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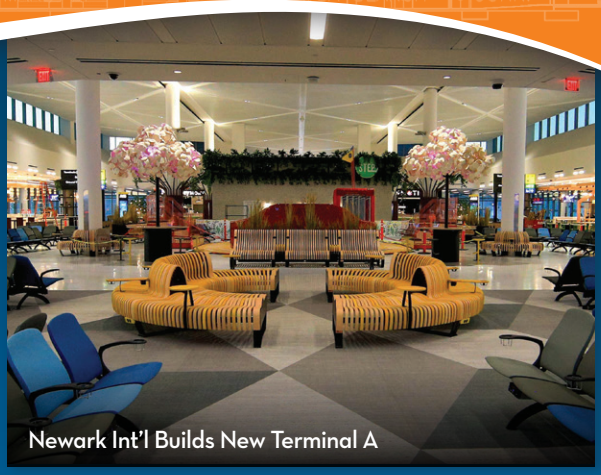
Nashville Int'l Expands Central Terminal with New Grand Lobby



Newark Int'l Builds New Terminal A

Kansas City Int'l Opens New $1.5 Billion Terminal

PHOTO: KANSAS CITY INTERNATIONAL AIRPORT

AIRPORT STORIES INSIDE: BNA | DAY | EWR | GEG | IND | MCI | MLI | PIE | SEA | STL | SYR | X06 | YQR

Pilots Flock to Arcadia Municipal for Taco Tuesday

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Nashville Int'l Expands Central Terminal with New Grand Lobby

BY KRISTEN RINDFLEISCH

Nashville International Airport® (BNA®) opened its five-story Grand Lobby this January, a 300,000-square-foot space designed to provide travelers with more space and give them a sense of Tennessee and its capital city. Key features of the $480 million project are new concessions offerings, 24 security screening lanes, large multimedia digital displays and several art installations.

A dozen restaurants and retail shops are open now, and 15 more are set to be added this September. The airport is also on track to open an on-site Hilton Hotel and a new 1,800-space parking garage later this year. All are components of the airport's larger $1.5 billion BNA Vision® program.

The Grand Lobby project's origin dates back to 2012, when the Airport Authority began considering how to rearrange BNA's lobby and add technologies to improve passenger experience and flow. During the next five years, Nashville grew significantly from both a population standpoint and as a tourist destination, prompting the Board of Commissioners to address the airport's long-range capacity as well.

When BNA reached approximately 17 million passengers in 2016, leadership began assembling a team to update and expand facilities to accommodate up to 35 million passengers. BNA President and Chief Executive Officer Doug Kreulen notes that the airport averaged 10% annual growth from 2012 to 2019 and recovered quickly after COVID rocked the industry. In 2022, traffic increased 124% over pre-pandemic levels in 2019. This year, BNA expects to serve 21 million passengers.


DOUG KREULEN

PHOTO: MATT SHOOTS FOR GOOD PHOTOGRAPHY

With the Grand Lobby project, airport leadership focused on streamlining passenger traffic, particularly at TSA checkpoints. To continue meeting its goal of moving passengers through checkpoints in less than 10 minutes, BNA increased from 14 screening lanes to 24. "We've been able to keep that [10-minute] average up for these past 10 years and hope to do it for many more years ahead," Kreulen says.

In addition to keeping up with growth in domestic travel, the Airport Authority expanded its ability to handle international service. Currently, BNA can only receive one international jet at a time. A new International Arrivals Facility slated to open this September will allow the airport to handle six international jets simultaneously.

The new Grand Lobby and concessions are already creating additional jobs at the airport for airlines, vendors, concessionaires, etc. While executing several BNA Vision® projects, the Airport Authority alone will grow its staff from 300 in 2022 to approximately 500 by 2024.

Partners for Multi-Faceted Projects

Historically, BNA has managed up to $50 million in capital improvement projects annually. Lately, that volume has been closer to $250 million per year, so the airport hired Paslay Group to assist with construction and project management. "They've been instrumental," says Kreulen. He even refers to Ron Marsh, one of the firm's lead project managers for BNA Vision®, as the half-billion-dollar man. "You couldn't find a better person than him to help build it."

