Bottle Filling Station
Overhead-braced Stainless Steel Stalls

Urinals with Tall Screens for Privacy

Diaper Changing Area

Counter Area with Paper Towels, Trash, and Child Step Lower Right
Hartsfield-Jackson Atlanta International Airport (ATL)

Full-height Mirror in Women's and Men's

Storage under Counter

Four-roll Toilet Dispenser

Guts of Custom Paper Towel Dispenser
### Hartsfield-Jackson Atlanta International Airport (ATL)

**ATL Quality Assurance Form** – Approximately 4,000 Collected Per Month

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<th>Common Area Rating</th>
<th>Traffic Rating</th>
<th>Time Rating</th>
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<tr>
<td>#2</td>
<td></td>
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</tbody>
</table>

**Note:** Ratings of 1, 2 or 3 must have comments describing problem
Participants

Airport
Kofi Smith – Executive Director – AATC
Rod Ozust - Deputy Executive Director – AATC
Stephen Morris – Assistant Director – Central Passenger Terminal Complex – HJDP
Brian Kingston – Senior Vice President – AirServ Corporation
Todd Butler – Vice President – CPS

Moderators
Rose Agnew – Aviation Innovation
Jens Rothausen-Vange – Architectural Alliance International
“Triple Bottom Line: Social (Passenger Needs), Cost, Environment”

Overview
Hub Type: Large Hub
Hours of Operation: 3:30 a.m. – 12:00 a.m.
Designed Life: 15+ years
Annual Enplanements: 27,100,656
Airport Size: 5,160,000 square feet
Number of Gates: 155
Number of Restrooms: 59 Women’s
59 Men’s
8 Family
1 Mother’s Room
2 Pet Relief Areas (1 landside, 1 airside)
Case Study Project: Terminal A Improvements partial completion in April, 2013
Date of Case Study: September 13, 2013

Background
DFW opened in 1974 with four terminals and in 2005 opened a fifth, International Terminal D. In 2009 a $1.9 billion “Terminal Renewal and Improvement Program” (TRIP) for the original four terminals began with the renovation of Terminal A. Gates A9-A26 was completed in April 2013 and included the renovation of the associated restrooms.

Ten years ago, the airport began to seriously focus on customer service. Among their efforts, they participate in the Airports Council International (ACI) Airport Service Quality (ASQ) survey and for the two restroom-related metrics – Cleanliness of Washrooms and Availability of Washrooms – has scored 3.92 to 4.41 in the last two years. Despite these good ratings, the airport knew that the 40-year-old infrastructure was aged, the finishes worn, the spaces too small, the utilities were inefficient, and the amenities non-compliant with the ADA.

Compounding the state of the restrooms, those in each of the four legacy terminals were built to suit the resident airlines, so there were no standards. In 2007, the DFW Airport Planning Department published their “Guidelines for Public Terminal Toilets,” which addresses design concepts, fixtures and accessories, finishes, and provides an appendix of product specifications. The manual was updated in 2012 upon the completion of the programming for the TRIP initiative. The airlines now comply with this standard. With each project, the planning staff assembles a task force, which gives all the stakeholders a voice in the outcome.

Problems/Solutions
One of DFW’s customer service initiatives is a posted QR code for passengers to register comments on the restrooms. The most common complaints are odors and water on the counters. There are also “Ambassadors” who roam the airport and provide day-to-day input. There are rarely lines at the restrooms; however, the spaces feel crowded. The triple bottom line philosophy of the airport is to address Social (passenger needs), Cost, and Environment. To that end, the restrooms in the Terminal A renovation addressed the following issues:

Small Toilet Stalls
- Enlarged the standard stalls
- Shelf above toilet and urinals for belongings
Dallas/Fort Worth International Airport (DFW)

Touching Fixtures and Surfaces
- Use hands-free dispensers for soap and paper towels, faucets, flushometers
- Eliminated entry doors

Water on Countertops
- Installed paper towel dispensers at sinks directly above trash openings, but water still drips from

Graffiti
- Installed graffiti film on mirrors that can be peeled off when marked
- Caused by both passengers and employees

People Walking Into Wrong Restroom
- An additional “verification” sign is installed farther into the entry to confirm the restrooms gender

No Diaper Changing
- Fold down models are provided in Terminal A. Dedicated counters were provide in D where the new construction allowed more space

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- Use the name “Assisted Care Toilet” instead of Family Room to acknowledge aging population and multiple cultures
- Provide a Family Room where space allows

Inadequate exhaust
- Increase exhaust rate

High Water Consumption
- Installed low-flow fixtures – cut consumption in half
- Looked at waterless urinals but had concerns about odors

Poor Lighting
- Provided task lighting over stalls and sinks

Inefficient Cleaning
- Overhead-braced stall partitions are easier to clean under. A few pilasters go to the floor to prevent racking of the doors.
- Use sustainable cleaning products

Product Stocking
- The toilet paper dispenser has two rolls available for use
Evaluation
With restrooms open for a year for evaluation and with years of renovation to come, lessons learned are plentiful. The following positives and negatives have been observed that either remain or have developed as a result of their initiatives and will be considered in the future restroom work:

- Trap primers are not cleaned enough so smells are an issue
- Toilet carriages are settling the clay masonry walls. As the fixtures rock back and forth, the pipe joints in the walls loosen and begin to leak.
- Due to multiple vendors throughout the airport, there are eight different styles of paper towel dispensers. The goal is to have an airport-wide standard for this.
- Paper towel dispensers are installed at sinks directly above trash openings, but water still drips from the sink to the dispenser.
- The goal is to have restroom sets no more 300 feet apart with fixture counts that exceed code minimums and additional fixtures for females.
- Terminals A and C have the only restrooms without plumbing chases making maintenance a challenge.
- The airport decided not to provide footbaths, however there is occasional damage to fixtures from people standing on them.
- The first stall within a restroom is always the cleanest. People pass by to get to the most private.
- A floor-mounted toilet or wall-hung toilet with a floor support at front may be required more in the future as people become more obese.
Wayfinding Blade Sign Beyond ADA Sign and “Verification” Sign Beyond and Acoustic Wall Carpet

Room Sign with Directions to Nearest Restroom Alternate Name for Family Room
Dallas/Fort Worth International Airport (DFW)

Entry Area

Sink Area

Urinals with Shelf Above

Typical Stall
Assisted Care Toilet

Assisted Care Toilet

Assisted Care Toilet Changing Table and Seat
## ACI Survey for DFW

### Dallas/Fort Worth International Airport (DFW)

![Image of the survey report](image)

*Note: The image contains a table with detailed survey results for various aspects of the airport experience, including Customer Service, Security Check, and Baggage Claim.*

