



# Construction Services Qualifications

**CONTACT:**

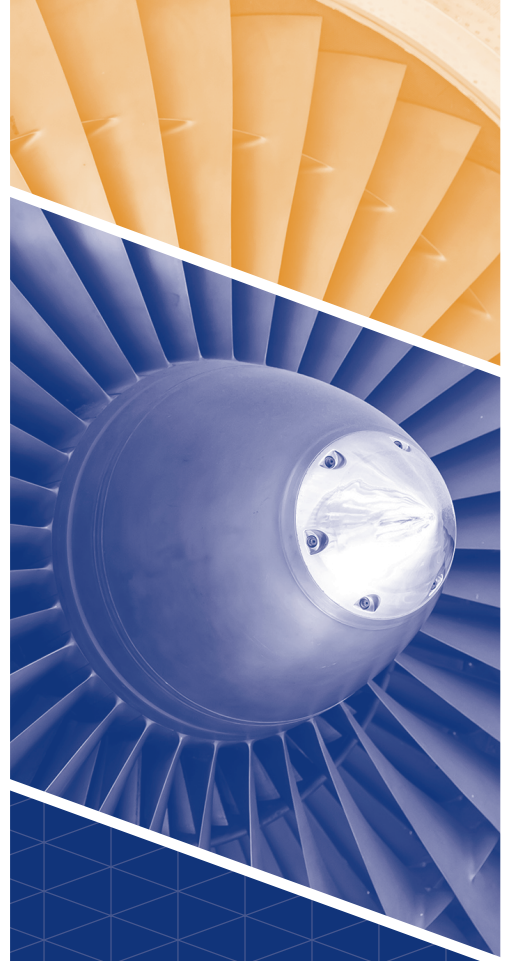
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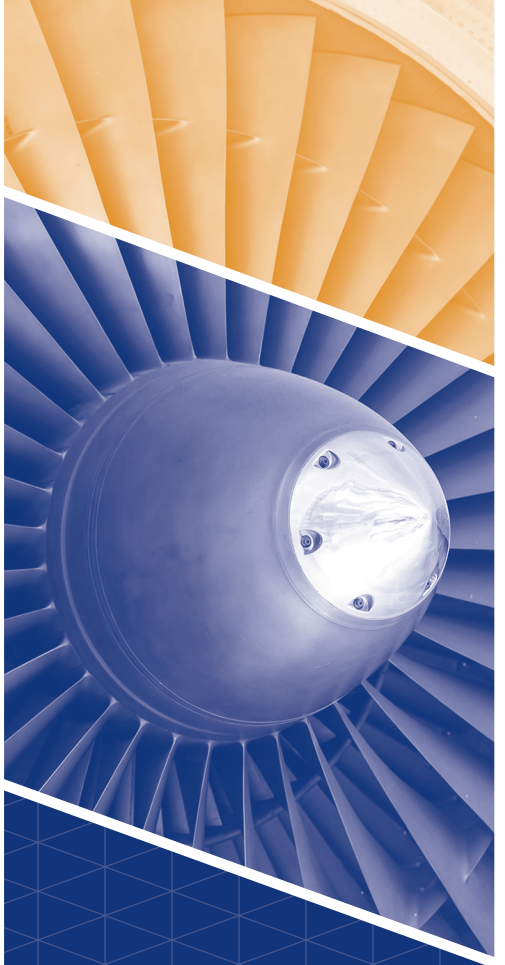




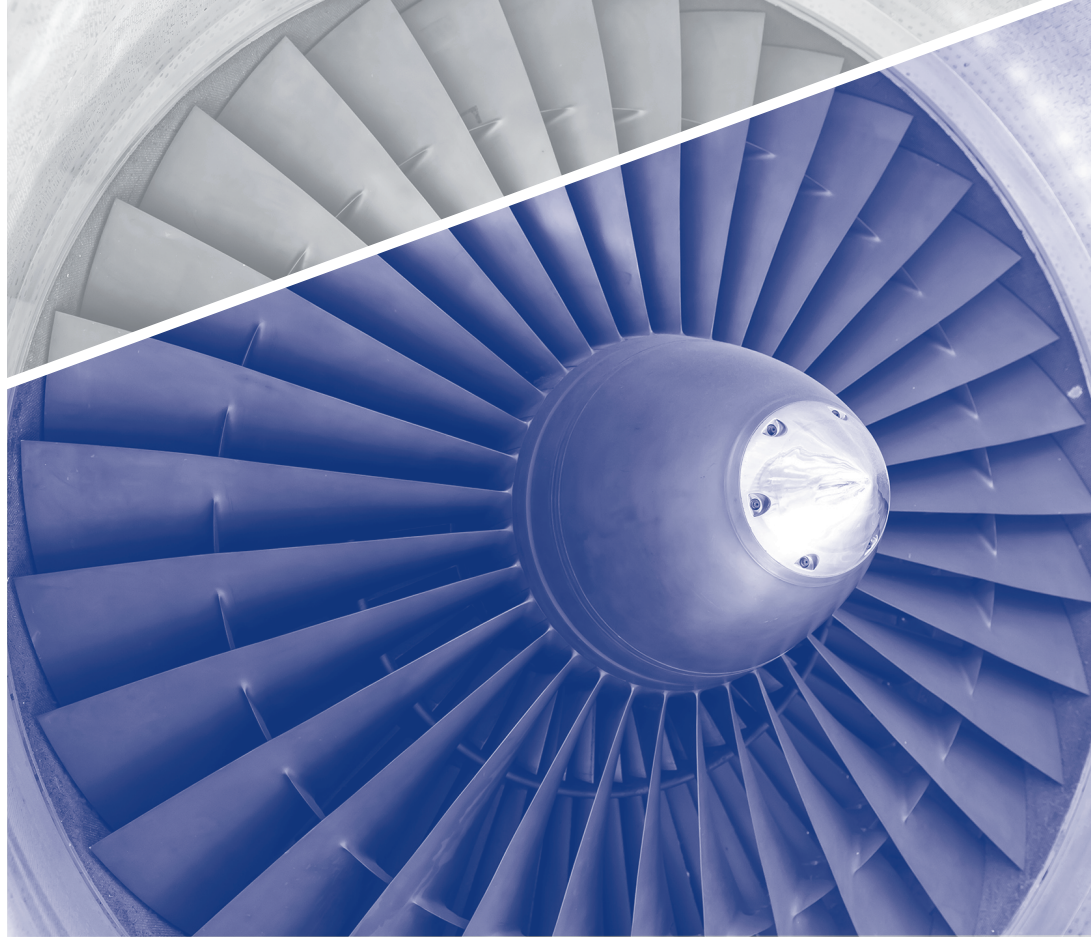
MASTER SYSTEMS INTEGRATION (MSI) SERVICES OVERVIEW



MASTER SYSTEMS INTEGRATION (MSI) EXPERIENCE



Rethinking Infrastructure®



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+ Master Systems Integration (MSI) Services Overview



+ Master Systems Integration (MSI) Experience



# Arora Engineers

At Arora Engineers (Arora), 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
- + 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

**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
- + 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

BALTIMORE

**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

BOSTON

**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

CHARLOTTE

CHICAGO

**FIRE PROTECTION AND LIFE SAFETY**

- + Fire alarm and detection system design
- + Standpipes and water-based sprinkler system design
- + Foam systems and special hazard suppression design
- + Fire pumps and 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

DALLAS

FT. LAUDERDALE

**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

NASHVILLE

MIAMI

**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

NEW YORK

ORLANDO

**CONSTRUCTION MANAGEMENT & INSPECTION**

- + Project administration
- + Master systems integrator
- + Daily inspection
- + Project documentation
- + Submittal review/tenant permit reviews
- + Design support
- + Constructability reviews
- + Value engineering
- + Runway Incursion Mitigation
- + Airfield Lighting Vaults and Power Distribution
- + Pavement Surface Sensor Systems
- + Construction Safety and Phasing

PHILADELPHIA

SAN JOSE



# Construction Services

Arora has rethought the role of a traditional program and construction management consultant to capitalize on processes and technologies that improve operations and longevity while connecting systems infrastructure to make facilities greener, safer, and more accessible.

## Key Services

### PROGRAM & PROJECT MANAGEMENT

- + Master Scheduling/Schedule Analysis
- + Master Budget Development
- + Design Management
- + Cost Management
- + Delivery and Contracting Strategies
- + Procurement Management
- + Cost Estimating
- + Change Order Management
- + Value Engineering
- + Claims Avoidance
- + Dispute Resolution
- + Facility Condition/Life Cycle Assessments
- + Construction Management
- + Commissioning Management
- + Design review for constructability
- + Subcontract bid package(s) preparation
- + Award recommendations

### CONSTRUCTION MANAGEMENT

- + Master Systems Integration (MSI)
- + Project administration
- + Submittal review/tenant permit reviews
- + Design support
- + Constructability reviews
- + Value engineering
- + Project documentation
- + Project administration
- + Critical path review
- + Materials testing review
- + Daily inspection
- + Reports
- + Commissioning Results
- + Tests Certifications Review
- + Data Collection Information

### STAFF SUPPORT SERVICES

Arora provides project management support as an extension of staff for capital improvement programs and projects. Support staff includes project managers, resident engineers, construction managers, project coordinators, contract administrators, and construction inspectors.



## PROJECT DETAILS

### Client

Michael Baker International  
Andre Szumylo, PE  
Project Manager  
International Plaza I  
Suite 200  
Philadelphia, PA 19153  
aszumylo@mbakercorp.com  
215-937-5449

### Construction

\$3,400,000

### Project Start

2016

### Project Completion

2017

### Highlights

- + Provided overall project management support during the planning, design, construction, and closeout for the Gate V01 Upgrades.
- + Coordinated the design review & delivery process.
- + Prepared progress charts, construction schedules, and reports.
- + Provided a project closeout.

