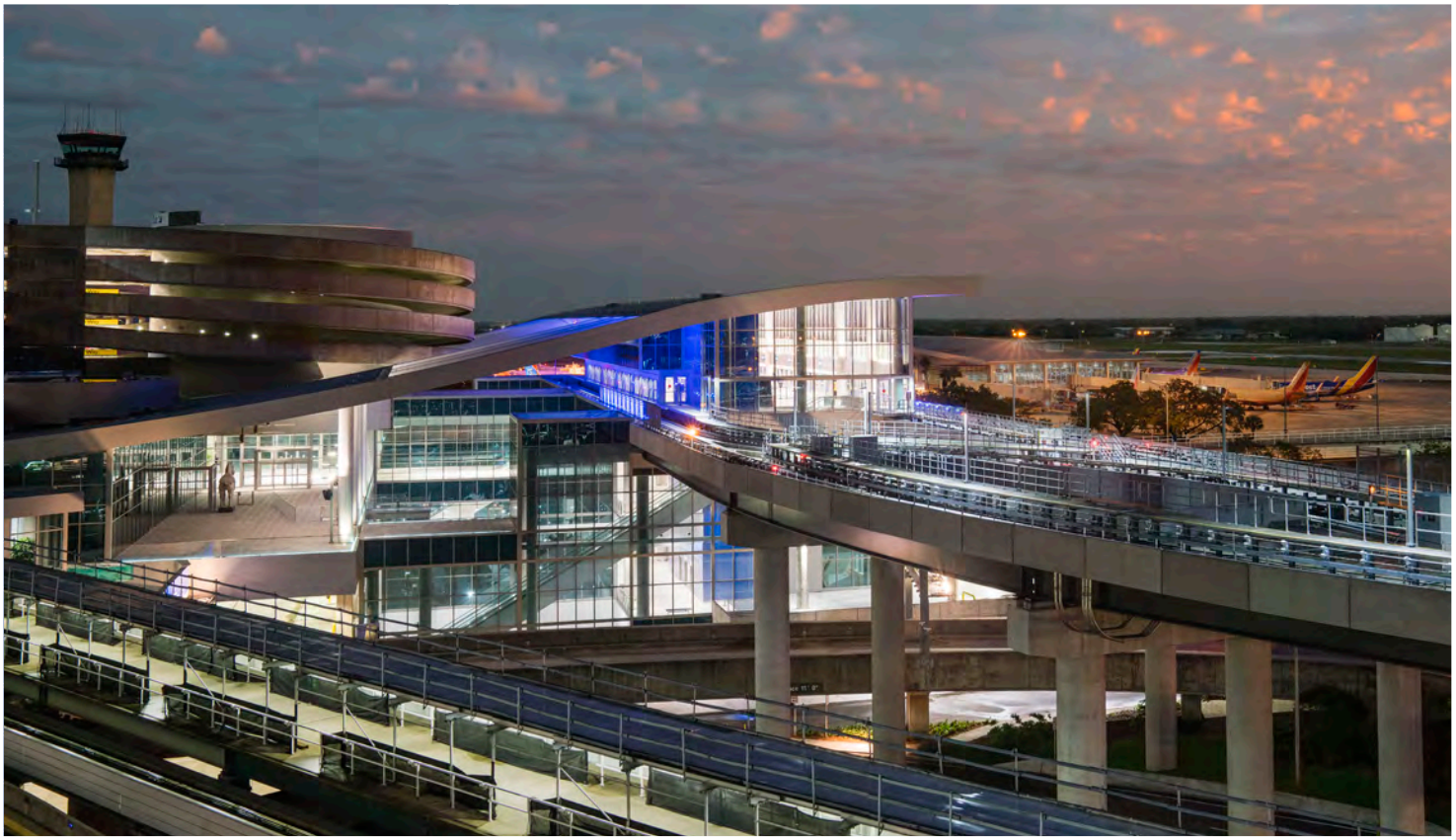


QUALIFICATIONS PACKAGE

Parking & ConRAC Experience

SUBMITTED BY:

Arora Engineers, LLC

61 Wilmington-West Chester Pike

Chadds Ford, PA 19317

Arora Engineers
aroraengineers.com

P (610) 459-7900
F (610) 459-7950

Dear Prospective Client,

Since 1986, Arora has specialized in providing engineering and construction phase services tailored for complex infrastructure projects including parking and transportation facilities. We have re-thought the role played by a traditional MEP engineering provider and our practice has evolved to emphasize the technology that connects systems infrastructure, improves operations and longevity, and makes life safer and easier for those who use it.