Appendix C.I  
Page 27
Participants

Airport
Bob Blankenship – Assistant Vice President, Planning
Darren Deffner – Senior Project Manager, ADE – Architecture
Tommy Huddleston – Assistant Vice President, Energy, Transportation, and Asset Management
Mark Holt – ISM / ETAM
Al Gonzalez – Analyst, Marketing Services
Mark Moreno – Manager, Infrastructure Plan / ETAM
Reeshema Brashear – Facility Services Coordinator

Moderators
Rose Agnew – Aviation Innovation
Jens Rothausen-Vange – Architectural Alliance International
“Like Painting the Golden Gate Bridges”

Overview
Hub Type: Large Hub
Hours of Operation: 24/7
Designed Life: 5 years for cosmetic refresh/10 years for gut
Annual Enplanements: 31,362,268
Airport Size: 5,800,000 square feet
Number of Restrooms: 38
Number of Gates: 140
Case Study Project: Tom Bradley International Terminal addition completed August 2013 and Terminal 1 Restrooms (representative of current standard) completed in 2007
Date of Case Study: September 26, 2013

Background
LAX is considered the world’s busiest O & D airport with a broad spectrum of travelers pulled in from the sprawling metropolis. As such, the restrooms take a constant beating, to the point where cosmetic updates are needed every five years and total guts every ten to fifteen years. With about 180 restroom sets, there are always restroom renovations underway. One case study participant likened it to painting the Golden Gate Bridge. “A soon as you’ve renovated them all, you start all over again.”

To manage this massive scope of work, the Los Angeles World Airports (LAWA) developed a Design and Construction Handbook in 2011 based in part on standards used by large entertainment venues for its facilities. The handbook is in its third iteration and covers all aspects of construction work at the airports. It is available the airport’s website. The restroom portion is unusually robust for the aviation industry. Lessons learned from both renovation, as in Terminal 1 and new construction, as in the new addition to the Tom Bradley International Terminal will likely spur another update to the handbook. While the new International Terminal restrooms were not available to visit for the case study, existing restrooms in Terminal 1 were toured as a typical representation of the more recent standards.

Problems/Solutions
As with other airports, customer service is the driving force behind the intense focus on keeping the restrooms at LAX appealing. Other drivers include increased security concerns since 9/11 and the cost of ongoing maintenance. An informal project team is involved in every restroom project that includes the managers from all entities involved in the restrooms – trades, vendors, cleaners, designers, etc. Despite the rigorous process shepherding projects from conception to completion, there remain numerous obstacles that the airport has to contend with such as ever changing vendors for paper and soap that require changes in dispensers. Issues that the facilities staff tries to improve include:

- ** Awkward Circulation in Restrooms**
  - Avoid dead end circulation – prefer loop around wall with sinks on each side and stalls flanking the perimeter
  - Accessible stalls should be near entry
Distance to Restrooms
- Try to have a maximum of 250 feet to nearest restroom
- Prefer bigger restrooms that are less frequent to accommodate arrival surges

Small Toilet Stalls
- Enlarged the standard stalls to 3’-6” wide by 6’-0” deep with a shelf
- Hooks on back of doors dent the front face when the door is slammed open against side wall

Water on Floors between Sinks and Paper Towels
- Installed paper towel dispensers between every other sink directly above trash openings

Overflowing Trash
- Provide large capacity under-counter trash cans between each pair of sinks with hole in counter

Graffiti
- Installed graffiti film on mirrors that can be peeled off when marked
- Found phenolic resin partitions easy to maintain but not good for vandal resistance

Durability of Finishes
- Provide finishes that are “bullet-proof” to withstand the traffic without looking like a rest stop
- Stainless steel stalls with diamond pattern very durable
- Test for new materials: If it scratches with a key it is not accepted. It cracks when whacked with a sharp heel it is not accepted.

Hard to Reach Faucets and Soap Dispensers
- Faucets are to one side of the sinks at 45 degrees and soap dispensers are to the other side also at 45 degrees

Touching Fixtures and Surfaces
- Use hands-free dispensers for soap and paper towels, faucets, flushometers
- Eliminated entry doors

Paper Waste
- Paper is the biggest expense
- Use large roll paper towels – limo drivers would use stacks of C-fold towels to clean their cars
- Paper is preferred. One hand dryer is provided in each restroom for those who like them

No Lactation Rooms
- Receptacles in Family Rooms allow someone to use a pump.

No Diaper Changing Area
- Provide fold-down table in accessible stall when there is no other space available.

Diaper Changing Area Always Dirty
- A flat counter with no depression and no straps keeps clean the easiest.

High Water Consumption
- Installed low-flow fixtures
- Tried waterless urinals but they did not work well in this application.


Inadequate exhaust
- Provide centralized air fresheners. “A clean restroom shouldn’t smell.”

Poor Lighting
- Prefer indirect lighting, use downlights that provide punch. If lighting is too dim - the room doesn’t feel clean.

Handling Emergencies
- A device in the Family Rooms turns on a light outside the room and sends an alert with the room number to the facility monitoring station when someone is in distress

Inefficient Cleaning
- Restrooms always take priority over other spaces when cleaning is required
- Cleaners tend not to take pride in their work when finishes are dated and worn
- Used overhead-braced stall partitions for easy cleaning underneath. Pilasters at every third stall keep partitions from racking.
- Try to make restroom with ability to close half for cleaning or repairs. If there’s only one restroom, you lose all the fixtures for a gender in that location
- Large format tiles that resist cracking are preferred
- Floor color is medium gray to mask dirt
- Avoid getting water behind mirrors

Sustainability
- A reclaimed water system is not available yet, but new restroom renovations include purple piping for future use.

Evaluation
To monitor the facilities, including the restrooms, each of the nine terminals has a quarterly “Terminal Walk” made up of one person from each department. The conditions are evaluated and documented using checklists, photos, and written comments. Positives and negatives have been observed in the most recent restrooms include:

- The mirrors in some of the new locations provide a reflected sightline into the restroom.
- Touch screens will be used in future renovations to collect passenger comments.
- Don’t like to have “Employees Must Wash Hands” in public restrooms. It sends a bad message about the airport workers.
- Concerns about how uric acid affects epoxy. Degrades epoxy grout over time and retains smell. What happens to an epoxy terrazzo floor? Provide a zinc strip 2-0” out from mall at urinals to aid future floor replacement.
- The current color scheme is too dark. The dark counters and floor show water spots and light dirt.
- Choose flooring color to match color of dust (will be different in various parts of the country) – hides the dirt. At LAX it is dark gray.
- Looking at trough-sinks for next renovation in Terminal 5 to avoid counters with standing water.
- Looking at different ways to prevent splashing from urinals
- Receptacles in accessible stalls would be useful for various medical devices, etc.
Entrainces to New Tom Bradley International Terminal Restrooms (Image from LAX)

Sink Area in New Tom Bradley International Terminal Restroom (Image from LAX)
Los Angeles International Airport (LAX)

Terminal 1 Restroom Entrances with Overhead and ADA Signs, Drinking Fountains Between

Sink Areas

Stalls with Accessible Stall at Fare End

Urinal Area
Los Angeles International Airport (LAX)

Accessible Stall

Accessible Stall

Typical Stall

Hand Dryer for Travelers Who Prefer Them
"Optimal" Floor Plan from LAWA Design and Construction Handbook. The Door between the Entrance and the Pipe Chase Allows One Half of the Restroom to be Shut Down for Cleaning or Repairs. When more space is available, put sinks in the middle with space to walk around them on both sides.
RESTROOMS, DESIGN INTENT

The following recommendations shall serve as minimum standards and in no way are intended to limit the Design Professional's creativity or their success in meeting the objectives.