## CITY OF PHILADELPHIA, DIVISION OF AVIATION

# PHL ON-CALL PM/CM SERVICES – GATE V01 UPGRADES

## Philadelphia International Airport (PHL), Philadelphia, PA

As part of an on-call project management/construction management contract with Michael Baker International, Arora Engineers (Arora) provided overall project management support to the engineering manager during the planning, design, construction, and closeout for the Gate V01 Upgrades at the Philadelphia International Airport (PHL).

Project upgrades included demolition and removal of existing gate/barrier equipment, hardware, and temporary Jersey barrier mounted fencing. The project also included the provision of new vehicle gates/barriers for traffic control, reconfiguration and expansion of roadways and parking areas to accommodate larger vehicles, construction of a new operations booth and security booth, installation of new lighting poles and fixtures throughout the work site, and installation of new security system and CCTV to control and monitor the new gates/barriers and booths. Work was done in phases to minimize impact to gate operations. The phasing plan was prepared to allow only one Gate V01 lane to be shut down for new upgrades at a time, while allowing vehicles to be screened and accessed through another lane.

### Scope of work included:

Arora's scope of work focused on reviewing, inspecting, and coordinating the Gate V01 Upgrades with the Division of Aviation (DOA). The team's tasks included:

- + Providing guidance to the consulting engineer regarding design and implementation characteristics respective to the DOA's requirements.
- + Coordinating to verify and validate, through design review and construction review, that the DOA's requirements and expectations were being met.
- + Coordinating the design review & delivery process with DOA engineering, IT, and other departments.

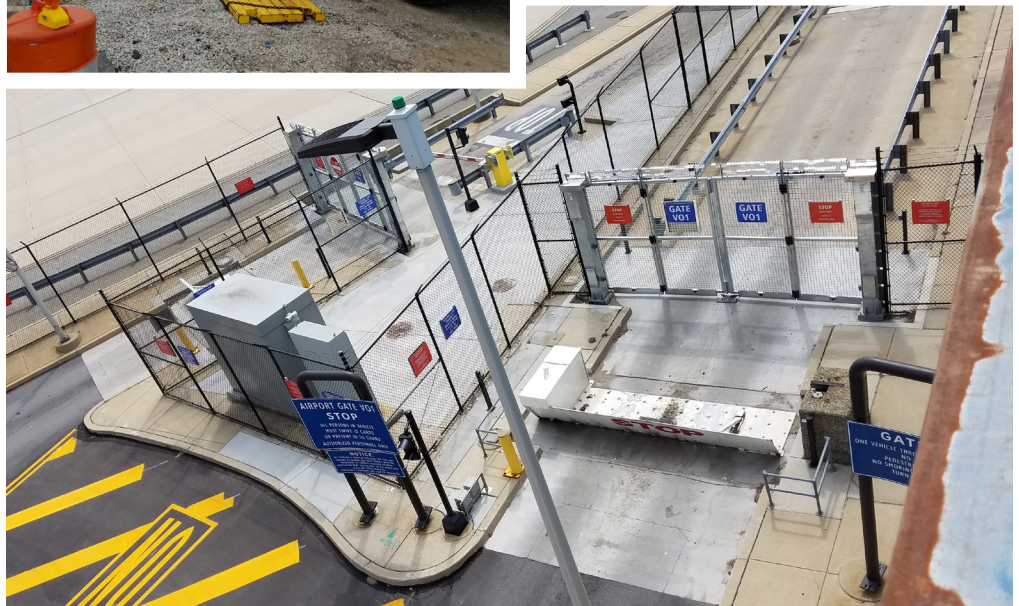
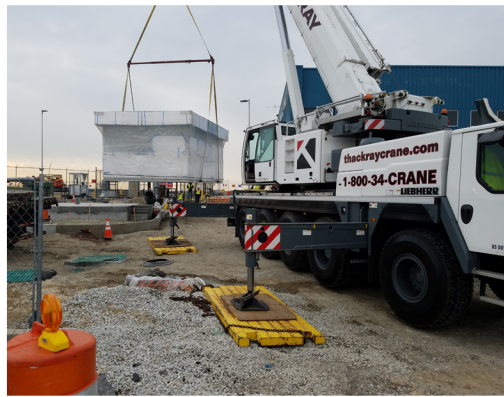


CITY OF  
PHILADELPHIA,  
DIVISION OF  
AVIATION

**PHL ON-  
CALL PM/CM  
SERVICES  
– GATE V01  
UPGRADES**

Philadelphia  
International Airport  
(PHL), Philadelphia, PA

- + Providing support during the project bid opening, evaluation, and procurement process.
- + Coordinating with the City of Philadelphia, Tinicum Township, etc.
- + Interfacing with different departments at PHL, including Engineering, CBP, TSA, and construction groups.
- + Reviewing shop drawings to ensure compliance with project specifications and the DOA's security requirements.
- + Conducting project coordination meetings.
- + Preparing progress charts, construction schedules, and reports.
- + Monthly billing reviews.
- + Testing and commencing systems as a PHL representative.
- + Generating all testing and certification paperwork to be given to the DOA.
- + Measuring the quantities of work and certifying estimates and payments to the contractors.
- + Generating weekly status reports.
- + Providing documentation for payment requisitions.
- + Collecting and validating as-built drawings from the contractor.
- + Providing a project closeout.



## PROJECT DETAILS

### Client

WSP  
Marc L. Beningson  
National Practice Lead  
One Penn Plaza, 2nd Floor  
250 W 34th Street  
New York, NY 10119  
beningsonml@pbworld.com  
212-532-9600

### Project Start

2019

### Project Completion

2020

### Highlights

- + Arora is an experienced inspector at Robert F. Kennedy (RFK) and/or Bronx-Whitestone Bridges.
- + Provide construction quality assurance and oversight inspection staff support for this project when directed by WSP.

## METROPOLITAN TRANSPORTATION AUTHORITY TRIBOROUGH BRIDGE AND TUNNEL AUTHORITY **ROBERT F. KENNEDY & BRONX-WHITESTONE BRIDGE INSPECTION**

### New York, NY

Arora Engineers (Arora), serving as a subconsultant to WSP provided inspection services at the Robert F. Kennedy (RFK) and Bronx-Whitestone (BW) bridges for the Metropolitan Transportation Authority (MTA) Triborough Bridge and Tunnel Authority (TBTA). Arora provided construction quality assurance and oversight inspection staff support for this project.

### Scope of work included:

Arora provided quality oversight for the installation of facility-wide electronic monitoring and detection systems at the Bronx Whitestone Bridge and Robert F. Kennedy Bridge Facilities.

Arora provided a Senior Inspector and Inspector to assist WSP in performing construction inspection services for the project. The Senior Special Systems Inspector assisted WSP in performing construction inspection services for the project. Arora performed construction inspection of the contractor's work, kept contract records, reviewed shop drawings and submittals, and performed oversight of the testing of materials as assigned by WSP.



## PROJECT DETAILS

### Client

GFP (Gannett Fleming/  
Parsons JV)  
Brad Mason, P.E., P.M.P.  
Program Manager  
100 M St SE, 9th Floor  
Washington, DC 20003  
bmason@gfnet.com  
202.969.3164

### Project Start

2017

### Project Completion

2021

### Highlights

- + Provided support for site surveys, scope development, and future contract generation for WMATA's Yard 2 project.
- + Collected scope requirements, defined scope, and identified stakeholders.
- + Provided administrative and technical support activities in the construction management field office.
- + Prepared cost estimates and analyses.
- + Developed pre-negotiation positions.
- + Supported contract negotiations.

## WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

### A/E SERVICE STAFF AUGMENTATION FOR YARD 2 PROJECT

#### Washington, D.C. Metropolitan Area

Arora Engineers, Inc. (Arora) is part of the Gannett Fleming/Parson Joint Venture (GFP) team for the Washington Metropolitan Area Transit Authority (WMATA) General Architectural and Engineering Consultant Services—Facilities Indefinite Delivery Indefinite Quantity (IDIQ) contract No. FQ1519.

The WMATA worked on a multi-year program for the rehabilitation of several rail yard facilities. Arora provided A/E service staff augmentation for the Yard 2 project. This included providing support to WMATA for site surveys, scope development, and future contract generation, as well as in-field coordination and administrative support for the future rail yard facilities' rehabilitation projects.

Arora recently provided staff augmentation for contract support services, specifically providing a Project Controls Specialist and a Construction Manager.

#### Scope of work included:

Arora's Project Controls Specialist provided the following:

- + Worked with the contract support group.
- + Developed pre-negotiation positions.
- + Prepared cost estimates.
- + Reviewed claims.
- + Performed cost analyses.
- + Supported contract negotiations.

Arora's Construction Manager scope of work:

- + Maintained full familiarity with plans, specifications, construction schedules, and contractor's plans on assigned contracts, Adjacent Construction Project Manual, JDAC Procedures, and current safety regulations relative to assigned projects to be knowledgeable of the contractor's obligations and Project Manager's responsibilities.
- + Disseminated information to office and field staff and internal stakeholder offices as required to keep all pertinent WMATA personnel accurately informed of relevant matters.
- + Established and maintained job record files for assigned projects per instructions contained in the Project Implementation Manual.
- + Reviewed contractor's Critical Path Method or bar chart progress schedules as applicable, and maintained current, marked-up copies of such schedules.
- + Collected scope requirements, defined scope, and identified stakeholders.
- + Participated in engineering package reviews during the select, define, and execute phases of projects and provided constructive input to the design team.
- + Provided administrative and technical support activities in the construction management field office.
- + Ensured work was performed per plans and specifications via coordination with Quality Assurance (QA).
- + Performed various administrative office functions and work under the direction of the Project Manager, who reviewed the work based on the daily informal contacts, reports, and conferences

## PROJECT DETAILS

### Client

Lehigh Northampton Airport Authority  
Ryan Meyer  
Director of Planning & Programming  
3311 Airport Road  
Allentown, PA 18109  
rmeyer@lnaa.com  
610-231-5230

### Construction

\$6,000,000

### Project Start

2015

### Project Completion

2017

### Highlights

- + Assisted with airport obtaining \$2.5MM PennDOT grant.
- + Stakeholder coordination
- + MEP design
- + Roadway improvements
- + Rental car maintenance building demolition
- + Terminal expansion
- + Rental car consolidation
- + Construction safety and phasing
- + Full-time on-site construction management

## LEHIGH – NORTHAMPTON AIRPORT AUTHORITY (LNAA) MULTIMODAL GROUND TRANSPORTATION HUB

### Lehigh Valley International Airport (ABE), Allentown, PA

In August 2017, the Lehigh Valley International Airport (ABE) opened its new Multimodal Ground Transportation Hub. Funding for this project included a \$1.75 million grant from the Multimodal Transportation Fund through the PennDOT Bureau of Aviation. The new facility provided a modern and convenient location for regional bus transportation companies (Lanta and Transbridge) and improved on previous operational deficiencies for the existing rental car operations.