Arora was proud to be named #17 on Building Design+Construction's 2023 Top Transit Facility Engineering firms list and consistently ranks among the Top Parking Structures Engineering Firms. In addition, Arora ranked #36 in BD+C's 2023 Top 75 Engineering Firms list. Arora has also been named to the INC 5000 list of fastest growing firms, CSE Magazine's MEP Giants list, and consecutively ranks as a Top 500 Design Firm by Engineering News Record.

At Arora, we understand that parking garage system architectures must be designed for flexibility in order to respond to emerging transportation trends. We design parking structures for clients in every sector with the future in mind and live our tagline of Rethinking Infrastructure as we approach each unique project. Despite constantly evolving transportation needs, all parking facilities must ultimately be designed for optimal user convenience, efficiency, durability and long-term return on investment.

Our team provides valuable insight to owners and stakeholders on the ways they can future-proof their parking facilities to prioritize customer ease, reduce maintenance and operations burdens, and drive economic development.

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

Sincerely,

Manik Arora, PE
President and CEO

TABLE OF CONTENTS

Arora Engineers, LLC

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

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

Expertise

Throughout our history of more than 38 years, we have held ourselves to rethinking the role of the traditional MEP firm. As a result, we've evolved our practice to emphasize the technology and processes that connect systems infrastructure, improve operations and longevity and make life safer and easier for those who use it.

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

Services

SPECIAL SYSTEMS / TECHNOLOGY

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

ARORA

ATLANTA

BALTIMORE

BOSTON

DALLAS

LOS ANGELES

MIAMI

NEW YORK

ORLANDO

PHILADELPHIA

SAN JOSE

ST. PETERSBURG

BENGALURU

PUNE

ELECTRICAL

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

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

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

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

CONSTRUCTION MANAGEMENT & INSPECTION

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

ARORA

PROJECT EXPERIECNE

PROJECT DETAILS

Client

Michael Baker International
Brad Homan, Regional Aviation Practice Lead
100 Airside Drive
Airside Business Park
Moon Township, PA 15108
412-269-2744
Bhoman@mbakerintil.com

Construction

Approx. $249M

Project Start

2020

Project Completion

2023

Highlights

+ Arora provided IT, Special Systems, and Electrical engineering for the Multimodal Center/ Consolidated Rental Car Facility
+ New six-story, 3,500 space parking garage

ALLEGHENY COUNTY AIRPORT AUTHORITY – TERMINAL MODERNIZATION PROGRAM

LANDSIDE PROGRAM, MULTIMODAL CENTER/ CONSOLIDATED RENTAL CAR FACILITY (CONRAC)

Pittsburgh International Airport, Pittsburgh, PA

The Terminal Modernization Program (TMP) addresses the need for terminal modifications at Pittsburgh International Airport (PIT) and involves the relocation of the Landside Terminal and related ground-side functions to a new terminal complex that will be constructed adjacent to the existing Airside Terminal. The TMP Landside projects include design of the approximately six-story, 3,500-space multi-user parking garage connected to the Landside Terminal by two (2) pedestrian bridges. Design services include new parking exit plaza, wayfinding services for the garage and rental car ready returns, rental car customer service facility, ground transportation center, quick turnaround facility for rental, rental car ready return lot, surface public parking lot, commercial vehicle lot, and all associated utilities and equipment. The goals of the Terminal Modernization Program include stabilizing airline costs, building out PIT's airport, encouraging environmental sustainability, enhancing the customer and passenger experiences, and providing value to the regional community.

Arora Engineers (Arora) provided low voltage, IT, special systems and electrical engineering services as a subconsultant to Michael Baker International for the Landside program's Multimodal Center / Consolidated Rental Car Facility (ConRAC) project.