1. Restroom shall have a minimum of 15 air changes per hour. Separate single use Family Restrooms shall be provided in new construction and where space is available for renovation projects.

2. All Public Restrooms to be equipped with a diaper changing station.

3. Diaper changing station to be fixed-type, constructed of stainless steel at all new restrooms, and where possible in remodel projects. "Fold down" type will be acceptable in space confined stalls.

4. Lighting should be ample but comfortable. There should be no areas that appear dark and unlit. Special lighting may be required at baby change stations, entry vestibules, and in front of mirrors.

5. Unless otherwise required by Code or unique space constraints exist, doors shall not be used to enter restrooms. Vestibules shall have 48” wide minimum clear openings that are arranged to allow free-flow traffic without sightlines into the restrooms.

6. Wall Finish assembly should be full height ceramic tile or stone – glass mosaic or other approved accent finish may be used.

7. Where feasible, metal studs should be set on a raised 6” concrete curb

8. Stainless Steel (306, No 6 Finish) corner guards shall be used at all outside corner walls at a minimum of 42” AFFL. Corner guard shall be installed above the base tile.

9. Ceiling heights shall be 9'-0" minimum, except in stall compartment area where the soffit should be 8'-0".

10. Porous ceiling materials are not acceptable. Ceiling shall be cement plaster or water-resistant drywall. All ceilings to be painted.

11. Access for water shut-off valves, temperature control valves, electrical transformers, etc. shall be located near a ceiling access panel to the extent possible.

12. All doors, frames and hardware shall be in compliance with the door and lock specifications provided in Section 08 90 00 of the Guide Specifications (Design & Construction Handbook).

13. Provide ADA and LAFD approved Emergency Strobe Lights and Speakers as required.

14. New restroom designs shall incorporate a pipe chase with a 30° minimum door.

*LAX Restroom Scope Guidelines*
Sample of LAX OPS Walk Report (page 1 of 3)

Los Angeles International Airport (LAX)
### Sample of LAX OPS Walk Report (page 2 of 3)

<table>
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<th>Location</th>
<th>Remarks</th>
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<td>Fire hydrants</td>
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<td>Fire extinguishers</td>
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Los Angeles International Airport (LAX)
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<td></td>
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**Sample of LAX OPS Walk Report (page 3 of 3)**

Appendix C.1  Page 39
Sample of LAX Building Condition Photos)
Participants

Airport
Ellen Wright – Director, Airport Terminal Planning
Mike Doucette – Chief of Airport Planning
Manuel Cheng – Assistant Director, Maintenance/FMG
Victor Rocha – Superintendent, Maintenance/FMG

Moderators
Rose Agnew – Aviation Innovation
Jens Rothausen-Vange – Architectural Alliance International
“Prototypes”

Overview
Hub Type: Large Hub
Hours of Operation: 24/7
Designed Life: 50 years
Annual Enplanements: 15,512,487
Airport Size: 3,331,700 square feet
Number of Gates: 124
Number of Restrooms: 78 Women’s
73 Men’s
32 Family
Case Study Project: New Concourse E and F Prototype Restrooms opened in January 2013
Date of Case Study: October 3, 2013

Background
The original 1958 terminal at Minneapolis-St. Paul International Airport has been expanded several times adding five concourses to the original terminal as well as a second terminal connected by light rail. With the additions have come renovations to keep the airport among the top-rated airports in terms of customer service. The effect on the restrooms is a legacy of spaces with identifiable vintage, the originals now surpassing five decades in age.

With the added complexities to traveling by air after 9/11, customer service became an industry hot-button. In response, the airport shifted from an operational focus to that of the customer. A participant in the ASQ Benchmarking Survey, MSP developed a new vision statement, “To give our customers the best airport experience in North America.” The Metropolitan Airports Commission (MAC) decided to go a step beyond a facelift in 2010 and endeavored to completely rethink the modern airport restroom. For a year, a group made up of managers, representatives from all the airport trades, vendors, and the design team met weekly to evaluate each of the 100 sets of public restrooms and dissect every aspect of the facilities. The major airlines also provided comments as they are equally interested in providing good service.

The end result was the development of a prototype restroom set, with one set constructed on two concourses in 2012 as a test. Since that time, additional sets are being developed for lactation rooms, service pet relief areas, less public restrooms, and fine-tuning the prototype for the next sets. The MAC plans to renovate all of the public restrooms over the next twenty years.

Problems/Solutions
Noting that the original restrooms remain in essentially their original state, the MAC realized that they needed to construct restrooms with a fifty-year life span. While fixtures and technologies will change, the bones needed to be durable, easy to maintain, and timeless. To this end, part of the planning effort is to place restroom sets in the “right” location inferred from providing IATA Level of Service A. This will occasionally incur the costs of relocating tenants, but the MAC’s feeling as that the payoff in long-term customer service is worth the effort.

Problems that have been addressed include the following:

Long Lines at Women’s
• Provided two times the fixtures for women compared to men
Security Issues
- Pipe chases are sized so that tool carts can be brought inside them so tools aren’t exposed to passengers who might take them. Otherwise, an additional staff person is needed to watch over the cart.

Accessibility Issues
- Providing ADA minimums not enough for different needs. Engaged individuals representing various disabilities to determine needs.

Dated Materials/Design
- Created a modern/timeless aesthetic with a focus on durability and cleanability. Art is used to provide focal points. Tried to balance between the durability of a bus terminal restroom and the elegance of a club lounge.

Water on Floors between Sinks and Paper Towels
- Installed hand dryer and paper towel dispensers at sinks directly above trash openings

Overflowing Trash
- Provide large capacity trash cans that are emptied in pipe chase where chase is available.

Graffiti
- Restrooms on non-secure side more prone to graffiti, loitering, needle disposals broken into, vandalism, etc. Future prototypes will be developed for these locations that will address these issues

Small Toilet Stalls
- Enlarged the standard stalls to 3’ wide by 6’-0” deep. Typical stalls are all set up as ambulatory stalls.

