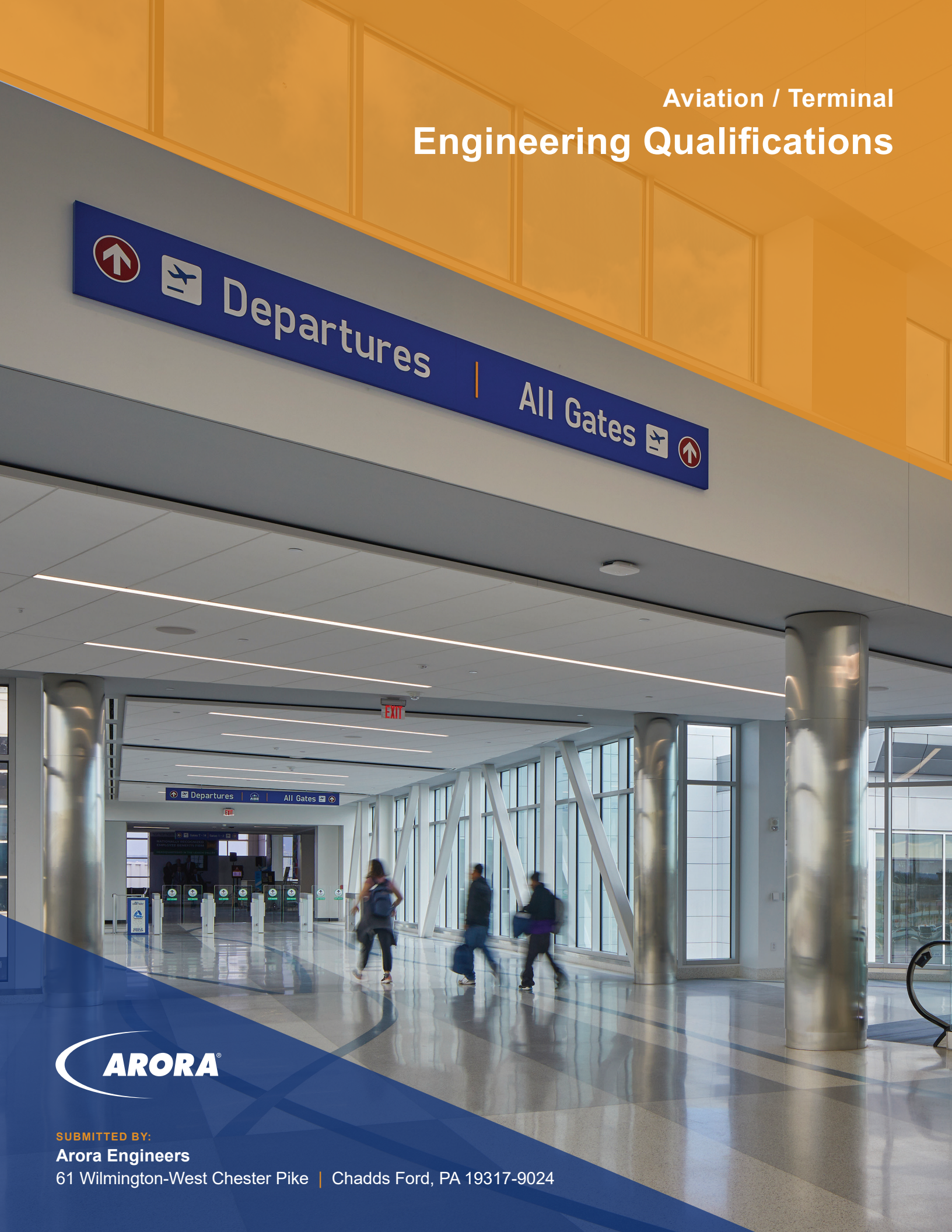
Aviation / Terminal

Engineering Qualifications



ARORA®

SUBMITTED BY:
Arora Engineers
61 Wilmington-West Chester Pike | Chadds Ford, PA 19317-9024

Arora Engineers
aroraengineers.com
P (610) 459-7900
F (610) 459-7950



Dear Prospective Client,

Since 1986, Arora Engineers has worked at over 120 airports across the world, from our 15 global offices and has grown into an Aviation centric firm.

For decades, Arora has been an integral force in shaping the aviation industry's landscape, spearheading the design of multi-billion-dollar projects for airside and landside developments at major airports across the United States. Arora has garnered additional impressive rankings including top 10 in Building Design+Construction's (BD+C) Top 65 Airport Facility Engineering Firms for the last 5 consecutive years in the annual Giants 400 report as well as #36 in the Top 75 Engineering Firms. Our expertise transcends traditional boundaries, encompassing a profound understanding of airport dynamics, intricate stakeholder collaboration, the intricate interplay of regulations and politics, and a nuanced relationship with the FAA.

Terminal design is at the core of Arora's technical expertise. Ranging from greenfield terminals, to expansions and renovations, we can lead or support any of the design and engineering for a terminal's building systems. We have dedicated disciplines in Mechanical, Electrical, Plumbing, Fire/Life Safety, and Special Systems (Security, Telecom, IT). We design terminals with the future in mind and live our tagline of Rethinking Infrastructure as we approach each unique project.

Our Construction Services group (PM/CM) experience ranges from serving as airport extension of staff and owners rep to running capital projects and programs, to field inspections, to working with general contractors as master systems integrators, performing constructability reviews, and managing and overseeing the design and construction process.

No project is too big or too small, and we look forward to working with you and exceeding your expectations for quality and service.

Sincerely,

Manik Arora, PE
President and CEO

Table Of Contents



+ Company Overview

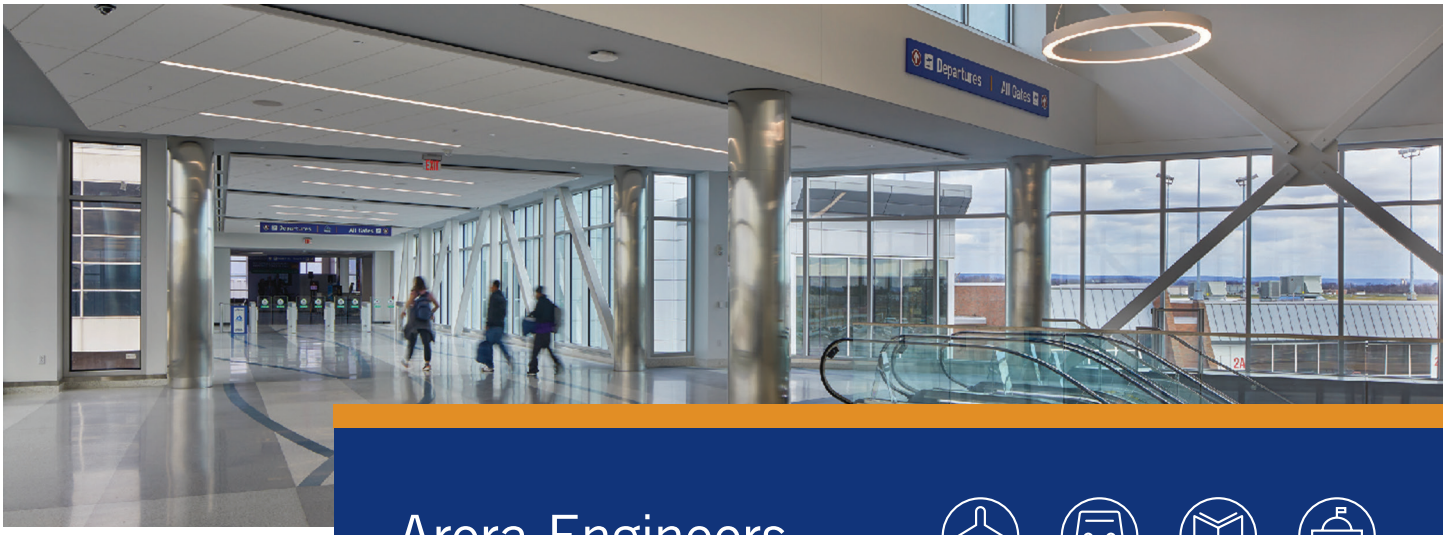


+ Project Experience

Company Overview



01



Arora Engineers

At Arora Engineers, we believe infrastructure needs to do far more than provide a seamless, safe, sustainable and comfortable environment. Our goal is to maximize its role, impact and value through highly intelligent solutions that not only meet operational needs, but forward business objectives.

We meet the evolving needs of the world's most critical industries – aviation, transportation and education – through more intelligent, sustainable and connected infrastructure solutions that maximize value for our clients and partners.

Expertise

Since 1986, we have held ourselves to rethinking the role of the traditional MEP firm. As a result, we've evolved our practice to emphasize the technology and processes that connect systems infrastructure, improve operations and longevity and make life safer and easier for those who use it.

Arora specializes in providing engineering services tailored for clients in aviation, transportation, education, government and commercial sectors, and has developed a unique understanding of the challenges and opportunities facing these critical industries.

Services

SPECIAL SYSTEMS / TECHNOLOGY

+ Mass Notification & Public Address
+ WiFi systems
+ Voice/data systems
+ Network architecture
+ Data centers
+ MDF/IDF room layouts
+ Network design via fiber or copper backbone
+ Plant cabling systems
+ Fiber optic and copper structured cabling systems
+ Communications system design
+ CCTV/MATV/CATV systems
+ Program Scheduling & Scheduling Review
+ Access control
+ Duress systems
+ Perimeter intrusion detection
+ Risk and needs assessments
+ Video walls
+ Security operations and procedures evaluation
+ Passenger/customer information display systems
+ Signage systems/Electronic video information display systems (EVIDS)
+ Software and equipment evaluation and recommendations
+ FIDS/BIDS/GIDS/CUPPS/SUPPS
+ Multi-lingual/International traveler



ATLANTA

BOSTON

CHICAGO

DALLAS

DENVER

FORT LAUDERDALE

HOUSTON

LOS ANGELES

NEW YORK

ORLANDO

PHILADELPHIA

PHOENIX

SAN DIEGO

SAN JOSE

SEATTLE

BENGALURU, INDIA

PUNE, INDIA

ELECTRICAL

+ Low and medium voltage power distribution
+ Emergency and standby power systems
+ Lighting design and photometrics
+ Substation/switchgear
+ Grounding and lightning protection
+ Single-line diagrams
+ Short circuit & coordination studies
+ Traffic Studies
+ Roadway and ITS Design
+ Power and lighting equipment selection and specifications
+ Motor control centers
+ Electrical equipment sizing
+ Energy efficient systems
+ Electrical code analysis
+ Electrical plan review and master plan development

AIRFIELD ELECTRICAL

+ Airfield Lighting and Signage
+ Approach Lighting Systems
+ Instrument Landing Systems
+ Navigational Aids
+ Airfield Lighting and Control Systems
+ Runway Incursion Mitigation
+ Pavement Surface Sensor Systems
+ Vertiports

HVAC / PLUMBING

+ Sustainable/Green Building design
+ HVAC
+ Central plant design
+ Underfloor Air Systems design
+ Constant and variable air volume systems
+ Radiant heating systems
+ Geothermal system design
+ Building automation and digital controls
+ Domestic water systems
+ Storm and sanitary system design
+ Fuel system design
+ Lifecycle Costing, Energy Analyses

FIRE PROTECTION AND LIFE SAFETY

+ Fire alarm and detection system design
+ Standpipes & water-based sprinkler system design
+ Foam systems & special hazard suppression design
+ Fire pumps & fire protection water supply system design
+ Smoke management
+ Code analysis and consulting
+ Plan review
+ Due diligence reports
+ Performance based analysis
+ Risk/hazard assessment
+ Site conditions survey

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

+ Database setup and implementation plans
+ CAD to GIS conversion plans
+ FAA Airport GIS program compliance
+ Legacy data access integration
+ Web-based GIS portal development
+ Asset and utility data management
+ Field inspection and inventory
+ GPS data capture and attribution

PROGRAM MANAGEMENT

+ Project management
+ Procurement coordination
+ Information management
+ All-inclusive project control
+ Runway Incursion Mitigation
+ Pavement Surface Sensor Systems
+ Airfield Lighting Vaults and Power Distribution
+ Sustainable Solutions
+ Construction Safety and Phasing
+ Multi-Airport Program Management

CONSTRUCTION MANAGEMENT & INSPECTION

+ Project administration
+ Master systems integrator
+ Daily inspection
+ Project documentation
+ Submittal review/tenant permit reviews
+ Design Development & Management
+ Owner's Representative
+ Feasibility & Planning Studies
+ Project controls
+ Design Development & Review
+ Quality Control & Quality Assurance
+ Constructibility reviews
+ Value engineering
+ Runway Incursion Mitigation
+ Airfield Lighting Vaults and Power Distribution
+ Pavement Surface Sensor Systems
+ Construction Safety and Phasing

ARORA®

Project Experience



02

PROJECT DETAILS

Client

Massachusetts Port Authority
Greg Etteridge, Senior Project Manager
Logan Office Center
One Harborside Drive, Suite 200S, East Boston, MA 02128
gettridge@massport.com
(617) 568-3588

Construction

Est. $640 Million

Project Start

2017

Project Completion

Est. 2027

Highlights

+ Design-Bid-Build / CM at Risk
+ Analysis and code review
+ Detailed design of all MEP, fire alarm systems
+ Prepared initial space planning exercises with architects for planning purposes.

MASSACHUSETTS PORT AUTHORITY

TERMINAL E MODERNIZATION

Logan International Airport (BOS), Boston, MA

Arora Engineers (Arora) was selected as part of the team to provide professional engineering services for the $640M Phase 1 and total program of $800-900 M modernization of Terminal E to efficiently accommodate current and projected international operations and passengers. The Terminal E Modernization Project extended the existing concourse, terminal core, and terminal roadway frontages within the airport's existing footprint. Massport's vision for Terminal E was to create a modern, iconic international passenger terminal with an emphasis on enhanced passenger experience and operational flexibility. The project focused on resource and energy efficiency, on the path toward net-zero emissions.

The Terminal E Modernization project consisted of a new addition of approximately 600,000 SF, as well as 250,000 SF of existing terminal extending from the 2016-completed crescent addition, which served Gates E10, E11, and E12. This new addition extended and continued the existing Terminal E levels 1, 2, and 3, with minimal elevation changes. The addition supported seven gates, E13 through E19, respectively. Phase I of this project included the first four gates, E13 through E16, with E17 through E19 completed under Phase II.

To support these gates, the Terminal E modernization included significant open-volume departure hold room spaces, retail and food concession spaces, new TSA security screening checkpoints, and circulation access to connect to the existing Terminal E, all on Level 3. Level 2 included a secure INS arrivals corridor, which connected to the existing Terminal E Customs and Border Protection entry checkpoints. Main mechanical and electrical rooms were also on Level 2. Level 1 contained predominantly baggage handling, checked baggage inspection systems (CBIS), and aircraft support services.

Executed in several phases over more than a decade, the Massachusetts Port Authority (Massport) had the vision and determination to complete the project while remaining flexible. For example, during preliminary design, the terminal was over the established budget.