In total, the $1.5 billion BNA Vision® program includes three major projects. The Grand Lobby, concessions marketplace and new International Arrivals

FACTS&FIGURES

Project: Grand Lobby & Central Terminal Expansion

Location: Nashville (TN) Int'l Airport

Size: Grand Lobby 300,000 sq. ft.; Int'l Arrivals Facility 330,000 sq. ft.

Cost: $480 million

Funding: Airport revenue bonds

Construction: Jan. 2020–Sept. 2023

Key Components: 24 TSA checkpoint lanes; food & retail marketplace; multimedia digital displays; art installations

Executive Program Management: Paslay Group

Master Architect: Corgan

Design Build Firm: Hensel Phelps

Design Build Architect of Record: Fentress Architects

Associate Architects: TMPartners; Feltus Hawkins Designs

Structural Engineering: Magnusson Klemencic Associates

Associate Structural Engineers: Logan Patri Engineers

IT/Technology/Low Voltage Engineer of Record: Burns Engineering

Electronic Video Displays & Public Address System Engineering: Arora Engineers

Mechanical, Electrical & Plumbing Engineer: I. C. Thomasson Associates Inc.

Digital Display System Provider/Integrator: International Display Systems Inc.

Digital Display System Subcontractors & Suppliers: Access Data Network Solutions Inc.; AVStumpfl Inc.; Infax Inc.; Omnivex Inc.; Nanolumens Inc.; Smart Monkeys Inc.

Digital Display Content Design: Gentilhomme Studio

Auto-Tinting Windows: SageGlass

Comprehensive Cellular & Enhanced Wi-Fi Provider: Boingo Wireless

Facility are part of Project 3. Project 2 adds a parking garage connected to the terminal by a pedestrian bridge as well as a new administrative building, a meet-and-greet plaza designed to accept future light rail and an on-site hotel. Project 1 expanded Concourse D and the North and South Terminal wings.

Through a request for qualifications process, the Airport Authority chose Corgan as master architect for all the projects that made up the BNA Vision® airport masterplan. The Hensel Phelps and Fentress Architects design-build team was selected for both Projects 1 and 3. (See Facts and Figures box on Page 11 for other key team members.)

Sense of Place

With Corgan's help, BNA conducted a survey to ask: What is Tennessee? Answers defined the design concepts/theme for the project and helped designers develop a unique sense of place for the new lobby. Guided by the survey results, Corgan and later Fentress worked to develop a highly efficient and open facility surrounded by nature, with a warm and welcoming feel. The design concept guided the shape of the roof, the artwork and the use of wood and natural elements throughout the space. Airport leadership wants passengers at BNA to experience beauty, openness, warmth and speed, Kreulen explains.

On the floor of the Grand Lobby, the state's tri-star emblem and the words "Nashville, Tennessee" provide a conspicuous wayfinding reference and a popular place for guests to take photos. As travelers enter the TSA checkpoint, there are 105-foot hanging gardens. A New Jersey firm called Garden on the Wall used preserved moss, hydrangea, ferns and other Tennessee flora to depict the local Korean Veterans Memorial Bridge and the Natchez Trace Parkway Bridge. "It's an opportunity to provide biophilic elements that aim to create a sense of calm in a very stressful space," says Emily Duncan, the Corgan vice president who serves as project manager and lead interior designer for BNA Vision®.

EMILY DUNCAN

The lobby design also leverages wood-tone ceilings and natural light. "We introduce light with clerestories that run the full length of the signature wave roof," says Ross Payton, Corgan's principal-in-charge for the BNA projects.

ROSS PAYTON

When viewed from above, the new central terminal is designed to mimic the shape of a guitar in reference to Nashville's active music scene. A round oculus skylight represents the guitar's sound hole, and the covered walkway represents the fretboard.

Matthew Meier, project manager at Burns Engineering, predicts that travelers will be amazed at how the sweeping five-story lobby and large 24-lane security checkpoint transform the central terminal. "From the high

MATTHEW MEIER

ceiling and oculus skylight to the color palette and striking display technology, I think passengers will really be delighted to travel to and from Nashville," he says.