Touching Fixtures and Surfaces
- Use hands-free dispensers for soap and paper towels, faucets, flushometers
- Eliminated entry doors

Paper Waste
- Use large roll paper towels
- Use toilet paper on coreless rolls

Wayfinding Ineffective
- There are too many signs competing for attention in already cramped concourse. Blade signs were removed and the restroom façade became the sign.
- Large, inset quartz super-graphics signify the restroom’s gender.
- Backlit ADA signs include a monitor indicating the nearest restroom when the restroom is closed for service. This action is activated when staff swipes their card at the reader hidden behind the sign glass. This activation also doubles the exhaust to pull out cleaning chemical fumes.

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- Provide a Family Room with each restroom set with a privacy wall between toilet and sink area

No Pet Relief Area on Secure Side
- First airport to provide indoor pet relief area. Formalizing a program for entire airport.
Minneapolis-St. Paul International Airport (MSP)

No Diaper Changing
- Built-in changing table with adjacent sink and hand drying. Shelf along wall like by sinks for belongings.

High Water Consumption
- Followed EPA “Water Sense”
- Installed low-flow fixtures
- Looked at waterless urinals but had concerns about odors

Clogged Drains
- Design drainage path so that toilets flow toward urinals and then flow to sinks to provide as much water pressure as possible to clear out drain pipes

Inadequate exhaust
- Supply air low under sinks where possible to dry wet floor and exhaust high above toilets

Poor Lighting
- Provided daylighting where possible
- Provided task lighting over stalls
- Provided vertical lights integrated in mirrors
- Bright surfaces use light more efficiently

Sustainability
- While not pursuing LEED certification, as many criteria as are practical were pursued

Inefficient Cleaning
- Seamless epoxy terrazzo floor
- Large-format 52” x 108” quartz wall panels with sealed butt joints
- Thermal motion detectors are connected to the facilities monitoring system and notify the cleaners when a threshold of passengers has visited a restroom so a cleaner can be dispatched.

Product Stocking
- The toilet paper dispenser has two rolls available for use
- Foam soap is plumbed from large storage tanks in pipe chase
- Large storage area between restrooms

A unique opportunity on these prototypes was the creation of new products or modifications to existing ones to suit the passenger needs. These included:

- A two-person trough sink, new to the market, that was modified to be 4” shallower from front to back to enhance reach to the faucets and the rear shelf and had an additional drain added so that a clogged drain wouldn’t take out both locations. A single-person version was also developed that included an overflow. The basin was also modified to accommodate a small plunger.
- A combination unit for the toilet stalls that met ADA requirements was created that combined a double-roll toilet paper with a hinged waste receptacle sized to hold an adult diaper.
- A biohazard disposal was created to house the unsightly red plastic disposal in a recessed stainless steel enclosure that matched the other accessories.
• A stainless steel patter/texture was developed that was more effective at eliminating fingerprints scratches.
• LED clerestory light boxes were developed to compliment the lighted mirrors and to provide a more inviting ambient light.

Evaluation
In the spirit of the design process, all the trades, vendors, and design team members were invited to evaluate how the prototypes are performing. Passenger comments via texting (a number is posted in each restroom) also contribute feedback.

• The toilets with the blow-out feature proved to be very noisy, startling users and are a distraction to people out in the concourse. Different models are being looked at for future restrooms.
• The hand dryers are quite noisy and make an awkward arrangement with the paper towels and trash. Negative passenger feedback has led the MAC to consider eliminating hand dryers from future restrooms.
• While the restrooms are distinctive within the concourses, they are still hard to see from a distance. A new waiting area that architecturally spans the concourse will be added to create a stronger identifier. This will also include space for vending so that each restroom set becomes an amenity node.
• Some of the new features, like bottle fillers and active signage can now be incorporated into existing restrooms so there’s an immediate benefit until those restrooms are renovated.
• Custom jambs and modified hinges and latches were created for the stall doors to prevent site lines between the door and partition and to be self-closing to a few inches from completely closed so you can see if the stall is occupied. These proved to not be durable enough because the stall doors, a prototype product and finish, ended up being manufactured with an MDF instead of aluminum core, making them quite heavy. All the hinges and latches had to be replaced after only a few months. A simpler jamb detail with standard door hinges and latches are planned for the next round of restrooms.
• The large trash cans in the pipe chases are heavy and unwieldy. Handles and a sliding shelf will be added to make emptying the trash easier.
• The ADA requirement to have the toilet paper low created a difficulty in replacing toilet paper rolls because the dispenser is low to the floor, making it awkward to get the rolls inside.

The case study group concurred that they are not competing with other airports, but rather with their own facility to keep improving the spaces and thus the travelers’ experience.
Entrance with Mosaic Tile Art Wall and Adjacent MUFIDS

Lavatory Block

Illuminated Room Signage on Right with Information Monitor

Typical Aisle with Double-lavatory Stations on Left and Stalls on Right
Minneapolis-St. Paul International Airport (MSP)

Lavatory Area

Changing Table Area

Typical Stall with Thickened Walls and Shelf/Alcoves for Belongings

Urinals with Thickened Walls Similar to Stalls
Accessible "Stall" is a private room with Translucent Daylighting on Right

Drinking Fountains with Bottle Filler
Participants

Airport
Phil Burke – Operations, MAC
Alan Howell – Senior Airport Architect, MAC
Tim Fox – Plumbing, MAC
Steve Gentry – Customer Experience and Operations Analyst, MAC
Shannon Gale – Assistant Manager, Facilities, MAC
Denise Faulke – Account Manager, ABM

Moderators
Rose Agnew – Aviation Innovation
Jens Rothausen-Vange – Architectural Alliance International
MEDIUM HUB
CASE STUDIES

Sacramento International Airport (SMF)
John Wayne Airport (SNA)


“Balance Aesthetics with Maintenance”

Overview
Hub Type: Medium Hub
Hours of Operation: 4:30 a.m. – 1:00 a.m.
Designed Life: 10 years
Annual Enplanements: 4,424,279
Airport Size: 670,000 square feet
Number of Gates: 32
Number of Restrooms:
  11 Women’s
  11 Men’s
  11 Family
Case Study Project: New Terminal B opened in October, 2011
Date of Case Study: September 27, 2013

Background
The Sacramento Metropolitan Airport opened in 1967. Continual growth that surpassed expectations and the addition of Southwest Airlines, Alaska Airlines, Horizon Air, and TWA precipitated the construction of Terminal A in 1998. Shortly after, Terminal A opened, at which point the facility became Sacramento International Airport. The ageing Terminal B was replaced in 2011 by a new terminal three times as large. The airport participates in the ASQ customer service survey process.

Problems/Solutions
One of the biggest issues in the original terminals was the marble partitions and doors. The heavy doors frequently cause the stall door hardware to fail incurring significant maintenance costs. In addition, the marble is from Italy so not only is it costly to transport pieces to California, there is a long lead time. One of the sustainable strategies used in the design of the LEED Silver terminal was to use locally sourced materials. The new restrooms have large readily available format tiles and use lighter stainless steel stall partitions and doors. A “strike team” of cleaners hit restrooms after surges.