The completed facility improved the walking distances to the rental cars from the terminal by 700 feet, provided adequate weather protection to the traveling customers, eliminated vehicle conflict points, improved area lighting, signage, and wayfinding, and nearly doubled the number of taxi stands and designated areas for bus service.

### Scope of work included:

The project entailed the demolition of the existing fire house/rental car maintenance facility (Building 10) and construction/erection of a new multimodal ground transportation hub within the footprint of the existing rental car lot. Arora provided overall program and construction management services including professional engineering services for the mechanical, electrical, plumbing, fire alarm/fire protection and special systems.

Arora utilized teaming partners for the architectural, civil, structural, HAZMAT, and regulatory aspects of this project. The construction team managed a fast-tracked construction schedule and completed the facility on time and within the allocated program budget.

Arora also provided full-time, on-site construction management services, which ensured that the project remained on schedule and within budget.



## PROJECT DETAILS

### Client

Lehigh Northampton Airport Authority  
Thomas Stoudt  
Lehigh Valley International Airport  
Director of Operations & Safety  
3311 Airport Road  
Allentown, PA 18109-3040  
tstoudt@lnaa.com  
(610) 266-6001

### Construction

\$26,320,958

### Project Start

2020

### Project Completion

2021

### Highlights

- + Multi-Prime Delivery

## LEHIGH NORTHAMPTON AIRPORT AUTHORITY

# LNAA TASK 38 – PROGRAM, CONSTRUCTION, AND INSPECTION MANAGEMENT SERVICES

## Lehigh Valley International Airport, Allentown, PA

Arora Engineers (Arora), serving as the Prime Consultant, was selected to provide on-call planning, architectural, and engineering services for the Lehigh-Northampton Airport Authority (LNAA). Under this contract, Arora issued a task for program management, program administration and construction management related to the implementation of the security checkpoint (connector) improvements project located at Lehigh Valley International Airport (ABE). The critical elements of this project included:

- + Improved departing (outbound) PAX flow via an elevated connector
- + New PAX Security Screening Checkpoint (SSCP)
- + New vertical circulation core located at the Wiley Terminal
- + Improved arriving (inbound) PAX flow via a new below-grade tunnel
- + LifeAire purification system evaluation and improvements
- + COVID-19 evaluation of potential modifications to design
- + Financial coordination assistance for the program funding
- + Township Coordination and response to comments
- + Haul route rehabilitation
- + Utility coordination
- + Stand-by emergency generator
- + Renderings and animation preparation
- + Art coordination

### Scope of work included:

Arora was responsible for program management, program administration and





LEHIGH  
NORTHAMPTON  
AIRPORT AUTHORITY

**LNA A TASK 38  
– PROGRAM,  
CONSTRUCTION,  
AND INSPECTION  
MANAGEMENT  
SERVICES**

Lehigh Valley  
International Airport,  
Allentown, PA

construction administration, including the following services:

**Project Management** with tasks including:

- + Owner's representative
- + Project schedule management – LNAA Stakeholders
- + Stakeholder coordination
- + Request for Proposal (RFP) development & management
- + Management of hours and review of documentation.
- + Conflict resolution
- + Day-to-day project management
- + Project partnering
- + Financial review & coordination with LNAA stakeholders
- + Project partnering

**Project Administration** with tasks including:

- + Owner's representative services.
- + Financial review & coordination with project primes.
- + Request for Proposal (RFP) development & management.

**Project Schedule Management** services includes:

- + Contract document peer reviews, including design change control and value engineering management & coordination.
- + Preparation of funding request applications, including federal applications (i.e. FAA) and state applications.
- + Document control & management.

On-Site **Construction Management** support services provided by Arora included:

- + Owner's representative services.
- + Providing LNAA stakeholder updates.
- + Bid phases project procurement support.
- + Monitoring MBE/DBE program compliance.
- + Reviewing and approving contractor's request for payment.

## PROJECT DETAILS

### Client

City of Philadelphia  
Division of Aviation  
Imad Haq, PE  
Airport Engineering Manager  
Capital Development Group  
Philadelphia International  
Airport  
1 International Plaza, Suite  
200  
Philadelphia, PA 19113  
imad.haq@phl.org  
215-937-7878

### Construction

\$25,000,000

### Project Start

2019

### Project Completion

2022

### Highlights

- + Arora provided Construction Management/ Project Management inspection support services.
- + Arora conducted a field investigation within the anticipated limit of work, including the existing electrical vault, to review and record site and equipment conditions.
- + Reviewed shop drawing submittals from the Contractor and maintained a submittal log to track the status of each submittal.

## CITY OF PHILADELPHIA DIVISION OF AVIATION EAST AIRFIELD REHABILITATION INSPECTION SUPPORT

### Philadelphia International Airport, Philadelphia, PA

Arora Engineers (Arora), working as a subconsultant to Johnson, Mirmiran & Thompson (JMT) provided Construction Management/ Project Management inspection support services for the North Apron Reconstruction and Rehabilitation of Taxiways D, E and K at Philadelphia International Airport (PHL). This project is a task order under the City of Philadelphia Department of Aviation On-Call Civil Engineering project for PHL and Philadelphia Northeast Airport (PNE) to aid with planning, design and construction inspection services in the discipline of civil engineering at the airport on an as needed basis.

The East Airfield rehabilitation project received the 2021 Philadelphia Aviation Project Award from the March of Dimes. The honor was presented at the organization's annual Transportation, Building and Construction awards ceremony in November of 2021.

### Scope of work included:

Arora provided CM/PM inspection support services for the North Apron Reconstruction and Rehabilitation of Taxiways D, E and K at Philadelphia International Airport. Scope of services included:

**Field Investigations & Equipment Analysis** - Arora conducted a field investigation within the anticipated limit of work, including the existing electrical vault, to review and record site and equipment conditions. Existing airfield electrical equipment, including airfield lighting infrastructure, signage, manhole/handholes, constant current regulators, Airfield lighting and Control Monitoring System (ALCMS), and underground distribution systems, were evaluated to confirm equipment and circuits affected by the project. Ideally, the field investigation was scheduled in coordination

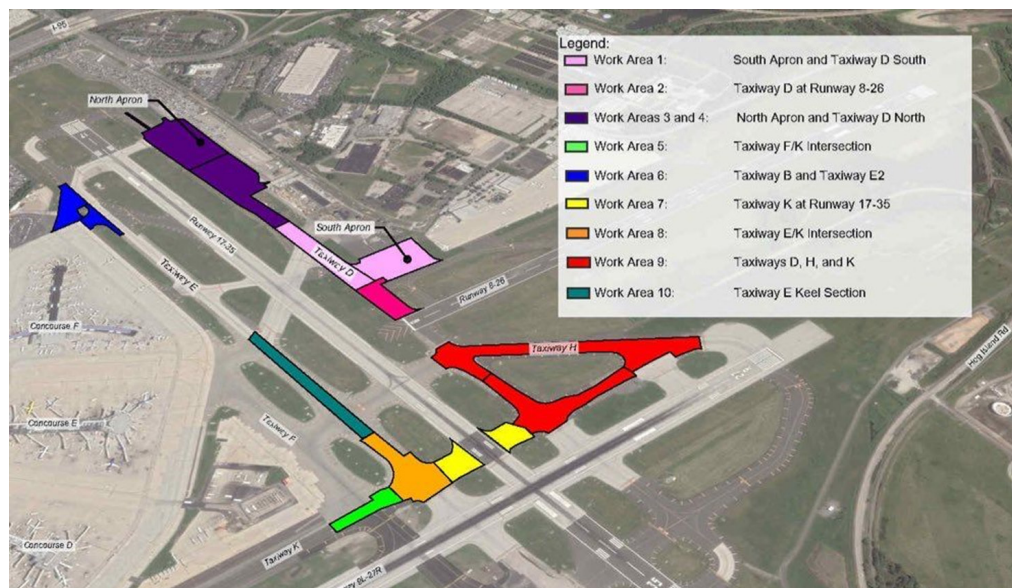


Photo provided by Philadelphia International Airport

**CITY OF  
PHILADELPHIA  
DIVISION OF  
AVIATION**

**EAST AIRFIELD  
REHABILITATION  
INSPECTION  
SUPPORT**

**Philadelphia  
International Airport,  
Philadelphia, PA**

with the project initiation meeting. The following was required to verify circuitry:

- + Manhole survey to verify circuit routing of underground distribution.
- + Toggling on/off of circuits within project limits to confirm circuit connections for lights and signage.
- + Verify utilities located within area by circuit tracing.

Shop Drawing/Submittal Review - Arora reviewed shop drawing submittals from the contractor and maintained a submittal log to track the status of each submittal. Arora ensured the timely processing of submittals were a high priority.

Responses to Requests for Information/Construction Clarifications (RFIs) - Arora reviewed and responded to clarification requests from PHL and the construction manager. An internal log tracked the status of each RFI and ensured each one was completed in a timely manner.

As built drawings - As-built drawings were completed of as-built conditions from the contractor-furnished redline prints regarding electrical installations. A hard copy and electronic version were submitted to JMT at the conclusion of construction.