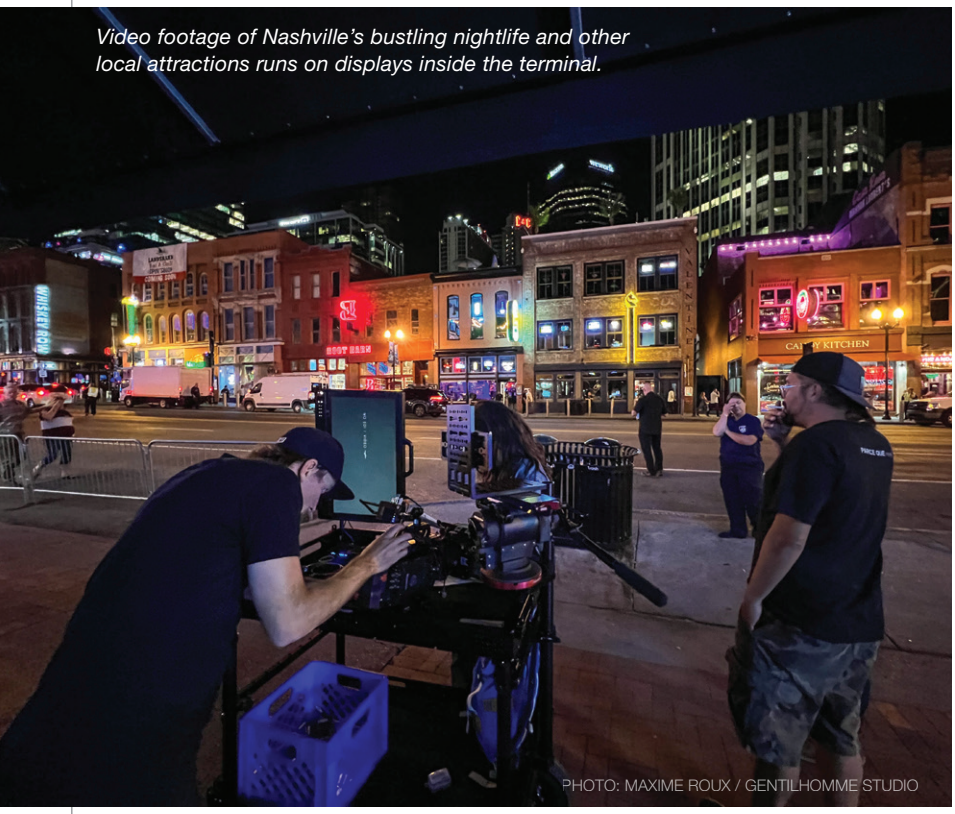
Art + Technology

Kreulen notes that the BNA team made a huge investment in art to help reduce traveler stress and add to BNA's sense of place.

A five-story sculpture called *The Unscalable Ramparts of Time*, by Jacob Hashimoto, features 8,000 washi paper kites hanging from fiberglass rods suspended from the ceiling. Passengers experience the piece differently from various angles around the lobby, Duncan notes. "As you move around, it continues to reveal different iconography and other elements that are special to Nashville and Tennessee," she explains.

Two large multimedia displays serve both practical and artistic/entertainment purposes. In addition to providing flight and weather information, the two 69-by-10-foot LED video walls show artistic Nashville-specific content. Large-format analog clocks on the displays include high-resolution visuals of a whiskey bottle, the center of a guitar, a tree stump and other local images.

Large art installations help add to the new terminal's sense of place.



Video footage of Nashville's bustling nightlife and other local attractions runs on displays inside the terminal.

PHOTO: MAXIME ROUX / GENTILHOMME STUDIO

Rob Keelor, president of International Display Systems Inc., explains that BNA wanted to combine information, art and efficiency. "The new video walls integrate beautiful electronic art and helpful wayfinding information, which fully complements the airport's vision for the new Grand Lobby," he remarks.