One of the challenges for the airport staff was getting the design team to balance their architectural ideas with the needs of the maintenance staff. While the representatives from the airport trades and airlines participated in the process, not all recommendations were incorporated into the design. Learning from previous renovations, the restrooms in the terminal addressed the following issues:

**Small Toilet Stalls**
- The typical stall size was increased for easier maneuvering and to have space for carry-ons
- A shelf behind the toilet and urinals provides a place to place belongings
- Hooks in stalls are heavy duty to support heavy bags

**Graffiti**
- Installed graffiti film on mirrors that can be peeled off when marked

**Touching Fixtures and Surfaces**
- Use hands-free dispensers for soap and paper towels, faucets, flushometers
- Eliminated entry doors
Paper Waste
- Change from C-fold to large rolls saves custodial time
- Paper towels are sometimes used to cover toilet seats, which can clog the toilet drains
- The airport chose not to use hand dryers

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- Provide a Family Room with each restroom set
- An outlet is provided in each Family Room for lactation pumps.

No Diaper Changing
- Both built-in and fold down types were used depending on the space available

High Water Consumption
- Provided low flow fixtures

Inadequate exhaust
- Each restroom has a dedicated exhaust system in Terminal A.

Poor Lighting
- Provided task lighting over stalls and sinks
- Motion detectors are used in some of the new restrooms
- Restrooms are on emergency power

Awkward Maintenance Access
- The access panels under the sink counters were originally constructed of stainless steel on MDF boards.
  Each panel weighed 75 pounds and hung on two hooks making it very difficult for staff to get access.
  Terminal B used lightweight plastic panels with a finish that blends with the surrounding materials.

Evaluation
The following positives and negatives have been observed that either remain or have developed as a result of new initiatives:

- Ideally, you would configure the restroom layouts so that a portion can be shut down for cleaning and maintenance at a time rather than the entire restroom.
- Expensive materials and equipment are not necessarily better. There should be a balance between reliable and affordable.
- Plumbing maintenance is best located in chase so that restroom availability isn’t interrupted.
- Access to plumbing chases is often within the restrooms, which creates a problem when staff of the opposite gender needs to work in the chase. Access should ideally be from the concourse.
- The current chases are too narrow to effectively work inside.
- The urinals did not come with permanent strainer so they frequently clogged from paper, gum, etc. that is tossed in. Disposable splashguards have helped.
- Because low flow fixtures use less water, it is easier for waste to get hung-up in the pipes. The plumbers found that the interior surfaces of old cast iron pipes below grade create a lot of friction compared to smoother PVC. The lower flow would also work better with the pipes sloped steeper.
• The curved bases integral in the epoxy terrazzo flooring has had a learning curve for the cleaners since they have to be cleaned by hand – the cleaning equipment only work with right-angle floor/wall transitions.
• “Don’t use Black Counters” – it shows water on counters. A water softener system is being tried at terminal A to reduce water stains. Dark floors have the same problem.
• The trap primers are located in a bad spot in the drainage system so it’s difficult to manage smells.
• The designers tried to make a simple wayfinding system that was intuitive; however, it is difficult to find another restroom if one is shut down.
• Some light fixture locations are difficult to access for lamp replacement
• LED lamps are being considered for future use
• A toggle switch to request maintenance in each restroom would be useful. QR codes are being considered for passengers to communicate comments
• Stainless steel is difficult to keep clean
Sacramento International Airport (SMF)
Sacramento International Airport (SMF)

Overhead Wayfinding Sign

Acoustic Wall Carpet and Changing Table in Entry

Drinking Fountains, Family Room, and Men's

Sink Area with Changing Table Beyond
Sacramento International Airport (SMF)

Stainless Steel Stalls

Urinals with Shelf Above

Family Room

Family Room
Participants

Airport
Carl Mosher – Deputy Director, Facilities and Infrastructure
Lisa Stanton – Airport Chief Operating Officer
Chris Martin – Airport Manager, Facilities
Greg Nowakowski – Airport District manager, DGS
Brian McKenzie – Trades Coordinator, DGS

Moderators
Rose Agnew – Aviation Innovation
Jens Rothausen-Vange – Architectural Alliance International
**“Passengers Should Not Be Aware of Terminal Support Systems”**

**Overview**
Hub Type: Medium Hub  
Hours of Operation: 7:00 a.m. – 11:00 p.m.  
Design Life: NA  
Annual Enplanements: 4,278,623  
Airport Size: 730,505 square feet  
Number of Gates: 20 bridged, 6 ground-level-loaded  
Number of Restrooms:  
  - 12 Women’s  
  - 12 Men’s  
  - 6 Family  
  - 2 Pet Relief Areas (landside)  
Date of Case Study: September 26, 2013

**Background**
The John Wayne Airport in Orange County, California is an Origin & Destination (O & D) airport (approximately 5% of passengers transfer) that is used heavily by tourists visiting nearby destinations such as Disneyland and Newport Beach. There is also a significant business-based travel demand. In 2008, a multi-year program to renovate the existing 20-year-old restrooms was begun. All but two sets have been completed. Terminal C was completed in 2011, adding six bridged gates bringing the total to 20. The new restrooms in Terminal C followed a refined version of the 2008 program incorporating lessons learned from the renovations. Despite its smaller physical size, John Wayne Airport has peaking conditions similar to major hub airports such as Chicago’s O’Hare International Airport.

Passenger comments are typically communicated via courtesy phone to John Wayne Airport’s Customer Relations staff. In addition, every two years since 1994 a survey by an independent third party is conducted of the passengers. The restrooms routinely get high marks (the 2011 survey gave the cleanliness of the restrooms an A, the same as in 2009). The airport’s philosophy is that the terminal support systems should never diminish the quality of the passenger-traveling experience. The airport has also decided not to have ads in the restrooms as that may increase dwell time and aesthetically add clutter.

**Problems/Solutions**
Two of the most important considerations for the restrooms are cleanliness and sufficient space to maneuver. The new terminal set a standard that the existing restrooms have followed as they are remodeled. The studs in the old restrooms were found to be severely rusted and so were gutted, new curbs were added to bring the structure off the potentially wet slab, and new walls were rebuilt on top. More durable and contemporary finishes that tied into the color palette and architectural vocabulary of the new concourse replaced the existing outdated 2” x 2” tiles enabling a brighter and more open feeling throughout. Restrooms on the landside are generally smaller since passengers tend to want to get through security quickly. The airport believes that being an O & D airport also minimizes graffiti problems.

