



Aviation / Airfield Electrical

Engineering Qualifications

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Rethinking Infrastructure®





Arora Engineers
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Dear Prospective Client,

Since 1986, Arora Engineers has worked at 120+ airports across the country from California, to Maine, to Florida and has grown into an Aviation centric firm. Arora's aviation expertise includes a range of services for the complete project life cycle.

Airfield electrical design is at the core of Arora's technical expertise. Our team has designed airfield lighting systems for over a billion dollars of construction at airports across the United States. Arora's airfield electrical engineers utilize the latest lighting technologies for increased reliability to enhance the safety of aircraft operations on the airfield.

Our capabilities in this area range from airfield lighting, signage, and NAVAIDS, to field lighting vaults and Runway Incursion Mitigation (RIM). We design airfield lighting with the future in mind and live our tagline of Rethinking Infrastructure® as we approach each unique project.

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

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

Sincerely,

A handwritten signature in blue ink, appearing to read "Manik Arora".

Manik Arora, PE
President and CEO



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Arora Engineers



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

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

Expertise

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

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

Services

SPECIAL SYSTEMS / TECHNOLOGY

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



Rethinking Infrastructure®

www.aroraengineers.com



ATLANTA

BOSTON

CHICAGO

DALLAS

DENVER

FORT LAUDERDALE

HOUSTON

LOS ANGELES

NEW YORK

ORLANDO

PHILADELPHIA

PHOENIX

SAN DIEGO

SAN JOSE

SEATTLE

BENGALURU, INDIA

PUNE, INDIA

ELECTRICAL

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

AIRFIELD ELECTRICAL

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

HVAC / PLUMBING

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

FIRE PROTECTION AND LIFE SAFETY

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

GEOGRAPHIC INFORMATION SYSTEMS (GIS)

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

PROGRAM MANAGEMENT

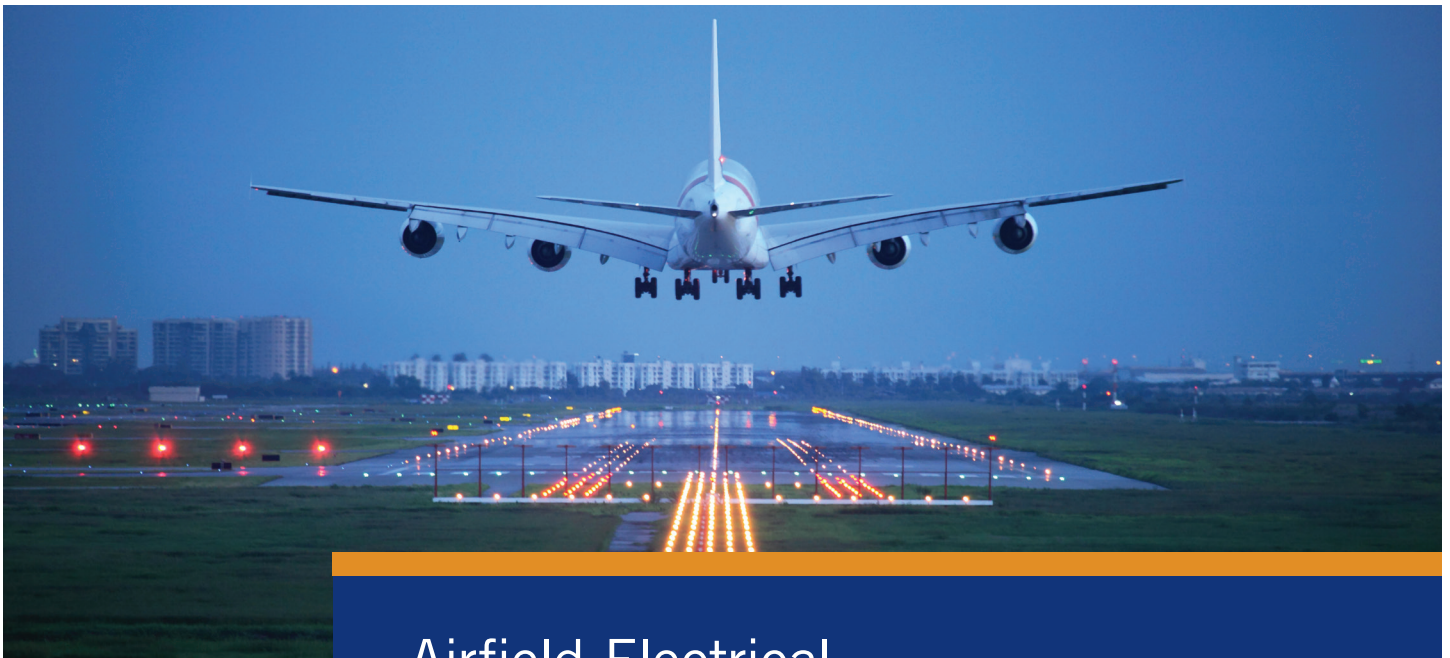
- + Project management
- + Procurement coordination
- + Information management
- + All-inclusive project control
- + Runway Incursion Mitigation
- + Pavement Surface Sensor Systems
- + Airfield Lighting Vaults and Power Distribution
- + Sustainable Solutions
- + Construction Safety and Phasing
- + Multi-Airport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

CONSTRUCTION MANAGEMENT & INSPECTION

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







Airfield Electrical

Arora's airfield electrical practice utilizes their experience and knowledge of current airfield products, standards (FAA, ICAO, UFC, NAVAIR, etc.), and installation practices to provide modern, coordinated, cost-conscious, sustainable, and schedule sensitive design solutions for large, medium, small, non-hub, and general aviation facilities. Throughout the life of the company, Arora has successfully designed airfield lighting systems for over a billion dollars of construction at airports across the United States. Our ACE Certified airfield designers are experienced in cargo, civilian, and military airfield systems and engaged in industry leading organizations such as American Association of Airport Executives (AAAE), Airport Consultants Council (ACC), Illuminating Engineering Society Aviation Lighting Committee (IESALC), Airports Council International (ACI), and the Transportation Research Board (TRB).

Key Services

Airfield Lighting Vaults

- + Airfield Lighting Control and Monitoring Systems
- + Individual Light Control and Monitoring Systems
- + Constant Current Regulators and 5kV Series Circuits
- + SwitchGear Regulator Systems (SGRS)
- + Generators and Emergency Power Distribution
- + S-1 5kV Cutouts and Enclosures
- + L-823 5kV Breakout Patch Panel Enclosures
- + Fiber Optic and Copper Installation

Airfield Lighting

- + Airfield Guidance Signage
- + Edge Lighting / Centerline Lighting
- + Touchdown Zone Lighting
- + Guard and Stop Bar Lights
- + Displaced Thresholds
- + Light Bases installed in Flexible (Asphalt) or Rigid (Concrete) Pavements, or Turf
- + Electrical Distribution
- + Temporary Lighting and Signage
- + Approach Lighting Systems – Medium Intensity (MALSR)
- + Apron Lighting
- + Approach Lighting Systems – High Intensity (ALSF-1, ALSF-2)
- + Runway End Identifier Light (REIL) Systems
- + Precision Approach Path Indicator (PAPI) Systems
- + Airport Rotating Beacons
- + Wind Cones
- + Obstruction Lighting
- + Surface Movement Guidance Control Systems (SMGCS)
- + Runway Status Light (RWSL) Systems >>





ATLANTA

BOSTON

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DENVER

FORT LAUDERDALE

HOUSTON

LOS ANGELES

NEW YORK

ORLANDO

PHILADELPHIA

PHOENIX

SAN DIEGO

SAN JOSE

SEATTLE

BENGALURU, INDIA

PUNE, INDIA

Underground Distribution Infrastructure

- + Junction Can Plazas
- + Airfield Rated Manholes and Handholes
- + Airfield Electrical Drainage
- + Duct Banks
- + Trenching
- + Directional Boring
- + Direct Buried
- + Counterpoise and Grounding Systems

Airfield Controls

- + L-854 Pilot Radio Control Equipment
- + L-821 Relay Based Airfield Lighting Control System (ALCS)
- + L-890 PC Based Airfield Lighting Control and Monitoring Systems (ALCMS)
- + Individual Light Control and Monitoring Systems (ILCMS)

Ground Based Navigational Aids (NAVAIDs)

- + Instrument Landing Systems (ILS) - Glideslope
- + Instrument Landing Systems (ILS) - Localizer
- + Precision Approach Path Indicator (PAPI)

Apron Lighting and Equipment

- + Apron Lighting (LED and Conventional)
- + Ground Service Equipment (GSE)
- + Ground Power Units (GPUs)
- + Visual Docking Guidance Systems
- + Passenger Boarding Bridges (PBB)
- + In-Pavement Gate Lead-In Lights

Additional Design Services

- + Support for Federal Aviation Administration (FAA) Facilities
- + Runway Weather Information Systems
- + Automated Weather Observation System (AWOS)
- + Maintenance and Storage Buildings
- + Aircraft Hangars
- + Helipads and Heliports
- + Vehicular Gate Access Controls Systems
- + Pavement Surface Sensor Systems
- + Construction Safety and Phasing
- + Runway Incursion Mitigation (RIM)
- + Photometric Calculations
- + Photometric Testing Specification
- + Airfield Asset Management
- + Airfield Existing Condition Assessments
- + Airfield Electrical Master Planning
- + Vertiports
- + FAA Airport Improvement Program (AIP)
- + Voltage Drop Calculations
- + Short Circuit Calculations
- + Arc Flash Studies
- + Selective Coordination Study
- + Engineer Estimate of Probable Cost (EEOPC)
- + Non-Destructive Engineering Investigations
- + Construction Observations
- + Construction Submittal Review
- + Sustainable Solutions

Representative Clients

- + MSCAA – Memphis Shelby County Airport Authority (MEM)
- + CRAA – Columbus Regional Airport Authority (LCK)
- + PTAA – Piedmont Triad Airport Authority (GSO)
- + GARAA – Greater Asheville Regional Airport Authority (AVL)
- + LNAA – Lehigh Northampton Airport Authority (ABE)
- + PANYNJ – Port Authority of NY and NJ (LGA) (JFK) (EWR) (FRG)
- + WCAA – Wayne County Airport Authority (DTW)
- + City of Philadelphia, Division of Aviation (PHL)
- + MPA – Massachusetts Port Authority (BOS)
- + MAA – Maryland Aviation Administration (BWI)
- + SARAA – Susquehanna Area Regional Airport Authority (CXY)
- + Wood County Airport Authority (PBK)
- + CAA – Connecticut Aviation Authority (BDL)
- + SJTA – South Jersey Transportation Authority (ACY)
- + ACAA – Allegheny County Airport Authority (PIT)
- + DRPA Delaware River Port Authority (ILG)
- + St Petersburg-Clearwater, FL Airport (PIE)
- + Morgantown Municipal Airport (MGW)
- + Mid-Ohio Valley Regional Airport (PKB)
- + John Glenn Columbus International Airport (CMH)
- + Westchester County Airport (HPN)
- + Jackson-Medgar Wiley Evers International Airport (JAN)
- + Colorado Springs Airport (COS)
- + Denver International Airport (DEN)
- + Southwest Florida International Airport (RSW)
- + Pocono Mountains Municipal Airport (MPO)
- + Hagerstown Regional Airport (HGR)
- + College Park Airport (CGS)
- + Tweed New Haven Airport Authority (HVN)



PROJECT DETAILS

Client

Reynolds, Smith and Hills Inc.
Alexander McKean, PE, LEED AP
Vice President
4700 S. Syracuse Street,
Suite 300 Denver, CO 80237
alex.mckean@rsandh.com
(303) 409-7915

Construction

N/A

Project Start

2012

Project Completion

2018

Highlights

- + Airfield electrical engineering design services
- + Field Investigations to review and record site conditions

COLORADO SPRINGS AIRPORT

TAXIWAY E, G, H RECONSTRUCTION

Colorado Springs Airport, Colorado Springs, CO

Arora Engineers (Arora), serving as a subconsultant to RS&H, provided engineering services for the reconstruction of Taxiways E, G, and H at Colorado Springs Airport (COS).