ROB KEELOR

Burns Engineering and Gentilhomme Studio collaborated to design a multimedia showpiece that lets passengers know "good times await their return." Other key objectives were using digital storytelling to contribute to the airport's sense of place and showcase Nashville's cultural staples. "Imparting the first and last impression travelers have of the city, the work will be the cornerstone for Project 3 of the BNA Vision® to maintain Nashville International Airport as a world-class facility," says Thibaut Duverneix, chief executive officer and executive creative director of Gentilhomme Studio.

THIBAUT DUVERNEIX

More than a dozen video vignettes include city skylines and nightlife scenes, guitar fabrication from start to finish, vinyl records and a whimsical mechanical animation of the whiskey distillation process. To create footage from Broadway Street, the city's cultural epicenter, Gentilhomme shut down the area for two days, converting it into a live action film set. Other content focuses on natural elements: local forests, waterfalls, freshwater streams and mountains. A guiding goal was to make the airport experience an extension of passengers' overall experience in Nashville.

"The team produced hours of original video content including advanced computer-generated imagery and live-action filmmaking captured in over 20 locations within Nashville and surrounding Tennessee areas, including Reelfoot Lake, Great Smoky Mountains National Park and Clingmans Dome," says Duverneix. Videos run on displays with resolutions ranging from 4K to 12K.

"When you're able to create a space and art that is engaging, and people will stop what they're doing and really want to be in that space and want to interact with that, I think that's a real sign of success," Payton summarizes.

Setting Up the Dominos

Each BNA Vision® project serves as an enabling project for the next. Construction on Project 1 (Concourse D and terminal wings expansion) began in 2019 and was completed in summer 2020. During this phase, the Hensel Phelps/Fentress design-build team moved BNA's security checkpoint and ticketing counters out of the central terminal and into the north and south terminal wings to keep passenger traffic flowing. This temporarily split BNA into two terminal buildings to facilitate construction work in the central terminal, explains Callie Hepler, project manager at Hensel Phelps.

CALLIE HEPLER

Airport administration offices on the fourth level, vertical circulation infrastructure and the rental car check-in counters were all removed to make way for the new Grand Lobby. Contractors installed two new elevators and six new escalators (one that spans three stories) and relocated and expanded the ground-level rental car facility.

While gutting the existing building, crews also expanded it by 50 feet on the front and sides and extended it 168 feet toward the airfield. "How do you go from 16 million passengers to 32 to 35 million passengers?" Kreulen asks rhetorically. "We needed more space."

Construction on the International Arrivals Facility began in January 2020 and is scheduled for completion this September. The new facility will add six swing gates for domestic and international flights as well as a Customs and Border Protection facility that connects to the Grand Lobby via an underground tunnel.

A pedestrian bridge takes travelers directly from the Grand Lobby to the new six-level terminal parking garage built during Project 2. Two canted 48-foot-deep trusses support the bridge with 14-inch diameter diagonals attached with pinned cast connections. The bridge was erected in stages, allowing roadways to remain open during construction; the roof framing and bridge girders were erected before diagonals were inserted. The bridge also connects to the 292-room hotel that is currently under construction and slated to open this fall.

Betting on Nashville

When the pandemic began in early 2020, construction was well underway for multiple BNA Vision® projects. A few months into the unprecedented challenge, the Airport Authority's Board of Commissioners decided to "bet on Nashville," as Kreulen puts it. "We're going to get through this pandemic, and we're going to come out of it better on the other side," he relates. "So we switched from concern to accelerate."

To avoid delays, contractors quickly purchased materials such as elevators and steel. As a result, BNA Vision® projects are still on schedule and on budget, Kreulen notes.

Lighter passenger volume during the pandemic allowed for more flexibility as construction pushed ahead. "The pandemic really didn't stop us," recalls Corey Ochsner, a principal at Fentress Architects. "We utilized the reduction in passenger volume to accelerate the schedule. It allowed the team to more efficiently phase and renovate the space with minimal passenger flow implications."


COREY OCHSNER

Teams could also complete additional work in concourses B and C that wasn't originally scheduled to occur until much later in the construction sequence. "They were able to install new terrazzo and replace holdroom flooring during that time, which is often a very painful, drawn-out process to incrementally phase," Duncan remarks.