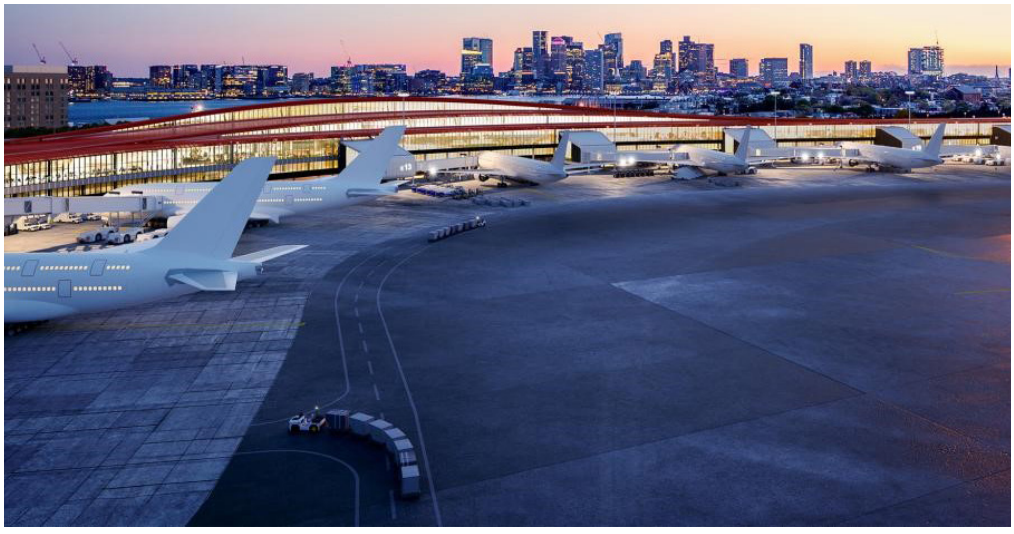


Photo courtesy of AECOM

MASSACHUSETTS PORT AUTHORITY

TERMINAL E MODERNIZATION

Logan International Airport (BOS), Boston, MA

The design and construction team targeted the values for each program element, right sized each functional element and reduced the terminal square footage by nearly 40 percent — without sacrificing terminal operations or passenger experience. The scope of work was divided into two phases to be performed over the course of approximately two years. Arora was responsible for critical heating and cooling engineering elements for the new structure, which tied into the heating and cooling systems from the existing Central Utility Plant. Under this expansion, the Central Utility Plant needed to be upgraded to increase chilled water (CHW) and high-temperature hot water (HTHW) capacity with direct distribution to the Terminal E Modernization. The project team personnel, having extensive experience with the BOS central utilities, including extending over a mile of HTHW and CHW piping from Terminal A to and through Terminal B, proposed the use of small parallel heat exchangers and variable-speed demand-responsive pumping within the terminal, which enabled efficiency, redundancy, and reliability while accommodating seasonal load profiles.

PHASE I

Arora provided full MEP, fire/life safety, and special systems engineering as well as on-site construction management services for the addition of approximately 95,000 SF known as the Cresant to Terminal E as well as the extensive modernization of existing 900,000 SF terminal. The completed Cresant addition provided three new A380 Gates with dual passenger boarding bridges for expedited two-level boarding, automated aircraft docking guidance systems (ADGS) with an integrated ramp information display system (RIDS), full capacity 400Hz, and pre-conditioned air ground support systems, addition of departure level holding rooms and arrivals level de-boarding areas, new concession spaces, and other support spaces. The existing terminal modifications included modernization upgrades to the GSE equipment at the ten existing gates to accommodate an expanded aircraft fleet mix and optimized operations with the addition of ADGS and RIDS, a security checkpoint expansion as well as modernization of the departures and arrivals area. The project was charged with including design for technology expected to echo the spirit of innovation in the City of Boston and surrounding areas.

SCOPE OF WORK: PHASE 1

Mechanical systems included new HVAC systems and modifications to the existing HVAC systems to accommodate the new loads. To serve the cooling and heating needs of the building addition, chilled and high temperature hot water were supplied by the existing central plant. A new mechanical pump room was installed in the mechanical crawl space, and the existing 10-inch CHW and 6-inch HTHW taps provided were extended. The new pump room was equipped with HTHW to GHW heat exchangers for the pre-heat coils, and HTHW to HW heat exchangers were provided for the heating water system. The pump room was also provided with GHW and HW circulation pumps controlled by variable frequency drives (VFDs), in addition to the heating system pumps CHW supply pumps equipped with VFDs were also provided for serving the cooling loads. The pumps were provided in an N+1 arrangement for redundancy.

Plumbing systems consisted of new rain leaders, multiple new men’s and women’s restroom groups, and extensions of sanitary, sanitary vent, and domestic water services for future connection by Club level tenants. The project included Smart Restroom systems for six new concourse restroom groups. The restrooms were fully integrated with the existing TRAX system at BOS and included stall occupancy systems, throughout counters, customer survey tablets, and BLE beacons to

MASSACHUSETTS PORT AUTHORITY

TERMINAL E MODERNIZATION

Logan International Airport (BOS), Boston, MA

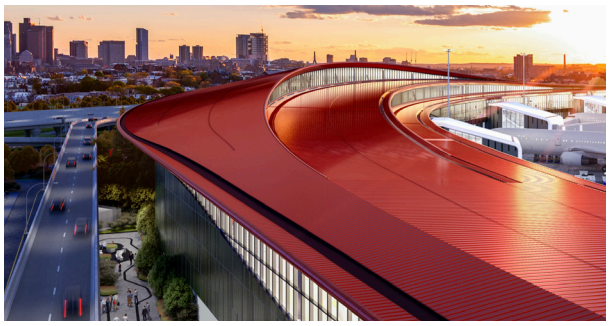
interact with TRAX-enabled custodial tablets that supported cleaning alerts/ acknowledgments, location reporting, checklist/cleaning status reporting, dashboards for cleaning status, etc.

Electrical design consisted of a new 13.8KV 28MW Cirucuit from Ever Source Utilities, two new 3750KVA unit substations, revised MV automatic switching and sequence of operations for the addition and existing terminal. New Main-Tie Main SWBDS, electrical rooms, and all electrical power panels, feeders, emergency generator and complete apron and terminal lighting were provided as well. The modernization of the existing 900,000 SF terminal also included replacement of the MV Substations and Main-Tie-Main SWBD's and Distribution. This required detailed multistep phasing plans to maintain all terminal operations. Complete OCP selective coordination, short circuit and arc flash analysis was provided from the utility relays to the last OCP device in the system. These upgrades and analysis provided significant enhanced reliability and redundancy for the entire facility.

Special systems engineering services included a public address system, universal cabling distribution system, voice/data network, passenger information systems, RIDS / gate docking systems, master clock, infrastructure for boarding, and infrastructure for tenant spaces.

Fire protection/life safety systems included sprinkler systems, fire pumps, incoming fire service/available water supply, standpipes, critical asset protection, fire alarms, mass notification systems, smoke management, fire/smoke dampers, passive and active fire/smoke barriers, and egress paths, illumination, and signage.

PHASE II



Arora was selected as part of the team to provide professional engineering services for the $800-900 million modernization of Terminal E, to efficiently accommodate current and projected international operations and passengers. The Terminal E Modernization Project extended the existing concourse, terminal core, and terminal roadway frontages.

The Terminal E Modernization project was a new addition of approximately 600,000 SF, as well as 250,000 SF of existing terminal extending from the 2016-completed crescent addition, which served Gates E10, E11, and E12. This new addition extended and continued the existing Terminal E levels 1, 2, and 3, with minimal if any elevation changes. The addition supported seven gates, E13 through E19, respectively. Phase I of this project included the first four gates, E13 through E16, with E17 through E19 completed under Phase II.

To support these gates, the Terminal E Modernization included significant open-volume departure hold room spaces, retail and food concession spaces, new TSA security screening checkpoints, and circulation access to connect to the existing Terminal E, all on Level 3. Level 2 included a secure INS arrivals corridor, which connected to the existing Terminal E Customs and Border Protection entry checkpoints. Main mechanical and electrical rooms were also on Level 2. Level 1 was predominantly for baggage handling, checked baggage inspection systems (CBIS), and aircraft support services.

MASSACHUSETTS PORT AUTHORITY

TERMINAL E MODERNIZATION

Logan International Airport (BOS), Boston, MA

Electrical/Special Systems

+ Identified location of new medium voltage switching station.
+ Developed initial loading calculations for proposed equipment (HVAC, Baggage Handling, Lighting, Jet bridge loads and general power) to provide initial sizing of planned unit-substations.
+ Identified existing baggage unit substation that will be impacted by construction of new terminal.
+ Planned location of new Massport medium voltage switching station.
+ Reviewed airside civil planning with the prime to discuss underground utilities (communications) located under or near proposed Big E footprint that will require investigation and identification prior to developing design recommendations for remediation.



Mechanical

+ Estimated order of magnitude CHP thermal loads both independently and then in concert with parallel CHP project design teams.
+ Walked utility tunnels and paths for new CHW and HPS piping.
+ Performed and tested preliminary calculations based on area, population, and associated ventilation outside air loads, weight against empirical values for similar projects at Massport.
+ Weighed different HVAC applications (e.g. displacement ventilation vs. conventional VAV) for the several occupancy classes.
+ Developed initial AHU selections and configurations for the various occupancy classes.
+ Developed initial mechanical room space allocations including shaft areas with future service provisions.
+ Developed initial electrical loads to support power distribution development.
+ Evaluated system scope iterations with proposed phasing alternatives.
+ Initial LEED® checklist analysis. Coordination with sustainability efforts.

Plumbing

+ Initial order of magnitude preliminary calculations for water distribution, sanitary and grease waste for the following areas:
    + General toilet room facilities
    + Domestic water for potable water cabinets
    + Concession space
    + Club space
+ Performed design and calculations for water distribution, sanitary and grease waste.
+ Performed design and calculation for redundant domestic water feed for terminal.
+ Performed design and calculation for hot water supply to fixtures.

MASSACHUSETTS PORT AUTHORITY

TERMINAL E MODERNIZATION

Logan International Airport (BOS), Boston, MA

+ Performed LEED® checklist analysis. Coordination with sustainability efforts.
+ Review of roof area and roof levels for drainage.
+ Redundant domestic water feed for terminal.



Fire Alarm / Fire Protection

+ Compared different fire alarm system applications/approaches (e.g. area detection, aspiration detection, linear detection, beam smoke detection and smoke imaging detection vs. typical conventional and addressable fire alarm system methods).
+ Evaluated system scope iterations with proposed phasing alternatives.
+ Performed initial code analysis review for fire protection design.
+ Developed initial fire zone plans.
+ Coordinated with the civil team to determine locations for the primary and redundant fire service main into the new building.
+ Established zone control assemblies for wet systems will be located in stair cases.
+ Developed initial fire pump room space allocation if required.
+ Fueling Points were coordinated to be at least 100 feet away from the building to avoid requirements for Deluge Sprinkler Systems. Electrical/Special Systems
+ Developed load calculations for proposed equipment (HVAC, baggage handling, lighting, jet bridge loads and general power) to allow early planning and coordination with Ever Source Utilities. Three new 13.8KV 28MW circuits were added from three separate utility substations to assure reliability and redundancy for this project with allowances for future projects as well
+ Identified existing baggage unit substation that was impacted by construction of new terminal.
+ Added a new MassPort medium voltage automatic switching station on site feed from five utility circuits for redundancy.
+ Reviewed airside civil planning with the prime and coordinated and designed underground MV utilities and Class A fiber communications loops located under or near proposed Big E footprint that required remediation, relocation, and additions to accommodate the new building.

MASSACHUSETTS PORT AUTHORITY

TERMINAL E MODERNIZATION

Logan International Airport (BOS), Boston, MA

+ Electrical design consisted of four new 3750KVA unit substations, MV automatic switching, development of the MV sequence of operations for the project. New Main-Tie Main SWBDS, electrical rooms, and all electrical power panels, feeders, emergency generator and complete apron and terminal lighting were provided as well.
+ Complete OCP selective coordination, short circuit and arc flash analysis was provided from the utility relays to the last OCP device in the system. This analysis provided enhanced reliability for the entire facility.

PROJECT DETAILS

Client

Luis Vidal + Architects
Andrew Kirchhoff
1200 Brickell Ave, Suite 210
Miami, FL 33131
ak@luisvidal.com
(305) 479-2455

Construction

$9,500,000,000

Project Start

2024

Project Completion

Est. 2027

Highlights

+ Delivered all building systems engineering services for JFK's international terminal expansion.
+ Supported the integration of a smart microgrid system (AlphaStruxure) with BMS and rooftop solar infrastructure.
+ Developed airfield electrical systems and landside utility designs within tight operational constraints.
+ Enhanced critical terminal systems infrastructure to meet OneJFK and PANYNJ requirements.

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

JFK NEW TERMINAL ONE – PHASE B

John F. Kennedy International Airport, Queens, NY

Arora Engineers (Arora) is serving as the Master Building Systems Engineer for Phase B of the New Terminal One (NTO) at John F. Kennedy International Airport (JFK), as part of the design team led by the Luis Vidal + architects and Woods Bagot joint venture. This historic expansion project continues the transformation of JFK into a world-class global gateway, further elevating the international travel experience to and from New York. Phase A of the NTO, scheduled to open in 2026, will introduce expansive arrivals and departures halls and 14 gates. Phase B, comprising approximately 680,000SF of additional terminal space and 9 new gates to the west of the headhouse, will complete the terminal's full buildout of 23 gates.

NTO is being delivered through a $9.5 billion public-private partnership led by the Port Authority of New York and New Jersey in collaboration with Ferrovial, JLC Infrastructure, and Ullico. Once complete, the 2.4M SF terminal will include 24 security screening lanes, over 300,000SF of retail, dining, and lounge space, and cutting-edge sustainable features such as onsite renewable energy generation, electric ground support equipment infrastructure, and intelligent building systems.

Arora delivers all building and airfield engineering efforts on Phase B, for a Basis of Design (BOD) and a Comprehensive Concept Design with a group of highly specialized subconsultants under Arora Design Leadership. Arora self performs electrical, mechanical, plumbing, fire alarm/ fire protection, airfield electrical and eGSE systems, with site utilities, airfield and landside engineering by subconsultants. Leveraging our role on Phase A, Arora ensured design consistency across terminal phases, integrating advanced technologies such as eGSE charging systems and microgrid power from AlphaStruxure.

Arora is also playing a key role in systems integration and utility coordination, collaborating with the Master Systems Integrator, TSA, CBP, and the Port Authority. The team addressed spatial constraints at the site, coordinated with existing Phase A infrastructure, and delivered sustainable, code-compliant systems designs aligned



Photo credit: The Port Authority of New York and New Jersey

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

JFK NEW TERMINAL ONE – PHASE B

John F. Kennedy International Airport (JFK), Queens, NY

with OneJFK standards. Arora has helped ensure the Phase B expansion will meet the operational demands of one of the world's busiest airports while enhancing efficiency, resiliency, and the overall passenger experience.

Scope of work included:

+ Developed HVAC, electrical, plumbing, and fire protection systems designs in alignment with BOD and CCD milestones.
+ Engineered airfield electrical systems, including apron lighting, eGSE charging, and passenger boarding bridge power.
+ Designed special systems including FIDS, GIDS, BIDS, public address, access control, security, and telecom infrastructure.
+ Integrated mechanical and electrical pathways to support AlphaStruxure's microgrid energy system.
+ Provided fire alarm and life safety engineering in compliance with PANYNJ, NFPA, and NYC Building Code requirements.
+ Coordinated baggage handling system (BHS) infrastructure with Vanderlande and ensured TSA/CBP integration support.
+ Modeled building systems using BIM 360 for clash detection and coordinated design reviews across disciplines.
+ Supported planning for curbside security systems, loading dock infrastructure, and utility connections.
+ Delivered technical documentation for regulatory submissions and reviewed system integration plans with *MSI* vendors.
+ Participated in stakeholder coordination meetings and implemented quality assurance and control measures across deliverables.
+ Landside and airside Civil and Electrical discipline coordination for gate planning, hydrant fueling, pavement design, grading, drainage, aircraft (Group V), emergency, and support vehicle parking, eGSE parking, airfield lighting, and associated utilities to terminal connections.
+ Coordinated aircraft simulation modeling for jet blast and RON positions.

PROJECT DETAILS

Client

AECOM
Navin Natarajan
Aviation Technical &
Operations Lead, NY Metro
125 Broad Street
15th Floor
New York, NY 10004
navin.natarajan@aecom.com
(212) 896-1857

Construction

$9,500,000,000

Project Start

2021

Project Completion

Arrivals and Departures Hall & First New Gates opening:
Est. 2026

Highlights

+ New 2.4 million SF terminal
+ 23 new gates
+ Arora is the lead EOR for electrical, communications, domestic water, natural gas, chilled water, thermal distribution, and sanitary site utilities.
+ Lead Engineer for Terminal Fire Protection
+ Lead Engineer for Airside and Airfield Electrical

PORT AUTHORITY OF NY & NJ (PANYNJ)

NEW TERMINAL ONE (NTO) – PHASE A

John F. Kennedy International Airport (JFK), Queens, NY

Arora Engineers (Arora) provided engineering, project controls, and construction phase services to the design/build team led by AECOM Tishman for the P3 delivery of the new Terminal One at John F. Kennedy International Airport (JFK), privately financed by a consortium of labor, operating and financial partners, including Ferrovial, Carlyle, JLC Infrastructure, and Ullico.