Arora's scope of work included electrical and airfield electrical engineering services to prepare demolition drawings, electrical layout drawings, details, specifications and quantities for the removal and replacement of associated airfield lighting and signage. Arora then prepared and delivered contract drawings, specifications and an estimate of probable construction costs.

Scope of work included:

- + **Project Initiation/Coordination** - Arora coordinated procedures, requested project related historical documents, and discussed the technical approach, design schedule, and coordinate initiation, plan, and schedules for airfield electrical survey.
- + **Field Investigations & Equipment Analysis** – Arora conducted field investigations including the existing electrical vault, to review and record site and equipment conditions. Existing airfield electrical equipment, including elevated lighting infrastructure, signage, light bases, manhole/handholes, constant current regulators, and underground distribution systems were evaluated to confirm equipment and circuits affected by the project.
- + **Airfield Electrical Design** – Arora provided engineering design services for the following key project elements:
 - Demolition of Taxiway Edge lighting & associated equipment.
 - Demolition of Runway Edge lighting along Runway 17L-35R at High speed Taxiway(s) E3 and E6.
 - Demolition of existing underground distribution.



COLORADO SPRINGS AIRPORT

TAXIWAY E, G, H RECONSTRUCTION

**Colorado Springs
Airport, Colorado
Springs, CO**

- Airfield Signage Revisions, including removal and relocation of signage on new sign base foundations and airfield sign panel modifications.
- Designed layout of new taxiway edge lighting (Quartz) with associated equipment.
- Designed layout of new runway edge lighting (Quartz) with associated equipment.
- Design layout of new/modified underground distribution, including ductbank & manholes/handholes.
- Design and layout of temporary electrical circuit jumpers for phased construction.
- Removal and Replacement of Pavement Surface Sensors.

PROJECT DETAILS

Client

Airport Design Consultants,
Inc. (ADCI)
Mahesh Kukata
Vice President and Chief
Financial Officer
6031 University Blvd,
Suite 330
Ellicott City, MD 21043

Construction

N/A

Project Start

2018

Project Completion

2019

Highlights

- + Electrical Aeronautical Design
- + Airfield Signage
- + Taxiway Edge Lights
- + Field Investigation & Equipment Analysis

HAGERSTOWN REGIONAL AIRPORT

REHABILITATION OF RUNWAY 9-27

Hagerstown, MD

Arora Engineers (Arora) as a subconsultant to ADCI, provided Electrical Aeronautical Design including Electrical Engineering associated with the Rehabilitation of Runway 9-27 located in Washington County, Maryland. Arora assisted ADCI with preparation of contract drawings, specifications, engineering report and an estimate of probable construction costs.

Scope of work included:

Field Investigations & Equipment Analysis - Arora performed a field survey of all electrical equipment, including edge light fixtures, underground distribution, signage and the electrical lighting vault.

Task Coordination - Arora assisted ADCI with coordination of electrical work amongst all project stakeholders. Meetings, presentations, and internal/external coordination with the project team, airport and FAA were part of this effort.

Drawings and Specification - Preparation of detailed drawings and specifications in compliance with current FAA Advisory Circulars and design standards. Specific Design elements were as follows:

Taxiway Edge Lights - The existing taxiway edge lights and associated circuits located within the work limits (Connector Taxiways B and D) were removed and replaced in coordination with the modified geometries designed by ADCI. The isolation transformer and series lighting cable shall were removed and replaced with new and adequately sized to the VA requirement of the new LED fixture without heater. The layout of the edge lights and interconnecting conduit are in conformance with FAA Advisory Circular 150/5340-30J. Arora completed taxiway edge light installation details and series circuit distribution for work required on the taxiway edge light system.



HAGERSTOWN REGIONAL AIRPORT REHABILITATION OF RUNWAY 9-27

Hagerstown, MD

Airfield Signage - Review and evaluation of existing signage within the project limits. Design and layout of the removal of existing airfield guidance sign, transformers, base cans, interconnecting conduit and associated equipment, and installation of new LED type airfield guidance sign, transformers, base cans, and interconnecting conduit within project limits in conformance to FAA AC 150/5340-18 (latest edition) and modified pavement geometries. Signs not equipped with concrete foundations were modified to be installed on a new concrete sign base. Signs within the work limits that are not LED type were upgraded to LED type. Arora completed airfield signage installation details and series circuit distribution for work required on the signage.

Airport Rotating Beacon - Design and layout of the removal and replacement of the existing rotating beacon on existing structure. Work included the review and evaluation of the existing equipment and replacement in conformance with FAA AC 150/5340-30J. Power and control cabling remained in place and were reconnected to the new beacon.

Underground electrical and communications distribution systems - Design and layout of modified underground distribution for airfield lighting systems, including junction structures, conduit and associated cabling. Junction structure adjustments were coordinated with ADCI if located within the limits of paving. All series lighting circuit homeruns were replaced to the nearest junction structure.

Lightning protection (counterpoise) design for underground cables - Design and layout of lightning protection for airfield lighting circuits in accordance with FAA AC 150/5340-30J for base cans, conduit and ductbank within the project limits.

Airfield Lighting Vault and Control System Modifications- The airfield lighting fixtures and signage were powered from constant current regulators located within the airfield lighting vault. The loads of the circuits were evaluated to ensure the constant current regulators are operating within the recommended design loads.

Design Calculations - All calculations (including circuit load calculations) performed were documented and submitted for record purposes.

Engineering Design Report - Arora submitted basis of design criteria for electrical work to ADCI for incorporation into the project engineering design report.

Quality Control/Quality Assurance - Prior to each submission, Arora's QA/QC Manager and CAD Manager conducted an in-house QA/QC review. This exercise included the review of CAD and drawing presentation, constructability, and cross discipline coordination. The documents were submitted to ADCI once the QA/QC review was deemed satisfactorily completed.

PROJECT DETAILS

Client

HDR Inc.
Thomas Bair, PE
300 Grant Street, Suite 1700
Pittsburgh, PA 15219
412-497-6210
Thomas.Bair@hdrinc.com

Construction

N/A

Project Start

2021

Project Completion

2022

Highlights

- + Airfield Electrical Design
- + Elevated taxiway edge lights
- + In-pavement centerline lights
- + Elevated guard lights
- + Airfield Signage
- + Wind Cone Assembly
- + Pavement Sensors

COLUMBUS REGIONAL AIRPORT AUTHORITY (CRAA)

TAXIWAY C RELOCATION

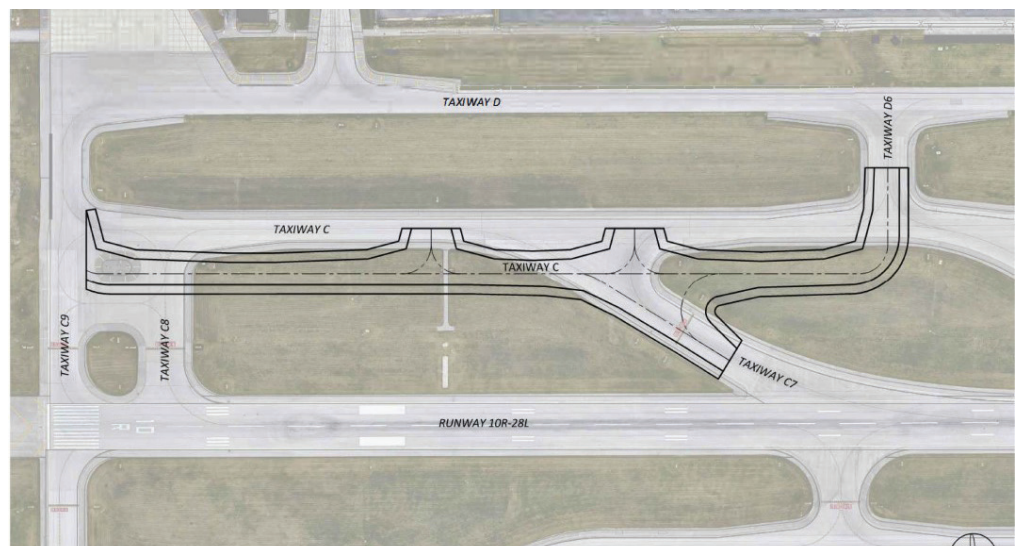
John Glenn Columbus International Airport (CMH), Columbus, OH

Arora Engineers (Arora) working as a subconsultant to HDR Inc., provided Airfield Electrical Design and Engineering services including development of drawings and specifications for John Glenn Columbus International Airport (CMH) Taxiway C Relocation. The scope of work included Airfield Electrical Design and Engineering of elevated taxiway edge lights, in-pavement centerline lights, elevated guard lights, airfield signage, wind cone assembly, pavement temperature sensors as well as associated underground structures, conduit raceways, and cabling impacted by grading, pavement demolition, and pavement construction.

Scope of work included:

Airfield Electrical Design: The design for airfield electrical systems included the below items associated with the demolition, construction, and modifications to grading, underground structures, and airfield pavement within the project area. The project area was bound by Runway 10R-28L, Taxiway D, 200 feet west of Taxiway C9 and 200 feet east of Taxiway D6.

- + Airfield Lighting Cable and Infrastructure per FAA standards associated with project scope within the project area.
- + Layout and Design of Airfield Lighting, Taxiway Directional Signage, Underground Structures and Associated Equipment per FAA standards associated with project scope:
 - + The airfield electrical design scope was limited to removal and addition of airfield lighting, airfield signage, and underground electrical structures associated with revisions to grading and pavement geometry.
 - + New airfield electrical cabling connected to existing cabling within existing fixtures or underground structures within 200' of new fixtures.