"We basically pulled out every floor in the airport with carpet and replaced it with terrazzo because we just didn't have the passengers to worry about at that time," Kreulen adds.

Passenger Impact

Throughout the Grand Lobby expansion (and other BNA Vision® efforts), the Board of Commissioners challenges project teams to preserve the passenger experience. "That is, their *whole* experience: arrival at the airport, parking, walking through to the ticket counters, going through security and on into the concourse,"

Kreulen specifies. Every week, BNA has a program management meeting with 40 to 50 people to discuss projects and how they will affect ongoing operations. Kreulen notes that overnight road closures for construction have probably had the biggest impact on the passenger journey. "Everything else we've been doing has been built for speed, so that we can get in there, do what we need to do, and then open it back up so that the passenger is impacted as little as possible," he explains.

For projects that potentially impact passengers, the design and construction teams worked closely with the Airport Authority to communicate their plans early and often. Changes or closures in pathways or roadways were announced to the public in a timely manner via the BNA website and social media. "That was probably the biggest direct conduit to the passengers," says Bryce Kellerman, project superintendent at Hensel Phelps.

BRYCE KELLERMAN

Teams worked with the airport to update wayfinding signage to provide passengers with clear directions through construction areas. At especially pivotal times, Hensel Phelps dispatched 40 to 50 staff members to supplement front-line airport personnel. "They'd be assisting passengers with directions or helping them get bags up and down the ramps, the escalators or the elevators—just making sure that during the major impacts, we were doing anything and everything to help them get where they needed to get," Kellerman recalls.

Raising the Roof

JOEL EFRUSSY

One of Corgan's key design goals was to provide an intuitive, cohesive and welcoming experience for travelers. Due to its prominent size, the new "airwave" roof is easily visible from the roadway, providing BNA passengers with a visual marker for wayfinding and guiding them through the security checkpoint and into the new marketplace. "The roof structure is really the large unifying element that ties all those elements together," says Joel Efrussy, Corgan's lead architectural designer for BNA Vision® projects.

During the proposal phase and early stages of the design process, the design-build team reviewed the construction timeline and passenger impacts and came up with the idea of raising the roof. Terry Palmer, senior principal at Magnusson Klemencic Associates, devised the idea of positioning the long airwave roof

about 6 feet higher than initially planned so it would clear-span the existing building. This allowed workers to construct the new roof while the terminal below remained operational and allowed phasing to continue to reduce passengers and operations in the new Grand Lobby space.

Palmer says that twin curvilinear long-span trusses stretching 660 feet between the adjacent garage and airfield create the roof's distinct, elegant and undulating effect. "This structural solution minimized the number of curved trusses, eased fabrication costs and enhanced the roof's stability during steel erection," he explains. To avoid the need for temporary shoring and bracing during steel construction over the operational terminal, engineers created 10-foot-deep spine trusses that provided natural stability. Connecting straight trusses to the spine trusses and cantilevering them outward achieved the curvilinear shape, which resembles an airplane wing.

The initial concept for the Grand Lobby included more than 80 structural columns to support the airwave roof. To achieve a more open design, Magnusson Klemencic Associates devised a solution to support the roof and adjoining pedestrian bridge with only two columns visible along the front façade. This design provides uninterrupted views of the suspended art installation, large multimedia displays, new central TSA checkpoint, marketplace and outside to the airfield.

The design of the airwave roof included bind trusses and cruciform columns to minimize the impact of the structure through the existing building and carry forward through the new building. In total, six columns were lifted over the top of the building and lowered down through five levels of the existing terminal structure through major functional rooms. "Hensel Phelps and Fentress eagerly embraced the idea [to reduce the structural column impact]," says Palmer. The design team closely coordinated the functional programming requirements with the column placement to be able to find the exact location for the columns to be installed without impacting the building's critical systems. Benefits of the strategy included:

- Enhanced visibility/views and natural light by eliminating dozens of interior columns
- Uninterrupted airport operations
- Weather protection from the new roof while crews removed the existing roof
- The existing roof served as a work platform to install ducts and pipes before crews removed it

- Reduced schedule/construction costs because existing columns and footings below the Departures Level required no strengthening

Hensel Phelps, Fentress Architects and Magnusson Klemencic Associates, the team's structural engineer, conducted a site visit to identify locations in the existing roof to incorporate two new W36 cruciform columns into the new long-span airwave roof without causing disruptions to airport operations. After identifying suitable locations, crews used a tower crane positioned directly in the Grand Lobby's new oculus skylight. This allowed vehicle traffic on adjacent roadways to continue while crews erected the steel, with only one night of disruption. "It was a monumental achievement!" Palmer exclaims.