Scope of work included:

Special Systems, Low Voltage, IT – Arora provided special systems design development, final design, and construction support services for the multimodal center to integrate with existing and terminal provided systems as Designer of

Renderings Courtesy of Gensler + HDR in Association with luis vidal + architects

ALLEGHENY COUNTY AIRPORT AUTHORITY – TERMINAL MODERNIZATION PROGRAM

LANDSIDE PROGRAM, MULTIMODAL CENTER/ CONSOLIDATED RENTAL CAR FACILITY (CONRAC)

Pittsburgh International Airport, Pittsburgh, PA

Record for all of the following systems: telecommunications, security, dynamic signage, paging and public address, blue phone, communications. Arora is responsible for overall site communications conduits, fibers, cabling, backbone and equipment to provide a fully functional communication system for the following areas:

+ QTA Administration Buildings
+ QTA Wash Building Connections
+ QTA Fueling Area
+ QTA Covered Staging
+ Customer Service Building
+ Toll Booths and Ticket Dispensers at Employee Parking, RAC Employee Parking, Surface Lot Entry and Exit Plazas, Parking Garage Entry and Exit Plazas, and Remote Lot Communications Building and Gate Conduits
+ Main demarcation connection to the new Terminal building and existing infrastructure including the existing parking management building
+ Data connections to overhead roadway dynamic signage

Arora provided the following special systems, low voltage, and IT services for the Parking Garage:

+ Ground Level Rental Car Kiosk Connection Points
+ Parking Garage Telecommunications Room Design
+ Coordination with Parking Control Systems by Watry
+ Security Surveillance of Garage
+ Blue Emergency Phones
+ Dynamic Signage

Arora provided the following special systems, low voltage, and IT services for the Customer Service Building:

+ Main building connections
+ Connection points for rental car fit out
+ Public address
+ Blue Emergency Phones

Arora provided the following special systems, low voltage, and IT services for the Site Structures:

+ Overhead Sign interface and connections
+ Surface Parking Security Cameras
+ Remote lot security cameras
+ Remote lot telecommunications equipment and Blue phones

Electrical – Arora provided electrical engineering design development, final design, and construction support services for the multimodal center to integrate with existing

ALLEGHENY COUNTY AIRPORT AUTHORITY – TERMINAL MODERNIZATION PROGRAM

LANDSIDE PROGRAM, MULTIMODAL CENTER/ CONSOLIDATED RENTAL CAR FACILITY (CONRAC)

Pittsburgh International Airport, Pittsburgh, PA

and terminal provided systems as Designer of Record for the following:

- Electrical power systems, including:
  - Normal and emergency power distribution systems including sub metering per LEED requirements
  - All 480/277V and 208/120V outlets and power connections to equipment
- All interior and exterior lighting and lighting control systems including external garage
- Lightning Protection System
- Grounding System

Arora's scope of work included the following:

- Overall site electrical distribution and equipment/system power connections to provide a fully functional electrical system for the following:
  - QTA Administration buildings
  - QTA Wash Building Connections
  - QTA Fueling Area
  - QTA Covered Staging
  - Parking garage
  - Customer Service Building
  - Toll Booths and ticket dispensers at:
    - Employee parking
    - RAC employee parking
    - Surface lot entry and exit plazas
    - Parking garage entry and exit plazas
    - Remote lot comm telecommunications building and conduits to gates

Arora provided Parking Garage electrical distribution and equipment/system power connections to provide a fully functional electrical system for the following:

- Ground Level Rental Car Kiosk
- Parking Garage Telecommunication Rooms
- Parking Control Systems
- Security Surveillance System
- Blue Phones System
- Dynamic Signage
- 33 Level II Electric Vehicle Charging StationsProvisions for six (6) Elevators
  - Coordinated the charger equipment and installation

Arora provided the following electrical engineering services for the Customer Service Building:

- Main Building Connections

ALLEGHENY COUNTY AIRPORT AUTHORITY – TERMINAL MODERNIZATION PROGRAM

LANDSIDE PROGRAM, MULTIMODAL CENTER/ CONSOLIDATED RENTAL CAR FACILITY (CONRAC)

Pittsburgh International Airport, Pittsburgh, PA

+ Connection Points for Rental Car Fit Out
+ Public Address
+ Blue Phones system

Arora isprovided the following electrical engineering services for the Site Structures:

+ Overhead Sign connections
+ Surface Parking Security Cameras
+ Remote Lot Security Cameras
+ Remote Lot Telecommunications Equipment and Blue Phones
+ Remote Lots