Airfield Electrical Project Scoping Area

**COLUMBUS
REGIONAL AIRPORT
AUTHORITY (CRAA)**

**TAXIWAY C
RELOCATION**

**John Glenn Columbus
International Airport
(CMH), Columbus, OH**

- + Airfield electrical cable homeruns and associated main underground structures from the lighting/sign circuits to the electrical vault were not to be relocated nor replaced except where structures conflicted with revised grading and pavement geometry.
- + Existing airfield lighting equipment located in the electrical vault was sufficient to serve revised airfield loads and modifications to equipment and electrical distribution in the electrical vault are not required.
- + Layout and Design of Wind Cone Assembly Relocation.
- + Layout and Design of Taxiway Pavement Sensor Relocation.
- + Layout and Design of American Electric Power (AEP) utility underground structure relocation per AEP requirements.
- + Layout and design of FAA Power and Communication Structures.
- + Edited FAA Specifications applicable to products required in design scope outlined above.
- + In addition to FAA standard book specifications, additional specifications were included on drawings.

PROJECT DETAILS

Client

Columbus Regional Airport
Authority Bart Powell, PMP,
Project Manager
250 Star Check Drive,
Columbus, OH 43217
bpowell@columbusairports.
com
614-239-3025

Construction

\$11,500,000

Project Start

2019

Project Completion

2020

Highlights

- + Arora provided professional engineering services to develop electrical contract documents for the Rickenbacker Runway Rehabilitation and MOS improvements Phase 2.
- + Development of the contract documents consisted of the airfield ground lighting modifications and visual approach aid modifications.
- + The design included shoulder pavement, new underdrain, stormwater management, and replacement of existing runway edge light fixtures with LED lamps.
- + Rehabilitation and geometric improvement of the four connector taxiways, to the approximately the runway hold positions.

COLUMBUS REGIONAL AIRPORT AUTHORITY (CRAA)

RICKENBACKER INTERNATIONAL AIRPORT RICKENBACKER RUNWAY REHABILITATION AND MOS IMPROVEMENTS PHASE 2A

Rickenbacker International Airport, Columbus, OH

Arora Engineers (Arora), as a subconsultant to HRD, Inc., provided professional design services for Runway 5R-23L Rehabilitation and Modification of Standards (MOS) Improvements Phase 2B at Rickenbacker International Airport (LCK). The project included the design of new paved shoulders for Runway 5R-23L at LCK to address existing modifications of standards for Airplane Design Group (ADG) VI operations.

The design included shoulder pavement, new underdrain, stormwater management, and replacement of existing runway edge light fixtures with LED lamps, new transformers, new cable in new conduit as well as new home run cable in existing conduit back to the electrical vault. The design also included the rehabilitation and geometric improvement of the four connector taxiways, to the approximately the runway hold positions; the Runway 5R-23L blast pad modifications; and miscellaneous pavement removals.

Scope of work included:

Arora provided professional engineering services to develop electrical contract documents for the Rickenbacker Runway Rehabilitation and MOS improvements Phase 2. The development of the contract documents consisted of the airfield ground lighting modifications and visual approach aid modifications, which were impacted by the new shoulder pavement, pavement tie-ins at taxiways, runway safety area (RSA) grading, and stormwater design by HDR.



**COLUMBUS
REGIONAL AIRPORT
AUTHORITY (CRAA)
RICKENBACKER
INTERNATIONAL
AIRPORT
RICKENBACKER
RUNWAY
REHABILITATION AND
MOS IMPROVEMENTS
PHASE 2A**
**Rickenbacker
International Airport,
Columbus, OH**

Arora coordinated work with the project team to facilitate a complete electrical design with expected design efforts to include the following specific design items:

Runway Edge Lights – The design indicated the removal of the existing in the unpaved area and the installation of new elevated/inpavement lights and associated infrastructure (light bases, series lighting cable, isolation transformers, etc.) in the new paved shoulder. The design was coordinated with the civil construction phasing, either through a complete or partial shutdown of the runway and taxiways. New lights were LED type with isolation transformers adequately sized to the VA requirements of the fixture. Fixture spacing and lens color complied with FAA AC 150/5340-30 (latest edition). New homerun series lighting circuit were provided.

Taxiway Edge Lights – The existing taxiway edge lights on the four connector taxiways were impacted by the addition of the runway shoulders. The design indicated the removal and reinstallation of the taxiway edge lights and isolation transformers on new light bases and conduit infrastructure and series lighting cabling. Fixture spacing and lens color comply with FAA AC 150/5340-30 (latest edition). The new portion of the lighting circuit was reconnected to the existing circuit.

Airfield Signage – The removal and reinstallation of airfield guidance signs within the RSA and impacted by the new shoulder pavement. The design included new foundations, conduit and series lighting cable. This is mainly for mandatory signs and runway exit signs connected to the runway edge light circuit, but included other signs as needed.

Underground Distribution Infrastructure Systems – The design included the removal and installation of new underground electrical and communication infrastructure impacted by the new should pavement. This included series light circuits for lights and NAVAIDS and modified underground distribution for airfield lighting systems, including ductbank, conduit, and associated cabling, as needed.

Precision Approach Path Indicators (PAP) – The removal and reinstallation of the runway's two PAPI systems. The PAPI systems were impacted by the new shoulder pavement and grading in the RSA. The existing systems were reinstalled on new foundations and with new infrastructure.

Runway 5R ALSF System – Revisions and modifications to the existing ALSF approach light system underground infrastructure including handholes, conduit/ductbank and series lighting cable. This was limited to the first five light bar stations, threshold up to Station 4, which was impacted by the new shoulder pavement.

Runway 23L MALSR System – Coordination with the Runway 23L MALSR design consultant for construction and design phasing of the project. The design focused on the shoulder pavement impacted by the MALSR system.

Engineer Design Report – The design included the development of an engineer's design report for the associated electrical sections of the total airport. The report included existing condition findings and proposed design review, recommendations, and materials and raised any design concerns.

PROJECT DETAILS

Client

Reynolds, Smith and Hills Inc.
Jeffrey Warkoski, PE
Vice President
4700 S. Syracuse Street,
Suite 300 Denver, CO 80237
jeff.warkoski@rsandh.com
(303) 409-7921

Construction

N/A

Project Start

2012

Project Completion

2018

Highlights

- + QAQC of contract drawings and bid schedules
- + Reviewed plans, details, and specifications and cross checked bid schedules.

DENVER INTERNATIONAL AIRPORT

RUNWAY 17R-35L COMPLEX PAVEMENT REHABILITATION AND ADG V IMPROVEMENTS

Denver International Airport, Denver, CO

Arora Engineers (Arora), serving as a subconsultant to RS&H, provided Quality Assurance & Quality Control Review of contract drawings and bid schedules for the Runway 17R-35L Complex Pavement Rehabilitation and ADG V Improvements at Denver International Airport in Denver, Colorado.

Scope of work included:

Arora was responsible for the thorough review of bid schedules & electrical drawings prepared by RS&H for the 90%, 100% and Bid submissions to the Airport Authority. Efforts included:

- + Reviewing and providing comments on approximately 140 electrical plans and details.
- + Cross-checking electrical and civil plans, including phasing, and providing comments.
- + Reviewed and provided comments on 10+ airfield electrical technical specifications and the airfield electrical sections of the engineers design report
- + Reviewed, cross checked, and provided comments between bid schedules and bid items in the specifications



PROJECT DETAILS

Client

Michael Baker International
David Folmar, PE
Technical Manager Aviation
100 Airside Drive, Airside
Business Park
Moon Township, PA 15108
dfolmar@mbakerintl.com
412-269-2739

Construction

\$20,000,000

Project Start

2018

Project Completion

2020

Highlights

- + Arora provided airfield electrical engineering services in support of the progression of bid documents for the Rehabilitation of Runway 16-34
- + Provided QA/QC of runway lighting layouts, along with light installation details and series circuit distribution work

WESTCHESTER COUNTY DEPT OF PUBLIC WORKS & TRANSPORTATION

REHABILITATION OF RUNWAY 16-34

Westchester County Airport, West Harrison, NY

Arora Engineers (Arora) provided engineering services to the Michael Baker/LiRO Group joint venture team for the rehabilitation of Runway 16-34 at Westchester County Airport. This complex rehabilitation project involved repaving more than 1 Million SF of the airport's primary runway and associated connector taxiways with 50,000 tons of bituminous hot-mix asphalt and installation of a new Runway Lighting System and Precision Approach Path Indicator Navigational Aid.

Arora was responsible for airfield ground lighting design to progress the existing 90% contract documents to bid submission.

Scope of work included:

Arora coordinated with the project team to facilitate a complete design, with efforts including the following:

- + Field Investigation & Equipment Analysis: Arora provided a redline markup of the field survey markups and photos of applicable electrical equipment.
- + Drawings and Specifications: Specific design elements included:
 - o Airfield Lighting – Demolition and proposed layout of the runway centerline lights, runway end lights, runway touchdown zone lights, and taxiway edge lights within the work limits. Arora provided QAQC and final design for these light fixtures locations previously completed by the prime, and advanced the installation details and series circuit distribution requirements for these airfield lighting systems.
 - o Underground Electrical and Communications Distribution Systems – Arora reviewed and provided necessary adjustments for the lightning protection system and underground distribution for the airfield lighting systems, ensuring they were in accordance with FAA AC 150-5340-30 (latest edition) for junction base cans, conduit, and ductbank systems within the project limits. Conflicts were indicated and distributed to the Prime for incorporation



**WESTCHESTER
COUNTY DEPT OF
PUBLIC WORKS &
TRANSPORTATION**

**REHABILITATION OF
RUNWAY 16-34**

**Westchester County
Airport, West Harrison,
NY**

within the area plans.

- o Navigational Aids - A new LED voltage driven Precision Approach Path Indicator (PAPI) system was requested by the Airport on the 16-End of Runway 16-34. Arora reviewed the PAPI layout, siting, and power distribution, to confirm conformance with FAA advisory circular 150/5340-30J. Arora provided design for replacement of the Runway End Identifier Lights (REILs) on the 34-End of Runway 16-34 in conformance with FAA advisory circular 150/5340-30J.

Two (2) existing incandescent Wind cones were replaced with LED Wind cones on their existing foundations. Arora provided necessary power requirements to these Wind cones.

- + Technical Specifications – Arora reviewed the 90% specifications and provided necessary modifications.
- + Design Calculations – All calculations performed were documented and submitted for record purposes.
- + Contract Documents – Drawings were reviewed and modified to ensure design intent met FAA requirements. Arora completed light fixture details, navigational aid details, and underground distribution details. Final submission of the contract documents were submitted in AutoCAD and PDF formats.
- + Construction Safety and Phasing Plan – Arora reviewed the phasing plans for temporary lighting circuitry requirements.
- + Bid and Procurement Support – Prepared and submitted Addendum drawings and addendum narrative to the Prime during procurement.
- + Estimate of Probable Construction Costs – Arora included cross-reference of quantity take offs for each respective electrical bid item.