After the new roof structure was built, the existing terminal building underneath was disassembled for the new Grand Lobby. Construction of the Grand Lobby also transpired above the lower-level baggage claim and baggage screening systems, which had to stay operational. "It really was a team effort that brought experts from across the building design industry to be able to execute that in, on and over a continually operating airport," Payton remarks. "It was a really impressive feat of design and engineering."

Challenges and Opportunities

The Grand Lobby project followed basic LEED principles, such as separating construction waste and using products and materials with low volatile organic compounds. Crews also reused, repurposed or recycled many structures and materials from the existing central terminal. Glass on the west side of the terminal building has electrochromic glazing that tints throughout the day to reduce solar glare and heat gain, which helps lower energy consumption and costs.

Corgan worked closely with the Airport Authority to take a campus-wide approach to sustainability, enabling BNA to achieve its LEED goals on various projects.

The airport's biggest challenge with the Grand Lobby project was accommodating continued passenger growth throughout the expansion and renovations. Ochsner, from Fentress, emphasizes that it's important for passengers not to be interrupted by construction work. "You don't want them to

Large multimedia displays greet passengers headed to the new central TSA checkpoint.

feel like they have to wear a hard hat," he remarks. "The goal is to provide a seamless passenger experience."

Careful planning and phasing allowed BNA to remain active while crews built the new airwave roof and completed other terminal improvements. Palmer notes that it was crucial for Hensel Phelps, Fentress Architects, Magnusson Klemencic Associates, the steel erector and the curtain wall contractor to work closely at each stage of the project to ensure the stability of the long-span airwave roof and accurately determine the final shape of the curvilinear roof. After the steel was erected and the roof was installed, the curtain wall contractor field-measured the deflected shape of the roof, enabling workers to precisely tailor the window mullions to fit the roof and eliminating the need for extra tolerances.

Lowering the new columns through five floors of operational areas was a great challenge, but also a great opportunity, says Neal Terrell, project development director at Hensel Phelps. In retrospect, he doubts using a traditional design-bid-build method would have worked on the project. "So many decisions both on the design and means/methods of execution had to be coordinated on a daily and weekly basis with the airport, the design team and all of the stakeholders at the airport," Terrell explains. "It's just a tremendous amount of coordination while you're designing and building, and I don't think it could have been done any other way."

NEAL TERRELL

Installing the suspended artwork in the new Grand Lobby presented added difficulties. "There were not substantial structural considerations for art when the ceiling structure was designed, so we were working within the limits of what was in place," Duncan says. Even though the art itself is relatively lightweight, it required significant coordination to make sure the installation was safe and secure, she adds.

Managing the large volume of data required for high-resolution screens was a major challenge for the video display team. Additionally, Gentilhomme had to consider multiple viewing angles, blend the screens with surrounding architecture and select locations to create a calming environment for travelers.

Over the past year, a concerted effort was made to plan the video content and ensure seamless integration of technology to power the massive digital displays. "One of the challenges was taking the large lobby displays from a standard informational system to a not only engaging, but spectacular experience," Meier

remarks. Achieving a successful balance between a highly creative process, a complex construction schedule and precise technology components required a collaborative team effort, he adds.

Insights for Others

Kreulen says that airport teams undertaking huge projects cannot be afraid to make decisions, and those decisions must be made in a timely manner. At BNA, leadership uses a four-month horizon to keep on top of planning, scheduling and decision-making.

Speaking from the master architect's point of view, Payton says that the decision-making process during the Grand Lobby project was instrumental. "It starts with the [Airport Authority] leadership and goes all the way through the project teams," he says, adding that enthusiasm from the Board of Commissioners was also key. "From day one, they were ready for this program, and they were very excited."