The new Terminal One aims to redefine international travel at JFK with 23 international gates, 22 of which will be designed to accommodate larger, wide-body aircraft (FAA Airplane Design Group V or VI), and a total terminal area of 2.4M SF. The new terminal will contain approximately 24 security screening lanes, state-of-the-art baggage handling system, over 300,000SF of retail, dining, and other concessions, 116,000SF of airline lounges, and 55,000SF of interior green space, children's play areas, and cultural exhibits. The new terminal includes the main headhouse/processor, east pier, and the airside hardstand elements.

In alignment with the Authority's commitment to reach net-zero greenhouse gas emissions by 2050, the Terminal will feature sustainable solutions such as on-site renewable energy generation, electric ground support equipment and optimized lighting and building controls.

Arora served as engineer of record under AECOM for the electrical, communications, domestic water, natural gas, chilled water, thermal distribution, and sanitary site utilities, and led airfield electrical engineering, highmast Lighting, eGSE charging, and PBB systems coordination services. In addition, Arora provided fire protection engineering services as a subconsultant to JB&B.

Airfield Electrical, Highmast Lighting, eGSE charging, and PBB Systems Coordination Scope:

Arora's scope of work included the supporting sanitary, electrical, telecommunications, lighting and eGSE design required for the airside utilities.



Rendering courtesy of the Port Authority of New York and New Jersey

PORT AUTHORITY OF NY & NJ

NEW TERMINAL ONE (NTO) – PHASE A

JFK International Airport, New York, NY

The eGSE battery charger system electrical and communications design and Apron electrical feeders were provided from the equipment to demarcation point 5ft outside the building. Arora coordinated the loads and SCADA monitoring requirements with the Terminal building team. Arora was also responsible for the electrical and communications design for the Apron High Mast Lighting (HML).

Arora provided pole mounted VDGS equipment and miscellaneous airside equipment including feeders and communications drops from the HML to the demarcation point 5ft outside the building. Arora also coordinated the loads and pole base / SCADA monitoring requirements with the Airside and Terminal building team.

Arora was also responsible for providing supporting electrical, telecommunications, lighting and VGDS/MLAT antennae design required for the airside utilities. The design included MLAT positioning and design services, including coordination, design and details for the installation of MLAT antennas/transmitters on the high mast light poles on the apron and power connections. MLAT antennas/transmitters and system were specified and designed ADB Safegate.

Fire Protection Engineering Scope:

Arora provided fire protection system engineering services for the new terminal. Arora's scope of work included the design of a fire protection system to protect the new facility as required by applicable codes and standards, including NFPA 13, NFPA 14, NFPA 20, NFPA 24, NFPA 130, NFPA 415, NFPA 2001 and local codes having jurisdiction as well as be in compliance with all applicable codes and guidelines, including (by example) PA requirements and/or if FM is involved.

These systems also included standard water-based sprinkler and standpipe systems. For spaces containing high value and/or water-sensitive assets specialized system (pre-action sprinkler and agent-based extinguishing systems) were provided. Deluge water spray systems were provided for exterior glazing located within 100ft of potential fuel spill points as required per NFPA-415.

Site Utilities Scope:

Initially, the team ensured all existing utility systems in and adjacent to the new terminal construction site were identified and those portions which had to be removed or abandoned in place were taken out of service in a methodical manner as construction advanced. Services to existing Terminals 1 and 2 and other facilities were sufficiently maintained until the services were no longer needed, and temporary connections / bypasses were provided.

+ Sanitary - The team began by verifying existing system routes and potential termination and reconnection locations, then met with JFK maintenance staff to review system operation.

  Advanced work included the design and construction of an interim sanitary sewer force main (SSFM), with lift station, opposite existing Terminal 1 which will collect and convey Terminal 1 and Terminal 2 discharge flow. The interim SSFM was sized to accommodate existing T-1 sanitary discharge. The force main was routed along the south and east sides of the proposed headhouse/processor to an existing sanitary manhole and gravity system at the northeast lower level of the project.

+ Thermal Distribution System (TDS) Chilled Water (CHW) and Medium Temperature Hot Water (MTHW) – The team first confirmed existing routes, connection locations and work restrictions, then developed designs for CHW and MTHW

PORT AUTHORITY OF NY & NJ

NEW TERMINAL ONE (NTO) – PHASE A

JFK International Airport, New York, NY

due to seasonal restrictions. Arora led the design which included construction of 30” black steel dual pipe (supply and return) CHW and 16” black steel triple pipe (supply, return, alternate) MTHW system. Interim TDS by-pass connections between existing CHW and MTHW lines and Terminal 1 were maintained during Phase A construction of the headhouse/processor. Portions of the permanent CHW and MTHW pipes were installed in the Utility Corridor in the front of the headhouse/ processor in order to facilitate this connection and will remain in place under the final design configuration. At the completion of Phase A, the MTHW and CHW service will be commissioned to the new building and allow terminal 1 to be decommissioned and demolished. Arora designed the pipe sizes and connections for interim and final pipe configurations. The MTHW was designed to include 2N redundancy with 2 supply and 2 return with a spare.

+ Low Pressure Domestic Water – The team verified existing system routes, valves and hydrant locations, then met with JFK mechanical maintenance staff on operation of the existing system and discussed specific problem areas within the new terminal 1 construction site. Temporary service was maintained to Terminal 1 and fire hydrants within the Lease Limits during Phase A construction. Arora designed the permanent domestic water service consisted of a 24” Ductile Iron Pipe (DIP) watermain in the utility corridor, 12” DIP fire loop around the east pier, headhouse/processor, and west pier as well as fire hydrants on the landside and airside.
+ Natural Gas – In coordination with National Grid, Arora confirmed existing routes and discussed their requirements and procedures for changes to the existing gas system. Arora designed new natural gas site utilities in coordination with National Grid, and coordination was maintained with National Grid on an ongoing basis.
+ Electric – Arora was responsible for the power distribution and lighting design. The team began by verifying existing routes and potential termination and connection points, then met with JFK electrical maintenance staff to confirm information was accurate and discussed procedures/protocols pertaining to work on the electrical system. Electrical service to Terminal 1 was maintained by re-routing existing feeders to Terminal 1. Permanent power to the New Terminal 1 will be provided by a new substation.
+ Communication – The team reviewed the system within the construction area and coordinated with the various interested parties (FAA, TSA, Customs, PANYNJ, Telcom firms, etc.) to gather information on the various systems, procedures, and protocols. Existing communications to Terminal 1 and other Port Authority facilities originates within Communications Rooms housed on the first (grade) level of the “Green Garage”.



Rendering courtesy of the Port Authority of New York and New Jersey

PORT AUTHORITY OF NY & NJ

NEW TERMINAL ONE (NTO) – PHASE A

JFK International Airport, New York, NY



Rendering courtesy of the Port Authority of New York and New Jersey

This garage is scheduled for demolition, and demolition plans are currently being prepared. Arora designed the temporary communications which were rerouted using the Air Train guide box as a pathway until the permanent duct bank was constructed and fiber was installed. In addition to maintaining and protecting critical existing communications infrastructure during demolition of the Green Garage, Arora was responsible for temporary and permanent communications facilities which were coordinated to clear the footprint of the Headhouse/Processor phased construction.

+ Meeter Greeter - Arora was responsible for the required supporting power, lighting, and telecommunications designs for the Meeter Greeter. Arora provided design services to power the gate guard operations, provide area lighting and obstruction lights, as well as FAA required solar lights.
+ EV Bus Charging Stations- Arora provided design services for the supporting power, lighting , and telecommunications required for the EV Bus Charging Stations Design. Designs included 600-1200A @ 480V 3PH, and a new panelboard/switchgear to feed the units.
+ Area 4 Trailer Complex - Arora designed the required supporting sanitary, electrical, domestic water, and telecommunications for the landside/airside utilities associated with the Area 4 Trailer complex. The design included 10-15 toilets and 8 sinks which would provide for up to 100 people, and a single service point for sanitary and water so that the trailers could be interconnected.

  The team began by verifying existing system routes and potential termination and reconnection locations for sanitary, then met with JFK maintenance staff to review system operation, with a goal of tapping into Sanitary across the street to supply low pressure domestic water. Arora was also responsible for the power distribution and lighting design. The team began by verifying existing routes and potential termination and connection points, then met with JFK electrical maintenance staff to confirm information was accurate and discussed procedures/protocols pertaining to work on the electrical system.

In parallel with construction of the communication duct bank and vaults, Arora completed validation of existing active fiber optic and copper cable plant in the demolition area. The process identified and categorized all active communication cables, documented their origin/splice points and their end user device (EUD) locations and functions. Once origin locations outside of the demolition area were determined, Arora designed the reroute of the cable temporarily using the Air Train guide box as a pathway. Arora designed permanent communication lines from the existing communication vaults outside the construction area to the new Terminal 1 and other airport facilities.

PROJECT DETAILS

Client

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Project Manager — Vice President
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Construction

Approx. $4.2 Billion

Project Start

04/2019

Project Completion

Groundbreaking: 2022

Construction Completion: Est. 2026

Highlights

+ P3 / Design-Build
+ New 1.15 million SF Terminal
+ 13 new gates
+ Lead Engineer (EOR) for Fire Alarm, Fire Protection, and Plumbing
+ Lead Engineer for Airside and Airfield Electrical.
+ Special Systems / Security Engineering
+ Master Systems Integration

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

TERMINAL 6 / TERMINAL 7 JETBLUE REDEVELOPMENT PROGRAM

John F. Kennedy International Airport, Queens, NY

Arora Engineers (Arora) provided engineering design and construction phase services to the JFK Millennium Partners consortium led by the RXR/Vantage/ American Triple I Development team for the Terminal 6 / Terminal 7 JetBlue Redevelopment program at John F. Kennedy International Airport (JFK). This Public-Private-Partnership (P3) design-build project includes 13 new gates and a total terminal area estimated at 1.15 million SF, with approximately 850,000 SF in Terminal 6 and 450,000 SF in existing Terminal 7, and roughly 74,000 SF of commercial dining and retail amenities, including lounges and recreational space.

Arora provided fire/life safety and plumbing engineering services as a subconsultant to Lilker related to the program's vertical structures, as well as special systems engineering and Master Systems Integrator (MSI) services to Burns McDonnell for the terminal's low voltage and IT systems. Arora also assisted in the design of the PBB/PCA/400Hz/PWC electrical and network infrastructure alongside AERO engineers and the terminal electrical engineering team, and designed the electrical ground service equipment charging (EGSE) and all of the airside electrical and network systems in addition to high mast lighting (HML) associated with the T6/T7 building and apron construction.

Sustainable design is a cornerstone of this project which incorporates several methodologies to promote energy efficiency, water conservation, and waste reduction. Renewable energy technologies include a solar photovoltaic system, aircraft de-icing and fluid recovery, and stormwater capture and re-use, as well as high efficiency lighting, baggage system motors, and automated building controls to help conserve energy in the completed terminal.



Rendering Courtesy of the Port Authority of New York and New Jersey

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

TERMINAL 6 / TERMINAL 7 JETBLUE REDEVELOPMENT PROGRAM

John F. Kennedy International Airport, Queens, NY

Fire/Life Safety

The scope of services for the fire protection systems included fire sprinkler, standpipe, and agent-based fire suppression systems, as well as wet and dry water-based sprinkler and standpipe systems. In addition, the scope included deluge sprinkler, pre-action sprinkler, and gaseous suppression systems for high-value or high-challenge assets. The fire alarm scope included protection throughout by a voice evacuation fire alarm system with automatic and manual fire detection as required by applicable codes and standards. The following tasks were included in the fire/life safety scope:

+ Definition of applicable codes and standards, facility standards, and insurance carrier requirements.
+ Definition of fire protection and alarm design objectives based on project scope and code analysis.
+ Review of as-built drawings, equipment list, and inspection reports.
+ Identification of make/model and location of existing fire alarm panels, as well as the capacity of existing fire alarm panels.
+ Identification of source of water supply, hydraulic demand of existing fire protection systems, and size/location of existing fire protection systems.
+ Definition of hazard classifications and associated hydraulic design criteria, as well as special hazard fire protection systems.
+ Definition of where system signals were sent (onsite security/ops center, offsite security/ops center, fire department, third-party central station) and by what means (telephone utility, facility fiber network, radio, cellular), as well as definition of mass notification objectives.
+ Fire protection site plan indicating locations for fire protection systems, fire protection water supply, fire protection areas/zones, feed mains, and special hazard fire protection systems.
+ Identification of systems requiring input and/or output signal communication, including fire protection, security, audio visual systems, telecommunications, public address, building management systems, baggage handling systems and mechanical (HVAC).
+ Indication of location of fire alarm panels (head end, data gathering panels, remote power supplies), primary and emergency power circuits, fire alarm detection areas/zones, and fire alarm notification areas/zones.
+ Provided network diagram for multi-system networks and system riser diagrams indicating major components.

In addition, Arora, serving as subconsultant to AECOM, assisted in the development of a fire/life safety code analysis for the JFK T6 Yellow parking garage, specifically Level 1, which was modified to operate as a passenger pick up area. Because the airport converted most of the first level of the Yellow Garage into a pickup area for personal vehicles, for-hire vehicles and short term taxis, Arora was asked to assess any necessary adjustments from an NFPA standpoint due to the change in use. Arora assessed the NFPA code requirements and performed a code compliance review to required changes and the extent of changes, along with options.

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

TERMINAL 6 / TERMINAL 7 JETBLUE REDEVELOPMENT PROGRAM

John F. Kennedy International Airport, Queens, NY

Plumbing:
Arora provided plumbing engineering design services for the new and existing terminals. The terminal, concourses, and gates were provided with domestic water service, waste/vent, storm, and gas service as required by applicable codes and standards. Plumbing engineering services included:

+ Survey and review existing documents and performance of a code review.
+ Provision of a schematic layout, design report, and spec outline of the equipment and piping required.
+ Identification and coordination of locations and initial layouts with the other MEP teams.
+ Preliminary design calculations based on the latest editions of the NYC Plumbing code, ASPE Data Book, and ASHRAE 90.1 to size domestic water, sanitary, storm and gas services.
+ Designs included riser diagrams for the water, waste/vent and gas systems for the entire system from the main point of connection to the most remote plumbing fixture/outlet.
+ Coordinated the related incoming site utilities (5 ft from the building) with the civil engineers.



Rendering Courtesy of the Port Authority of New York and New Jersey

Special Systems:

Arora was responsible for special systems (low voltage and IT) engineering and master system integrator (MSI) services as a subconsultant to Burns & McDonnell related to the following building systems:

+ Access Control & Video Surveillance System (CCTV) - Included the design of access control doors, equipment, infrastructure, and management software, as well as integration with fire protection, EVIDS, CCTV and baggage handling system.
+ Passenger satisfaction / queue management system - Arora provided design and engineering for the customer satisfaction systems, known as queue management

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

TERMINAL 6 / TERMINAL 7 JETBLUE REDEVELOPMENT PROGRAM

John F. Kennedy International Airport, Queens, NY

systems including queue monitoring equipment type specifications and non-CCTV type queue monitoring system equipment such as LIDAR and BLE.

Arora also provided all required structured cabling, all software control and monitoring systems and features, and interfaces with other systems such as building management or AODB defined by stakeholder workshops and MSI coordination.

All systems design were inclusive of their respective cabling infrastructure. Arora closely coordinated all structured cabling systems designs for termination points, cabinets, racks, patch panel assignments, raceways, and cable trays.

Serving as MSI, Arora's overall objectives included:

+ Development and oversight of low voltage system integration requirements. Our services included defining integration requirements to be carried by the individual low voltage systems designers' specifications and drawings. In addition, Arora provided input on systems' interconnectivity requirements such as new or existing AODB connectivity, based on previous working history with AODB's in the PANYNJ network.
+ Meeting with stakeholders to gather business requirements and define integrations requirements for all Terminal, Airline and Owner systems.
+ Oversaw testing and commissioning type activities during construction specific to integration.