Arora provided construction administration services in support of the Runway 16-34 Rehabilitation project. Runway 16-34 was originally scheduled for rehabilitation in the summer of 2020, however, the outbreak of COVID-19 allowed the JV team to completely redevelop the construction phasing plan and construction schedule to expedite the completion of the project to earlier in the year while air traffic was greatly reduced. This allowed construction to be completed in just three weeks on a fully closed runway, rather than the planned three months of nighttime-only construction. The result was higher quality construction, reduced construction costs, no operational impacts to the airport or airlines, and increased safety during construction – all on an aggressive schedule.

Arora's construction phase services included: progress meetings, change orders and field orders, electrical shop drawings, RFI's, record documents, and a substantial completion site visit. The Arora team was praised by the Project Manager for quick turnaround responses to submittal reviews, RFI's, and general trouble shooting and engineering solutions provided during the expedited construction.

PROJECT DETAILS

Client

Memphis-Shelby County
Airport Authority
Jimma Owens
2491 Winchester Rd.
Suite 113
Memphis, TN 38116
JOwens@flymemphis.com
901-922-8250

Construction

\$9,500,000

Project Start

2019

Project Completion

2023

Highlights

- + Provided design and engineering services required to upgrade the existing airfield guidance signs at Memphis International Airport.
- + Replacement of 460 airfield guidance signs with new LED signs, with the conformance to current standards and regulations.

MEMPHIS-SHELBY COUNTY AIRPORT AUTHORITY MEM AIRFIELD SIGNAGE REPLACEMENT

Memphis International Airport, Memphis, TN

Arora Engineers (Arora) provided design, engineering, and construction administration services required to upgrade the existing airfield guidance signs at Memphis International Airport. The project included the replacement of 487 airfield guidance signs with new LED signs and partial replacement of taxiway centerline lights along taxiway A, with the conformance to current standards and regulations. The project consisted of surveying, inventory, and engineering design and the creation of complete construction documents for the replacement of the elevated airfield signs and in-pavement taxiway centerline lights. Arora was responsible for surveying and evaluating existing signs and locations. The design services were carried out in accordance with the MSCAA standards, Federal Aviation Administration (FAA) guidelines, as well as all applicable Federal, State, and Local Codes, Regulations, Ordinances, and Policies.

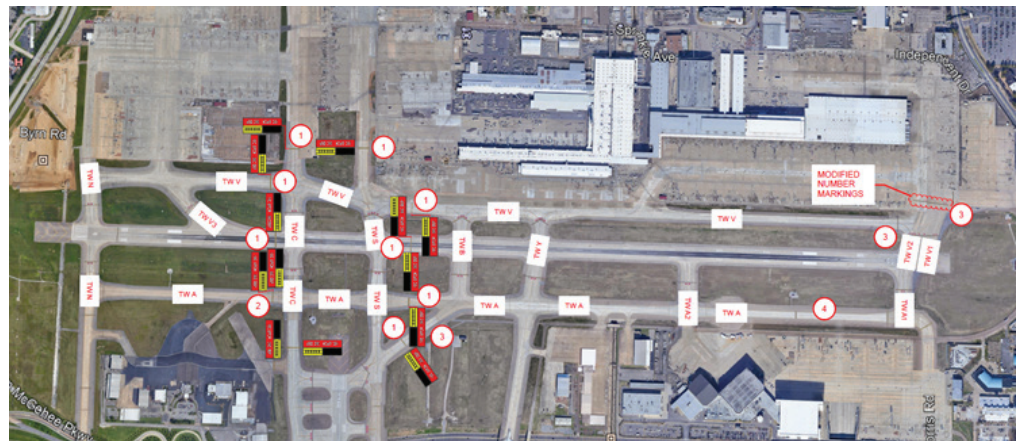
Scope of work included:

The project scope included survey, field investigation, stakeholder coordination, and the design of the removal and replacement of the existing airfield signage in compliance with current standards and regulations. Arora prepared and delivered signed and sealed contract documents, including a detailed basis of design, estimate of probable construction costs, and engineering calculations to the MSCAA.

Field Investigations & Equipment Analysis – The Arora Team conducted field investigations within the anticipated limits of work, and associated utilities, to review and record site and equipment conditions. Existing airfield electrical equipment, including lighting infrastructure, signage, and underground distribution systems were evaluated to confirm equipment and circuits affected by the project.

Project Initiation/Coordination Meeting – Arora conducted a project initiation meeting with MSCAA to coordinate procedures, schedule acquisition of MSCAA's project related historical documents, and to finalize the technical approach, design schedule, and project plan.

Acquisition & Review of Existing As-Built Data – Arora obtained all available MSCAA information relative to the project and adjacent project areas. The information gathered was useful in creating base files for performance requirements



**MEMPHIS-SHELBY
COUNTY AIRPORT
AUTHORITY (MSCAA)**

**MEM AIRFIELD
SIGNAGE
REPLACEMENT**

**Memphis International
Airport, Memphis, TN**

and conceptual design solutions. Any discrepancies were identified during the field investigation and mitigated through coordination with MSCAA. Hardcopies of any project related documents were reproduced in-house and immediately returned to MSCAA after reproduction.

Approach / Departure Signage / Marking – Throughout the project FAA advisory circulars and engineering briefs provided revised guidance on runway approach departure surfaces allowing many existing protected zones to be reduced or removed with new signage/markings coordinated with the FAA to improve ground traffic operations.

In-Pavement Taxiway Centerline Light Replacement – The Arora Team evaluated specific areas such as instrument landing system mandatory hold markings. This evaluation required the marking and signage to be moved increasing the protected area as well as reconfiguration of taxiway centerline light color coding. Modifications included removal of the existing L-852C Green/Green fixtures located in the new protection zone and a relocation of an L-852C Green/Yellow fixture. The current taxiway lighting manufacturer, ADB Safegate, was engaged to discuss the benefits of new LED fixtures, specifically in the new protection zone. LED fixtures were ultimately excluded from the project due to lighting requirements located in FAA AC 5340-30 (latest edition). Removed fixtures were replaced with L-852C fixtures provided by MEM. New fixture colors complied with appropriate advisory circulars.

Airfield Signage – Design included removal of existing airfield guidance signs, transformers, sign bases, L-867 sign base cans, interconnecting conduit, and associated equipment as well as installation of new LED type airfield guidance signs, pre-cast concrete bases, L-867 sign base can, isolation transformers, connectors, series lighting cable, and interconnecting conduit. Sign bases were installed plumb to meet required advisory circular criteria with sloped grading around signs tie into existing elevations. Signage was in accordance with FAA AC 5340-18 (latest edition) and placed to avoid any obstructions or utilities.

Airfield Lighting Vault – Although the new LED signs required less load from the airfield lighting vault constant current regulators, many signs required recircuiting to existing dedicated sign circuits to comply with advisory circular operational requirements. Load calculations were performed to confirm regulator capacity for modified lighting circuits and regulators are expected to be resized in the future as they are replaced.

Underground Electrical Distribution Systems – The project involved the design and layout of modified underground distribution for airfield lighting systems, junction structures, duct bank, interconnecting conduit, and associated cabling. Per MSCAA standards pullcan plazas are utilized to segregate circuits into separate conduits and improve airfield worker safety.

Lightning Protection (Counterpoise) Design for Underground Cables – Design and layout of lightning protection for airfield lighting circuits were developed in accordance with FAA AC 150-5340-30 (latest edition) for all base cans, conduit, and duct bank installed.

Construction Administration Support Services – The Arora Team provided construction administration support services to MSCAA and their on-site construction management team. Throughout the construction process the Arora Team provided continued support of their designs including additional efforts to ensure project success including owner requested design modifications, FAA guideline revisions, and unforeseen site conditions. Throughout the project through weekly construction meetings, timely submittal reviews, quick request for information responses, and other correspondence, the design and construction management team provided a consistent and organized oversight of the construction to keep the project moving forward to successful completion.

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

\$80,000,000

Project Start

2016

Project Completion

2025

Highlights

- + Design-Bid-Build
- + Performed field investigations of existing electrical vault and equipment
- + Prepared detailed design drawings and specifications in compliance with applicable FAA Advisory Circulars
- + Multi-Year FAA funding

LEHIGH NORTHAMPTON AIRPORT AUTHORITY

LNA A TASK 21 – REHABILITATION OF RUNWAY 6-24

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 (LNA A). Under this contract, Arora was issued a task for professional engineering and construction phase services for the Rehabilitation of Runway 6-24 at Lehigh Valley International Airport (ABE). Arora ensured that the staging and phasing plan for the project minimized impacts on flight operations at the airport and adjacent construction projects.

Scope of work included:

Arora began by conducting a field investigation within the anticipated limit of work and 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, Precision Approach Path Indicators (PAPI), Airfield lighting and Control System (ALCS), and underground distribution systems were evaluated to confirm equipment and circuits affected by the project.

The Arora team then prepared detailed drawings and specifications in compliance with current FAA Advisory Circulars and design standards. Specific design elements were as follows:

- + **Runway Edge Lights** – Design and layout of the removal and replacement of existing elevated/in-pavement lights and associated infrastructure (base cans, series lighting cable, isolation transformers, etc.) to finished grade. New lights were LED type with isolation transformers adequately sized to the VA requirements of the fixture. Fixture spacing and lens color were designed to comply with FAA AC 150/5340-30.
- + **Runway Centerline** – Design and layout of the removal and replacement of existing runway centerline lights on existing bases. Base can and conduit were replaced in areas where pavement was reconstructed. New lights were LED type



LEHIGH
NORTHAMPTON
AIRPORT AUTHORITY

**LNA TASK 21 –
REHABILITATION OF
RUNWAY 6-24**

Lehigh Valley
International Airport,
Allentown, PA

with isolation transformers adequately sized to the VA requirements of the fixture. Fixture spacing and lens color were designed to comply with FAAAC 150/5340-30.

- + **Taxiway Edge Lights** –The existing taxiway edge lights and associated circuits located within the work limits were removed and replaced, including adjustment of the edge light assembly to finished grade with new LED-type fixtures for areas requiring paved shoulders. The isolation transformer and series lighting cable were removed and replaced.
- + **Airfield Signage** – Services included design and layout of the removal of existing airfield guidance sign, transformers, base cans, interconnecting conduit and associated equipment, and installation of new LED type airfield guidance sign, transformers, base cans, and interconnecting conduit within project limits. Signage was reviewed and verified for conformance to the FAAAC 5340-18 and Engineering Brief 89.
- + **Underground Electrical and Communications Distribution Systems** – Responsibilities included design and layout of modified underground distribution for airfield lighting systems, including manholes, handholes, ductbank, conduit and associated cabling.
- + **Lightning Protection (counterpoise) Design for Underground Cables** – Design and layout of lightning protection for airfield lighting circuits in accordance with FAA AC 150-5340-30 for base cans, conduit and ductbank installed.
- + **Airfield Lighting Vault and Control System Modifications** –Arora evaluated the loads of the circuits to ensure the constant current regulators powering the airfield lighting fixtures and signage operated within the recommended design loads.
- + **Pavement Surface Sensors** – Provided design and layout of removal and replacement of pavement surface sensors as necessary within pavement limits.
- + **Precision Approach Path Indicators (PAPI)** - Provided design and layout of the removal and replacement of the existing Precision Approach Path Indicators (PAPI) for Runway 6 and Runway 24 with new LED type PAPI units including new power/ control wiring.