Kreulen notes that it is important to consider the "burn rate" to keep projects on schedule and complete them successfully. Between April and September 2023, Metropolitan Nashville Airport Authority will spend more than $1 million a day on BNA Vision® projects. "That's $54,000 an hour, 24 hours a day," Kreulen specifies. "That really wakes you up in terms of how much money is being spent. So if you delay a decision by seven days, that can be an awful lot of money if you don't do things smartly."

Due to the pandemic, it proved highly beneficial to procure long-lead and difficult-to-secure items (escalators, elevators, steel, etc.) in advance. "We would not have opened up on time if we would have waited and bought based on the old delivery schedules, given the shortages that people have seen coming out of the pandemic," Kreulen notes.

Hepler, from Hensel Phelps, notes that weekly and bi-weekly meetings to discuss logistics, operations and impact of passengers helped the project teams work together effectively. "I think that close coordination has been instrumental in getting us to where we are," she reflects.

Kellerman emphasizes the importance of keeping an open mind during complex projects. "Never think something's unattainable," he advises. "When we went and looked at this job and started planning, it almost seemed unreal to think about building this monumental structure over the top of this main terminal and keep everything going."

From a design standpoint, Efrussy highlights the value of taking a team approach, with a common sense of purpose and shared


PHOTO: MATT SHOOTS FOR GOOD PHOTOGRAPHY

A pedestrian bridge connects the terminal and parking garage.

goals. "We were able very early on to have an inclusive process to align all of the various goals, agendas and constraints that happen in a large airport and develop a real clarity of purpose," he reflects. "That early alignment and stakeholder group ownership was critical and ultimately led to where we are today, which is a successful transformation of the entire airport."

Meier, from Burns Engineering, says that airport teams need to have a specific objective and communicate it to the designers and builders. "BNA had a clear vision, and I think that gave everyone involved in this long, complex project a focus," he reasons. "And it really provides a sense of accomplishment when it becomes reality!"

Speaking on behalf of Magnusson Klemencic Associates, Palmer contends that even with a common vision and sense of purpose, success can only happen when airport leadership is committed to building something unique. "The airport had confidence in the design-build team and high expectations, which led to creative solutions to complex design and construction challenges," he explains. The design-build team also worked to bring on personnel with experience, ingenuity and passion for delivering an exceptional project, Palmer adds.

Ochsner, from Fentress Architects, says that large, complex projects like BNA's new Grand Lobby benefit from long-term planning with room for adjustments when needed. The Airport Authority had an aggressive project vision and selected the progressive design-build approach to each project. This approach provided for a very fast-paced design and construction schedule with each BNA Vision project, he notes. Alternative design options were developed and approved in weekly design meetings with the Airport Authority, which enabled the team to develop design packages and procure materials early.

Other airports interested in adding large-scale multimedia displays should approach such projects with an architect's perspective to ensure that artistic content is integrated seamlessly with other on-screen material (such as flight information and clocks) and the surrounding architecture. "Every passenger journey is different, so diversify your content," Duverneix also advises. "For instance, use a blend of docu-style live action, computer-generated media and interactive technology. And the action doesn't always have to be slow-paced."

Keelor adds that it is important to budget ample time for content creation, testing and commissioning. "As with most any project, it is essential to not cut corners when designing the end product," he says. "The greater the level of detail in the design, the greater the success of on-time/in-budget deliverables."

Coming Up

Having its new Grand Lobby in operation is a major milestone for BNA, but more projects are still underway. An additional terminal garage will open this spring, and the rest of the new International Arrivals Facility and marketplace and a satellite concourse are slated to open this fall. The on-site Hilton Hotel and its plaza are on track to open by year-end.

Looking further ahead, another major program is being developed to accommodate escalating growth and passenger demands through more construction and renovation. Named New Horizon, this program includes plans to expand two more concourses, add an air freight facility, improve the terminal roadways and implement further upgrades to elevate the overall traveler experience. The estimated cost for New Horizon is $1.4 billion, with projected completion in late 2028.