## 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

\$4,000,000

### Project Start

2014

### Project Completion

2015

### Highlights

- + Project provided more accurate information to the traveling public
- + Prepared bid documents
- + Managed overall project
- + Coordinated with PHL operations, IT, properties, airlines, and tenants

## CITY OF PHILADELPHIA, DIVISION OF AVIATION

# MULTI-USER FLIGHT INFORMATION DISPLAY (MUFID) UPGRADE

## Philadelphia International Airport, Philadelphia, PA

Arora Engineers (Arora) provided planning, managed the design process, and provided project and construction management for this multi-prime contract project to upgrade MUFIDS throughout Terminal A-East, A-West and F. The main elements of the contract included demolition of existing MUFIDS enclosures and construction/installation of both new and temporary enclosures, and respective structure support assemblies within Terminal A-West. This included MUFIDS banks in the ticket lobby and at gate A-14. A total of 27 small and large MUFIDS banks were upgraded along with 13 gate podium monitors including mini MACs and new LED monitors.

### Scope of work included:

Arora prepared project bid documents for the city procurement process. Arora was also responsible for managing the overall project. Responsibilities included the following:

- + Support contractor procurement process, project budget, and schedule
- + Review and process shop drawings
- + Coordination of drawings for installation suitability
- + Submittals
- + RFIs
- + Field directives
- + Letters of correspondence
- + Estimates for payments
- + Pay applications
- + Change orders
- + Utilize construction management software.

Arora was responsible for the coordination of over 30 MUFIDS location upgrades around PHL terminals with PHL operations, IT, properties, airlines, and tenant.



## 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. \$800-900 Million

### Project Start

2017

### Project Completion

Est. 2023

### Highlights

- + 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 \$800-900M 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 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

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Airport (BOS), Boston,  
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occupancy systems, throughout counters, customer survey tablets, and BLE beacons to interact with TRAX-enabled custodial tablets that supported cleaning alerts/acknowledgements, location reporting, checklist/cleaning status reporting, dashboards for cleaning status, etc.

Electrical design consisted of a new 13.8KV 28MW Circuit 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

# MASSACHUSETTS PORT AUTHORITY

## TERMINAL E MODERNIZATION

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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.

### 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



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For the main substation space, a load calculation was performed converting the transformer rated kVA capacity into anticipated heat gain to the spaces due to transformer inefficiency. This was converted to a heat gain in BTU/hr and based upon assumed supply air and space temperatures, a required cooling airflow requirement was determined for each of the spaces within the overall substation area. See attached "Boston Terminal E Transformer Room Heat Gain Calculation".



To serve this need, two 20,000 CFM hydronic cooling only air handling units with full economizer operation were provided. Refer to schedule on attached drawing M8.101 with units in question highlighted. Two units were provide with one normally operating and the other standby in case of primary unit failure, as loss of cooling in this vital space would have rendered the terminal non-operable. The units were provided with both chilled water from the CUP for summer operation as well as economizer capability to use cold outdoor air during the winter when the CUP chillers are not in service. Refer to drawings M1.204 & M1.210 for the annotated drawings indicating the location of these units and associated ductwork, illustrating how these spaces were served.

With chilled water only seasonally available, its sole use for the scattered electrical rooms was not possible. Also, with these small spaces scattered about the terminal, use of local air handling units with economizer capability would not have been practical. So, for the scattered electrical rooms the design solution included a variable refrigerant flow (VRF) system, which would be capable of cooling these spaces year round (as well as heating them, if needed). The VRF systems were arranged to serve the electrical rooms, as well as the adjacent IDF and MDF spaces, in their part of the terminal. Note that due to the sheer size of the terminal, multiple VRF systems were required. This was because as the internal volume of the VRF system refrigerant piping became too large (due to the scattered spaces served), the system refrigerant charge increased to where there should have been a leak the refrigerant concentration in the spaces would have exceeded the maximum allowed under ASHRAE 15, the refrigeration code which governed maximum refrigerant concentration resulting from piping leaks. The equipment schedules for the exterior VRF Condensing Units and associated indoor Wall Mounted Variable Refrigerant Units are shown on attached drawing M8.104. In addition, also attached are two dozen floor plans numbered between MR1.102 and MR1.202 that show

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

#### 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
- + 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

Fire Alarm - The BOS Terminal E program modified and expanded the existing Johnson Controls (Simplex) fire alarm network that served Terminal E and were designed in accordance with NFPA-72 and all local codes, standards, and client guidelines. The project required the addition of 15 fire alarm nodes to accommodate the expanded building footprint, more than doubling the existing 14-node system. The new nodes included all signaling line circuit (SLC) cards, notification appliance circuit (NAC) cards, power supplies, amplifiers, and networking hardware.

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In addition to the fire alarm nodes a second Fire Operations Center (FOC) was added to Terminal E to provide a redundant location for emergency management within the Terminal. The new FOC included a fire alarm workstation that indicated the status of the Terminal E fire alarm system, as well as the entire airport network, and a paging microphone to transmit live voice messages directing occupants in the event of an emergency. In addition to the FOC remote annunciator panels with microphones were provided approximately every 200 ft within the public spaces to allow for additional locations for emergency managers to transmit live voice messages to the occupants.

The fire alarm design for the terminal expansion included approximately 600 new initiation and interface devices to detect a fire and integrate with fire/life safety building systems. These devices included manual pull stations, area smoke detectors, heat detectors, duct detectors, duct detector remote test stations and input/output modules for the supervision and control of the building's life/safety systems. In addition, the design included over 400 notification appliances, including speakers, strobes, and combination speaker/strobes, to provide audio and visual notification of fire and emergency events.

The Terminal E program also included modifications to existing building areas required to facilitate the interface with the terminal expansion as well as improvements to existing customer experience areas. To accommodate this work the fire alarm design included the demolition, relocation of existing and addition of new fire alarm field devices including initiation and interface devices and notification appliances. The terminal was required to remain fully occupied and operational throughout construction which required the fire alarm design to address phased construction with temporary means and methods to ensure all existing fire alarm devices and functionality remained fully operational.

**Fire Protection-** The fire protection systems for the Terminal E program were designed in accordance with NFPA-13, NFPA-14 and all local codes, standards, and client guidelines. The building expansion included both sprinkler and standpipe that were supplied by two 10-inch underground fire water service mains and double check backflow preventers. The water services were remotely located and interconnected with each other the existing terminal via sectionalizing valves to provide redundant water service to the new fire protection systems. In addition, five fire department connections for use by the responding fire department were located on the exterior of the terminal expansion.

The building was classified as fully sprinklered and provided with both wet and dry sprinkler systems throughout. The expansion included 22 new wet sprinkler systems to protect interior, conditioned spaces of the terminal and included all fire alarm supervision including water flow and tamper switches to monitor system status. For exterior and non-conditioned areas, such as baggage handling tug drives and exterior soffits, the building was provided with 12 dry sprinkler systems and a centralized nitrogen generator system which were supervised via waterflow pressure, low air pressure and tamper switches to monitor system status.

The new terminal was provided with a new interconnected standpipe system located within all egress stairs and at horizontal exits to meet a code required maximum travel distance of 200 ft. The new system was interconnected with the existing terminal standpipe system and included 39 new fire hose valves for use by the responding fire department. The site water supply was adequate to meet the hydraulic demand of the new sprinkler systems without a fire pump. However, it

## MASSACHUSETTS PORT AUTHORITY

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not sufficient to meet the code required 100 psi standpipe demand. To provide a code compliant standpipe system, the design team reviewed the applicable codes and determined that, with the approval of the local authority having jurisdiction, the standpipe system could be classified as a Manual Wet Class I system. The issue was thoroughly reviewed with the client and the local fire chief, and all parties agreed that this approach was code compliant and aligned with the facility's current standards.

In addition to the terminal expansion the fire protection systems in the existing Terminal E were modified to maintain code compliant sprinkler and standpipes system of the renovated areas. To ensure the existing building could remain occupied during construction, careful design and planning was required to maintain sprinkler and standpipe service. The fire protection design included careful review of existing conditions as well as temporary piping to and sprinklers to maintain service outside the areas of work.

#### 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 staircases.
- + 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.

#### Sustainability

Massport's mission was to create a sustainable, highly-efficient, resilient building that prioritizes the healthy and safety of its occupants. Terminal E was designed to serve as a noise barrier to the nearby East Boston neighborhoods and will achieve energy efficiencies at least 20% better than MA Energy Code dictates. Improvements include dynamic glass to provide shade, lower energy and greenhouse gas emissions, water conservation, air quality improvements, reduced energy consumption, improved water and storm water quality, and additional waste management and recycling.

- + To meet the sustainability goals of LEED Gold certification, the HVAC, plumbing and electrical systems were designed with high efficiency equipment. The HVAC system was modeled to use district heating and cooling system that served high efficiency air handling equipment. The plumbing systems for the new building addition was designed to minimize the use of domestic water and reduce the energy used for generating domestic hot water.
- + Low flow plumbing fixtures were used in restrooms to reduce the domestic water usage. Electrical systems employed lighting fixtures such as light emitting diode (LED) and lighting control systems to reduce the energy usage. The lighting control system used day lighting strategies that reduce the output of lighting fixtures if the outdoor lighting was sufficient to maintain the desired lighting levels inside the building.

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**BIM**

Arora provided LOD 350 models of the above noted systems, providing Massport with a fully functional model that included construction documents with load calculations, lighting, and other critical system details. To simplify the construction process, the team provided extensive clash coordination and model QA/QC services to ensure that system designs did not interfere with the other architectural, structural, or system models and that the BIM model recorded exact conditions with no interferences. With a project of this magnitude, clashes were one of the most common challenges the design and construction teams faced, so the team made sure to work closely with the other design team members to try to limit interference while untying clashes.

**Work Order #7 - Base Building Elements for Future Air Cargo**

Arora provided mechanical, electrical, plumbing, special systems, and fire/ life safety engineering services to identify Terminal E base building elements that needed to be modified to accommodate a future air cargo facility under and in front of the terminal footprint. This also included modifications that were necessary on the site, outboard of the terminal footprint, to be modified and/or relocated to accommodate the program. Arora also helped establish the “working” area of a future through cargo facility under the terminal and will be a coordinated effort to re-route the MEPs to avoid these areas.