LEHIGH
NORTHAMPTON
AIRPORT AUTHORITY

**LNAA TASK 21 –
REHABILITATION OF
RUNWAY 6-24**

Lehigh Valley
International Airport,
Allentown, PA

- + **FAA Equipment Coordination** - Coordinated with final pavement grades for modification to existing ILS systems and associated underground distribution. Arora facilitated FAA coordination and reimbursable agreements.

Upon completion and acceptance of construction documents for the rehabilitation of Runway 6-24, Arora then became responsible for construction management and inspection services associated with the related runway intersection rehabilitation and safety area restoration project. Arora's construction phase support services included overseeing the relocation of Runway 6 and Runway 24 vehicle service road relocation, earthwork and regrading, drainage structure/pip installation, adjustment of junction structures, stormwater management installation and liner repairs, pavement markings, temporary stabilization and permanent turfing, sinkhole mitigation and repair, and runway intersection rehabilitation. To ensure the contractor's installation conformed to FAA requirements, the Arora team provided the following efforts:

- + **Construction Management** - Overall coordination of construction activities, coordination with the LNAA, FAA Harrisburg Airports District Office (HADO), airlines, tenants, local regulatory agencies and all other project stakeholders from the start of construction through project closeout.
- + **Resident Engineering/Inspection** - Full-time Resident Inspector to inspect and monitor the contractor's work on a nightly basis for compliance with the contract documents.
- + **Construction Administration** - Construction administration efforts included those for airfield electrical, electrical engineering and overall construction administration, services included:
 - + Arora and appropriate project designers attended progress meetings on a weekly basis, including pre-construction meetings.
 - + Specialty checklist inspections were performed as needed to determine conformity with the contract plans, specifications, FAA standards, advisory circulars, and local codes having jurisdiction. Checklist inspections were completed for major construction milestones including substantial, pre-final and final inspections prior to project closeout.
 - + Arora reviewed shop drawing submittals from the contractor and maintained a submittal log to track the status.
 - + Arora reviewed and responded to clarification requests from the contractor. An internal log was maintained to track the status of each RFI.
 - + Preparation of design changes required by differing field conditions and unforeseen items.

PROJECT DETAILS

Client

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

Construction

Approx. \$7.4B

Project Start

11/2021

Project Completion

Est. 04/2026

Highlights

- + P3 / Design-Build
- + New 2.8 million SF terminal
- + 23 new gates
- + Arora is the lead EOR for electrical, communications, domestic water, natural gas, chilled water, thermal distribution, and sanitary site utilities.

PORT AUTHORITY OF NY & NJ (PANYNJ)

NEW TERMINAL ONE – SITE UTILITIES

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

Arora Engineers (Arora) provided professional engineering and project controls services to the Tishman/AECOM/Gensler team for the construction of the new Terminal One at John F. Kennedy International Airport (JFK) which includes the main headhouse/processor, east pier, and the airside hardstand elements. The new Terminal One aims to redefine international travel at JFK with 23 international gates, 22 of which will be designed to accommodate larger, wide-body aircraft (FAA Airplane Design Group V or VI), and a total terminal area estimated at 2.8 Million Square feet. The new terminal will contain approximately 24 security screening lanes, over 230,000 SF of retail, dining, and other concessions, 116,000 SF of airline lounges, and 55,000 SF of interior green space, children's play areas, and cultural exhibits.

Arora served as engineer of record under AECOM for the electrical, communications, domestic water, natural gas, chilled water, thermal distribution, and sanitary site utilities.

Scope of work included:

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

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

Advanced work included the design and construction of an interim sanitary sewer force main (SSFM), with lift station, opposite existing Terminal 1 which will collect



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

PORT AUTHORITY OF NY & NJ

NEW TERMINAL ONE – SITE UTILITIES

JFK International
Airport, New York, NY

and convey Terminal 1 and Terminal 2 discharge flow. The interim SSFM was sized to accommodate existing T-1 sanitary discharge. The force main was routed along the south and east sides of the proposed headhouse/processor to an existing sanitary manhole and gravity system at the northeast lower level of the project.

- + **Thermal Distribution System (TDS) Chilled Water (CHW) and Medium Temperature Hot Water (MTHW)** – The team first confirmed existing routes, connection locations and work restrictions, then developed designs for CHW and MTHW due to seasonal restrictions. Arora led the design which included construction of 30" black steel dual pipe (supply and return) CHW and 16" black steel triple pipe (supply, return, alternate) MTHW system. Interim TDS by-pass connections between existing CHW and MTHW lines and Terminal 1 were maintained during Phase A construction of the headhouse/processor. Portions of the permanent CHW and MTHW pipes were installed in the Utility Corridor in the front of the headhouse/ processor in order to facilitate this connection and will remain in place under the final design configuration. At the completion of Phase A, the MTHW and CHW service will be commissioned to the new building and allow terminal 1 to be decommissioned and demolished. Arora designed the pipe sizes and connections for interim and final pipe configurations.
- + **Low Pressure Domestic Water** – The team verified existing system routes, valves and hydrant locations, then met with JFK mechanical maintenance staff on operation of the existing system and discussed specific problem areas within the new terminal 1 construction site. Temporary service was maintained to Terminal 1 and fire hydrants within the Lease Limits during Phase A construction. Arora designed the permanent domestic water service consisted of a 24" Ductile Iron Pipe (DIP) watermain in the utility corridor, 12" DIP fire loop around the east pier, headhouse/processor, and west pier as well as fire hydrants on the landside and airside.
- + **Natural Gas** – In coordination with National Grid, Arora confirmed existing routes and discussed their requirements and procedures for changes to the existing gas system. Arora designed new natural gas site utilities in coordination with National Grid, and coordination was maintained with National Grid on an ongoing basis.
- + **Electric** – Arora was responsible for the power distribution and lighting design. The team began by verifying existing routes and potential termination and connection points, then met with JFK electrical maintenance staff to confirm information was accurate and discussed procedures/protocols pertaining to work on the electrical system. Electrical service to Terminal 1 was maintained by re-routing existing feeders to Terminal 1. Permanent power to the New Terminal 1 will be provided by a new substation.
- + **Communication** – The team reviewed the system within the construction area and coordinated with the various interested parties (FAA, TSA, Customs, PANYNJ, Telcom firms, etc.) to gather information on the various systems, procedures, and protocols. Existing communications to Terminal 1 and other Port Authority facilities originates within Communications Rooms housed on the first (grade) level of the "Green Garage". This garage is scheduled for demolition, and demolition plans are currently being prepared. Arora designed the temporary communications which were rerouted using the Air Train guide box as a pathway until the permanent duct bank was constructed and fiber was installed. In addition to maintaining and protecting critical existing communications infrastructure during demolition of the Green Garage, Arora was responsible for temporary and permanent communications facilities which were coordinated to clear the footprint of the Headhouse/Processor phased construction.

**PORT AUTHORITY OF
NY & NJ**

**NEW TERMINAL ONE
– SITE UTILITIES**

**JFK International
Airport, New York, NY**

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

PROJECT DETAILS

Client

Michael Baker International
Brad Homan, PE
Associate VP & Regional
Aviation Lead
100 Airside Drive
Moon Township, PA 15108
412-269-2744
bhoman@mkbarkerint.com

Construction

\$20,000,000.00

Project Start

March 2020

Project Completion

July 2020

Highlights

- + Electrical Aeronautical Design and Electrical Engineering services
- + Airfield Lighting Control and Monitoring System (ALCMS)
- + Incoming Utility Power
- + Airfield 5kV Infrastructure
- + Standby Generator

WOOD COUNTY AIRPORT AUTHORITY

AIRFIELD LIGHTING CONTROL SYSTEM (ALCS) REPLACEMENT

Mid-Ohio Valley Regional Airport (PKB), Parkersburg, WV

Arora Engineers (Arora), working as a subconsultant to Michael Baker Inc.(MBI) provided Electrical Aeronautical Design and Electrical Engineering services associated with the Airfield Lighting Vault Power Upgrade at Mid-Ohio Valley Regional Airport, Parkersburg, West Virginia. The scope of work was developed from the Airfield Electrical Infrastructure Assessment provide by MBI.

The project focused on the replacement of the Airfield Lighting Control System (ALCS), the replacement of the utility power (electrical service), an Engineering Report for the replacement of the standby generator and airfield electrical infrastructure (duct bank).

The existing vault building was an adequate size and condition, structurally. However, the equipment layout did not meet the required electrical working space clearances due to the size of the exiting medium voltage equipment. The design intent was to remove the existing MV service and electrical equipment and replace it with a low voltage (600-volt) distribution system.

The existing incoming utility power was an overhead service originating from a utility pole not located on airport property. The overhead line terminates on a power pole inside the airport property and transitions to underground infrastructure. The underground service continued to a pad mounted transformer. The service then entered the vault and terminated on a MV switch. The design intent was to relocate the utility point of connection and point of service (meter) onto the airport property and provide a new pad mounted distribution transformer adjacent to the vault, service entrance equipment and metering.

The cursory assessment indicated the automatic transfer switch was non-operational and the standby generator appeared to be under sized for a full load demand. The design intent was the replacement of the generator, ATS and fuel system and ventilation equipment.



**WOOD COUNTY
AIRPORT AUTHORITY
AIRFIELD LIGHTING
CONTROL
SYSTEM (ALCS)
REPLACEMENT**

**Mid-Ohio Valley
Regional Airport (PKB),
Parkersburg, WV**

The existing airfield lighting control system was in dis-repair and obsolete. The design intent was to replace the system with a computer base system, including a communication network and infrastructure. All relative systems and NAVAIDS were interfaced with the new system. The existing airfield infrastructure was in poor condition, with failing raceways and drainage issues. The design proposed a multi-duct raceway system with junction light base plazas from the ALV to mid-field which can be used for future reconfiguration of the airfield circuits.

The challenge of the project was the planning and construction phasing of the installation and transition (cutover) of the equipment to maintain operations. The work was phased for each task and included overnight shutdowns, temporary systems and parallel systems. This was coordinated and set during the design phase with input from stakeholders.