Drawing upon our extensive expertise with PANYNJ airports and standards, our team defined the interconnectivity of security system architecture/protocols to match existing JFK Airport systems wherever possible.

During the procurement phase Arora participated in bid and vendor design reviews and provided general input, as well as specific input and review to security systems bid and vendor selections. Arora also provided reviews of integrations pertaining to those related to MEP and other base building systems.

During construction, Arora acted as the primary on-site point of contact to the MSI team.

Airside Electrical

Arora assisted AERO and the terminal electrical engineer with the coordination designs for the passenger boarding bridge (PBB), 400Hz, preconditioned air units (PCA), potable water cabinet (PWC) electrical infrastructure and led the design of the electric ground service equipment (EGSE) charger electrical and all of the airside electrical and network systems associated with the Terminal T6 and T7 building and Apron construction. Arora's scope of work was related to nine (9) WB gates convertible to 16 NB gates, and our responsibilities included:

+ Determining and coordinating the power and communication/data requirements for the PBB's and associated PCA, 400Hz, PWC and GSE battery chargers for use by AECOM and terminal engineers.
+ Terminal electrical feeders and communication/data drops design from the JB's, or demark points of connection from the terminal to the PBB, at the face of the building to the building electrical distribution system and IDF connection points within the terminal. Provided typical connection details from JB's on the face of the building to the PBB rotunda.
+ GSE battery charger system electrical and communications design and electrical feeders and communication/data drops to the building electrical distribution system

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

TERMINAL 6 / TERMINAL 7 JETBLUE REDEVELOPMENT PROGRAM

John F. Kennedy International Airport, Queens, NY

and IDF connection points within the terminal.

+ Determined, coordinated and designed the PBB/400Hz/PCA/PWC network, data & monitoring for interface with AODB/COMM/VDGS/WIFI/BAS/Etc.
+ Specified servers, MOD-Bus, software and PBB and associated equipment requirements.

In addition, Arora was responsible for airside electrical design of the high mast lighting (HML) for aprons associated with the Terminal T6 and T7 building. Our team provided airfield electrical design services for all phases of the project, including:

+ Electrical demolition plans associated with HML.
+ Electrical demolition plans with non-building apron associated electrical devices.
+ Electrical layout drawings of HML pole locations.

Following the schematic design, Project Definition Document (PDD), and Basis of Design (BOD) phases and deliverables, delivered under the developer team, Arora continued on in multiple sub-projects to aide in the transition to the builder under the design-build team and performed value engineering adjustments to meet the needs of the client and budget. Some such tasks between the SD and start of DD phase included:

+ Builder coordination and handoff
+ East Concourse design updates
+ Sustainability design changes and coordination
+ Concessions coordination
+ Center Concourse expansion
+ Lounge expansion options
+ Value engineering and Terminal Building cost savings
+ Arrivals Hall studies
+ Satellite Concourse modifications
+ PANYNJ load calculations and submission
+ Cooling Tower Study
+ 10+1 Alternate options for the west end of the terminal
+ Center Concourse Shift option

PROJECT DETAILS

Client

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Construction

$340,000,000

Project Start

2019

Project Completion

2023

Highlights

+ Integrated Project Delivery (IPD) / Design-Build
+ Part of a $13 Billion campaign to modernize JFK airport and increase passenger capacity.
+ MEP, Fire Life Safety, and Special Systems engineering services
+ Additional 70,400 SF for T8
+ Refurbishing 57,500 SF at T8
+ Addition of five gates
+ Baggage system upgrades

AMERICAN AIRLINES

TERMINAL 8 CAPACITY ENHANCEMENT

John F. Kennedy International Airport (JFK), Queens, NY

Arora Engineers (Arora) was selected to be part of the team responsible for the renovation and enhancement of Terminal 8 at John F. Kennedy International Airport (JFK). Arora is a member of the construction team and served as a subconsultant to AECOM, who, along with Merchant Aviation, led design services with Holt Construction serving as the construction manager. The project scope included 70,400 SF of added space, including 33,000 SF of public space and 57,500 SF of refurbished existing space. Terminal amenities included five gates, new premium lounges, improved baggage systems, and upgraded check-in areas and concessions. The project included five new wide-body gates to allow for more flights and four nearby on-airfield plane parking and unloading areas to accommodate the added flights.

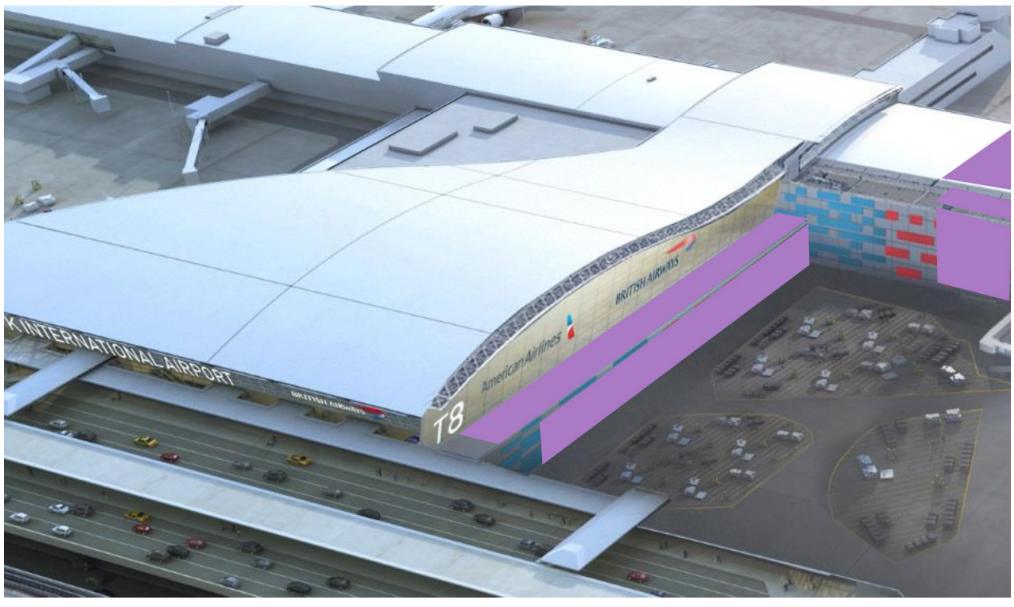
The expansion of Terminal 8 was part of JFK's $13-billion modernization program, aimed at transforming the airport into an ultramodern, global hub with new and restructured terminals adding four million SF and increasing the airport's capacity by 15 million passengers annually.

Arora provided lead mechanical, electrical, plumbing, fire life safety, and special systems engineering design services from 30% conceptual design through 100% implementation document phase, as well as construction support services for the duration of the project.

Scope of work included:

Arora provided professional design and engineering services as the lead engineer for the following disciplines:

+ Mechanical, electrical, plumbing (MEP)



Rendering Via Gov. Andrew Cuomo's Office

AMERICAN AIRLINES

TERMINAL 8 CAPACITY ENHANCEMENT

John F. Kennedy International Airport (JFK), Queens, NY

- Fire life safety, including
  - Fire suppression
  - Fire alarm
- Special systems – (less security and surveillance)
- Baggage handling system (BHS) existing-conditions survey
- Apron lighting
- Head house extension (30ft) on arrival and interstitial levels
- Extension of the concourse adjacent to gate 14 & 16 to the East, a total of 60 ft (Zone 1)
- Extension to gate 18/20 on ramp, interstitial and boarding level
- Buildout of space on the fourth level of the terminal, including relocation of American Airlines staff
- Development of shell space of 22,300 SF for a future lounge construction on the fourth level
- Installation of three new 777-300 capable hardstands of the existing parcel M
- Separate gates 14 & 16 common boarding to allow for parallel boarding and deplaning of the two gates
- Addition of line zero of security screening
- Reinstallation and modification of screening subsystem (CTX9800)
- Reconfiguration of the existing premium service check-in
- Up-gauge gate 31 to a 777-300 capable gate
- Up-gauge gate 32 and 46 to a 777-200 capable gate
- Installation of new CBR area
- Addition of a new international claim devices

PROJECT DETAILS

Client

HOK
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Construction

$4,200,000,000

Project Start

2015

Project Completion

2020

Highlights

+ P3 for 1.5 million square foot terminal
+ First airport project to receive LEED v4 Gold Certification
+ Fire alarm and suppression complete design scope
+ PS, Design Build Model
+ Despite the coronavirus pandemic hitting during the final five months of construction, the project was completed on time and on budget.

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

CENTRAL TERMINAL BUILDING

LaGuardia Airport, New York, NY

Arora Engineers (Arora) provided engineering services for the design/build of Terminal B at LaGuardia International Airport (LGA) as a member of one of the largest (public-private partnership) P3 teams in US history, LaGuardia Gateway Partners, made up of Vantage/HOK/PB/Skanska and others. The scope related to the Terminal Building portion of the project, which consisted of the Terminal Headhouse, Concourses A and B, West Garage Connector, Portal Building, and Central Heating and Refrigeration Plant (CHRP). Arora provided fire and life safety engineering and special systems peer review services as a subconsultant to the LaGuardia Gateway Partners Team with HOK and WSP as the lead design team.

LGA's new terminal was the first airport project to receive LEED v4 Gold Certification from the US Green Building Council. In addition to earning the LEED v4 Gold designation, the Terminal B redevelopment project was awarded the first Envision Platinum Award for commitment to sustainable practices and resiliency from the Institute for Sustainable Infrastructure (ISI) in 2019, the 2022 Design-Build Institute of America's National Award of Merit Winner in Aviation as well as the National Design-Build Project/Team award.

The new terminal is four stories in height and approximately 1,500,000 SF in area, and features elevated pedestrian skybridges leading to two concourses housing 35 gates. Most of the space in the CTB was classified as assembly due to the larger occupancy loads and included hold rooms, screening areas, restaurants, airline clubs, baggage claim areas, and arrival check-in areas. The remaining uses included business occupancies for offices, conference spaces with lower occupancy loads (i.e. not assembly) and airport operations; Mercantile Occupancies for retail spaces; and storage for miscellaneous storage and baggage handling areas.

One of the project's most distinct elements was a pair of pedestrian bridges that



Photo via Lester Ali

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

CENTRAL TERMINAL BUILDING

LaGuardia Airport, New York, NY

spanned active taxi lanes and connected the newly opened arrivals and departures hall (also known as the headhouse) to the terminal's two concourses. The dual bridges allowed contractors to build over top of the existing terminal, which saved significant construction time and minimized impact to ongoing airport operations. Many considered the headhouse to be one of the most complex airport projects completed. The facility's large scale and small footprint combined with the need to build on top of an active operating terminal significantly increased the project's level of difficulty.

The design/build delivery methodology allowed the team to reduce the overall program schedule by 20% (2 years) compared to an earlier design/bid/build concept, and despite the coronavirus pandemic hitting during the final five months of construction, the project was completed on time and on budget.

Scope of work included:

Fire Protection Scope:
Arora provided designs for the CTB to be a fully sprinklered building consisting of a variety of protection systems due to the many hazards and conditions present. There were two dual connections for the fire protection systems. One dual system was used for the sprinkler systems. Electrical and Mechanical rooms are protected. All baggage and handling areas and other inaccessible areas such as above and below the conveying systems were also protected, and gaseous type suppression systems (eg. FM 200) were included for the control and data rooms, as well as deluge systems for protecting areas such as openings in fire resistance rated walls and along exterior glazed walls to protect the bridges and connectors.

Fire Alarm Scope:

Arora provided a comprehensive fire alarm and detection system throughout the CTB. The systems included control panels, sub panels, annunciators and associated equipment, wire, and conduit to provide a fully addressable fire alarm system. Arora laid out all smoke detectors, heat detectors, duct smoke detectors, pull stations, monitor modules, relay modules, horn, strobes, and all other field devices pertaining



Photo via Gov. Andrew Cuomo's Office

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

CENTRAL TERMINAL BUILDING

LaGuardia Airport, New York, NY

to the fire alarm system. The system was multi-faceted and interconnected with the fire/life safety, HVAC, smoke management, smoke purge systems, elevator recall, escalator, baggage conveying system, and atrium smoke control.

The supervised fire alarm signal system was a pre-signal system and incorporated an emergency voice/communications system in accordance with NFPA 72. This system was designed for intelligibility throughout the concourses and hold rooms. Visual notification devices were provided throughout. The system design was a Positive Alarm Sequence in accordance with NFPA 72 to minimize false alarms and the evacuation of occupants in and out of secure spaces. This sequence, with specific requirements, allowed for an initial investigation prior to evacuation the building. The fire alarm system tied into the existing PANYNJ fire optic ring and provided notification to the PANYNJ Wide Area Network at each MDF demarcation.

Special Systems Scope:

Design peer reviews for the following systems:

+ Structured cabling
+ Network (LAN&PAWANET)
+ Airport operational systems (AODB, AOS, EVIDS, Etc.)
+ Security
+ Public address

Construction During Coronavirus:
A portion of the project was nearing completion in mid-March when COVID-19 struck New York City. This project was deemed essential by state officials, and therefore the mandate was to continue working. New protocols and practices were implemented regarding safe distancing, face coverings, hand washing, cleaning and other safety measures. LaGuardia Gateway Partners put numerous measures in place at the new facility to enhance safety for passengers and airport workers. With the safety measures in place, the project was completed on time and on budget with a nearly perfect safety record.

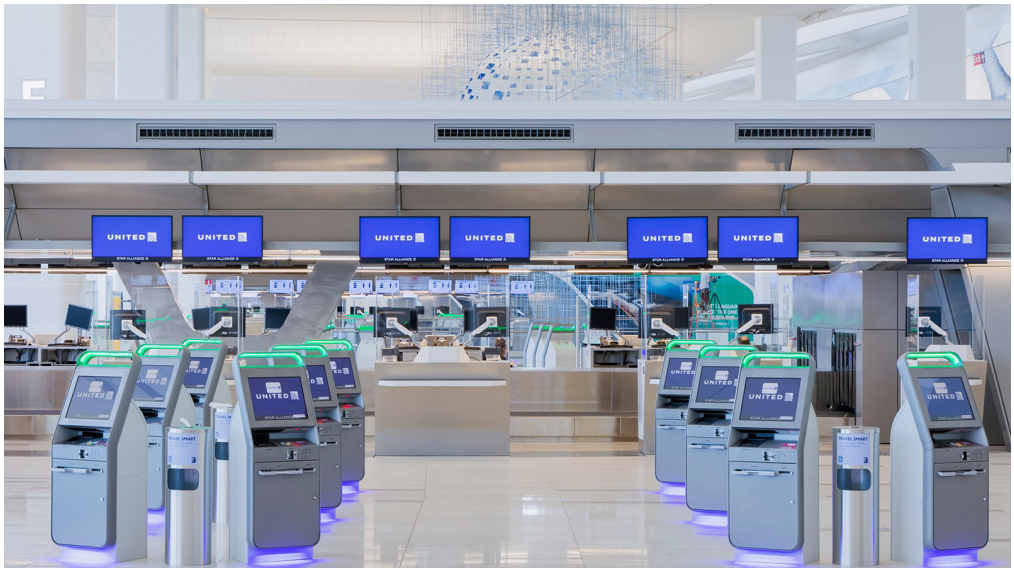


Photo via Gov. Andrew Cuomo's Office

PROJECT DETAILS

Client

STV – Buildings & Facilities Division
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Construction

$2,700,000,000

Project Start

2018

Project Completion

2023

Highlights

+ Providing special systems, fire protection, technical systems, and airside design engineering and CA services for the EWR Terminal A Redevelopment Program
+ Fire protection design includes the Pedestrian Bridge and Generator Building
+ Special systems design included MUFIDS/EVIDS, common use systems, public address/audio paging systems, etc.