PROJECT DETAILS

Client

Port Authority of NY & NJ
Omar Morales-Armstrong, AIA, LEED APBD+C,
Staff Services Architect
4 WTC, 19th Floor
New York, NY 10007
omarmstrong@panynj.gov
212-435-5792

Construction

$1,240,000,000

Project Start

2019

Project Completion

Est. Completion 12/2027

Highlights

+ GTC parking garage to include 1,950 parking spaces with 20% electric vehicle charging stations, and an estimated 180,000 square feet of new space
+ Providing all Fire Alarm, Plumbing, and Communications/Electronics Systems including: Parking and Revenue Control, EZ Pass, Mounted Welcome Center Information Display Wall(s), GT Info. Systems, Taxi Dispatch and Queue Measurement Systems, and Advanced Technologies for Parking Indication

PORT AUTHORITY OF NY & NJ (PANYNJ)

GROUND TRANSPORTATION CENTER

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

As part of the $19B, public-private John F. Kennedy International Airport (JFK) redevelopment, the airport is constructing a new roadway network to connect their four new, state-of-the-art hubs which will replace their six outdated terminals. This $1.24B portion of the JFK redevelopment includes the design/build of new, streamlined roadways, a Ground Transportation Center (GTC), and supporting infrastructure.

This assigment consists of the design and construction of an improved on-airport roadway transportation network, replet with roadway reconfiguration, maintenance and protection of traffic during construction, intuitive wayfinding and enhanced traffic technologies, along with at-grade pavement, retaining walls and bridges as well as utility relocations and upgrades.This new, simplified roadway network and GTC will dramatically improve access, navigation, and connectivity for the airport's 62M+ annual passengers.

"The transformation of JFK into a global gateway that will rival the best in the world would not be complete without the roads, parking and infrastructure to match," Port Authority Chairman Kevin O'Toole said in QNS article *Port Authority signs $1.24 billion contract to design, build new roadway network at JFK Airport.* "When we are done, JFK will be as easy to access as it is beautiful to behold, serving as the front door to the region that it deserves."

Located within the airport's Central Terminal Area (CTA), the new GTC facility includes ground floor arrivals for taxis, for-hire-vehicles, buses and private vehicles, as well as two levels of parking and the ability to support a high-rise commercial office space on the rooftop. The four-story GTC parking garage houses 1,950 parking spaces, with 20% dedicated to electric vehicle charging stations and room for expansion in the future to service 100% electric charging. The facility will also feature a passenger connector to the New Terminal One.

Photo Credit: WSP

PORT AUTHORITY OF NY & NJ (PANYNJ)

GROUND TRANSPORTATION CENTER (GTC)

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

The uppermost fourth floor level of the GTC parking garage included a landscaped green roof and was designed to support the addition of a high-rise commercial building referred to as JFK Central. This Over Site Development (OSD) structure consisted of six stories of commercial office space with approximately 180,000 gross square feet.

Arora Engineers (Arora) led MEP, fire alarm (FA), fire protection (FP) and special systems (SS) engineering as a subconsultant to Mott MacDonald, a member of the design team led by Parsons, for the schematic design of the GTC program. Arora provided plumbing, fire alarm and partial special systems electronics design services as a subconsultant to WSP, who was selected by the Port Authority to complete 60% design development plans and specifications used as bridging documents for procurement of a design/builder. Once selected, it was expected that Arora and the WSP team would be assigned to the design/builder to complete 100% construction documents.

Scope of work included:

Phase I – Schematic Design

The GTC related design services led by Mott MacDonald encompassed system schematics and spatial planning for the parking garage and future OSD. Arora detailed the Requirements and Provisions for Work (RPW), including general provisions, technical requirements, and the Basis of Design (BOD) with conceptual schematic design plans and details used as bridging documents for a design/build solicitation for the GTC parking garage and OSD development. Arora's scope of work included design for HVAC and plumbing, electrical power and lighting, fire alarm and suppression, and security/communications engineering for the parking garage. Arora design services for the future OSD included fire life/safety (both fire alarm and fire suppression) and special systems electronics design disciplines for the high-rise core and shell spaces.