- + The overall goal was to provide unimpeded tenant space for a fully operational and flexible cargo operation in the future. The as-designed systems were be evaluated, and the team identified those elements that should not be built until a fully coordinated set of design documents can be prepared.

**Work Order #1F CA Services-**

- + Arora provided mechanical, electrical, plumbing, and fire/ life safety engineering services for the construction administration services for BOS Terminal E Enhancements.

**Work Order #8- Ticket Counter & Hall Extension**

Arora provided mechanical, electrical, plumbing, special systems, and fire/ life safety engineering services for the expansion of the ticketing to the west of the current ticket counter lobby. It replaced the already designed and bid retail shell that was deferred at the east end of the new checkpoint.

- + The re-design of the retail shell area included the addition of 16 ticket counters, scales, and other devices, backdrop, floor, ceiling, and wall finishes, lighting suitable for a checkpoint operation and queue along with take away belts, structural modifications, and tie ins to the existing BHS system. In addition, the scope of work included modifications to the paging system, IT, and security/CCTV systems as well as MEP and fire protection systems.

**IN THE MEDIA:**

<https://aecom.com/blog/airport-terminal-designs-for-the-future-build-in-design-flexibility-and-be-prepared-to-pivot/>

## PROJECT DETAILS

### Client

ARUP USA, Inc.  
Jeffrey Tubbs, PE  
Principal  
60 State Street, 10th Floor  
Boston, MA 02109  
617-864-2987  
jeff.tubbs@arup.com

### Construction

\$2,300,000,000

### Project Start

2019

### Project Completion

2022

### Highlights

- + Oversaw the Design-Build Team's commissioning of mechanical and electrical systems.
- + Testing and Commissioning
- + Systems Integration Testing
- + Performed operational readiness

## MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

## GREEN LINE EXTENSION CONSTRUCTION PHASE SERVICES

### East Cambridge, Somerville, and Medford, MA

Arora Engineers (Arora) working as a subconsultant to ARUP USA, Inc. (ARUP), assisted with monitoring and observing the Design-Build Team's commissioning of mechanical and electrical systems in an owner's representative role for the Massachusetts Bay Transportation Authority's (MBTA) Green Line Extension (GLX) project.

The GLX project was an initiative of the Massachusetts Department of Transportation (MassDOT) and the MBTA to provide a direct rail link connecting the underserved areas of Cambridge, MA to Union Square in Somerville and College Avenue in Medford, MA.

The project extended the existing Green Line service from a relocated Lechmere Station in East Cambridge to Somerville and Medford. Construction for the project included six stations, 4.3 miles of Green Line light rail tracks, the relocation of four miles of double track commuter rail, extensive bridge repair and development, and a vehicle maintenance storage facility.

Our team was engaged when the MBTA had to reevaluate the project's scope, schedule, programming and procurement methodologies due to major budgetary overruns. The team re-engineered the project design and delivery methodology to design/build, which enabled them to reduce the overall schedule by 19 month and the project cost by a staggering \$700M.

### Scope of work included oversight of the design/build teams consisting of:

**Testing and Commissioning:** The testing and commissioning phase of the project consisted of factory and field verification testing, systems integration and verification testing, training, safety and security certification, and configuration management.



Image of Green Line Ribbon Cutting at the Union Branch Opening Ceremony courtesy of MassDOT

MASSACHUSETTS  
BAY  
TRANSPORTATION  
AUTHORITY

GREEN LINE  
EXTENSION  
CONSTRUCTION  
PHASE SERVICES

East Cambridge,  
Somerville, and  
Medford, MA

**Factory and Field Verification:** Testing included systematic inspection, testing, and documentation of the testing of field installed equipment to verify the proper functional performance of components and assemblies of a system element (e.g. traction power). Factory and field verification testing activities were accomplished using inspection and test procedures prepared and accepted by the design/build entity.

**Systems Integration Testing:** The purpose of systems integration testing was to confirm that all system elements operate, function, and can be maintained in a safe manner when integrated as an overall system. Arora performed and documented all integration activities and verified that all subsystems, and assemblies thereof, were installed and interconnected in accordance with accepted designs. Systems integration testing involved interface testing as well as point-to-point verification of the system's functionality when more than one subsystem is involved.

Upon successful test completion, the test procedure, test data and test results were documented in a Test Report.

**System Pre-Revenue Test and Operational Readiness:** The purpose of the system pre-revenue test and operational readiness was to verify that the integrated systems of the Project perform individually and collectively as required by the contract and MBTA staff have been effectively trained and certified for facility operations and revenue service.

**System Acceptance:** Acceptance of the system involved substantial completion and final acceptance. Substantial completion signifies the end of the design, supply, construction, and testing stages of the work and that the project is certified by the design/build entity and MBTA as ready for revenue service.

Promptly after system acceptance, Arora performed punch list items and other work, as needed. Arora also provided technical support to the MBTA for the evaluation, diagnoses, and remediation of GLX Project defects found during this period.

The opening of the Union Branch in March 2022 was followed by the opening of Medford Branch in December 2022, which marks the completion of this important project.

**In the News:**

[https://www.enr.com/articles/55580-bostons-mbta-green-line-extension-finally-reaches-terminus?oly\\_enc\\_id=8241D4763101I5C](https://www.enr.com/articles/55580-bostons-mbta-green-line-extension-finally-reaches-terminus?oly_enc_id=8241D4763101I5C)

## PROJECT DETAILS

### Client

City of Philadelphia  
Division of Aviation  
Imad Haq, PE  
Airport Engineering Manager  
Capital Development Group  
Philadelphia International  
Airport  
1 International Plaza, Suite  
200  
Philadelphia, PA 19113  
imad.haq@phl.org  
215-937-7878

### Construction

\$300,000,000

### Project Start

2007

### Project Completion

2015

### Highlights

- + Program management
- + Construction management and inspection
- + Project cost estimating and coordination

## PHILADELPHIA DEPARTMENT OF AVIATION TERMINAL D – E EXPANSION AND MODERNIZATION, PHASE I, II, III

### Philadelphia International Airport

Arora Engineers (Arora) provided construction management for Phase I, II, & III of the Terminal D-E Expansion and Modernization at the Philadelphia International Airport. The project consisted of a new multi-level connector building between Terminals D and E, a 50,000 SF addition to the Terminal E concourse, and various renovations within the two terminals and the adjacent Thermal Plant. The project included a new 14-lane checkpoint, ticket lobby, in-line baggage system with eight EDS, deployment of 290 new VOIP phones, and the relocation of two main server rooms.

Arora provided onsite inspection, design, and design review services. Tasks entailed construction management (CM) and contractor quality control (C.Q.C.) services to ensure that electrical, plumbing, and mechanical construction was completed in accordance with the requirements of construction documents and applicable codes/standards on various projects.

### Scope of work included:

- + Program management
- + Construction management and inspection
- + Project logistics
- + Cost estimating
- + Project coordination
- + Representation at stakeholder meetings
- + Project close out
- + Assistance in the management of tenant projects





## PROJECT DETAILS

### Client

City of Philadelphia  
Division of Aviation  
Imad Haq, PE  
Airport Engineering Manager  
Capital Development Group  
Philadelphia International  
Airport  
1 International Plaza, Suite  
200  
Philadelphia, PA 19113  
imad.haq@phl.org  
215-937-7878

### Construction

\$40,000,000

### Project Start

2007

### Project Completion

2014

### Highlights

- + Responsible for design and construction administration
- + Fire protection engineering for baggage screening system
- + Clean agent suppression system provided for critical systems
- + New cctv camera design
- + new access control system doors design
- + universal cabling distribution design

## CITY OF PHILADELPHIA, DIVISION OF AVIATION IN-LINE BAGGAGE SCREENING (CBIS) SYSTEM

### Philadelphia International Airport, Philadelphia, PA

Arora Engineers (Arora) performed MEP, special systems, fire protection engineering, and construction management services for the Checked Baggage Inspection Systems (CBIS) in Terminals A-West and A-East at Philadelphia International Airport.

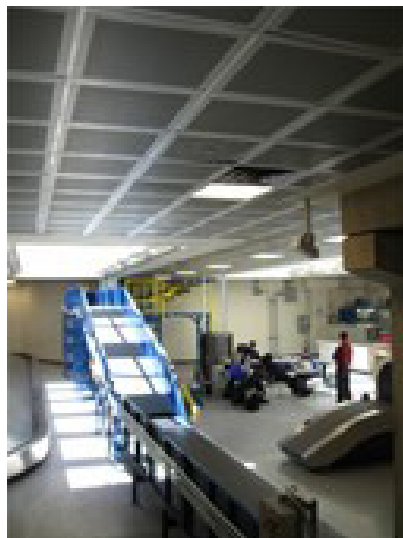
#### Scope of work included:

The scope included modifications to the existing A East Pier to include a new connector bridge for baggage conveyors, two new baggage handling rooms, and modifications to the existing baggage handling system in Terminal A-East.

Mechanical design included HVAC, radiant heating, door heaters, CO2 sensing, and ventilation. Electrical engineering services included design for new motor control panels, a new electrical substation, lighting, and low voltage power distribution. The plumbing design included engineering for drainage, new restrooms, and condensate.

The fire protection scope of work included modifications to the existing wet sprinkler systems that were necessary to accommodate the new space layouts. New pre-action and clean agent systems were also required for the new space layout. The scope also involved fire alarm and detection system design tasks, such as notification appliance and initiating device relocations per NFPA codes and fire alarm programming matrix revisions per DOA standards. New notification appliance and initiating device layouts were required for the new structures, in addition to all new devices that were required for the pre-action and clean agent systems.

Special systems engineering included the addition of approximately 50 new CCTV cameras, 20 new security doors, universal cabling distribution design, telecom room modifications, multi-user flight information display systems, TSA systems, and full systems design for a new OSR and BHS rooms.