The following issues found in the original restrooms as well from the recent renovations were addressed in the new expansion:
Toilet Stall Sizes
- The length of the new stalls was increased to make space for people’s carry-ons
- Code minimums are not enough – additional fixtures were provided where space allowed

Fixtures and Surfaces
- Hands-free dispensers for soap and paper towels, faucets, flushometers
- Faucets and soap dispensers are located 45-degrees to each side of sink to make them easier to reach
- Eliminated entry doors

Paper Waste
- Trash used to be located far from the paper towel dispenser, now it’s integrated with the dispenser
- Single-ply toilet paper is provided in the public restrooms due to the volume of paper used. Two-ply is used in employee restrooms.
- Hand air dryers are not used

Water Consumption
- Installed low-flow fixtures
- Tried waterless urinals but problems with odors occurred when following recommended maintenance

Adequate Air Exhaust
- Proper ventilation is a priority
- Drains are cleaned frequently
- Deodorizers are avoided because some people are sensitive to fragrances

Adequate Lighting
- Provided task lighting over stalls and sinks
- Lights are on 24/7
- Only lights are on emergency back-up. The airport has a co-generation plant so it is unlikely all power would fail completely.

Restroom Way-Finding
- Blade signs are not intuitive, especially when competing with other signs. A linear concourse floor plan makes it easier to locate restrooms and other spaces because they are more visible as passengers approach.

Restrooms for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- Provided a Family Restroom adjacent to primary restrooms, (space permitting)
- A fold down seat is located in each Family Restroom for family member or a companion

Efficient Cleaning
- Wall-hung toilets are easiest to clean. If mounted properly, there shouldn’t be a problem with fixtures working loose due to heavy use.

Product Stocking
- The toilet paper dispenser provides two rolls
- Foam soap was replaced with liquid soap. Liquid soap has performed more satisfactorily.
All the restrooms are checked on by the cleaning staff every fifteen minutes and spot cleaned and restocked if needed. Airport managers have found that even if restrooms are dirty or out of paper, travelers are more forgiving if they see someone taking care of it.

**Evaluation**

John Wayne Airport (JWA) Considers “Lessons Learned” with each restroom renovation. As new products are made available, they are incorporated as appropriate. The following points have been addressed as a result of JWA initiatives and will be considered in future restroom work:

- Counters have a gap in back at the wall to allow water to drain off. However, the water remains on the flat counters.
- The restroom set in the Customs area has a shared entry area for Men and Women. Because travelers are distracted and tired, they often walk into the wrong restroom. All future restrooms will likely have separate entries.
- JWA considered trough-style urinals but they are illegal in California
- The automatic flush valves are good for cleanliness but they do not save water because they may be activated several times during every use.
- Low-flow urinals don’t provide enough water to flush liquid waste through drain pipes.
- Existing pipe chases between sink banks are wasted space. They are not wide enough to work inside. It would be more efficient to eliminate the chase and do maintenance from the restroom side.
- The ambulatory stalls were located in a space sized for a fully accessible stall. This leaves an unusable space that might have accommodated cleaning carts had it been a little bigger.
- Hooks for coats and bags should be large enough to accommodate large bags or bags with wide straps.
- There are two pet relief areas on landside, but there are no options once through security. An airside pet relief area is planned.

An additional issue is the difficulty in maintaining standard hardware products, accessories, fixtures, etc. During construction, bidders may substitute hardware products and vendors may change out dispensers as new products become available. This can create a maintenance issue keeping track of locations for different models, maintaining attic stock, and ordering replacement parts.
Wayfinding Medallion Signs

Entrance to Men's – Note California Required Triangular Sign for Vision Impaired

Sink Area

Double Sink with Changing Table
John Wayne Airport (SNA)

Double-Loaded Aisle

Typical Stall on Older Restroom Set

New Pipe Chase with Studs on Concrete Curbs

Urinals with Shelf Above
Appendix C.1

John Wayne Airport (SNA)

Family Restroom Sign

Family Restroom with Changing Table / Sink

Fold Down Seat in Family Restroom
Participants

**Airport Management**
Gary Blankenship – Airport Architect
Ambi Thurai – Manager, Airport Engineering
Rick Cathey – Senior Project Manager

**Airport Custodial**
Mariella Lewis – Regional Airport Manager
Aleida Ponu – Customer Service Manager

**Moderators**
Rose Agnew – Aviation Innovation
Jens Rothausen-Vange – Architectural Alliance International
SMALL HUB

CASE STUDIES

Long Beach Airport (LGB)
Blue Grass Airport (LEX)
Overview
Hub Type: Small Hub
Hours of Operation: 5:00 a.m. – 10:00 a.m.
Designed Life: 20 years
Annual Enplanements: 1,451,404
Airport Size: 77,850 square feet
Number of Gates: 11
Number of Restrooms: 4 Women’s
                                 4 Men’s
                                 2 Family
Case Study Project: New Concourse Restrooms opened in December, 2012
Date of Case Study: September 25, 2013

Background
The original terminal opened in 1941. The streamlined modern building is on a registered Cultural Historic Landmark so modernization has been minimal. The four original restrooms remain essentially unchanged, because renovation may require ADA compliance and that would reduce the fixture count, which is already inadequate. After years of housing passenger functions in trailers around the old terminal, including the restrooms, a new concourse was finished in late 2012 spurred by the arrival of Jet Blue in 2001.

The brightly day-lit modern facility is comprised of two separate hold room buildings connected by an outdoor plaza shaded by towering palm trees. This unusual configuration was the result of a sometimes contentious, ten-year planning process. The airport is land-locked with very restrictive noise ordinances so expansion was strictly limited. The restrooms were considered by the City to be part of the hold rooms, which squeezed the restroom sizes to allow larger gate lobbies. The planners split the building, which allowed them to increase the number of plumbing fixtures by using the building code minimum for each separate building.

A separate checkpoint building is located in the plaza area between the original terminal and the new concourse. The checkpoint building does not have restrooms, as passengers tend to flow through without lingering. The new concourse is Silver LEED, and an upcoming project to add photovoltaics should bring it a Gold certification.

Problems/Solutions
The biggest driver for the new restrooms followed those of the new concourse – to provide facilities that offer the quality experience travelers expect that trailers simply cannot provide and the historic terminal is not capable of delivering. The new restrooms receive consistently good feedback, which is monitored by available email and Twitter addresses. The biggest complaint was that baby changing tables had not been provided. This has since been remedied. Other issues the new restrooms addressed include:

- **Not Enough Fixtures**
  - The fixture count is based on building code requirements. Lines have not been observed.
  - One set is provided in each new terminal building.
No ADA Stalls
- The new terminals are fully accessible, replacing the trailers that had been provided before.

Dated Materials and Colors in Original Terminal
- Provided a clean, simple appearance with durable, easy to maintain finishes and fixtures.

Graffiti a Problem
- Use a peel off film that is graffiti resistant.