Mechanical/Electrical/Plumbing Conceptual Design services included:

+ Determined the design criteria based on latest PANYNJ design standards and guidelines as well as relevant code requirements
+ Coordinated any related incoming site utilities with civil engineers
+ Reviewed applicable and available documents (including as-built drawings and/or reports) to support the conceptual design and a code review
+ Conducted field surveys to assess the proposed new layout and space requirements
+ Assisted in providing a schematic layout, design report and spec outline of the major equipment and systems
+ Prepared drawings showing major program spaces of the GTC
+ Prepared a design report outlining proposals for building services systems
+ Attended meetings and performed QA/QC of our work

Mechanical engineering services also included preliminary load calculations and ventilation requirements for spaces requiring HVAC, sizing of HVAC equipment in the proposed mechanical rooms, and installation and maintenance concepts for major plant equipment. Mechanical infrastructure included:

+ Heating systems and medium temperature hot water thermal distribution system
+ Chilled water system

PORT AUTHORITY OF NY & NJ (PANYNJ)

GROUND TRANSPORTATION CENTER (GTC)

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

+ Ventilation systems
+ Exhaust systems including exhaust fans at the first parking level interlocked with approved automatic gas detection devices and sized to comply with NYC Mechanical Code requirements
+ Air Conditioning (AC) systems

Electrical engineering and plumbing conceptual design services included designs for two 15kv substations and future provisions to service 100% electric vehicle charging stations. Details were included for all systems and lighting, with riser diagram(s) indicating all major components.

Fire protection conceptual design services included project definition design for fire protection systems based on project scope and code analysis for sprinkler, standpipe, and agent-based fire suppression systems, including standard wet and dry water-based sprinkler and standpipe systems. Deluge sprinkler, pre-action sprinkler and gaseous suppression systems for high value or high challenge assets were also included as part of this scope of work. Deluge suppression was required for specific areas due to potential of large-scale fires from heavy goods vehicles and buses that traveled through the GTC.

Additional fire protection services included:

+ Defined applicable codes and standards, facility standards and insurance carrier requirements
+ Reviewed as-built drawings, equipment list and inspection reports
+ Identified source of water supply (existing service, new service, tank, etc.), size/location of existing fire protection system(s), and hydraulic demand of existing fire protection system(s)
+ Defined hazard classifications and associated hydraulic design criteria, as well as special hazard fire protection systems
+ Identified location of fire protection systems, fire protection water supplies, fire protection areas/zones, feed mains, and special hazard fire protection systems
+ Provided a fire protection site plan indicating location/configuration

Special systems conceptual design scope of work included system schematics and spatial planning for security (access control, CCTV), telecom, WiFi, data closets, tolling, electronic signage, parking and flight kiosks and interface with a smart parking guidance system. The GTC was integrated into the airport's existing fiber optic ring topology, and the design included provisions for an Entrance Facility (EF) on the GTC arrivals level dedicated for use by commercial service providers. Features included:

+ Communications raceways for electronics with provisions for rack space within communications rooms and fibers required to inter-connect PARC systems and to connect those elements to the centralized revenue collection system.
+ Digital signage displays and information kiosks to share information with patrons concerning the GTC facilities and services, as well as up-to-date information concerning bus and train schedules.
+ Three independent radio systems (public safety, maintenance, and airport operations) in use at JFK with coverage extended throughout the GTC.

PORT AUTHORITY OF NY & NJ (PANYNJ)

GROUND TRANSPORTATION CENTER (GTC)

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

+ Taxi dispatch system and taxi queue measurement systems

LEED Silver Conceptual Design scope of work included review of LEED Silver options submitted by the LEED consultant for the project and support services for the LEED consultant. Arora was also a participant for the related MEP services.

QA/QC services were performed by Arora's quality control manager who participated in the scope of work and project expectations, provided general guidance and consultation to the project team related to the technical issues of the project, weighed in specifically on the electrical tasks and supported the electrical discipline lead and team on complicated electrical issues. This scope of work also included performing overall QA/QC for all disciplines per the Arora QA Process.

Phase II – Design Development

Arora's scope related to services as a subconsultant to WSP as they were retained by the Port Authority to redesign the GTC program as a four-story, precast, concrete parking garage. Arora provided plumbing, fire alarm, and partial special systems electronics design services that redefined the project's scope, scale, system concepts, and functional relationships to be used in bridging documents for a design/build delivery.