## PROJECT DETAILS

### Client

STA Joint Venture  
C/O STV Incorporated  
Anthony G. Cracchiolo, P.E.  
225 Park Avenue South  
New York, NY 10003  
Anthony.Cracchiolo@stvinc.  
com  
(212) 777-4400

### Construction

\$1,600,000,000

### Project Start

2012

### Project Completion

2021

### Highlights

- + Arora provided special systems and fire/life safety engineering services and document control services for the new Moynihan Station Program project.
- + The new Moynihan Train Hall relieved station crowding and improved passenger comfort and security.

## AMTRAK, MOYNIHAN STATION DEVELOPMENT CORPORATION

## MOYNIHAN STATION PROGRAM PROJECT

### New York, NY

Arora Engineers (Arora) served as a subconsultant to AECOM and Tishman Construction and provided fire/life safety engineering services as well as document control services for the new Moynihan Station Program project. The \$1.6 billion project transformed the 100-year-old James A. Farley Post Office building into a state-of-the-art transit hub. The 225,000 SF Moynihan Train Hall nearly doubled the existing Penn Station rail complex's concourse space. The expansion of Amtrak's passenger services into the new Moynihan Train Hall relieved previous station crowding and improved passenger comfort and security.

This project was owned by Amtrak, in partnership with the New York Empire State Development Corporation (ESD) and its subsidiary Moynihan Station Development Corporation (MSDC). The Moynihan Station Program project included enhanced passenger facilities for Amtrak's Northeast Corridor (NEC) and long-distance travelers, including accessibility for passengers with disabilities, all within a new, grand train hall.

The project was constructed into two phases. Phase I created the West End Concourse. The new concourse provided new stairs and elevators to boarding platforms, passenger circulation space, and a new entrance across 8th Avenue from Penn Station. Arora provided construction management and controls support for this phase, maintaining document control and shop drawings, construction monitoring, and providing cost estimating support by performing quantity take-offs.

Phase II entailed the Moynihan Train Hall, a new, enhanced intercity and commuter passenger boarding concourse for Amtrak and MTA-Long Island Railroad



Rendering Courtesy of SOM | Volley

**AMTRAK,  
MOYNIHAN STATION  
DEVELOPMENT  
CORPORATION**

**MOYNIHAN STATION  
PROGRAM PROJECT**

**New York, NY**

passengers. The Moynihan Train Hall included a sunlit atrium boarding concourse, a combined ticketing and baggage unit, a new Metropolitan Lounge, a new reserved customer waiting room, casual waiting space features, retail, and food shops. Arora provided full-time, on-site project controls including the preparation of monthly cost reports for CM services, assembly and update of the project management plan, construction management plan, and financial management plan, as well as preparation of monthly project progress reports and creation of project progress tracking drawings in AutoCAD to demonstrate project development. In addition, Arora performed QA/QC of submittals and RFIs, attended design and construction management coordination meetings, and supported the construction field office.

Moynihan Train Hall opened to the public in January, 2021.

## 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

\$750,000,000

### Project Start

1998

### Project Completion

2004

### Highlights

- + 850,000 SF facility with 13 new international gates
- + Arora was tasked with project management oversight of special systems construction
- + Systems included access control, surveillance, fire protection, terminal announcement, flight information displays, and baggage screening

## CITY OF PHILADELPHIA, DIVISION OF AVIATION

# TERMINAL A WEST PROJECT/CONSTRUCTION MANAGEMENT

## Philadelphia International Airport, Philadelphia, PA

The \$750 million terminal is a four-level, 850,000 SF facility with 13 new international gates, 26,000 SF of concession space, expanded federal inspection facilities, and exciting original artwork. Arora Engineers (Arora)'s project responsibilities included oversight and project management for new special systems construction involving security access and surveillance, universal cabling distribution system, fire alarm, specialty hazard systems, terminal announcement control systems (TACS), multi-user flight information display systems (MUFIDS), specialty power distribution systems, baggage information display systems, and home land security. Additionally, Arora oversaw the construction of the Thermal Plant providing service to Terminal A.



The Thermal plant handled delivery of chilled water and hot water to Terminal A-West and included cooling towers, chillers, boilers, pumps, air heaters, piping, and a hub for the Building Automation System (BAS). This area was protected by a pre-action sprinkler and fire alarm system.

### Scope of work included:

- + CM of supply and return modifications affected by new baggage belt mainline locations
- + CM of HVAC needed to provide optimum temperature for EDS machines as required
- + PLC logic coordination and shutdown of baggage doors based on addressable smoke
- + Coordination with Tinicum, TSA, and DOA SST
- + Access control and intrusion designed for all AOA boundary doors in accordance with TSA 49CFR and the DOA SST department
- + Integration of access control and baggage PLC'S start circuit
- + Modifications to existing access control doors affected by location of baggage belt
- + Integration with EDS lockout panel in Sector 23 Control Room
- + Access control back of house and public carousel coordination with baggage PLC
- + Assess multiplexer assignments and door hardware requirements
- + Design of new and relocated CCTV equipment with DOA SST standard
- + Provided digital recording details for TSA reconciliation
- + Designed BIDS inputs Burr Brown Tugnamn Keypads and BIDS/MUFIDS network architecture
- + Updated BPS 8600 core and 2000 distribution switches in accordance with the MUFIDS Phase II design
- + Designed structured cabling and horizontal station cabling for both voice and data



## PROJECT DETAILS

### Client

C&S Engineers, Inc.  
Jon P. Donahue, PE  
Aviation Department Manager  
499 Col. Eileen Collins Blvd  
Syracuse, NY 13212  
jdonahue@cscos.com  
315-455-2000

### Construction

\$3,000,000.00

### Project Start

2014

### Project Completion

2015

### Highlights

- + Construction observation services for the Reconstruct Taxiways "B" & "E" - Phase I at New Castle Airport.
- + Observed testing and inspection.
- + Mill and overlay on the perimeter of the proposed pavement to tie-in to existing pavements.
- + Prepared and submitted daily inspection reports of construction activity and problems encountered.

## DELAWARE RIVER AND BAY AUTHORITY (DRBA) RECONSTRUCT TAXIWAY B & E-PHASE 1 - CONSTRUCTION MANAGEMENT

### New Castle Airport, New Castle, DE

Arora Engineers (Arora), serving as a subconsultant to C&S Engineers, Inc. (C&S) provided construction management and observation services for the Reconstruct Taxiways B and E - Phase I at New Castle Airport. The work for this project included a full-depth removal of Taxiway B south of Runway 9-27, Taxiway C east of Taxiway B to Runway 1-19, Taxiway D east of Taxiway B to Runway 1-19, and reconstruction of Taxiway B 400 feet east of Runway 1-19 from centerline to centerline between Runway 9-27 to Taxiway A.

This project also included a mill and overlay on the perimeter of the proposed pavement to tie in to existing pavements, and a connector taxiway was constructed perpendicular to the parallel taxiway onto Runway 1-19. In addition, re-grading was conducted on all new construction and rehabilitation completed, the storm water removal system within the work limits was upgraded to conform to the current standards, and electrical work associated with the reconstruction, including replacing and/or re-adjusting light cans along the taxiway system.

### Scope of work included:

The construction observation phase consisted of construction observation with the following scope of work:

- + Observed the work to determine general conformity with the contract documents and to ascertain the need for correction or rejection of the work.
- + Attended pre-construction, pre-paving, and pre-installation conferences; weekly progress meetings; and final inspection of the completed project.
- + Observed testing and inspection. Arranged for, conducted, or witnessed field, laboratory, or shop tests of construction materials as required by the plans and



Photo Credit Dave Sheehy

**DELAWARE RIVER  
AND BAY AUTHORITY  
(DRBA)**

**RECONSTRUCT  
TAXIWAY B &  
E-PHASE 1 -  
CONSTRUCTION  
MANAGEMENT**

**New Castle Airport,  
New Castle, DE**

specifications for the project; monitored the suitability of materials on the project site or brought to the project site to be used in construction; interpreted the contract plans and specifications and checked the construction activities for general compliance with the design intent; measured, computed, or checked quantities of work performed and quantities of materials in-place for partial and final payments to the contractor.

- + Prepared and submitted daily inspection reports of construction activity and problems encountered.
- + Prepared and implemented a quality control and assurance plan as required by the FAA for monitoring material requirements and properties throughout the course of construction.

## PROJECT DETAILS

### Client

Susquehanna Area Regional  
Airport Authority  
Harrisburg International  
Airport  
David Spaulding  
One Terminal Drive, Suite 300  
Middletown, PA 17057  
dspaulding@saraa.org  
717-948-3900

### Construction

\$500,000

### Project Start

2009

### Project Completion

2013

### Highlights

- + Rehabilitation and upgrade of airfield lighting systems and lighting vault
- + Study featured an extensive evaluation of electrical and lighting infrastructure
- + Identified areas for improvement that reduced lighting loads and streamlined maintenance needs

## SUSQUEHANNA AREA REGIONAL AIRPORT AUTHORITY

# REHABILITATION OF RUNWAY LIGHTS

## Capital City Airport, Harrisburg, PA

The Susquehanna Area Regional Airport Authority (SARAA) tasked Arora Engineers (Arora) with providing engineering design to rehabilitate and upgrade the airfield lighting systems and airfield lighting vault at Capital City Airport (CXY). A preliminary design study was completed by Arora as part of a general services on-call agreement with SARAA to identify existing infrastructure, phasing constraints, and probable construction costs for replacement of the outdated equipment.

### Scope of work included:

Specifically, the design study evaluated the existing edge lighting systems, underground distribution, and components of the electrical vault and determined the infrastructure exceeded its normal life span. New technology was proposed to reduce lighting loads and provide better maintenance history for airport personnel. The Federal Aviation Administration (FAA) and SARAA utilized the information within the design study to program funding and submit project criteria for final design documents and construction.