Too Much Signage Clutter
- Tried to minimize need for signage by making concourse open and easy to see all areas.

Touching Fixtures and Surfaces
- Use hands-free dispensers for soap and paper towels, faucets, and flushometers – soap dispensers by vendor
- Eliminated entry doors

Paper Waste
- Use large roll paper towels – dispensers provided by vendor

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- A Family Room is provided at each new set.

High Water Consumption
- Provided dual flush valves for the toilets
- Waterless urinals have worked well. They are serviced regularly and have no issues with odors.

Evaluation
With over a half year in operation, the public is delighted with the modern and open design of the new terminal, especially the new larger restrooms. The following positives and negatives have been observed that either remain or have developed as a result of their initiatives and will be considered in future restroom work:

- Changing tables were added after construction was complete. There was in each accessible stall. There was not room in the Family Room to add one.
- The Janitor’s Closets have a door that leads into the SIDA area. It does not have the usual panic hardware so maintenance staff occasionally forgets to swipe their card and set off the alarm. Training has helped this situation.
- The airport is considering adding a restrooms set for the extensive outdoor plaza area, which includes access to the security checkpoint.
- The airlines have requested signage to direct arriving passengers back to the restrooms where the gates are after the restrooms.
Wayfinding Blade Signs

Entrance to Family Room and Men's

Stall and Urinal Area

Typical Stall
Long Beach Airport (LGB)

Changing Table in Accessible Stall

Sink Area

Family Room

Family Room
Participants

Airport
Jeffrey Sedlak, P.E., Senior Civil Engineer
Fred Peña, Facilities Management Officer

Moderators
Jens Rothausen-Vange – Architectural Alliance International
“Touch-free Environment”

Overview
Hub Type: Small Hub
Hours of Operation: 4:30 a.m. – 12:00 a.m.
Designed Life: 15-20 years
Annual Enplanements: 539,492
Airport Size: 216,000 square feet
Number of Gates: 14
Number of Restrooms: 9 Women’s
                     9 Men’s
                     2 Family
Case Study Project: Renovated baggage claim restrooms opened in 2009
Date of Case Study: September 11, 2013

Background
The second terminal, built in 1976, has been expanded and renovated numerous times. The most recent expansion is a new 6-gate concourse addition completed in 2007. This project created new standards for the airport restrooms that the airport will use for future upgrades. In 2009, the baggage claim restrooms were renovated using these standards to provide additional fixtures in this busy area as well as larger stalls to accommodate traveler’s belongings.

Problems/Solutions
The primary goals of the restroom renovations were to provide a touch-free environment, update old and unsightly finishes, and to provide better pipe chase access. The latter keeps plumbers from needing to close down the restroom to make repairs when the work can be done in the chase. Locations of restrooms had originally been planned based on proximity to gates, concessions, baggage claim, etc. versus passenger counts. An adverse effect of this strategy was that the non-secure side restrooms are oversized, but the baggage claim were too small.

The airport has seen the demographics shift from 60% business travelers to a 50/50 mix with leisure. With connections to Florida now there has been an increase in elderly travelers. Lines occasionally form at restrooms when two flights arrive simultaneously. While mothers nursing babies tend to find a private spot in the public areas, outlets are provided in the Family Rooms for lactation. The 2007 restrooms addressed the following issues with some refinements in 2009:

  Tired Looking Finishes
  • Used larger format 12” x 12” tiles without white grout (which eventually turns gray)
  • Colors were chosen for the aesthetics as well as ability to hide dirt

  Small Toilet Stalls
  • Widened standard stalls to 3’ 6”
  • Provided a recessed shelf above and behind each toilet and urinal

  Graffiti
  • Hard tile surfaces are more resistant to graffiti
Touching Fixtures and Surfaces
- Use hands-free dispensers for soap and paper towels, faucets, flushometers
- Eliminated entry doors

Paper Waste
- Use large roll paper towels because C-fold types were very wasteful
- The airport used hand dryers in the baggage claim restrooms

No Diaper Changing
- Diaper changing surface at some counters or at standalone cabinet with paper supply storage below

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- Added two Family Rooms

High Water Consumption
- Installed low-flow fixtures

Inadequate Chase Access for Plumbing Maintenance
- Provided wider chases. While still tight, offer better access.

Inadequate exhaust
- Exhaust rate above minimum requirement
- Use battery-powered air fresheners with gel packs (last about 2-1/2 months)
- Deodorizers for urinals (last 30 days if lucky)

Sustainability
- Use primarily green products

Inefficient Cleaning
- Hard surfaces easier to clean
- Drains cleaned weekly to avoid odors

Product Stocking
- Janitor’s Closet at each set has space for daily paper supply
- The toilet paper dispenser has two rolls available for use and two in reserve above that drop down to ensure the dispenser never runs out
- Foam soap dispensers each have an individual reservoir accessed in the cabinet below the counter. Refilled every 10-12 days.

When there is a flight surge, cleaners continually spot clean amongst the travelers to keep the restroom looking fresh.
Evaluation

Passenger comments on the new restrooms have been minimal and very positive, primarily praising the cleanliness of the facilities. Some considerations from lessons learned include the following:

- In the 2007 restrooms, the sloped trash enclosure below the counters quickly filled because of the way the trash bags had to be squeezed into the space. The 2009 version boxed out an enclosure between the sinks that provided space for a standard trash can.
- Paper towel dispensers require frequent battery replacement. Hard-wired are better and have been implemented.
- Flushometers cause “toilet sneeze” when the occupant moves while sitting or standing and the flush splashes outside the bowl onto the person. Cleaning staff experience the same problem when cleaning.
- Fingerprints on stainless steel partitions require constant cleaning.
- Soap dispenser shoots out soap when people walk by. No way to adjust sensitivity.
- Considering an automatic seat-cover dispenser to help perception of cleanliness.
- Water bottle filling stations are being considered at drinking fountains.
Blue Grass Airport (LEX)

Typical 2007 Version Restroom Entrance

Baggage Claim Restroom Entrance with Blade Signs

Stall and Urinal Area with Recessed Shelves

Typical Stall
Diaper Changing Area in Entry

Sink Area

2006 Version of Under Counter Storage

Sloped Trash Container Below Quickly Clogs with Trash
2009 Version of Under Counter Storage

Standard Trash Can Slide Out Easily and Does Not Clog

Access to Refill Soap, Traps, and Electrical Below Sink

Typical Pipe Chase
Participants

Airport
Mark Day – Director, Engineering and Maintenance
Amy Caudill – Director of Marketing
Anthony J. Harris – Building Maintenance Supervisor
Leslie Sandusky – Maintenance Manager
David Burdette – Tech Maintenance Supervisor

Moderators
Jens Rothausen-Vange – Architectural Alliance International
NON-HUB

CASE STUDIES

Jackson Hole Airport (JAC)
Duluth International Airport (DLH)
Overview
Hub Type: Non-hub
Hours of Operation: 4:30 a.m. – 11:00 a.m.
Designed Life: 10-15 years
Annual Enplanements: 288,325
Airport Size: 100,000 square feet
Number of Gates: 6
Number of Restrooms: 4 Women’s
4 Men’s
1 Family
Case Study Project: Terminal Expansion and Renovation completed December 2010
Date of Case Study: September 24, 2013

Background
Nestled within the Teton Range, Jackson Hole Airport is the only commercial airport in the United States located inside a national park. The interface with the surrounding natural habitat and associated stringent government controls has brought sustainability to the fore, particularly in waste disposal. The recent LEED Silver project is now adding a pretreatment system to the septic system. A new set of restrooms was provided in the ticketing hall expansion to the original 1988 terminal and the existing three sets were renovated to match. Another expansion is just beginning that will include additional baggage handling, screening, and waiting areas to process passengers at peak times. This expansion will also have a set of new restrooms.