Arora was responsible for all fire alarm, plumbing, and communication/electronics systems including:

+ Parking and revenue control
+ EZ Pass
+ Welcome center wall – mounted information displays
+ Ground transportation information systems
+ Taxi dispatch system and taxi queue measurement systems
+ Advanced technologies for parking indication

Plumbing design services included the following:

+ Determining design criteria based on latest PANYNJ design guidelines and standards as well as relevant codes, such as the latest editions of the NYC Plumbing code, ASPE Data Book and ASHRAE 90.1 to size domestic water, sanitary, storm and gas services
+ Reviewing any applicable and available documents (including as-built drawings or reports) to support the conceptual design and a code review
+ Conducting field surveys to assess new layout and space requirements
+ Providing major equipment and systems layout including fixture count and calculations
+ Identifying locations and initial layouts, coordinating with the other MEP teams
+ Drawings showing major program spaces of the GTC, preliminary equipment scheduling, and circuitry/control intent and riser diagrams
+ Establishing layout of lighting fixtures showing design intent and necessary calculations for proper illumination levels
+ Designing narrative outlining proposals for building services systems

PORT AUTHORITY OF NY & NJ (PANYNJ)

GROUND TRANSPORTATION CENTER (GTC)

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

+ Providing system riser diagram(s) indicating major components

Fire alarm design services included project definition design for fire alarm systems to comply with applicable codes and standards. The systems tied into the fire alarm included standard wet and dry water-based sprinkler and standpipe systems as well as deluge sprinkler, pre-action and gaseous suppression systems for high value or high challenge assets. fire alarm design tasks included

+ Defining applicable codes and standards, facility standards, insurance carrier requirements
+ Defining fire alarm design objectives based on project scope and code analysis
+ Reviewing as-built drawings, equipment list, inspection reports
+ Identifying size/location of existing fire alarm system(s)
+ Defining hazard classifications
+ Providing location of fire alarm system
+ Providing firm alarm areas/zones
+ Providing location of special hazard fire alarm systems
+ Providing fire alarm plan indicating location/configuration of fire alarm features
+ Providing fire alarm system riser diagram(s) indicating major components
+ Providing fire alarm monitoring schedule

Photo Credit: WSP

Special systems electronics scope of work included system schematics and spatial planning for security (access control, CCTV), telecom, WiFi, data closets, tolling, and electronic signage, parking and flight kiosks and interface with a smart parking guidance system. Electronic systems as listed above included parking and revenue control, EZ Pass, a welcome center wall with mounted information displays, ground transportation information systems, taxi dispatch system and taxi queue measurement system, and advanced technologies for parking indication.

PROJECT DETAILS

Client

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

Construction

$144,600,000

Project Start

2018

Project Completion

2021

Highlights

+ Provided Special Systems and IT design and construction administration services for Garage C (appox. 3,000 spaces), and an approx. 64,000 sq. ft. administration building on the 5th floor.
+ Systems include Security, Public Address, MDF/IDF room layouts, structured cabling, EVIDS, Voice and Data, and Communications Systems.

METROPOLITAN NASHVILLE AIRPORT AUTHORITY

MNAA BNA 1902A TERMINAL GARAGE C & AIRPORT ADMINISTRATION BUILDING

Nashville International Airport, Nashville, TN

As part of BNA Vision, the dynamic expansion plan at Nashville International Airport (BNA), the Metropolitan Nashville Airport Authority (MNAA) is enhancing terminal area parking through three (3) garage projects (Garages A, B, and C).

Project 1902A, utilizing design-build methodology, is comprised of the design and construction of Garage C (approximately 3,000 spaces) and the Airport Administration Building (approximately 64,000 square feet). This project includes:

+ The demolition, removal, and disposal of the existing short-term garage and pedestrian walkway connecting the existing garage to the terminal.
+ The design and construction of Garage C including:
    + An Administration Building for MNAA and TSA administrative offices on the fifth (5th) floor of the garage.
    + Accommodations for a future transit station.
    + Coordination and accommodation of the Project 3 pedestrian bridge and canopy to be supported on the Garage C structure.
    + Pedestrian access from terminal to CONRAC.