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

EWR TERMINAL A REDEVELOPMENT PROGRAM

Newark International Airport, Newark, NJ

The Port Authority of New York and New Jersey (PANYNJ) embarked on the largest Design/Build project in New Jersey history with the Redevelopment of Terminal A at Newark Liberty International Airport (EWR). The new Terminal A is three stories high and 1 million SF in area. Terminal A includes a centralized arrivals/departures hub with world-class dual-sided roadways and over 1,000ft of upgraded curb frontage to ease passenger movement and improve passenger and baggage processing systems and three radiating concourses to service 33 aircraft gates. The facility also houses a hospital-grade air filtration system and other amenities like self-check in, self-serve bag drop stations, and biometric upgrades to expedite security screening and offer touchless payment options for concessions.

Arora Engineers (Arora) provided fire protection and special systems engineering and construction administration services for this program under the Tutor Perini Design Build Team as a sub-consultant to STV. In addition, Arora served as Master Systems Integrator (MSI) and Technical Systems Expert (TSE) under the electrical contractor Five Star Electric, as well as provided electrical, plumbing and special systems engineering services as a subconsultant to AERO Systems Engineering, Inc. (Aero) for the Airside Gates during design development, construction documents, and construction administration phases of work.

Scope of work included:

Special Systems – Special systems engineering design services provided for the new Terminal A included:

+ Low voltage design and engineering



Image courtesy of Grimshaw Architects

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

EWR TERMINAL A REDEVELOPMENT PROGRAM

Newark International Airport, Newark, NJ

- Electronic Video Information Displays (EVIDS)
- Airline operations and support
- Common use systems
- Emergency mass notification
- Public address/audio paging system
- Taxi dispatch systems
- Visual messaging systems
- Visual docking guidance system
- Visual paging
- Virtual apron, control room, terminal operations center, and emergency operation control center, which comprise the Integrated Terminal Operations Control Center (ITOCC) – Services included:
    - Identifying structured cabling for necessary equipment, including audio, visual systems and IT systems for workstations
    - Delivering the complete ITOCC system design
- Structured Cabling System and horizontal backbA (SCS)
- Telecommunications spaces (MDF, IDF, radio rooms)
- Telephone (VoIP and traditional)

Fire Protection – As the lead engineer for fire protection, Arora performed engineering services for the new vertical structures of the new Terminal A, as well as the Pedestrian Bridge and Generator Building. The Pedestrian Bridge connected Terminal A to the new parking garage, designed and constructed separately, adjacent to the P1 Airtrain Station. The standby Generator Building, located south of Terminal A, supported the new facility. The design included standard wet and dry water-based sprinkler and standpipe systems as well as deluge sprinkler, pre-action sprinkler, and gaseous suppression systems for high-value or high-challenge assets.

Construction Administration – Arora provided construction administration for special systems and fire protection engineering services to the design team, which included reviewing submittals, reviewing RFIs, attending meetings, and performing inspection.

Technical Systems – Arora provided Technical Systems Expert Services (TSE) to the Functional Systems Expert (FSE) to guide the FSE through construction phase services for the successful integration of airport systems. TSE services included but were not limited to the following:

- Reviewing RFC drawings and identifying performance criteria vs. out of scope items (assessment)
- Reviewing vendor shop drawings and coordinating vendor interfaces and shop drawings with A another
- Coordinating and scheduling third-party testing agencies
- Developing special systems delivery and construction schedule

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

EWR TERMINAL A REDEVELOPMENT PROGRAM

Newark International Airport, Newark, NJ

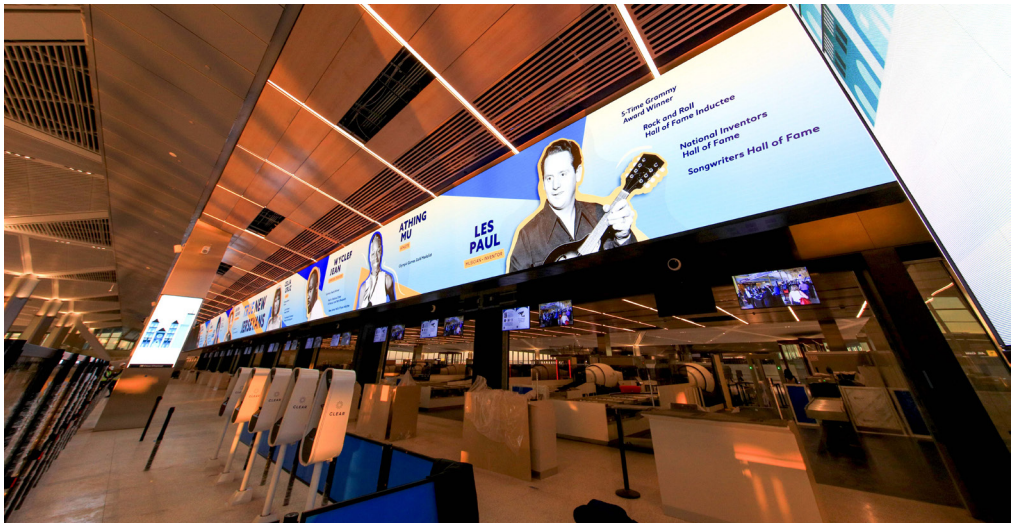


Image courtesy of PANYNY

+ Developing testing and commissioning plan(s)
+ Developing tracking mechanisms for systems tests and requests
+ Reviewing disparate systems product data and shop drawing submittals, reviewing and consolidating shop drawings
+ Generating integration shop drawings containing detailed schematics, data, programming and software, and process information for the integrations between access control, CCTV and fire alarm systems

Together with FSE, Arora verified that all airport systems and integrations were tested and functiAd in accordance with the design phase documentation, assisted in all testing, commissioning and operationalizing of airport systems.

Airside Design – Arora provided electrical, plumbing and special systems engineering services for the Airside Gates as part of this redevelopment program, which included a new 33-gate terminal building and ramp. Services for the Airside Gates are defined as follows:

+ Communications, data, CCTV, security supporting:
    + PBB's, PCA, 400Hz, potable water, bag valet, ADGU, RIDS, eGSE battery charging, EFSO and hydrant fueling system and fiber loop
+ Power supporting:
    + Potable water, bag valet, ADGU, RIDS, eGSE battery charging, EFSO and hydrant fueling system
+ Potable water system and plumbing
+ EFSO system controls

PACC 66 Self-Bag Drop – Arora provided special systems engineering services for a low voltage design related to the check-in hall modifications to support self-bag drop, identified as PACC 66. The design and engineering scope of work included the following:

+ Revised structured cabling drawings to accommodate equipment changes including:

THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

EWR TERMINAL A REDEVELOPMENT PROGRAM

Newark International Airport, Newark, NJ

- IDF room details
- Cable schedules
- Sleeve locations
- Details as required
- Specifications as required

Arora was responsible for plans, specifications, and services related to the design development, construction documents, and construction administration.

Sustainability - To meet the PANYNJ's goal of reducing greenhouse gas emissions, the new terminal features several sustainable design solutions including solar panels on the curbside glass canopy and roof of the integrated parking structure, water-efficient plumbing fixtures, electrical buses, and energy-efficient indoor lighting and controls.

In the News:

"Terminal A is expected to generate more than $4.6 billion in regional economic activity, create more than 2,500 jobs and provide more than $1.9 billion in wages. As of June 2022, the Terminal A program had awarded 94 sub-contracts to minority and women-owned business enterprises (MWBE) totaling more than $686 million and $213 million for 92 sub-contracts to New Jersey firms."

Learn more here: https://www.panynj.gov/port-authority/en/press-room/press-release-archives/2022-press-releases/governor-phil-murphy--port-authority-leaders--state-and-local-of.html



Image courtesy of PANYNY

PROJECT DETAILS

Client

Bart Jacobson
Siemens Smart Infrastructure
8066 Flint Street
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913-208-0470
bart.jacobs@siemens.com

Construction

$1,500,000,000

Project Start

2020

Project Completion

2023

Highlights

+ P3 / Design/Build
+ Arora provided engineering design services (special systems & BIM) for the Kansas City International Airport (KCI) MCI Airport Terminal Modernization Project.
+ Project consists of a one million square foot terminal facility.
+ Arora's scope specifically related to the program's new vertical structures including the new single terminal and parking at KCI project.
+ Lead Engineer for all Special Systems and Technology.

KANSAS CITY AVIATION DEPARTMENT

AIRPORT TERMINAL MODERNIZATION

Kansas City International Airport, Kansas City, MO

Arora Engineers (Arora), as a subconsultant to Siemens, provided engineering design services (special systems & BIM) for the Kansas City International Airport (KCI) Airport Terminal Modernization Project. The new single terminal and parking at KCI project consisted of a one million square foot terminal facility including curbside, ticketing lobby, TSA compliant security screening checkpoint, TSA compliant in-line checked baggage inspection system and associated support areas, baggage claim areas, baggage make-up area, and associated support functions. The terminal included two concourses attached by a 634-foot connection with moving walkways above and baggage handling systems below. Officials opened 18 security lanes to service the 39-gate facility, which replaced the airport's current configuration with gates spread across separate terminals.

The new terminal was the largest single infrastructure project in Kansas City history. The facility included secure concourses providing concessions and customer amenities. The facility initially supported 39 aircraft gates, but facility systems were designed to ultimately support 42 gates. The new single terminal project promised to improve the passenger experience, particularly for those making connections in Kansas City. It included dozens of retail and restaurant options beyond security checkpoints. It also doubled the number of restroom facilities available with 120 toilets spread throughout the terminal. The $1.5 billion new terminal at Kansas City International Airport remained on schedule and on budget.

Scope of work included:

Arora's scope specifically related to the program's new vertical structures, including the new single terminal and parking at KCI project. Arora provided special systems engineering services to the CWC JV Team as a subconsultant to Siemens for the Systems Integrator role.



KANSAS CITY AVIATION DEPARTMENT

AIRPORT TERMINAL MODERNIZATION

Kansas City International Airport (KCI), Kansas City, MO

Arora's special systems services included the following systems:

+ Access control system (ACS)
+ Video Surveillance System (VSS)
+ Public Safety Radio Distributed Antenna System (DAS) and Wireless Access Points (WAP or WiFi)
+ Converged communications network
+ Voice Over Internet Protocol (VOIP) telephone system
+ Audio Visual (AV) systems
+ Information Display System (IDS)
+ Visual paging
+ IPTV
+ Common Use System (CUS)
+ Transportation Security Administration (TSA) and Customs and Border Protection (CBP) IDS/VSS
+ BIM and Maximo ongoing support

Arora also provided a TRAX® SmartRestroom solution for Kansas City International Airport. The airport used this system for 16 restrooms utilizing TRAX Smart Restroom Technology.

+ The TRAX® Smart Restroom Solution is a cloud-hosted solution that included the following feature-sets:
+ Custodial cleaning activity data collected by the TRAX® iOS mobile application
+ TRAX® Smart Restroom Portal with business intelligence dashboards and real time reporting (web-based)
+ Passenger thermal throughput system with real time alerts and reporting with LTE Technology
+ Custodial staff mobile application with IOS Devices with LTE Technology

Asset List, BIM-FM/EAM Asset Data Standard

The project team worked with both CWC and KCAD to review the provided list of included asset types. The team then submitted and reviewed EDI's Strategic Asset Management (eSAM) Standard Data Model for Airports, which identified standard asset types, system, and attribution to be collected. A comprehensive BIM-FM/EAM Asset Data Standard was finalized, which included required systems, asset types, attribution, and required operations and maintenance (O&M) documentation.

The BIM-FM/EAM Asset Data Standard was achieved by

+ Facilitating on-site workshops that reviewed existing and previously submitted documents
+ Performing follow-up interviews and discussions
+ Drafting a BIM-FM/EAM asset data standard, and facilitating the review of the standard document as well as incorporating feedback
+ Delivering a final BIM-FM/EAM asset data standard
+ Presenting final content to KCAD and project management

PROJECT DETAILS

Client

Gresham Smith
Matthew H. Wilson, AIA, LEED AP
Sr. Architect
The Loft at Midtown
3615 Bromley Grand Avenue
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Tampa, FL 33607
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Construction

$73,000,000

Project Start

2022

Project Completion

Groundbreaking: 2023

Est. Construction Completion: 2027

Highlights

+ Designed interrelated Special Systems which were subsequently integrated into the existing systems already employed at the airport
+ New, 5-position Ground Boarding Facility

SARASOTA MANATEE AIRPORT AUTHORITY

TERMINAL CONCOURSE B EXPANSION & NEW CONCOURSE A

Sarasota, FL

Arora Engineers (Arora), serving as a subconsultant to Gresham Smith, provided engineering services for various upgrades and renovations to the Sarasota Bradenton International Airport (SRQ)'s existing terminal Concourse B along with new terminal Concourse A. The key goals of this project were to expand the existing holdroom capacity, expand and increase concessions areas, improve efficiency of the arrival/departure gate areas, install an additional ingress/egress elevator system, evaluate and upgrade power and utilities, and construct a new, 75,300SF concourse with 5 new hold rooms containing 970 seats accommodating five additional gates with four security-checkpoint lanes.

"SRQ has seen an unprecedented increase in passenger traffic and demand, growing from 6 airlines and 12 nonstop destinations to 11 airlines serving 55 nonstop destinations, over the last 5 years. This new facility will ease crowding and allow for future expansion of airlines and destinations" said Rick Piccolo, President, CEO.

Phase 1 of the Terminal Concourse Expansion project involved the design of a new, 5-position Ground Boarding Facility (GBF) and all associated work. Designs also included 30% design of an elevated connector and additional gates (Concourse A) and 2nd level shell space directly above the GBF holdroom for subsequent Phase 2 connection.

Phase 2 will included the realignment of existing Concourse B holdroom ares, followed by two "bump-out" expansions of the existing Concourse B for additional concessions and holdroom space, and a renovation of the Main Terminal Central Hub, which will included the addition of new escalators and the relocation of the existing boardroom.



Rendering Courtesy of Gresham Smith

SARASOTA MANATEE AIRPORT AUTHORITY

TERMINAL CONCOURSE B EXPANSION & NEW CONCOURSE A

Sarasota, FL

The new, 1-story GBF with five aircraft gate positions connects to the east end of the Ticket Wing of the airport and the facility includes independent SSCP and associated TSA support spaces, expanded ticket counters, ground boarding holdrooms, passenger amenities such as concessions and restrooms (both pre and post security), support spaces, vertical circulation core for Phase 2 elevated connection, site utility relocation, as well as MEP/CEP improvements and expansions.

Scope of work included:

To support the new Ground Boarding Facility (GBF), the Arora team designed the following interrelated Special Systems, which were integrated into the existing systems already employed at the airport:

+ Telecommunications space design (ICT Rooms) new and modifications to existing, required for tying in new ICT rooms and or systems modifications, adds, removals
+ Structured Cabling Systems (SCS):
+ Electronic Video Information Display Systems (EVIDS)
+ Passenger Processing Systems
+ Wi-Fi
+ Distributed Antenna System (DAS)
+ Public Address (PA) System
+ Hearing Loop System
+ Access Control System (ACS)
+ Video Surveillance System (VSS)
+ Active Shooter Detection/Gunshot Detection Systems

PROJECT DETAILS

Client

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Principal Aviation Services
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Construction

Approx $70M

Project Start

2021

Project Completion

2025

Highlights

+ Special Systems Engineering
+ 2 levels, 6 new gates and additional parking positions
+ Scope includes telecommunication, audio visual systems,and security

HORRY COUNTY DEPT. OF AIRPORTS

MYR TERMINAL CONCOURSE EXPANSION AND SSCP RELOCATION AND EXPANSION

Myrtle Beach International Airport, Myrtle Beach, SC

Arora Engineers (Arora), working as a subconsultant to Gresham Smith, provided Special Systems Engineering and Construction Phase services for the terminal expansion at Myrtle Beach International Airport (MYR) for Horry County Department of Airports that required an additional 6 gates, associated amenities, concessions, and facilities alongside 600 new parking spaces. After the pandemic, the expansion was implemented to increase tourism and promote the local economy.

The expansion included two (2) levels and 6 gates and additional parking positions. The expansion contained airline and building support spaces on the ramp (first) level. The upper level featured hold rooms for each gate, restrooms, concessions, circulation and other amenities.