## PROJECT DETAILS

### Client

Lehigh Northampton Airport Authority  
Thomas Stoudt  
Lehigh Valley International Airport  
Director of Operations & Safety  
3311 Airport Road  
Allentown, PA 18109-3040  
tstoudt@lnaa.com  
(610) 266-6001

### Construction

\$26,320,958

### Project Start

2020

### Project Completion

2021

### Highlights

- + Multi-prime delivery

## LEHIGH-NORTHAMPTON AIRPORT AUTHORITY (LNAA)

### LNAA TASK 38 – PROGRAM, CONSTRUCTION, AND INSPECTION MANAGEMENT SERVICES

#### Lehigh Valley International Airport (ABE), Allentown, PA

Arora Engineers (Arora), serving as the prime consultant, was selected to provide on-call planning, architectural, and engineering services for the Lehigh-Northampton Airport Authority (LNAA). Under this contract, Arora issued a task for program management, program administration and construction management related to the implementation of the Security Checkpoint (Connector) Improvements project located at Lehigh Valley International Airport (ABE). The critical elements of this project included:

- + Improved departing (outbound) PAX flow via an elevated connector
- + New PAX Security Screening Checkpoint (SSCP)
- + New vertical circulation core located at the Wiley Terminal
- + Improved arriving (inbound) PAX flow via a new below grade tunnel
- + LifeAire purification system evaluation and improvements
- + COVID-19 evaluation of potential modifications to design
- + Financial coordination assistance for the program funding
- + Township coordination and response to comments
- + Haul route rehabilitation
- + Utility coordination
- + Stand-by emergency generator
- + Renderings and animation preparation
- + Art coordination





**LEHIGH-  
NORTHAMPTON  
AIRPORT AUTHORITY  
(LNAA)**

**LNAA TASK 38  
– PROGRAM,  
CONSTRUCTION,  
AND INSPECTION  
MANAGEMENT  
SERVICES**

**Lehigh Valley  
International Airport  
(ABE), Allentown, PA**

**Scope of work included:**

Arora was responsible for program management, program administration and construction administration, including the following services:

- + Project management with tasks including:
  - + Owner's representative
  - + Project schedule management – LNAA stakeholders
  - + Stakeholder coordination
  - + Request for Proposal (RFP) development & management
  - + Management of hours and review of documentation.
  - + Conflict resolution
  - + Day-to-day project management
  - + Project partnering
  - + Financial review & coordination with LNAA stakeholders
  - + Project partnering
- + Program administration services included:
  - + Owner's representative services.
  - + Financial review & coordination with project primes.
  - + Request for Proposal (RFP) development & management.
  - + Project schedule management services includes:
    - + Contract document peer reviews, including design change control and value engineering management & coordination.
    - + Preparation of funding request applications, including federal applications (i.e. FAA) and state applications.
    - + Document control & management.
  - + On-site construction management support services provided by Arora included:
    - + Owner's representative services.
    - + Providing LNAA stakeholder updates.
    - + Bid phases project procurement support.
    - + Monitoring MBE/DBE program compliance.
    - + Reviewing and approving contractor's request for payment.

## PROJECT DETAILS

### Client

Pond & Company, Inc.  
R. Chris Jenkins,  
Principal, Program Manager  
3500 Parkway Lane  
Suite 500  
Peachtree Corners, GA 30092  
jenkinsc@pondco.com  
(678) 362-7133

### Construction

\$44,000,000

### Project Start

2023

### Project Completion

2025

### Highlights

- + Arora provided full-time, on-site, Resident Project Representative

## GREATER ASHEVILLE REGIONAL AIRPORT AUTHORITY

# RESIDENT PROJECT REPRESENTATIVE SERVICES FOR AIR TRAFFIC CONTROL TOWER AND ASSOCIATED FACILITIES

## Asheville Regional Airport, Asheville, NC

The Greater Asheville Regional Airport Authority engaged Pond & Company, Inc. to provide architectural/engineering design and resident project representation for a new air traffic control tower at Asheville Regional Airport (AVL).

The existing air traffic control tower was connected to the airport terminal building. The new tower needs to be constructed so the existing tower can be demolished to make room for the airport to expand the existing terminal. The new air traffic control tower will be a free-standing tower and FAA office building located near the southwest area of the airport's property, across the airfield from the airport terminal building.

"For several years, we have been working with the Federal Aviation Administration and Pond, our architectural firm, to design a new tower," said Lew Bleiweis, A.A.E., President and CEO. "It is exciting to take this step and award a construction contract. We will break ground in early 2023.

### Scope of work included:

Arora is providing a full-time, on-site, Resident Project Representative (RPR) to GARAA under a subconsultant agreement with Pond & Company.

Our RPR role includes conducting on-site observations of the construction project to monitor conformance with contract documents and schedule; serving as the owner's liaison with the contractor, designers, and other stakeholders; maintaining adequate records of contract work ongoing and completed; maintaining a detailed daily diary; reviewing the contractor's monthly applications for payment; and other duties as assigned.



Photo credit Jarred/GARAA

## PROJECT DETAILS

### Client

WSP USA  
Zachariah Panneton, Senior  
Technical Specialist  
1 East Pratt Street, Suite 300  
Baltimore, MD 21202  
zachariah.panneton@wsp.  
com  
(443) 280-3895

### Construction

Varies per Task

### Project Start

2023

### Project Completion

2024

### Highlights

- + Staff Augmentation:  
Systems Technical Manager

## MARYLAND DEPARTMENT OF TRANSPORTATION ON-CALL COMMUNICATIONS AND SECURITY ENGINEERING SERVICES

### Baltimore, MD

The Maryland Department of Transportation Maryland Transit Administration (MDOT MTA) engaged WSP to provide in-house engineering and operations technical support services for MDOT MTA METRO Facilities Maintenance.

#### Scope of work included:

Arora provided a Systems Technical Manager (STM) to MDOT MTA under a subconsultant agreement with WSP. Our STM provided direct operations technical support in coordination with the MDOT MTA task manager. The technical support consisted of assistance for project management, drawing reviews, quality assurance, negotiating change orders, and warranty issues.

Support also included monitoring of contract progress, progress payment review; technical correspondence review; monitoring of modifications and contract submittals; conducting technical meetings with Contractors; and documenting the resolution of technical, quality assurance, and contractual issues between the MDOT MTA and the Contractors and vendors.

Arora provided the following services under the direction of the MDOT MTA Manager:

- + Project management.
- + Project development support and investigation.
- + Design document review including plans, specifications, and cost estimates.
- + Work scope, budget, and schedule development.
- + Construction management and inspection.
- + On-site technical support.
- + Coordination with the MDOT MTA Engineering department.
- + Meetings as directed by the MDOT MTA Work Order Manager.



## PROJECT DETAILS

### Client

Washington Metropolitan Area  
Transit Authority  
Ginna Greenbaum,  
Director, Capital Projects  
Financial and Contracts  
Management  
600 Fifth Street NW  
Washington, DC 20001  
ggreenbaum@wmata.com  
(202) 525-8543

### Project Start

2021

### Project Completion

2025

### Highlights

- + Staff Augmentation:  
Construction Claims  
Specialist

## WASHINGTON METROPOLITAN AREA TRANSIT AUTHORITY

# GENERAL ARCHITECTURAL AND ENGINEERING CONSULTANT SERVICES PROGRAM MANAGEMENT, CONSTRUCTION MANAGEMENT, AND ENGINEERING SUPPORT CONTRACT CPFCM 21001

### Washington, DC

The Washington Metropolitan Area Transit Authority (WMATA) is one of the largest transit organizations in the United States. The WMATA service area is approximately 1,500 square miles, with a population of approximately four million people. WMATA provides three core transit functions: Metrorail, Metrobus, and Metro Access paratransit.

WMATA continues to develop, modernize, and grow the infrastructure needed to remain one of the premier transit systems in the country. Within the Capital Program Delivery Group, the Office of Project Financial and Contract Management (PFCM) helps WMATA maintain the fiscal accountability necessary to continue its multi-billion-dollar capital construction program. Due to the large volume of work, the PFCM office requires the services of a Construction Claims Specialist in support of the capital program. Arora, serving as the prime consultant, provided construction claims support for WMATA's Capital Programs.

### Scope of work included:

Arora provided a Construction Claims Specialist to assist the office of PFCM in support of their capital construction program. Arora was involved in the implementation of a new Construction Change Order Management (CCOM) tool within the organization. In addition, our Construction Claims Specialist prepared cost estimates, performed cost analyses, developed pre-negotiation positions, reviewed claims for merit, supported and conducted contract negotiations, and documented the resolution of claims and changes.



## PROJECT DETAILS

### Client

AECOM  
Brian Fuerst,  
Vice President - Aviation  
6000 Fairview Road  
Charlotte, NC 28210  
brian.fuerst@aecom.com  
(703) 489-7444

### Construction

\$2,000,000,000

### Project Start

2022

### Project Completion

2027

### Highlights

- + Staff Augmentation: Project Coordinator & Contracts Administrator

## RALEIGH-DURHAM AIRPORT AUTHORITY PROJECT MANAGEMENT, PROJECT CONTROLS, AND SPECIAL ASSIGNMENT SERVICES

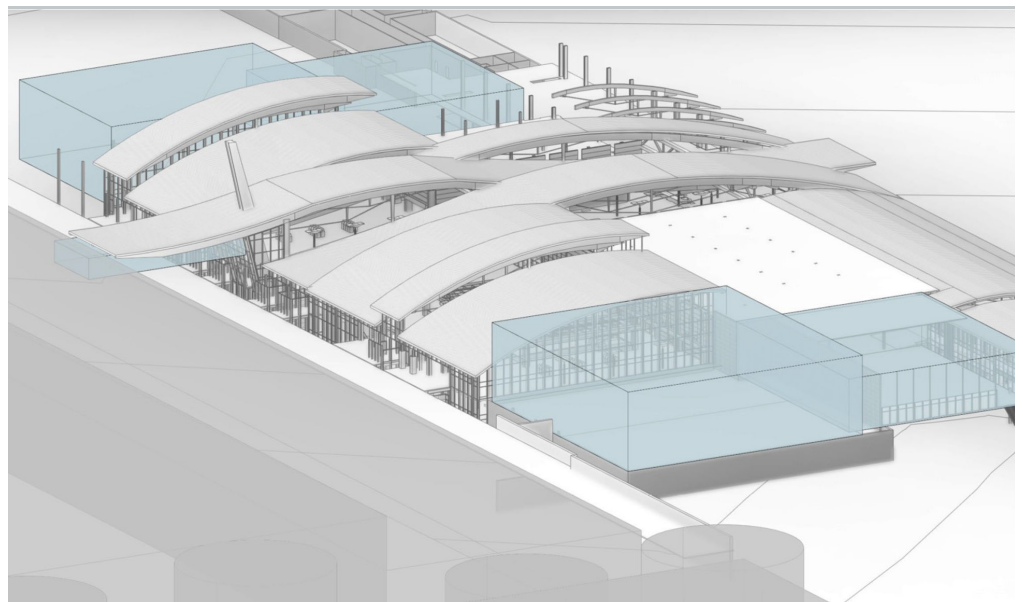
### Raleigh-Durham International Airport, Morrisville, NC