Scope of work included:

Airfield Lighting Control and Monitoring System (ALCMS): The design of the ALCMS included fiber optic cable network and infrastructure for system, low voltage and communication distribution for computers and control devices, modifications to ATCT Cab for touch screen, coordination with FAA and the Airport, schematic layout of ALCMS, installation and Elevation details of ALCMS equipment, interface schematics for existing equipment.

Incoming Utility Power: The design of the incoming utility power and service included design coordination with Utility Power Company, MonPower, service entrance equipment and metering cabinet, underground Infrastructure for routing of the new service to the lighting vault, medium voltage cable distribution, this includes both overhead and underground, pad-mounted LV Distribution Transformer sized accordingly to lighting vault, the main service switchboard, and LV power and lighting panels and transformers.

Airfield 5kV Infrastructure: The design of the airfield 5kV infrastructure included a 2-inch PVC conduit, multi-duct, duct bank system extends from the lighting vault to a location center of the airfield. The exact quantity will be determined after review of existing conditions and consideration of future circuits. The intent is to have a single home run feed in each duct. Junction Light Base Plazas were designed and utilize as junction and access point along the run of the duct bank. Plazas will be configured to allow multi-entrance points into the light base for current use and future use. Drainage of the light bases will be reviewed and considered during design and layout of plazas.

Standby Generator: The design of the Standby Generator included a generator rating and size – Elements requiring back-up power were verified and reviewed to ensure correct load is provided for sizing. The generator was designed to be located adjacent to the ALV in a self-contained enclosure. This will also free up floor space in the ALV. The generator will be designed with an integral (belly) tank. Automatic transfer switch was configured for the transfer from the utility to the generator. Arora also removed the existing generator.

Runway Edge Light System: The design of the runway edge light system included the removal of the existing and infrastructure, the design of edge light bases, conduit infrastructure and 5kV cabling, load calculations, QA/QC verification of proposed light layouts and light schedule by MBI, as well as the design of constant current regulator and connections.

PROJECT DETAILS

Client

T.Y. Lin International
Richard Raymond
110 William Street
29th Floor
NY, New York 10038
(212) 228-0662

Construction

N/A

Project Start

10/2023

Project Completion

Ongoing

Highlights

- + Airfield Electrical Design
- + Bidding Support Services
- + Limited On-Site Escorting Services

CITY OF PHILADELPHIA, DIVISION OF AVIATION REHABILITATION OF TAXIWAYS U & Y

Philadelphia International Airport, Philadelphia, PA

Arora Engineers provided Airfield Electrical Engineering, Design, Bid Support Services and limited On-Site Escorting Services to T-Y·LIN International for the Philadelphia International Airport's rehabilitation of Taxiways U & Y.

The project consisted of elevated taxiway edge lights, elevated in-pavement centerline lights, elevated in-pavement guard lights, as well as associated underground conduit raceways and cabling to the nearest accessible structure associated with the rehabilitation of Taxiway U & Y pavements.

Scope of work included:

- + **Airfield Electrical Design:** Arora engineers provided Airfield Lighting Cable and Infrastructure per FAA standards and layout and design of airfield lighting, taxiway directional signage and associated equipment per FAA and edited FAA Specifications applicable to products required in the design along with FAA standard book specifications.
- + **Bidding Support Services:** Bidding Support Services for airfield electrical systems included attending pre-bid meeting , supporting TYLIN in providing responses to bidder's requests for Information on Arora's design, developing revised drawings or bulletins as needed to issue addendums and RFI responses, and issuing Conformed Set of Construction Documents incorporating RFI responses and addendums.
- + **Limited On-Site Escorting Services:** Arora will provide limited on-site escorting services on and off the active air operations area TYLIN and subconsultants.



PROJECT DETAILS

Client

City of Philadelphia Division of Aviation
Mark Tiger
Vice President
Johnson Mirmiran & Thompson
1600 Market Street, Suite 520
Philadelphia, PA 19103
215-496-4735
MTiger@jmt.com

Construction

N/A

Project Start

2021

Project Completion

2022

Highlights

- + Airfield Electrical Engineering
- + Design and Bid Support
- + Airfield lighting, taxiway directional signage, and associated equipment.

CITY OF PHILADELPHIA DIVISION OF AVIATION TAXIWAY S RECONSTRUCTION

Philadelphia International Airport (PHL), Philadelphia, PA

Arora Engineers (Arora) working as a subconsultant to Johnson, Mirmiran & Thompson (JMT) provided Airfield Electrical Engineering, Design and Bid Support services including development of drawings and specifications for the reconstruction of Taxiway S at Philadelphia International Airport (PHL). The overall scope of work of The Project includes Airfield Electrical Design, Engineering of elevated taxiway edge markers, in-pavement centerline lights, airfield signage, as well as associated underground conduit raceways and cabling to the nearest accessible structure and vault modifications as associated with the reconstruction of Taxiway S pavements.

Scope of work included:

Airfield Electrical Design: The design for airfield electrical systems includes the below items associated with the project. Arora created a layout and design of Airfield Lighting, Taxiway Directional Signage and associated equipment per FAA standards associated with the scope of the project. The airfield electrical design scope included the removal and addition of airfield lighting, reflective markers, airfield signage, and pavement sensors associated with reconstruction of pavement and revisions to pavement geometry. New airfield electrical cabling connected to existing cabling within existing light fixtures or underground structures within 200' of new fixtures.

Airfield electrical cable homeruns and associated main underground structures from the lighting / sign circuits to the electrical vault were evaluated for relocation or replacement. It was assumed that existing airfield lighting equipment located in the electrical vault was sufficient to serve revised airfield loads and modifications to equipment and electrical distribution in the electrical vault were not required.

Airfield electrical vault equipment serving airfield circuits affected by scope of work were replaced or modified due to age or condition. Temporary modifications to the airfield signage and airfield lighting circuits were required during construction to maintain operation of airfield operations. Signage and circuits were evaluated during design and be coordinated with the development of the Construction Safety Phasing Plan to create temporary wiring plans. Arora also coordinated light fixture layout locations with PCC rigid pavement joints.

Bidding Support Services: Bidding Support Services for airfield electrical systems included attending one-hour video/phone conference call Pre-Bid Meetings and supporting JMT in providing responses to Bidder's Requests for Information (RFI) on Arora's design. Arora developed and revised drawings as needed.



PROJECT DETAILS

Client

St. Pete-Clearwater
International Airport
Scott Yarley, PE
Airport Engineer
14700 Terminal Blvd.
Suite 221
Clearwater, FL 33762
yarley@co.pinellas.fl.us
(727) 453-7830

Construction

\$18,000,000

Project Start

2018

Project Completion

2020

Highlights

- + Airfield electrical, airfield signage, lighting, and navigational aids engineering
- + Designed in compliance with FAA standards and requirements
- + Early NAVAIDS package to Facilitate FAA flight inspections

PINELLAS COUNTY PURCHASING RUNWAY 18-36 REHABILITATION

St. Pete-Clearwater International Airport, Clearwater, FL



Arora Engineers (Arora) was part of the team responsible for the rehabilitation of Runway 18-36 at St. Pete-Clearwater International Airport. Repair was deemed necessary from pavement distress including longitudinal cracking, raveling, and weathering along the runway. Arora was tasked with design, bidding and construction administration for airfield electrical, airfield signage, lighting, and navigational aids engineering, and prepared contract drawings, specifications, and reports in addition to contributing to the complex construction phasing schedule. .

Scope of work included:

The project consisted of the rehabilitation of the existing bituminous asphalt pavement and reconstruction of the centerline, touch down zone, and runway edge lighting system. Arora prepared aeronautical electrical engineering design and specifications for: preliminary design (30%), engineering design (60%), final design (90%), bid documents (100%), bidding services, and construction administration.

- + Design and layout of RW edge, center line, and touchdown zone lights and lighting cable
- + Design for the relocation of existing airport-owned PAPI and REIL system
- + Airfield electrical vault modifications and power distribution
- + Design of two temporary PAPI systems for construction phasing
- + Modifications/revisions to TW's A5 and A6 lighting circuits and guidance signs and ALCMS, calibration, and commissioning



PROJECT DETAILS

Client

American Airlines for
the City of Philadelphia,
Division of Aviation / Capital
Improvement Program
Bijan Pashanamaei
AECOM
1700 Market Street
Suite 1600
Philadelphia, PA 19103
215-735-0832
bijan.pashanamaei@aecom.
com

Construction

\$35,000,000

Project Start

2016

Project Completion

2017

Highlights

- + MEP, FP / life safety, airfield engineering and special systems
- + New Crew Building
- + New Vehicle Maintenance Building

CITY OF PHILADELPHIA, DIVISION OF AVIATION AMERICAN AIRLINES PHL TRUCK BASED DEICING APRON PROJECT

Philadelphia International Airport, Philadelphia, PA

American Airlines funded a project on behalf of the City of Philadelphia Division of Aviation to convert the boom based deicing facility at Philadelphia International Airport (PHL) to a truck based operation. Arora Engineers (Arora) provided mechanical, electrical, fire/life safety, special systems, and airfield electrical engineering as part of the team led by AECOM, who was responsible for the project.

Constructed in 2001, the boom based deicing system showed signs of wear and repairs. In addition, the new ADG IV aircraft could not fit in between the booms, putting PHL in an untenable situation. The two-phased transformation provided four deicing bays capable of servicing the largest aircraft or two smaller aircraft at the same time. Additional provisions were made to deice at a contiguous cargo apron. A fleet of 50 deicing trucks was accommodated. Underground systems delivered Glycol #1 and #4 and water to filling stations located between the bays. Diesel fuel was dispensed off the apron within the operational limits. A new Crew Building and Vehicle Maintenance Building were erected to provide work and support facilities for the staff and full truck mechanical servicing capability.

The Deicing Apron was illuminated by wireless controlled high mast LED lighting. The 12 centerlines of In-Apron lighting were individually controlled to enhance directional guidance to the pilots, followed by individually illuminated lead-off lighting when deicing was completed. Other operational features included utilization of the Harris System for aircraft identification prior to their arrival at the Deicing Apron, blanket coverage by a robust CCTV system, and a WiFi system for telemetry transference between trucks and Command. Phase 1 involved the removal of approximately half of the booms and the creation of two new truck based bays and the diesel fueling station. Phase 2 included the construction of the buildings and the last two deicing bays, an additional diesel tank, modification to the fluid distribution system, new in-apron lighting regulators, and controls. The project reused two transformers from the boom based system and mothballed 12 others for future PHL use.