Scope of work included:

Arora's scope of work included telecommunication, audio visual systems,and security. Schematic Design included:

Telecommunications:

+ Provide updated analysis of the building systems that require data transmission and how they will impact network performance. Identify transmission media and general routes for redundancy. Identify any individual cabling systems for owner vs. tenant etc.
+ Perform a wireless spectrum analysis and provide solution identifying the need for a Wi-Fi and/or Distributed Antenna System. Provide approximate quantities and topology based spectrum analysis findings.



HORRY COUNTY DEPT. OF AIRPORTS

MYR TERMINAL CONCOURSE EXPANSION AND SSCP RELOCATION AND EXPANSION

Myrtle Beach International Airport, Myrtle Beach, SC

+ Define a network security schema to protect/separate the individual systems behind the IDS/IPS.
+ Identify equipment list for EF/ER/TR's. Include quantities and BOD for equipment cabinets/racks, cable trays and topology (Centralized, Top of Rack, End of Row), and other typical Telecommunication Space requirements.
+ Work with the Electrical Designer to determine equipment loads for UPS and Generator requirements, Grounding and Bonding design and Power Distribution for devices.
+ Work with the Mechanical Designer to determine heat loads for telecommunication spaces.

Audio Visual Systems:

+ Conduct a formal Needs Analysis to determine the specific activities the end users must perform.
+ Outline Public address Zones and initial speaker count.
+ Determine the required A/V presentation applications and the supporting tasks and functions to perform these functions. This includes systems such as audio/videoconferencing, public-address, digital signage, Cable TV distribution, etc. and the required level of integration between each system.
+ Define the physical and environmental conditions including size and layout of A/V centers (i.e. conference room, training room, auditorium, etc.) and begin to define the granular A/V task parameters.

Software:

+ Develop list of software that is required in specifications for the operation and function of any and all systems above.

Security:

+ Provide CCTV device distribution plan based on asset identification and the owner's security plan.
+ Provide BOD for CCTV system, identifying critical network equipment. Identify if it will be integrated with an existing system and the requirements for integration. Determine basis for data transmission, camera parameters, and storage requirements. Provide an equipment list for a Command Center or viewing station(s).
+ Identify points of vulnerability where electronic access control should be provided. Identify points of integration for camera call ups with CCTV system.
+ Identify if ACS is the extension of an existing system. Provide system BOD, including a high-level sequence of operation for each type of access-controlled door.
+ Provide monitoring points for an intrusion detection system and integration requirements to other on or off premises systems. Identify monitoring and response procedures.
+ Work with Telecommunications Designer to identify the network requirements and impacts along with a network security plan for protecting critical systems.

Schematic Design Deliverables Include:

HORRY COUNTY DEPT. OF AIRPORTS

MYR TERMINAL CONCOURSE EXPANSION AND SSCP RELOCATION AND EXPANSION

Myrtle Beach International Airport, Myrtle Beach, SC

+ Telecommunications summary BOD considering the existing systems assessment.
+ Telecom backbone cable proposed architecture
+ Theoretical Wi-Fi Spectrum analysis
+ ICT space requirements
+ A/V needs assessment
+ Identification of all software needs for all systems
+ Access control and CCTV system architecture diagrams
+ Proposed access-controlled points
+

Design Development

Telecommunications:

+ Layout telecommunications pathways and routing plan. Provide pathway types and sizes, cable quantities and characteristics. Layout end devices. Provide installations details.
+ Show telecommunication space equipment and furniture layout. Identify key components including monitoring sensors, raised floor and cable tray systems, and interdisciplinary device coordination.
+ Provide network cabinet and wall elevations detailing equipment positions and interconnections
+ Provide single line and system diagrams, for all intended telecommunications systems.
+ Provide equipment and installation details, riser diagrams, schedules and set coordination.

Audio Visual Systems:

+ Speaker, microphone, digital display, amplification, control and distribution equipment layout for public space, conference rooms, auditoriums, lobbies, etc. based on calculations and findings from SD phase.
+ Coordinate with Architect on EVIDS locations.
+ A/V block diagrams for audio, video and control distribution, including system interconnection and integration.
+ Installation details for displays, speakers, etc. including coordination with architectural and structural enclosures.
+ Equipment rack layouts and elevations
+ Specifications defining hardware and software parameters, control requirements, and installation details and configurations.

Software:

+ Software requirements must be defined in specifications including all workstations required.

Security:

+ Layout communication and power pathways and routing plan for security devices provide pathway types and sizes, cable quantities and characteristics.

HORRY COUNTY DEPT. OF AIRPORTS

MYR TERMINAL CONCOURSE EXPANSION AND SSCP RELOCATION AND EXPANSION

Myrtle Beach International Airport, Myrtle Beach, SC

+ Show camera locations, view angles, and installation details for CCTV based on SD report.
+ Show door locations, specific electronic access control devices, and movement sensor device locations based on SD report.
+ Provide sequence of operations for ACS including integration with CCTV and/or existing systems. Include detailed information on normally open or closed characteristics and other parameters.
+ Detail security riser diagrams, security rack layouts, and wall elevations. Provide detailed schedules for CCTV and ACS doors outlining all essential installation and configuration parameters.

Design Development Deliverables Include:

+ New and removal work drawings including
  + Devices to be removed
  + Backbone pathways
  + Proposed device locations all systems
+ Telecommunications rooms preliminary layouts and elevations
+ Preliminary rack and cabinet elevations
+ Systems diagrams
+ Specifications

Construction Phase Services

Arora's responsibilities included reviewing and responding to Submittals, RFIs, and other project correspondence; issuing drawing revisions as needed; traveling to site for meetings, inspections, and punch lists; preparing and submitting inspection reports; reviewing and consulting on necessary codes; and attending weekly virtual construction meetings. Services included:

+ Submittal Reviews returned within seven working days
+ RFI Reviews returned within three working days
+ Inspection Reports returned within three working days after site walk
+ All other deliverables required will be on an agreed upon time schedule

PROJECT DETAILS

Client

Gresham, Smith & Partners
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Construction

$608,000,000

Project Start

2016

Project Completion

Construction broke ground: 2019

West Side of TLE: 2022

Construction Completion: Est. 2025

Highlights

+ Largest construction project in the airport's history
+ 366,000 SF terminal enhancement and expansion project
+ Arora is responsible for all special systems design and engineering

CITY OF CHARLOTTE, CHARLOTTE AVIATION DEPARTMENT

TERMINAL LOBBY EXPANSION

Charlotte Douglas International Airport, Charlotte, NC

Charlotte Douglas International Airport (CLT) is undergoing several critical improvements to its infrastructure as part of the $3.1 billion Destination CLT capital investment program. This program is designed to meet the growing needs of CLT's 46 million annual customers. Destination CLT projects include increased terminal roadway capacity, new walk-ways, main terminal expansion, expanding concourses A, B, and C, and the addition of a fourth parallel runway.

Arora Engineers (Arora) is part of the design team tasked with expanding the existing terminal and lobby, which has been in use since 1982. This 366,000 SF expansion, encompassing a 175,000 SF addition, along with the renovation of 191,000 SF, significantly enhance the existing terminal interiors and extend the terminal area.

On the exterior, improvements include a new 146,000 SF canopy to cover the elevated roadway and curb to shield passengers. In addition, There is a new west end subterranean walkway, located on the Hourly Deck's first floor which provides a traffic-free, covered walking path from the Hourly Deck to the terminal. Terminal improvements include state-of-the-art ticket counters, original artwork, five additional concession spaces, expanded seating and charging stations, and a consolidation of the existing five security checkpoints into three larger checkpoints with automated screening lanes. This project also includes a new central energy plant and all associated low voltage and security systems.

Portions of the Terminal Lobby Expansion's (TLE) west side opened in the summer of 2022, providing approximately 90,000 SF of additional circulation space, access to the west subterranean walkway and a preview of the terminal's modern interior



Rendering courtesy of Gresham, Smith & Partners

CITY OF CHARLOTTE, CHARLOTTE AVIATION DEPARTMENT

TERMINAL LOBBY EXPANSION

Charlotte Douglas International Airport, Charlotte, NC

design replete with new, expansive windows, terrazzo flooring, bright blue tiles and architectural-detailed scalloped ceilings.



Image Courtesy of Charlotte Douglas International Airport

A unique challenge of this project was phasing. Specifically, a construction phase was proposed to make modifications to an existing access control intelligent controller or controllers location that would affect areas outside the phase's physical scope of work. Our design team worked to address this issue by designing permanent and temporary access-control measures and infrastructure that would limit downtime to acceptable durations and not affect ongoing operations. The project included several hundred access control points and CCTV cameras.

The additional space provides more room for check-in, baggage claim areas, redesigned security checkpoints with larger, more efficient configurations, and increased circulation space in the lobby. The project also includes bridges and tunnels for pedestrians, connecting the hourly deck and car rental agencies to the terminal so passengers can access them without crossing the road.

Scope of work included:

Arora was responsible for all special systems design and engineering services, including access control, CCTV, passenger processing systems, security checkpoint design, Electronic Video Information Display Systems (EVIDS), public address, ICT and structured cabling systems, Wi-Fi, and passenger information systems including passenger analytics. The CCTV security systems design included head-end upgrades and expansions to support new technology as well as modifications to the head-end monitoring hardware.

The terminal lobby expansion also included the design and construction of a new Central Energy Plant (CEP) serving CLT. Arora's scope included the special systems, telecom, security and CCTV for the new CEP including, but not limited to:

New Telecommunications Room/Closets – The telecommunications room is a dedicated and maintained telecommunications space absent of other energy plant electrical components or services except for electrical and other systems serving

CITY OF CHARLOTTE, CHARLOTTE AVIATION DEPARTMENT

TERMINAL LOBBY EXPANSION

Charlotte Douglas International Airport, Charlotte, NC

this room. The CEP Telecommunications Room provided adequate space for information technology cable terminations (horizontal and backbone), active and passive communications equipment, cross-connection wiring and hardware, and any other materials or equipment associated with the CEP technology deployment. Arora included a design factor of 50% growth in the layout of the CEP Telecommunication Room.

Telecommunications Room Mechanical Systems - The CEP Telecommunications Room was designed to include HVAC service designed to dissipate the heat generated by electrically powered communications equipment supporting the airport's 24/7 operations. The temperature for the telecommunications room was in the range of 68 degrees F to 75 degrees F, and humidity was maintained between 40% and 55% relative humidity.

Telecommunications Room Fire Protection/Fire Alarm - The CEP Telecommunications Room was protected by a pre-action clean agent system. The fire protection system in the room was integrated with the HVAC system and UPS/ Power source to disconnect service in the event of system activation. Wall linings were covered with two coats of fire-retardant white paint.

Universal Cabling Distribution System (UCDS) – Arora designed the UCDS, backbone cabling systems, fiber backbone, and horizontal cabling at the CEP which consisted of a passive cabling infrastructure that features copper cabling, fiber cabling, serial cabling, and other low voltage cabling. The UCDS incorporated the telecommunications room/closets as well as outside connectivity to the CLT TSO and external service providers such as AT&T. Support systems included:

+ Access control
+ CCTV
+ SCADA/MEP systems
+ Voice (VoIP, POTS)
+ Wi-Fi

Construction of the main terminal lobby expansion began in December 2019 and is expected to be completed in six progressive phases with an anticipated completion in 2025.



Rendering courtesy of Gresham, Smith & Partners

PROJECT DETAILS

Client

Rick Belliotti
AUS Airport Department of Aviation IT
Chief Experience and Performance Officer (Acting), Deputy Chief of Information Systems
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Construction

Not Available

Project Start

2022

Project Completion

2028

Highlights

+ Arora played a pivotal role in the provision of a 40-year master plan for all of the Airport's Information Technology/Low Voltage systems as part of the campus-wide Utility Area Plan, which includes tripling the number of data centers and an exponential increasing of AUS's I/MDF's.
+ Arora also participated in the development of the AUS "Airport Design Standards Manual", the CUP's "Design Criteria Manual", four "Program Definition Documents" for all IT/LV/SS of the current Expansion Planning effort known as AEDP.

CITY OF AUSTIN

AUS AIRPORT PRINCIPAL ARCHITECT/ ENGINEER CONTRACT

Austin Bergstrom International Airport (AUS), Austin, TX

Arora Engineers (Arora), serving as a subconsultant to HNTB, provided professional engineering services for the Airport Expansion and Development Program (AEDP) at AUS, which included: Airport Design Standards Manual creation, a new midfield satellite, Concourse B, optimization of the Barbara Jordan Terminal (BJT), Central Utility Plant (CUP), Arrivals and Departures Hall, Tunnel- Interconnection, and other projects that were designed on the site of the existing Mid-Field cross Taxiways Golf and Hotel.

Under this agreement, Arora played a pivotal role in the provision of a 40-year master plan for all of the Airport's Information Technology/Low Voltage systems as part of the campus-wide Utility Area Plan. In 2022, Arora led efforts to prepare for all Information Technology/Low Voltage upgrades by overseeing the design services for the demolition of 30+ buildings and dozens of miles duct-banks necessary for the Taxiway Realignment(s) and all future constructions. All of these are part of the Airport's 40-year master plan and are affected by the Information Technology/ Low Voltage plan that the Arora team developed. The Taxiway Realignment and demolition work was merely the first step in AUS realizing their master planning effort to prepare for the construction of three new concourses and a new arrivals and departures hall and make accommodations for International Arrivals growth, all of which will be designed utilizing the Information Technology/Low Voltage master plan and design standards that the Arora team developed.

Tasks Included:

Master Utility Planning

Under this task, Arora contributed to a 40-year master plan for all of the Airport's Information Technology/Low Voltage systems as part of the campus-wide Utility Area Plan, which includes tripling the number of data centers and an exponential increasing of AUS's I/MDF's. Arora also participated in the development of the AUS "Airport Design Standards Manual", the CUP's "Design Criteria Manual", four "Program Definition Documents" for all IT/LV/SS of the current Expansion Planning effort known as AEDP.

Arora's scope included reviewing the existing Airport Master Plan, existing Special Systems/Low Voltage utility drawings and Special Systems/Low Voltage utility studies to gain a high-level overview of the existing Special Systems/Low Voltage network, including subsurface and above-ground utilities. Arora developed a graphical representation of this high-level overview of existing conditions; and, currently planned Special Systems/Low Voltage high-level overview for the upcoming infrastructure. Infrastructure that was part of this analysis included utilities 5'-0" outside of buildings/facilities, Main terminal, and future Terminals.

Arora also developed a high-level Conceptual utility requirements to an approximate 15% master plan level, for Airport Operations Area/facility that can be used in conceptual utility capacity planning (specific to Special Systems/Low Voltage).

CITY OF AUSTIN

AUS AIRPORT PRINCIPAL ARCHITECT/ ENGINEER CONTRACT

Austin Bergstrom International Airport (AUS), Austin, TX

DCM for Central Utility Plant

During the Program and Planning Phase for the AUS AEDP CUP, a concept to construct a new CUP (CUP-B), located north of the existing CUP (CUP-A) was developed. This plant served the heating and cooling needs for the entire AEDP Phase 1 program and included area for expansion to accommodate future airport growth. Existing CUP-A was designated to be demolished. This option was then configured to avoid conflicts with the future building development, allowing for the facility to be commissioned without major operational impacts. This scope of services consisted of preparing the Design Criteria Manual, which included a 15% set of construction documents consisting of drawings, performance specifications, engineer's cost opinion, and design calculations for the area defined as the AUS CUP-B.

In addition, we are working on the program definition documents to accommodate programmatic changes to Barbara Jordan Terminal (BJT) including the establishment of "utility corridors" for everything related to replacing the existing Central Utility Plant and associated hydronics for the new campus build-out. Our team has spent 2,000+ hours in meetings, page turns, workshops, and in production of work products both directly and indirectly related to the critical Central Utility Plant replacement and will draw upon this knowledge to ensure comprehensive design solutions under this important project.

The new CUP was developed to serve the new concourse/tunnel as well as the existing BJT. A site was designated for the new CUP; however, horizontal and vertical control for this facility was needed, as well as analyses of likely routing for connections to the concourse and BJT. This task resulted in higher locational definition for these elements to support the AEDP. Effort included dozens of workshops to establish advanced planning aspects.