The Raleigh-Durham Airport Authority (RDAA) engaged AECOM to provide staff augmentation in support of Project Management (PM), Project Controls (PC), and Special Assignment (SA) services for the Authority. The PM services are needed to support a \$2 billion capital program over the next 10-years at Raleigh-Durham International Airport. Planned projects include design and construction of a new Consolidated Rental Car Facility; Runway 5L/23R Replacement Program; landside component expansion of Terminal 2 in addition to an expanded Customs and Border Protection Facility; Park Economy 3 expansion; Aviation Parkway Interchange; John Brantley Boulevard Extension; expansion of Terminal 1; design and construction of a new Airport Operations Center combined with an ARFF station; major concession redevelopment in both terminals; and various other support buildings associated with a medium-hub commercial airport.

### Scope of work included:

Arora is providing a Project Coordinator and Contracts Administrator to RDAA under a subconsultant agreement with AECOM.

Our Project Coordinator is providing technical and administrative support to a variety of project managers responsible for delivering the capital program. Their duties are wide ranging and include ensuring compliance with the procurement process, reviewing various design documents, assisting with project management responsibilities, maintaining document control, attending meetings, and participating in the oversight of construction activities.



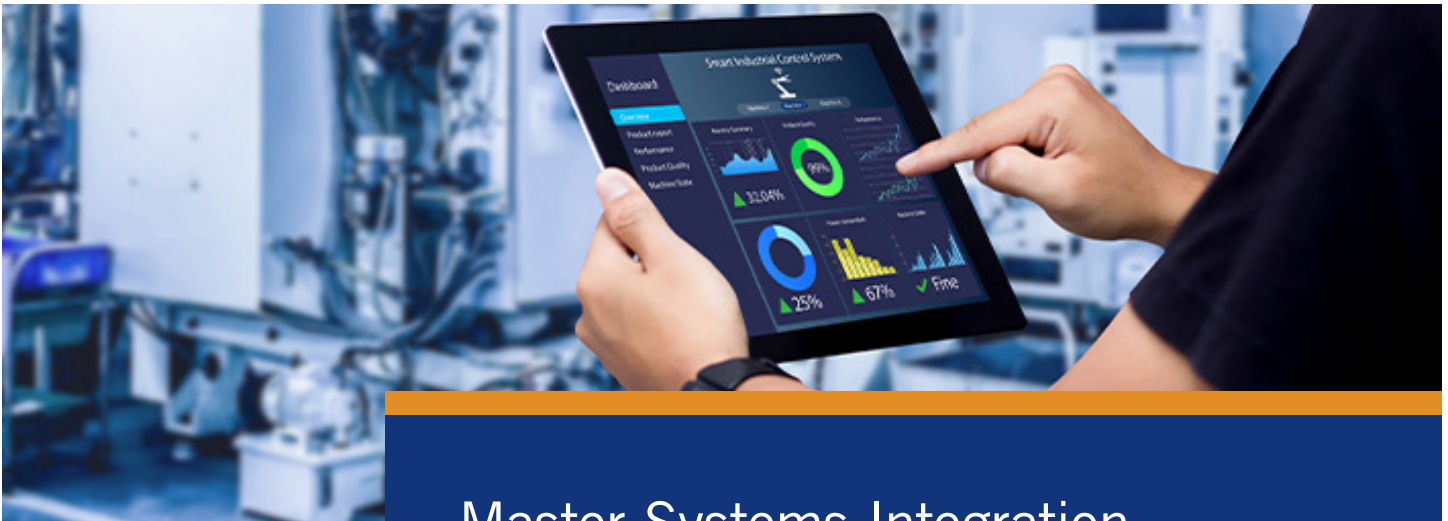
Rendering courtesy of Raleigh-Durham Airport Authority

**RALEIGH-DURHAM  
AIRPORT AUTHORITY**

**PROJECT  
MANAGEMENT,  
PROJECT  
CONTROLS,  
AND SPECIAL  
ASSIGNMENT  
SERVICES**

Raleigh-Durham  
International Airport,  
Morrisville, NC

Our Contracts Administrator oversees prime and subcontract formation and administration, project setup, and accounting. Oversees bidding process, including bid reviews, bid addenda, and recommendations for the award for all RDU landside and airside projects as assigned. Reviews new project setup ensuring compliance with contractual provisions and billing requirements. Compares project budget changes with contractual documentation and resolves any discrepancies. Reviews all potential change orders as they are discovered to determine contractual merit. Continually reviews project activity to identify projects for close out. Ensures subcontracts are in place for each sub-consultant working on a project.



# Master Systems Integration

Arora provides Master Systems Integrator (MSI) services to help facilities maximize the efficacy of the complex, smart systems and devices they rely on to improve their asset management, sustainability, and customer satisfaction.

Our team of construction experts integrate and manage various complex systems or sub-systems into a single, cohesive and functional system. They participate in and oversee the integration of critical building management systems such as security, fire protection, HVAC, lighting control, and access control to ensure smart automation of a facility is both possible and effective.

## Services

Arora assists our clients in managing multiple architects, engineers, constructors, schedules, and budgets. As your MSI, Arora coordinates your trade contractors and procurement packages to ensure system requirements are integrated into project planning, design, installation, testing and commissioning.

Arora provides MSI services throughout the lifecycle of a project from planning, design, construction, testing and commissioning. In the planning and design phases, Arora develops and coordinates system integration requirements with other designers. Arora then provides oversight during construction and facilitates and verifies system integration testing and commissioning.

## Systems We Integrate

- + Access Control Systems
- + Video Management Systems
- + Passive and Active IT systems
- + Fire Protection Systems
- + Building Announcements Systems
- + Electrical Power / Lighting
- + Common Use / FIDS / MUFIDS / BIDS
- + Baggage Handling Systems
- + Building Management Systems
- + Queue Management Systems



## PROJECT DETAILS

### Client

Five Star Electric Corp.  
Allen Hirsch  
350 West 31st St., 6th Floor  
New York, NY, 10001  
AHirsch@fivestartelectric.net  
718-641-5000 ext. 48003

### Construction

\$1,200,000,000

### Project Start

2018

### Project Completion

Est. 2022

### Highlights

- + Provided TSE Expert construction phase services
- + Verified all airport systems and integrations were tested and functioned in accordance with design phase documentation
- + Assisted in all testing, commissioning and operationalization of airport systems

## THE PORT AUTHORITY OF NEW YORK AND NEW JERSEY

# EWR TERMINAL ONE REDEVELOPMENT PROGRAM – TECHNICAL SUPPORT EXPERT SERVICES

## Newark International Airport, Newark, NJ

The Port Authority of New York and New Jersey (PANYNJ) is currently undertaking the Newark Liberty International Airport (EWR) Terminal A Redevelopment Program. The new Terminal One will replace Terminal A and is estimated to be three (3) stories high and approximately 1.2 million square feet (SF) in area. Terminal One will include a centralized arrivals/departures hub, passenger and baggage processing systems, and 3 radiating concourses to service thirty-three (33) aircraft gates. Arora Engineers (Arora) provided Master Systems Integrator (MSI) and Technical Systems Expert (TSE) services under the electrical contractor Five Star Electric.

### Scope of work included:

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 one another.
- + Coordinating and scheduling third-party testing agencies.
- + Developing special systems delivery and construction schedule.
- + Developing testing and commissioning plan(s).



Rendering by PANYNJ



**THE PORT  
AUTHORITY OF NEW  
YORK AND NEW  
JERSEY**

**EWR TERMINAL ONE  
REDEVELOPMENT  
PROGRAM**

**Newark International  
Airport, Newark, NJ**

- + 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 functioned in accordance with the design phase documentation, assisted in all testing, commissioning and operationalizing of airport systems.

**THE PORT  
AUTHORITY OF NEW  
YORK AND NEW  
JERSEY**

**EWR TERMINAL ONE  
REDEVELOPMENT  
PROGRAM**

Newark International  
Airport, Newark, NJ



**THE PORT  
AUTHORITY OF NEW  
YORK AND NEW  
JERSEY**

**EWR TERMINAL ONE  
REDEVELOPMENT  
PROGRAM**

Newark International  
Airport, Newark, NJ

## PROJECT DETAILS

### Client

Joseph Adams, AIA, LEED AP  
BD+C  
Project Manager — Vice  
President  
Corgan  
350 Fifth Avenue, Suite 5401,  
New York, New York 10118  
212 847 3074  
Joseph.Adams@corgan.com

### Construction

Approx. \$2B

### Fee

\$6,177,323

### Project Start

2019

### Project Completion

Groundbreaking: 2022

Construction Completion:  
Est. 2025

### Highlights

- + New 1.15 million SF Terminal
- + 13 new gates
- + Arora provided fire/life safety, plumbing, a engineering design services

## PORT AUTHORITY OF NEW YORK AND NEW JERSEY TERMINAL 6 / TERMINAL 7 JETBLUE REDEVELOPMENT PROGRAM MSI SERVICES

### 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**

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.



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