PROJECT DETAILS

Client

Bering Straits Companies
Shawn Weaver
Project Manager
823 Old Philadelphia Rd.
Aberdeen, MD 21001
sweaver@beringstraits.com
443-327-6406

Construction

\$1,000,000

Project Start

2016

Project Completion

2017

Highlights

- + LED Airfield Signage
- + Conditions Assessment
- + Cost Benefit Analysis
- + Power Distribution

US DEPARTMENT OF DEFENSE

INSTALLATION OF AIRFIELD SIGNAGE AND ASSOCIATED EQUIPMENT

Phillips Army Airfield (PAAF), Aberdeen Proving Ground (APG), Aberdeen, MD

Arora Engineers (Arora) provided electrical design services for airfield signage improvements at Phillips Army Airfield in Aberdeen, Maryland. Arora also performed an analysis of existing conditions, using value engineering & expert judgement to design the installation of new airfield signage and associated underground distribution powered from the airfield lighting vault. Arora created Bering Straits Companies' contract drawings, specifications, and an estimate of probable construction costs in conformance to UFC and FAA design standards for a fully functional airfield guidance sign system.

Scope of work included:

- + LED Airfield Signage.
- + Airfield lighting-vault equipment modifications, new lighting, emergency egress lighting, and exit signage were provided.
- + Power distribution.
- + Airfield lighting control system panel and toggle switch upgrades within the control tower and operations office.



PROJECT DETAILS

Client

Piedmont Triad Airport
Authority
Piedmont Triad International
Airport
Alex Rosser, P.E.
Deputy Executive Director
1000A Ted Johnson Parkway,
Greensboro, NC 27409
rossera@gsoair.org
336-665-5600

Construction

\$39,227,710 (Design/Bid/
Build)
Phase 1 - \$17,370,800
Phase 2 - \$1,001,050
Phase 3 - \$20,855,860

Project Start

2017

Project Completion

2019

Highlights

- + Rehabilitation and upgrade of airfield lighting systems
- + High intensity LED runway lighting system (TDZ's and Centerline)
- + Airfield Lighting & Control Monitoring System
- + Surface Movement and Guidance Control Systems
- + Pavement Surface Sensor System
- + LED runway guard lights
- + Modified underground distribution
- + Airfield signage modifications
- + Economy approach aids

PIEDMONT TRIAD AIRPORT AUTHORITY

REHABILITATION OF RUNWAY 5R-23L

Piedmont Triad International Airport, Greensboro, NC

Arora Engineers (Arora) completed contract documents for the Rehabilitation of Runway 5R-23L at Piedmont Triad International Airport (GSO). The project included the mill and overlay of the existing pavement surfaces as proposed by Michael Baker International (Prime), which impacted several existing runway airfield systems. The modified airfield systems included the existing airfield lighting, signage, and underground distribution. It was a challenging project considering the abbreviated design schedule and multiple electrical systems requiring modifications from changes in pavement grade elevations.

Scope of work included:

The existing runway, centerline, and touchdown zone lighting systems were upgraded to LED, with existing conduit/light base cans removed, disposed of, and replaced. Runway edge lights were removed and replaced with quartz lights. Lighting for the connector taxiway (edge, elevated/in pavement guard lighting) were also designed to be LED. Base can and conduit infrastructure was proposed for the airports approved Surface Movement and Guidance Control System (SMGCS) plan.

Additional design elements included a pavement surface sensor system, relocation of wind cone and PAPI units on new foundations, and MALSR/ALSF-2 approach lighting modifications in accordance with pavement grade elevations. The project included all new series circuit distribution to Airfield Lighting Vault No. 1 in a new junction can plaza system, which paralleled the runway. Airfield signage improvements included relocated signage to accommodate modified taxiway geometries and signage upgrades to LED.

Lessons Learned:

This runway rehabilitation project involved complete replacement of electrical systems. The project challenges included stakeholder and project team coordination to maximize the construction area within Airport Authorities adjusted program budget. The electrical team remained flexible with the modified work areas and implemented a phased approach accomplish electrical improvements that would minimize reworking during the future full build out. Lessons learned included coordination with civil disciplines early in design to coordinate drainage of light bases and phased approach to implement partial runway centerline lighting replacement with future new LED upgrades.



PROJECT DETAILS

Client

Wayne County Airport
Authority
Detroit Metropolitan Wayne
County Airport
Theresa Samosiuk
Project Manager
L.C. Smith Building –
Mezzanine
Detroit, MI 48242
Theresa.samosiuk@wcaa.us
734-247-3692

Construction

\$110,000,000 (Design/Bid/
Build)

Project Start

2014

Project Completion

2016

Highlights

- + Rehabilitation and upgrade of airfield lighting systems and Airfield Lighting Vault No. 1
- + Complete high intensity LED runway lighting system
- + Airfield lighting & control monitoring system
- + Pavement surface sensor system
- + LED in-pavement runway guard lights
- + Modified underground distribution
- + Airfield signage modifications
- + Load analysis and configuration for series circuit distribution

WAYNE COUNTY AIRPORT AUTHORITY

RECONSTRUCTION OF RUNWAY 4L/22R & ASSOCIATED TAXIWAYS

Detroit Metropolitan Wayne County Airport, Detroit, MI

Arora Engineers (Arora) completed contract documents for all professional electrical engineering tasks associated with the pavement rehabilitation of Runway 4L/22R and associated taxiways. The associated taxiways included Taxiways N, N1, N2, Q, R, and V. The project primarily included full-depth removal of the existing pavement section and replacement with new PCC sections as proposed by RS&H (Prime), which impacted several existing runway airfield systems. The modified airfield systems included the existing lighting, signage, and underground distribution.

Scope of work included:

The existing runway centerline, edge light, and touchdown zone lighting systems were upgraded to LED with existing conduit/ light base cans removed, disposed of, and replaced. Lighting for connector taxiway (centerline, guard lighting) was also designed to be LED type in conjunction with the existing reinstalled LED taxiway edge lights on new infrastructure.

Additional design elements included a pavement surface sensor system, in-pavement runway guard lighting and Runway 22R touchdown zone lighting. The project included all new series circuit distribution to Airfield Lighting Vault No. 1 and new constant current regulators for the majority of the modified circuits. Airfield signage improvements included relocated signage to accommodate four new high-speed exit taxiways and new signage (Taxiway N/N1/N2) and sign panels for the renaming of Runway 4L/22R connector taxiways to conform to Engineering Brief 89.

Lesson Learned:

The pavement section for this \$100M runway rehabilitation consisted of 18" of PCC pavement over existing subgrade requiring complete replacement of electrical infrastructure. Project challenges included coordination with paving and joint patterns



**WAYNE COUNTY
AIRPORT AUTHORITY
RECONSTRUCTION
OF RUNWAY 4L/22R
& ASSOCIATED
TAXIWAYS**

**Detroit Metropolitan
Wayne County
Airport, Detroit, MI**

to accommodate the installation of the interconnecting conduits and light base cans. This project included directional drilling under existing service roads and temporary circuit connections to minimize disruption to airport operations. A fully functional LED runway and coordination with the airport authority and the FAA were necessary for installed equipment that was non-AIP eligible. The project included the modifications/adjustments of electrical elements typically found within the runway safety area of a CAT II runway. Major lessons learned included the realized benefits of engaging all stakeholders early during the design process, including the Airlines and FAA. Majorly impacted utilities were identified and mitigated prior to construction, which minimized change orders.



PROJECT DETAILS

Client

Massachusetts Port Authority
Sarah Dennechuk, PE
Project, Manager
One Harborside Drive
East Boston, MA 02128
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617-568-5971

Construction

\$22,000,000

Project Start

July 2016

Project Completion

October 2017

Highlights

- + Airfield lighting
- + ALSF-2 approach lighting
- + Underground electrical distribution
- + FAA coordination
- + Utility coordination

MASSACHUSETTS PORT AUTHORITY

RUNWAY 4R-22L REHABILITATION AND APPROACH PIER REPLACEMENT

Boston Logan International Airport, Boston, MA

Arora Engineers (Arora) performed professional engineering services to design and layout the removal and reinstallation of the Runway 4R ALSF-2/SSALR approach lighting system in coordination with the upgrades to the Runway 4R Light Pier. Arora's work included design efforts and FAA coordination to reinstall the ALSF-2 system at exact locations in conformance to FAA design standards for a fully functional airfield lighting system upgrade within the limits of disturbance..

Scope of work included:

- + Cross-discipline coordination with Pier replacement to minimize downtime of ALSF-2 system and associated CAT II/III infrastructure.
- + Design and layout of the removal of the existing ALSF-2 approach lighting system lighting fixtures and structures. Lighting fixtures & structures were carefully stored for reinstallation.
- + Design and layout of the demolition/removal of existing ALSF-2 power and controls back to junction cans adjacent to the new pier.
- + Design and layout of ALSF-2 light plane profiles and lamp schedules. Light planes were coordinated with the proposed pier elevation change.
- + Design and site layout of the reinstallation of ALSF-2 light equipment.
- + Design and layout of removal and reinstallation of Far Field Monitor, shelter and associated components from existing pier to new. The existing antenna elevation was adjusted to 8" below the ALSF-2 light plane.
- + Design and layout of power distribution to Far Field Monitor and ALSF-2 light station.



MASSACHUSETTS PORT AUTHORITY

RUNWAY 4R-22L REHABILITATION AND APPROACH PIER REPLACEMENT

Boston Logan
International Airport,
Boston, MA

- + Design and layout details for mounting, cabinet and wiring installation for ALSF-2 components.
- + Underground electrical and series circuit distribution with limits of disturbance.
- + FAA and Utility coordination.

Lessons Learned:

This was a unique project consisting of the complete replacement of the existing ALSF-2 light stations to facilitate the demolition of the Runway 4R existing wooden pier and construction of a new concrete pier. The light plane profile required adjustment in coordination with the modified grade elevation. A challenging aspect of the project involved the coordination with structural to accommodate the electrical conduits within the 8-foot concrete plank.

Up to thirteen conduits were installed in sections of the plank, requiring proper clearances for the national electric code, structural rebar, and mounting equipment. Careful detailing was necessary to ensure the communication, low voltage and airfield lighting were fully coordinated prior to concrete placement. FAA coordination was an important component of the project, which included removal of inner marker antennas, relocation of far field monitor antennas and a new equipment shelter. All equipment that required reinstallation was carefully stored, tagged, and reinstalled at the locations designated in the documents. Lessons learned involved the equipment shelter, which was to be shipped to the Contractor by the FAA complete for installation on the new pier. The shelter had several variations that required field modifications to make the system work. The contract required a construction representative to approve the shelter before shipping to the site but was not enforced. If Arora had a construction representative visit the FAA depot before shipment, the team may have been able to mitigate the field changes.