Major Landside Facility Improvements

Arora provided information technology (IT)/low voltage design & engineering services for a series of program definition documents for the following projects:

+ New Terminal Arrivals and Departures Hall
+ Concourse A – the Redevelopment of the Existing BJT as Airside Concourse
+ New International Arrivals Facility (IAF)
+ BJT to Tunnel Interface
+ BJT East End Expansion

Under this task, Arora reviewed and provided opinions on current technologies, advancements in terminal design, and current trends in amenities as part of a brief benchmarking workshop. Arora then provided validation of terminal/concourse components for our IT scope, and participated in concept development workshops with the DOA and other key stakeholders.

The technology section of these PDDs will be used to define program requirements and standards for the upcoming Major Landside Facility Improvements Program projects noted above. These PDDs document and define the following requirements for the major system categories:

+ Hardware and Software definition

CITY OF AUSTIN

AUS AIRPORT PRINCIPAL ARCHITECT/ ENGINEER CONTRACT

Austin Bergstrom International Airport (AUS), Austin, TX

+ Infrastructure requirements
+ Interface/Integration requirements
+ Operational requirements
+ Installation methods
+ General Standards
+ Testing, Training and Commissioning

Technology systems recognized under this program and included in the Project Definition Documents included:

Airport Information Systems

+ Structured Cabling Systems (SCS)
+ Low Voltage Pathways
+ Horizontal and Backbone Cabling
+ Electronic Video Information Systems (EVIDS) related to Flight, Baggage, Ticketing, Gate, Visual Paging, Curbside and Wayfinding Signage
+ Audio-Visual and Unified Communications Systems (A/V and UCS)
+ Wide Area and Local Area Networking (WAN/LAN)
+ IP/MA/CA Television
+ Public Address System (PAS)
+ Voice Over IP Telephony (VoIP)
+ Telecommunication Room Fitout, including MEP Coordination and Equipment Room Fittings
+ Common and/or Preferred Use Passenger Processing Systems (CU/PUPPS)
+ Airport Operational Database (AODB)
+ Resource Management Systems (RMS)
+ Security Checkpoint Systems
+ Checked Baggage Information Systems

Traffic Information Systems

+ Parking and Revenue Control Systems (PARCS)
+ Parking Guidance Systems (PGS)
+ Vehicle Tracking and Information Systems
+ Taxi Queuing System

Security Systems

+ Access Control Systems (ACS) including Duress Systems
+ Video Surveillance System (VSS)
+ Gunshot Detection System

Radio Systems

+ Wireless Radio (WIFI)
+ Cellular Distributed Antenna Systems (CDAS)

CITY OF AUSTIN

AUS AIRPORT PRINCIPAL ARCHITECT/ ENGINEER CONTRACT

Austin Bergstrom International Airport (AUS), Austin, TX

+ Emergency Responder Radio Communications Systems (ERRCS)
+ Airline Radio Systems (GtG)

Airport Design Standards Manual

Arora developed design standards, guidelines, concepts, and criteria for the design and development of newly constructed and renovated facilities spaces at AUS airport. Arora also provided Special Systems/Information Technology/Low Voltage services and assisted in the authentication of the “AUS Design Standards Manual Outline” and anticipated needs updating from recent (industry improvements in state of the art/benchmarks at the specific airport). Further, Arora collected, reviewed and organized all existing documents.

Arora’s scope of work on this project was specifically related only to the Special Systems Scope of the Airport Design Standards. In addition, Arora had emphasis on early delivery of the new CUP standards as it was being released as D/B in the earliest days of Standards creation.

Final Phase of Digital Governance

Arora prepared Digital Asset Management Standards Version 1.0 to address Asset Management Data Standards through Planning, Design, Construction, Commissioning, Turn Over to ensure that the data formats delivered by the various parties meet the data requirements for migration into AUS’s Maximo System. To accomplish these efforts the following phases were completed:

Phase 1 – Arora conducted an on-site workshop over three days with all AUS stakeholders focused on discovery to inform the development of a broad vision that will be prioritized for planned progression. This workshop focused on asset management and Maximo requirements only.

Phase 2 – Arora conducted two additional workshops focused on progress updates and to solicit feedback from AUS stakeholders on the proposed asset management standards. The results of the workshops informed the development of necessary standards and guidance documentation that is critical to successful consistent deliverables for Maximo asset management data.

PROJECT DETAILS

Client

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Construction

$400,000,000

Project Start

2019

Project Delivery

CMAR

Project Completion

2025

Highlights

+ Providing special systems, fire protection engineering, and code consulting services for the AVL Phase 1 Terminal Modernization Project.
+ Special systems included structured cabling systems, EVIDS, public address/ audio paging systems, etc.
+ Fire protection included wet and dry water-based sprinkler and standpipe systems.
+ Code consulting included occupancy classification, egress coordination, definition of fire/life safety strategies, etc.

ASHEVILLE REGIONAL AIRPORT AUTHORITY

AVL PHASE 1 TERMINAL MODERNIZATION

Asheville Regional Airport, Asheville, NC

Arora Engineers (Arora) was selected as part of the team responsible for the expansion and modernization of the Asheville Regional Airport Authority's existing single story, seven-gate terminal building to a two story, 12-gate terminal building. The project broke ground in August 2023 to accommodate AVL's 1.8 million annual passengers--making it the third most populated airport in the state.

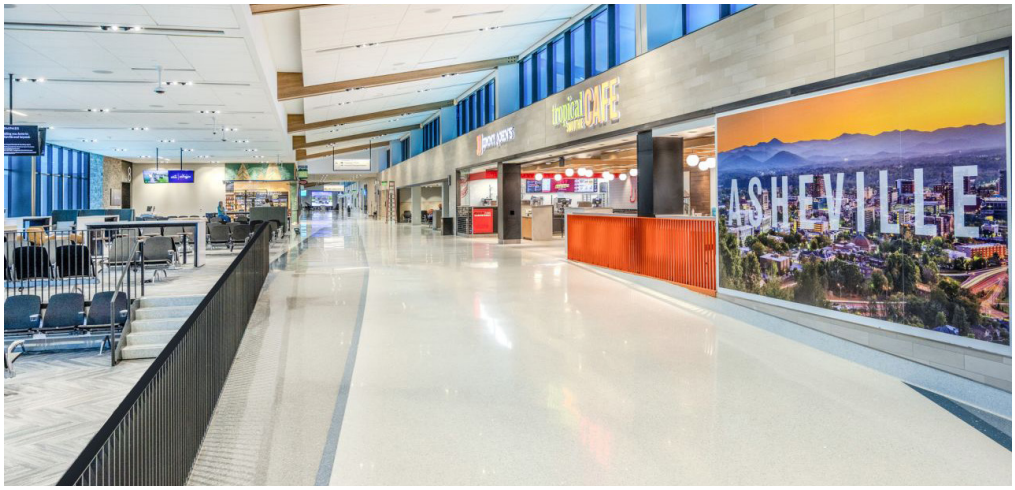
Arora served as a subconsultant to Gresham Smith, a member of the design team for this Construction Manager @ Risk (CM@R) delivery project. The project included elements to enhance the terminal for future growth that AVL expects over the next 20 years.

The project also included a new second-level security screening checkpoint to allow for future growth and adaptability to evolving security needs, a modernization and resizing of the ticketing lobby to accommodate multiple users and growth, enhanced curbside amenities including dynamic signing elements, and a new baggage-claim hall sized to meet the intended fleet mix and provide the necessary airline and airport support space, as well as a central energy plant located on site to support the growing infrastructure needs while providing expandability. The facility includes floor-to-ceiling windows, a new concessions plaza, and art installations like a "living wall" in the new baggage claim.

Arora led the special systems and fire protection engineering design and provided code consulting services associated with the Asheville Regional Airport (AVL) Phase 1 Terminal Modernization Project.

Scope of work included:

The team began by completing a basis of design report (BOD), which documented and analyzed the connections to the existing terminal building systems and tower



Courtesy of Gresham Smith

ASHEVILLE REGIONAL AIRPORT AUTHORITY

AVL PHASE 1 TERMINAL MODERNIZATION

Ashville Regional Airport, Asheville, NC

which sits atop the terminal. The BOD analysis documented systems in need of upgrades, expansion, replacement and/or relocation. The data was used for conceptual design and phasing to accurately determine how to keep systems active during construction. Arora's design services included:

Special Systems-

+ ***Structured Cabling System-*** The terminal structured cabling system (SCS) supported all networked systems. The SCS was the backbone of all communications. Arora coordinated, documented, and designed all systems' structured cabling requirements, including mechanical, electrical, and plumbing (MEP) systems, tenants' systems, TSA, CBP, ACS, CCTV, EVIDS, CUPPS, etc. Along with structured cabling, Arora provided all infrastructure designs for backbone communication cables—including cable tray and conduits—and coordinated closely with other building systems for routing including structural, mechanical, and baggage systems. Very closely related to the SCS are the required telecommunications rooms (TR's) for termination of passive infrastructure and origination of active networking components as well as space for ACS and other systems. Arora worked closely with building architects to appropriately size TR's based on areas served and systems supported. Arora was responsible for all design and layout of cabinets, racks, wall fields, cable tray, and telecommunications grounding systems.



Courtesy of Gresham Smith

+ ***Electronic Video Information Displays (EVIDS)-*** EVIDS included traditional FIDS, BIDS, GIDS, RIDS, TIDS, visual paging, etc.
+ ***Public Address/Audio Paging Systems-*** Speaker selections and locations coordinated with architect, ambient noise sensing system, intelligibility calculations for all areas, paging station requirements, mass notification requirements, backup power requirements for PA system components, network device requirements, paging system zoning, integration with common use system for automated gate boarding, integration with EVIDS and visual paging systems for emergency notification and mass notification, wiring diagrams, elevations, details.
+ ***Access Control and CCTV-*** Arora provided designs for security technology and infrastructure based on regulatory need and thorough risk assessment. CCTV cameras were designed using the latest in IP camera technology, connected via the SCS to secure telecommunications rooms and storage network. Arora selected CCTV camera specifications based on the camera's location, height and view. The design enabled different terminal stakeholders to access video associated with their roles in the terminal.

CCTV cameras were designed as a part of the baggage handling system (BHS) as well as the airport's CCTV system. Arora coordinated with the BHS designer on areas of potential jams and designing CCTV cameras for those areas as well as monitoring of screening devices. CCTV camera views were made available in the BHS system operation office as well as TSA screening rooms. All baggage handling systems which cross from public space to secure or sterile space were controlled and monitored by access/security surveillance system (SA/SS).

ASHEVILLE REGIONAL AIRPORT AUTHORITY

AVL PHASE 1 TERMINAL MODERNIZATION

Ashville Regional Airport, Richmond, VA

Access control required the design of access control doors, equipment, infrastructure, management software, integration with Fire, EVIDS, CCTV and BHS. Arora worked with the architect to identify and coordinate all access control door hardware.

Arora provided design services for all required ACS and CCTV devices required for the new checkpoints inclusive of duress systems.

+ ***Wi-Fi, DAS-*** Arora included the design of Wi-Fi and DAS systems.
+ ***Passenger Processing Systems-*** Arora provided special systems design and engineering for common use systems or traditional passing reprocessing systems. Arora worked closely with the architect regarding common use equipment selection, locations functionality, and programming. Arora coordinated all ticketing and gate use equipment power requirements with other consultants, as well as millwork coordination. Arora specified integration requirements between the common use system, MUFIDS, baggage reconciliation systems and public address/visual paging/mass notification systems. The design and engineering included all required specifications and details as well as structured cabling requirements.

Fire Protection- The scope of work included the design of various fire protection



Courtesy of Gresham Smith

systems to provide a fully sprinklered building as required by code. These systems included standard wet and dry water-based sprinkler and standpipe systems as well as deluge sprinkler, pre-action sprinkler, and gaseous suppression systems for high value or high challenge assets. The fire protection systems were designed in accordance with the applicable building codes and NFPA standards. A water-based fire suppression system was supplied by the existing water infrastructure. However, hydraulic calculations were performed to verify that the existing capacity met the proposed demand. The alteration of existing systems accounted for construction phasing to ensure fire-protection-occupied areas remained operational.

Code Consulting- Arora's in-house design professionals supported the team with code-consulting services. These services included occupancy classification, egress coordination, definition of fire/life safety strategies, and the analysis of codes and design features.

PROJECT DETAILS

Client

AIR Alliance Joint-Venture
Robert J. Kleinman
Vice President – Aviation
3101 Wilson Boulevard, Suite 700
Arlington, VA 22201
robert.kleinman@aecom.com
703-399-3914

Construction

$269.8 Million

Project Start

2017

Project Completion

2021

Highlights

+ New Secure National Hall
+ Sufficient room for TSA equipment
+ Heightened security at airport
+ Improved the screening experience
+ Arora provided plumbing, fire alarm, and fire protection engineering services

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

SECURE NATIONAL HALL

Ronald Reagan National Airport, Washington, DC

Arora Engineers (Arora) was part of the joint venture team identified as AIR Alliance, comprised of AECOM and PGAL for the new Secure National Hall project at Ronald Reagan Washington National Airport (DCA). The Metropolitan Washington Airports Authority (MWAA) procured professional engineering services for on-call planning, design, and construction projects at DCA as part of Project Journey, a billion-dollar, multi-year capital improvement program designed to transform the passenger experience at DCA. The new Secure National Hall was designed to heighten security at the airport and improve the screening experience for passengers and TSA officers.

The new 100,000 square foot checkpoints, located in the airport's iconic Secure National Hall, expand TSA's screening operation from 20 to 23 total lanes, with the ability to expand to a total of 28 lanes. Screening operations were relocated, and the new facilities engineered to create a seamless, free-flowing environment between Terminal B/C and the new 14-gate concourse. The checkpoints offered sufficient room for TSA equipment and included an area for passengers to recompose themselves after screening. This process not only increased capacity but ensured a comfortable space and experience for travelers.

The checkpoint improvements were a key part of Project Journey, which included the construction of an enclosed $391.5 million regional aircraft concourse to offer passengers greater connectivity, more shopping and dining options, and a more gratifying post-security space.

Scope of work:

Arora's overall scope of services for AIR Alliance included plumbing, fire alarm, and fire protection engineering services for the Secure National Hall Project. Arora was



METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

SECURE NATIONAL HALL

Ronald Reagan National Airport, Washington, DC

also responsible for conceptual design services integrating renovated space in the National Hall and the New North Concourse connector with the existing systems and technology at DCA. Additionally, Arora provided construction administration services for the Secure National Hall.

In providing plumbing and fire protection design services, the team produced creative solutions to accommodate the complex roof forms of the new security checkpoint buildings. Several coordination efforts took place with other disciplines for routing of the storm water piping from the new roof to the existing leaders to a below ground main. This approach yielded a very clean design of an exposed roof structure and maintaining of the aesthetic qualities of the building.

Typical fire protection systems are designed for a flat or sloped roof, so it will usually only vary in two directions. However, the roof of DCA's new security checkpoint buildings had a tilted, wave-like design, meaning the roof varied in three different directions (an XYZ system).

In the design approach, Arora was tasked with getting the sprinklers placed up high while still being able to merge with the existing wet system. Therefore, they had to consider regulating pressure losses and not exceeding the current pressure system supply. Maintaining cost and adequate safety measures were also critical to the design.

In a sprinkler system, water is always draining back to a common source for testing purposes so that the system can be inspected. In this space, the team had to look closely at the elevation in the design (foot-by-foot increments along a 400-foot span, per building), be mindful of the routing, and avoid pitfalls of low points and artificial high points. Through their creative efforts, the team matched the profile of the roof while maintaining a positive slope back to a common drain.

The team also focused on the routing below the structure, again considering the dry system they were working with. A key concern with these types of systems is protecting them from freezing while crossing through an unconditioned space. In this design, the source water was on the opposite end of the building from the point of use, so the piping had to loop back around to the ceiling. There was no right-of-way of direct piping in this design. Keeping pressure loss in mind, as well as water demand, the team had to decrease the size of each individual system while increasing the number of zones.