Problems/Solutions
Enplanements had increased from about 190,000 in 2003 to 300,000 so the new restrooms provided much needed additional fixtures. The architects led the planning and design effort with periodic check-ins with the airport managers. The existing restrooms were already ADA compliant but were looking dated. The locations were based on available space and adjacency to car rental, baggage claim, and restaurant. The biggest change in demographics has been an increase in international travelers, first Asian, now European. Issues the new restrooms addressed include:

Dated Materials and Colors in Original Terminal
• Architects chose a palette of modern-rustic materials that included narrow, horizontally oriented wall tiles, large format floor tiles, wood ceilings, stone counters, and wood ceilings.

Touching Fixtures and Surfaces
• Use hands-free dispensers for soap and paper towels, faucets, and flushometers
• Eliminated entry doors

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
• A Family Room was provided at each new set.
• Only diaper changing location is in the Family Room
High Water Consumption
- Provided low-flow fixtures

Inadequate Exhaust
- Exhaust system always on – pulls air in from concourse

Paper Waste
- Hand dryers only

Supply Stocking
- Large toilet paper rolls prevents paper from running out (2 rolls per stall)

Evaluation
Over the last couple of years, the airport has found a number of initiatives that they will likely refine or change in the upcoming expansion. These include:

- The airport realized that paper towels were still needed to clean off faces, bags, etc. The next set of restrooms will have paper towels in addition to hand dryers.
- Expensive three-dimensional metal signs depicting male and female versions of common animals in the west proved to be too subtle. People didn’t take the time to understand the images and so often walk in to the wrong gender restroom.
- Paper supply vendors are required to be bid out annually, which can be a challenge to standardizing dispensers.
- Biodegradable paper clogs the drains because it doesn’t break down fast enough, so it is not used.
Wayfinding Blade Sign Beyond

Custom Metal Art Sign and ADA Sign

Sink Area

Hand Dryers and Stalls Beyond
Jackson Hole Airport (JAC)

Typical Stall

Hi-Lo Drinking Fountain with Bottle Filler

Family Room

Family Room
Participants

Airport
Ron Campbell, Project Manager, Operations

Moderator
Jens Rothausen-Vange – Architectural Alliance International
“Roving Customer Service Patrols”

Overview
Hub Type: Non-hub
Hours of Operation: 4:30 a.m. – 12:00 a.m.
Designed Life: 40 years
Annual Enplanements: 150,556
Airport Size: 110,000 square feet
Number of Gates: 4
Number of Restrooms: 4 Women’s
                      4 Men’s
                      3 Family/Assisted Care
Date of Case Study: September 16, 2013

Background
In January 2013, the new terminal for Duluth International Airport opened after three years of development. The new terminal was built in front of the previous terminal that was built in 1973. This expansion was designed to remedy a number of deficiencies. Primary on the list was the increase from three gates to four and the creation if restrooms on the secure side. The previous original airside restrooms were removed after 9/11 when the TSA require more space for the security measures. The new facility is LEED Silver certified.

Problems/Solutions
The key considerations in the new restrooms were to fully comply with ADA requirements, increase the number of fixtures to accommodate an increasing passenger load, provide locations on both landside and airside, and provide materials that were updated and easier to maintain. Customer complaints have been few and are monitored by roving staff who ask questions of passengers and airport tenants. Issues that were addressed in the new restrooms included:

Not Enough Fixtures
- The fixture count is based on building code requirements. With the increased size of the new terminal, the count increased proportionally. While the count is based on the code minimum, lines have not been observed.
- One set is provided on each of the two levels on the non-secure side. Two sets are on the main level of the secure side.
- Restrooms were located where they could fit in the overall plan

Dated Materials and Colors
- Architect developed palette that is warm and inviting

Small Toilet Stalls
- Enlarged the standard stalls to 3’ wide by 5’-1” deep

Water on Floors between Sinks and Paper Towels
- Installed paper towel dispensers at sinks directly above trash openings
Duluth International Airport (DLH)

Overflowing Trash
- Provide large capacity under-counter floor-mounted trash cans between each pair sink with hole in counter
- Additional trash receptacles provided at the exits of all restrooms

Touching Fixtures and Surfaces
- Use hands-free dispensers for soap and paper towels, faucets, and flushometers
- Eliminated entry doors

No Restroom for Parents Traveling with Small Children or Person’s Requiring Assistance from a Companion
- A Family & Assisted Care Room is provided at three of the restroom sets. These have an outlet for women who are lactating.

No Diaper Changing
- Provided a changing table in the Women’s and Family Room. A changing table is planned to be installed in the Men’s.

High Water Consumption
- Installed low-flow fixtures

Inadequate exhaust
- Provided better exhaust

Poor Lighting
- Provided task lighting over stalls and sinks
- Bright ambient lighting

Hard to Maintain Surfaces
- Changed from 1” x 1” floor tiles to 18” x 18” with 12” x 3” and 1” x 6” wall tiles. A gray grout color is used to hide staining over time
- Stone counters and backsplashes
- Stalls and sinks are stainless steel

Paper Waste
- Use large roll paper towels
- The airport chose not to use hand dryers

Evaluation
With over a half year in operation, the public is delighted with the modern and open design of the new terminal, especially the new larger restrooms. The following positives and negatives have been observed that either remain or have developed as a result of their initiatives and will be considered in future restroom work:
- Water bottle fillers at the drinking fountains are being considered.
- Noise from the restrooms is an issue with all the hard surfaces. Considering providing music through the paging system.
- There have been maintenance issues with the flush valves on the toilets. Alternates are being studied.
**Duluth International Airport (DLH)**

Accessible Stall

Floor-mounted and Overhead-braced Stalls

Counter Area with Trash Below

Family Room with Diaper Changing on Left
Duluth International Airport (DLH)

Participants

Airport
Blaine Peterson, Director of Operations

Moderators
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