PROJECT DETAILS

Client

City of Philadelphia
Division of Aviation
Thomas Joseph, PE
Project Manager
International Plaza I
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Philadelphia, PA 19113
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Construction

\$35,000,000

Project Start

2011

Project Completion

2015

Highlights

- + Airfield lighting and signage upgrades in new runway/taxiway pavement
- + Introduced LED lighting within runway environment
- + Load analysis and configurations for electrical distribution
- + Pavement surface sensor revisions
- + Designed dedicated sign circuits for mandatory hold signs
- + Implemented color scheme for airfield lighting circuits to assist with field circuit verification
- + Airfield lighting and control system modifications

CITY OF PHILADELPHIA, DIVISION OF AVIATION REHABILITATION OF RUNWAY 9L-27R AND TAXIWAY K EXTENSION

Philadelphia International Airport, Philadelphia, PA

Arora Engineers (Arora) prepared contract documents for all professional electrical engineering tasks associated with the pavement rehabilitation of Runway 9L-27R. The typical 3"-5" mill and overlay of the 9,500 feet long by 150 wide runway impacted several existing runway airfield systems. The modified airfield systems included the existing approach lighting, signage, airfield lighting, and pavement surface sensor system for both the runway and the associated taxiway connectors.

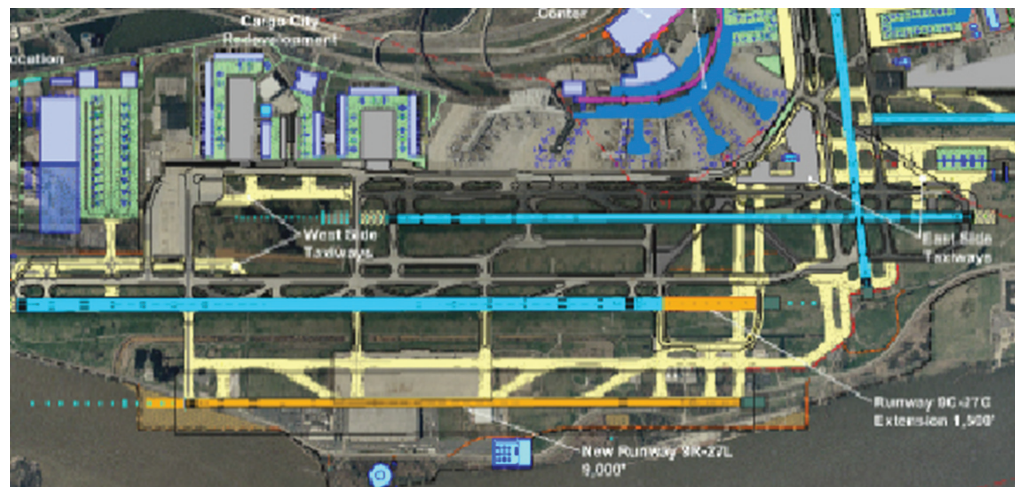


Scope of work included:

The existing centerline system and conduit was replaced with new LED centerline lighting and associated underground distribution. Lighting for the connector taxiway (centerline, guard lighting) was also designed to be LED-type to the runway hold line of each taxiway connector. With exception of the runway high intensity edge lighting, all runway lighting and signage within the Runway 9L-27R safety area was designed to be LED-type. Additional design elements included runway status light infrastructure, field lighting vault revisions, and relocation of existing utilities.

The project included innovative concepts. Aside from the LED lighting, the project also featured colored series lighting cable for light fixtures within the runway environment based on a color scheme incorporated within the contract documents. The installation enabled quick circuit identification by maintenance, allowing for the performance of repair work within a shorter timeframe.

Design phase services were completed on time and within budget. Contract documents included drawings, specifications, cost benefit analysis, engineering calculations, and an estimate of probable construction costs. Arora also provided construction administration services to the Division of Aviation, including shop drawing review, field investigations, and responses to requests for information.



PROJECT DETAILS

Client

Port Authority of New York
and New Jersey
Somnath Mukherjee
Airport Engineering Task
Leader
2 Gateway Center
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973-792-4446

Construction

\$13,000,000

Project Start

2008

Project Completion

2012

Highlights

- + Evaluation of existing approach lighting systems and NAVAIDs
- + Designed parking lot lighting modifications to accommodate RSA improvements
- + New ILS localizer system and shelter layouts with associated power and communication
- + New ILS glide slope system and shelter layouts with associated power and communication
- + New Inpavement ALSF-2 approach lighting system layouts with associated power and controls

PORT AUTHORITY OF NEW YORK AND NEW JERSEY NAVIGATIONAL AIDS IMPROVEMENTS TO RUNWAYS 22L, 22R, AND 4L

Newark Liberty International Airport, Newark, NJ

Arora Engineers (Arora) prepared contract drawings for navigational improvements to Runway 22L and 22R at Newark Liberty International Airport as part of a Call-In Contract with the PANYNJ.

Design phase tasks on the Runway 22L end involved the upgrade for the existing CAT I system to a new CAT II/III system. Components included in pavement ALSF-2 system, pre-fab shelter and associated ALSF-2 components, ILS system upgrades – relocated glideslope shelter and antenna, far field monitor antenna, inner marker beacon, and associated underground electrical and communication distribution.

A parking lot and taxiway relocation was required to accommodate the placement of ILS system components outside the runway/taxiway safety areas. Design phase tasks for Runway 22R involved the upgrade of the existing CAT I system. The new system replaced an outdated localizer and glideslope system (and associated components).

Additional design responsibilities included field investigation, FAA coordination, inter-discipline design coordination, calculations, equipment specification, and cost estimating.



PROJECT DETAILS

Client

Port Authority of New York
and New Jersey
Greg Gadowski, Staff
Engineer
2 Gateway Center
16th Floor SW
Newark, NJ 07102
ggadowski@panynj.gov
973-792-4445

Construction

\$2,000,000

Project Start

2011

Project Completion

2014

Highlights

- + Demolition of existing airfield lighting and signage to facilitate taxiway realignment
- + Design and layout of airfield lighting, signage and associated base cans
- + Series lighting system distribution to modified airfield lighting and signage
- + Life cycle cost and load capacity analysis for airfield lighting fixtures and associated cables
- + Modifications to airfield lighting and control system

PORT AUTHORITY OF NEW YORK AND NEW JERSEY REALIGNMENT OF WESTSIDE TAXIWAYS AND RVSR

LaGuardia Airport, New York, NY

Arora Engineers (Arora) prepared contract documents for the realignment of Westside Taxiways at LaGuardia Airport. The project area was located northwest of Runway 4-22 adjacent to a newly constructed Police Crisis Command Center (PCCC) and Aircraft Rescue and Firefighting Facility (ARFF). This area was identified for realignment because the PCCC & ARFF occupied a portion of the existing Taxiway Y. In addition, the FAA indicated additional modifications to the existing taxiway configuration must be completed because of this impact to the air operations area. The primary scope of work entailed the removal and installation and/or relocation or adjustment of taxiway drainage and electrical infrastructures, the milling and overlay of asphalt pavements, full-depth installation of asphalt pavements, and the revision of pavement markings and signage.

Scope of work included:

As an extension of PANYNJ staff, Arora was responsible for electrical tasks including airfield lighting fixtures, underground distribution, manhole/handhole modifications, signage, helipad lighting, and electrical distribution to facilitate pavement construction. Electrical infrastructure was either removed and replaced or adjusted to finished grade in accordance with all relevant FAA advisory circulars and PANYNJ standards.

Design phase services were completed on time and within budget. Contract documents included drawings, specifications, sole source letters, engineering calculations, and an estimate of probable construction costs.

Arora also provided construction administration services to the PANYNJ during construction, including shop drawing review and responses to requests for information (RFI).



PROJECT DETAILS

Client

Port Authority of New York
and New Jersey
Greg Gadowski, Staff
Engineer
2 Gateway Center
16th Floor SW
Newark, NJ 07102
ggadowski@panynj.gov
973-792-4445

Construction

\$2,000,000

Project Start

2012

Project Completion

2014

Highlights

- + Demolition of existing airfield lighting and signage to facilitate taxiway realignment
- + Design and layout of airfield lighting, signage and associated base cans
- + Series lighting system distribution to modified lighting and signage
- + Life cycle cost and load capacity analysis for airfield lighting fixtures and associated cables
- + Modifications to airfield lighting and control system

PORT AUTHORITY OF NEW YORK AND NEW JERSEY REHABILITATION OF TAXIWAYS A, M AND ZA

LaGuardia Airport, New York, NY

Arora Engineers (Arora) prepared contract documents for the rehabilitation of Taxiways A, M and AZ at LaGuardia Airport. These existing asphalt concrete taxiways required mill and overlay to maintain a “state of good repair” and extend the useful life of the pavement. The primary scope of work entailed the removal and installation and/or relocation or adjustment of taxiway drainage and electrical infrastructures, the milling and overlay of asphalt pavements, full-depth installation of asphalt pavements, and the revision of pavement markings and signage.

Scope of work included:

As an extension of PANYNJ staff, Arora was responsible for electrical tasks including airfield lighting fixtures, underground distribution, manhole/handhole modifications, signage, and electrical distribution to facilitate pavement construction. Electrical infrastructure was either removed and replaced or adjusted to finished grade in accordance with all relevant FAA advisory circulars and PANYNJ standards.

Design phase services were completed on time and within budget. Contract documents included drawings, specifications, sole source letters, engineering calculations, and an estimate of probable construction costs.

Arora also provided construction administration services to the PANYNJ during construction, including shop drawing review and responses to requests for information (RFI).



PROJECT DETAILS

Client

AECOM
Jennifer Lutz
Associate Vice President,
Planning
4 North Park Drive
Suite 300
Hunt Valley, MD 21030
Jennifer.lutz@aecom.com
410-891-9415

Construction

\$5,000,000

Project Start

2016

Project Completion

2016

Highlights

- + Airfield lighting and signage
- + Conditions assessment
- + Cost benefit analysis
- + LED lighting
- + Construction safety and phasing plan

NEW YORK STATE DEPARTMENT OF TRANSPORTATION

RUNWAY 1-19 SAFETY AREA IMPROVEMENTS

Republic Airport, Farmingdale, NY

Arora Engineers (Arora) completed design services for the Runway 1-19 Safety Area Improvements and relocation of Taxiway G. The improvements included shifting and extending the Runway 1 threshold north and reclaiming the displaced threshold on the Runway 19 end. Taxiway G required relocation to meet FAA runway to taxiway separation requirements.

The design elements included new LED runway/taxiway edge lighting & airfield signage, circuit distribution modifications, supplemental windcone upgrades, LED type Precision Approach Path Indicators (PAPI) lamp housing assemblies, and LED type Runway End Identifier Lights (REILS) units.

Scope of work included:

- + New and relocated airfield signage
- + New LED edge lighting
- + Runway 1 and Runway 19 PAPI assembly
- + Runway 1 and Runway 19 REIL assembly
- + Modifications to the Airfield Lighting Vault and Airfield Lighting and Control System.

Arora performed an analysis of existing conditions, using value engineering & expert judgement to develop the design documents. Design documents included contract drawings; specifications and an estimate of probable construction costs in strict conformance to FAA design standards for a fully functional airfield lighting; and signage and economy approach aid upgrade. In addition, Arora provided procurement and bid award services and construction administration services.

Rethinking Infrastructure®



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