These constraints generated multiple iterations of the fire protection design. The system was routed half a dozen times, and the team had to collaborate with other disciplines in organizing the building systems (e.g. lighting, electrical, public address, etc.) in limited ceiling plenum. There was also an aesthetic quality to consider by maintaining the spacing from sprinkler to sprinkler.

PROJECT DETAILS

Client

AIR Alliance Joint-Venture
Robert J. Kleinman
Vice President – Aviation
3101 Wilson Boulevard, Suite 700
Arlington, VA 22201
robert.kleinman@aecom.com
703-399-3914

Construction

$391,500,000

Project Start

2016

Project Completion

2021

Highlights

+ New North Concourse
+ Arora provided electrical, plumbing, and fire/life safety engineering services.
+ Added 200,000 SF to DCA

METROPOLITAN WASHINGTON AIRPORTS AUTHORITY

NEW NORTH CONCOURSE

Ronald Reagan National Airport, Washington, DC

Arora Engineers (Arora) was part of the joint venture team identified as AIR Alliance, comprised of AECOM and PGAL for the New North Concourse at Ronald Reagan Washington National Airport (DCA). This project was funded by the Metropolitan Washington Airports Authority (MWAA), who procured professional engineering services for on-call planning, design, and construction projects at DCA.

The New North Concourse project consisted of an addition to Terminal B/C to facilitate expanded airline operations with 14 new gates, several concessions spaces, and airport operations. The project added approximately 200,000 SF to DCA.

This was a multi-year, multi-task A/E task order program for Terminal B/C at DCA. The program objective was to centralize TSA operations for passengers and secure and expand the existing Terminal B/C to ensure equitable and efficient passenger level of service. The long-term redevelopment complemented the on-going near-term rehabilitation efforts and led to a full facility program.

Scope of work included:

Arora provided full electrical, plumbing and fire/life safety engineering services for the New North Concourse project. Arora was also responsible for conceptual design services integrating renovated space in the National Hall and the New North Concourse connector with the existing systems and technology at DCA. Additionally, Arora provided Construction Administration services for the New North Concourse



Photo courtesy of MWAA

PROJECT DETAILS

Client

AECOM
Terry Rookard
Vice President/Principal Architect
1 Federal Street, 8th Fl
Boston, MA 02110
terry.rookard@aecom.com
(617) 371-4493

Construction

$185,000,000

Project Start

2018

Project Completion

Ongoing

Highlights

+ Provided professional services for the planning, design, engineering and construction oversight of a new terminal at BDL.

CONNECTICUT AIRPORT AUTHORITY

TERMINAL DEVELOPMENT PROGRAM

Bradley International Airport, Windsor Locks, CT

Arora Engineers (Arora) provided professional engineering services to AECOM for the Terminal Development Program at Bradley International Airport, which is the state's largest airport serving the capitol of Connecticut and the surrounding southern New England region. The program involved planning, design, engineering, architectural and construction oversight services related to the construction of a new terminal, and improvements and expansions to existing facilities.

Scope of work included:

The construction of this new terminal will be completed in phases, and Arora supported the team in reviewing, evaluating, and suggesting technical approaches to further define the terminal development concepts, informed by the recently completed Bradley Airport Master Plan. Project responsibilities included:

+ Scope, schedule and price development associated with the various phases of the overall project.
+ Terminal programming, including airside and landside components, and phasing plans.
+ Completion of an air traffic forecast update.
+ Design elements, including relocation of the current Federal Inspection Services (FIS) facility, inline bag screening equipment, airport concessions, passenger circulation improvements, and security checkpoint enhancements.



Rendering Courtesy of AECOM

CONNECTICUT AIRPORT AUTHORITY

TERMINAL DEVELOPMENT PROGRAM

Bradley International Airport, Windsor Locks, CT

In-Line Checked Baggage Inspection System (CBIS) Task:

Under this agreement, Arora provided engineering services for the design of a new In-Line Checked Baggage Inspection System (CBIS) utilizing explosive detection systems (EDS) for Terminal A at Bradley International Airport (BDL). The system will transport the nearly two million checked bags BDL screens each year along a mile-long network of conveyor belts to a new, 80,000 SF building for security screening. This facility will eliminate baggage screening from the terminal lobby, freeing up space for up to 16 new airline ticket counters.

The initial phases of work included reviewing and commenting on the 30% package developed and submitted to the TSA in 2013. The 30% package envisioned replacing all existing “in-lobby” CT80 stand-alone screening machines with an in-line CBIS/CBRA located in a new airside facility. The review was accomplished with ILDT participation to validate/verify the overall system capacity requirements, location, and other operational requirements.

Upon completion of this review, the team provided complete design and bid phase services for the new CBIS in accordance with the OTA and based upon the Transportation Security Administration Planning Guidelines and Design Standards (PGDS) v6.0, for all phases of design from schematic through final design and construction phase services.

Overall Design Phase services for the Baggage Handling Checked Baggage Inspections System included:

+ Development of the BHS/CBIS plans and sections to provide the content and the level of detail to the TSA for final review and approval to proceed to construction.
+ Development of conveyor maintenance catwalk and access drawings, BHS structural support and loading details, user interface details, control system schematics and details, signage details.
+ Conveyor manifest (approximate conveyor lengths and belt speeds).
+ BHS/CBIS Description of Operation.
+ Estimate of BHS/CBIS power requirements.
+ Assistance with completion of project/phasing schedule.
+ Assistance with completion of Configuration Management Plan.
+ Assistance with completion of Contingency Plan.
+ Assistance with preparation of responses to review comments received in previous phase.
+ Specifications for the BHS/CBIS.
+ Preparation of100% Construction Documents suitable for public bidding, including frontend specifications and submit for CAA review.

PROJECT DETAILS

Client

Nashville International Airport
Traci Holton, PE, CM
Assistant Vice President
Development & Engineering
One Terminal Drive, Ste. 501
Nashville, TN 37214
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615-275-4139

Construction

$327,000,000

Project Start

2018

Project Completion

2023

Highlights

+ Providing special systems engineering and design services for BNA's Terminal Lobby and International Arrivals Facility (IAF).
+ Special systems included public address, Electronic Video Information Display Systems (EVIDS), and the integration of those systems.
+ The project spanned 210,000 square feet of new space and 350,000 square feet of renovated space.

METROPOLITAN NASHVILLE AIRPORT AUTHORITY

BNA TERMINAL LOBBY AND INTERNATIONAL ARRIVALS FACILITY (IAF)

Nashville International Airport, Nashville, TN

As part of BNA Vision, an expansion plan at Nashville International Airport (BNA), the Metropolitan Nashville Airport Authority (MNAA) renovated the Terminal Lobby and designed a new International Arrivals Facility (IAF).

This design-build project included a new high roof canopy extending from Parking Garage B/C to the new International Arrivals Facility. The canopy provided coverage over the roadways and curbside access to the terminal as well as a new pedestrian walkway connecting the parking garage to the terminal. The pedestrian bridge connected the central core with the Garage B/C plaza, the administration building, the hotel, and the future train station to improve accessibility to and from the airport terminal. The terminal also included a new consolidated Security Screening Checkpoint (SSCP). The SSCP was located central to the terminal, providing easy access to departing passengers. The SSCP included biophilia opportunities through low-maintenance vertical garden walls. The terminal renovation also included new concessions, airline club space, and gates serving international flights.

The project also included a new International Arrivals Facility (IAF), which provided a new Customs and Border Protection (CBP) Area with primary and secondary processing, complete with a pedestrian tunnel moving the passengers from the CBP to the Terminal and Ground Transportation areas

Scope of work included:

Arora Engineers (Arora), as part of the Hensel Phelps and Fentress Architects led Design/Build team, was selected to provide special systems engineering and design services for this project, including public address and Electronic Video Information Display Systems (EVIDS), as well as the integration of those systems into common-use terminal equipment. Passengers will be greeted by two monumental displays playing gorgeous video capsules that pay homage to Music City's legacy. Each large-scale screen stands at 70 x 10 feet. This project incorporated 210,000 square feet of new space and 350,000 square feet of renovated space.



Metropolitan Nashville Airport Authority

PROJECT DETAILS

Client

City of Philadelphia
Division of Aviation
Jim Jones, PE
Project Manager
International Plaza II,
Suite 540
Philadelphia, PA 19113
james_t.jones@phl.org
215-937-6229

Construction

$150,000,000

Project Start

2008

Project Completion

2013 (Hub)
2015 (Bag claim & ticketing)

Highlights

+ Project included 86,000 SF of new floor space and a baggage claim building
+ Provided MEP, fire protection, and security/ special systems engineering
+ Responsible for construction administration support and inter-agency coordination

CITY OF PHILADELPHIA, DIVISION OF AVIATION

TERMINAL F HUB EXPANSION

Philadelphia International Airport, Philadelphia, PA

Arora Engineers (Arora) provided design for the mechanical, plumbing, fire protection, fire detection, electrical, special systems, and security engineering services for an expansion of Terminal F at the Philadelphia International Airport. Improvements involved approximately 88,400 SF of new floor space, a new baggage claim building, additions and modifications to the existing building, new architectural finishes, and systems upgrades. Terminal F has three concourses connected by a central hub, 38 gate positions, a ticketing building, a baggage claim, and a skybridge leading to the parking structure.

Scope of work included:

+ Electrical: Power distribution; lighting design and controls, power ductbank design, motor control panel, substation modification and analysis, and concession space low voltage power.
+ Mechanical: Study of future cooling and heating capacity, satellite thermal plant expansion systems, including pumps and pipelines, domestic water piping, sanitary and stormwater design, and gas piping modifications required.
+ Fire/Life Safety: code review; fire alarm and detection system, clean agent suppression (Fm 200 or other), fire sprinkler systems (wet, dry, pre-action), hydrant and hose reel systems, and fire egress interfaces.
+ Special Systems/Security: Multi-use flight information displays, visual paging advertising/wayfinding, network architecture (Mac minis, cat 6 Cabling, upgrade G4 Platform), horizontal structured cabling design, access control and intrusion detection, access control doors, CCTV, digital video recording, TACS, ambient noise sensing and automatic compensation, amplification of Live Speech announcements originating at microphone stations, UCDS, and MDF/IDF analysis and design.

Arora also provided construction administration support and inter-agency coordination. With this expansion, the airport hoped to create a better passenger experience and generate additional concession sales by expanding available space and improving retail options.



PROJECT DETAILS

Client

Atkins
Donald A Koppy, AIA, CIA, CCS
Architecture Team Leader
Two Commerce Square
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donald.koppy@atkinsglobal.com
813-281-4459

Construction

$184 million

Project Start

2018

Project Completion

2024

Highlights

+ Arora was responsible for reviewing mechanical, electrical, plumbing, special systems, security, life safety, and civil disciplines
+ Utilized Bluebeam for interactive review

LEE COUNTY PORT AUTHORITY

TERMINAL EXPANSION DESIGN

Southwest Florida International Airport (RSW), Fort Meyers, FL

Arora Engineers (Arora) provided professional peer review and quality control services to the Atkins team responsible for improvements at the terminal building and concourse areas at Southwest Florida International Airport (RSW).

The project consisted of a multi-story expansion of the existing terminal's north face along its entire length between the current checkpoint queues of concourses B and D. The expansion of the building's footprint extended northward into Concourse C past the existing ramp and security checkpoint. When completed, the expansion consolidated the airport's three checkpoints into one and provided for new concession and retail spaces and upgrades to the building's infrastructure and MEP systems. Also included was a remote loading dock and renovations and improvements to TSA administration space and non-public airport administration spaces. The total area of expansion and renovation was more than 300,000 square feet.

The project comprised renovations and expansion in the Terminal, Concourses A, B, C, and D, and the Terminal Apron, with services including removal and relocation of central elevator and stair access/egress to all levels, including relocation of associated building system equipment and piping; rework of structural, mechanical, electrical, plumbing, fire protection, and special systems necessary to implement the design, addition of new signage, and wayfinding.

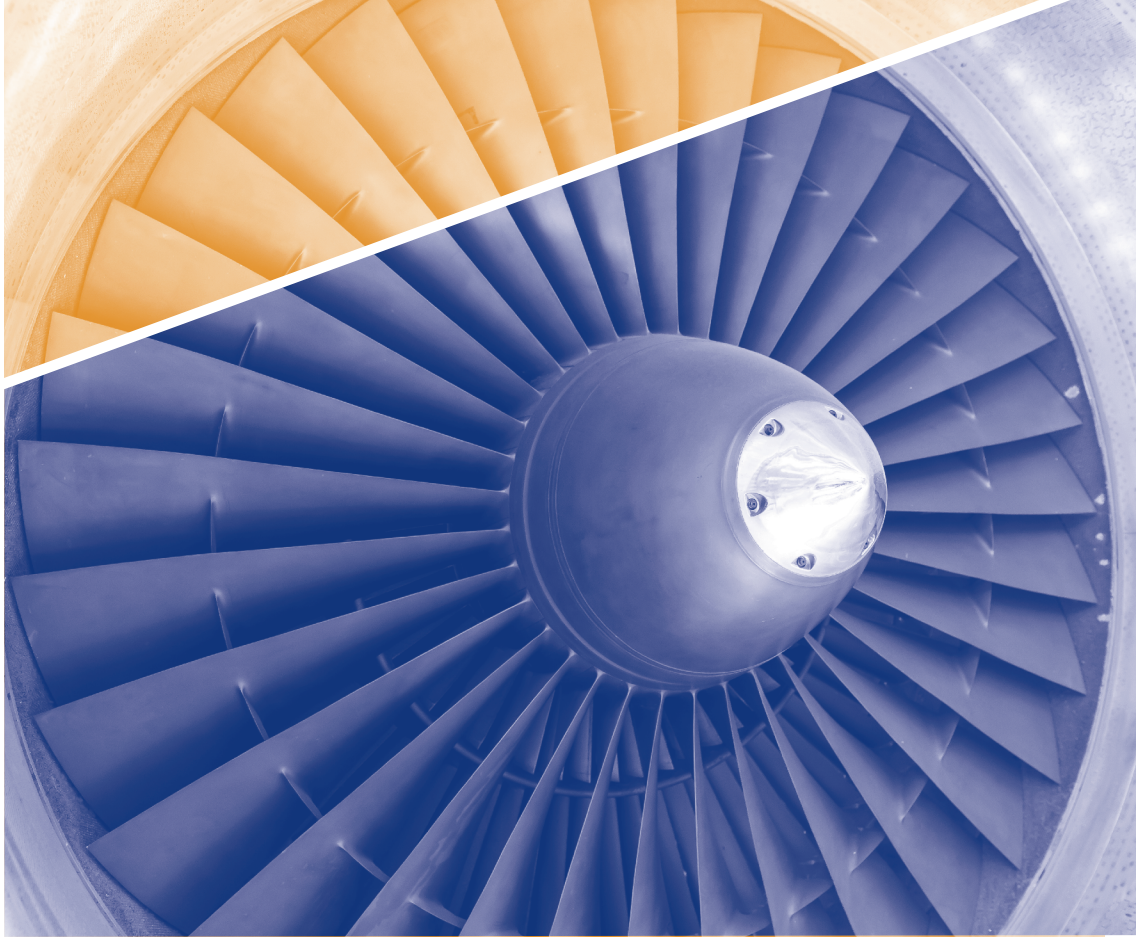
Arora was selected to provide a peer review for mechanical, electrical, plumbing, special systems, security, life safety and civil disciplines.

Scope of work included:

Arora coordinated their review with the Atkins Project Team to provide a five-step, phase-specific bluebeam-based interactive review of the following:

+ Review of record drawings
+ Review and provide comments for mechanical, electrical, plumbing, special systems, security, life safety, and civil disciplines
+ Review and provide comments on technical specifications
+ Review, cross check, and provide comments on bid schedules
+ Review applicable calculations
+ Review of baggage handling equipment as it relates to Arora disciplines
+ Review of concession utility analysis
+ Review of LCPA Tenant Design Criteria Manual
+ Review of final design criteria report
+ Review of descriptive materials prior to presentations to RSW

Rethinking Infrastructure®



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