Scope of work included:

Arora was selected to provide design and construction administration services for the Special Systems and IT services including Security (CCTV, Access Control), Public Address, MDF/IDF room layouts, structured cabling, Electronic Video Information Systems (EVIDS), Voice and Data, and Communications Systems.

Courtesy of Metropolitan Nashville Airport Authority

METROPOLITAN NASHVILLE AIRPORT AUTHORITY

MNAA BNA 1902A TERMINAL GARAGE C & AIRPORT ADMINISTRATION BUILDING

Nashville International Airport, Nashville, TN

Arora's scope of work includes:

+ Meeting with Stakeholders to understand the operating and business processes of MNAA.
+ Reviewing all relevant existing conditions and utility information associated with the existing facilities to be demolished.
+ Identifying the roles of technology on top of established published requirements to provide more specific technology design guidelines for the facility.
+ Developing plans and specifications directly with the build team.
+ Documenting all systems integrations across IT and technology systems.
+ Providing construction administration services.

PROJECT DETAILS

Client

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

Construction

$144,600,000

Project Start

2017

Project Completion

2018

Highlights

+ Provided design and engineering services for the Electronic Video Information Displays (EVIDS) in a new six-level parking and ground transportation structure.
+ Providing LEDs and LCDs sized to accommodate all flight information on all garage levels.
+ Providing programming and content guidelines for new LEDs and LCDs.

METROPOLITAN NASHVILLE AIRPORT AUTHORITY

TERMINAL AREA PARKING GARAGE A

Nashville International Airport, Nashville, TN

The first major project of BNA Vision, the Metropolitan Nashville Airport Authority's (MNAA) $1.2 billion comprehensive expansion plan, went underway with the construction of a new terminal area parking garage A and an administrative office building for $144 million.

The new six-level parking structure was constructed just south of the current short-term garage, which was demolished in 2018. The garage contained approximately 3,000 parking spaces, a large pedestrian plaza, a dedicated Ground Transportation Center on the first floor (for limos, shuttles, ride sharing, etc.), a parking space guidance system, electric vehicle charging stations, and a new parking management facility.

The garage also included a 64,000-square-foot airport administrative building on the fifth level. The office building replaced the MNAA's current space in the terminal and provided space for the Transportation Security Administration (TSA) and other airport services. The sustainable building also featured a rooftop canopy to capture upto 20,000 gallons of rainwater for landscape irrigation, as well as rooftop solar panels to assist in powering parking and airport operations.

Scope of work included:

Arora Engineers (Arora) was tasked with providing design and engineering services for the garage's new Electronic Video Information Displays (EVIDS). The scope of work included:

+ Providing the design, engineering, and specifications for LEDs and LCDs sized to accommodate all flight information, departures and arrivals for three hours, as well as airport facts on levels two through six, and flight information on level one (ground level).
+ Providing programming and content guidelines for new LEDs and LCDs, including color, font size, spacing, and all programming requirements.
+ Coordinating with the electrical, telecommunications, and structural engineers and/or sub consultants as necessary.
+ Specifying display mounts as required and providing wiring diagrams for EVIDS, as well as elevations for mounting heights as required.

Courtesy of Metropolitan Nashville Airport Authority

PROJECT DETAILS

Client

Gresham, Smith and Partners
Altan Cekin, Senior Architect
Two Harbor Place
302 Knights Run Avenue
Suite 900
Tampa, FL 33602
altan_cekin@gspnet.com
813-769-8917

Construction

$650,000,000

Project Start

2014

Project Completion

2017

Highlights

+ The HCAA is building the most state-of-the art ConRAC and APM system to date in the country.
+ Special systems design incorporates latest technology to enhance passenger experience.

HILLSBOROUGH COUNTY AVIATION AUTHORITY

CONRAC AND AUTOMATED PEOPLE MOVER

Tampa International Airport, Tampa, FL

Hillsborough County Aviation Authority (HCAA) is relocating the existing rental car facility currently located at the main terminal to a location approximately 1.3 miles south. Connecting the main terminal to the new consolidated rental car facility (ConRAC) is an Automated People Mover System (APM), which will include a station at each facility as well as at the existing economy parking garage located south of the main terminal and a station for tramcar maintenance. The ConRAC facility is a 4-level garage consisting of over 620,000 square feet per level including the customer service center on the top level. Its purpose is to provide the most state of art facility to operate from for the 14 rental car agencies.

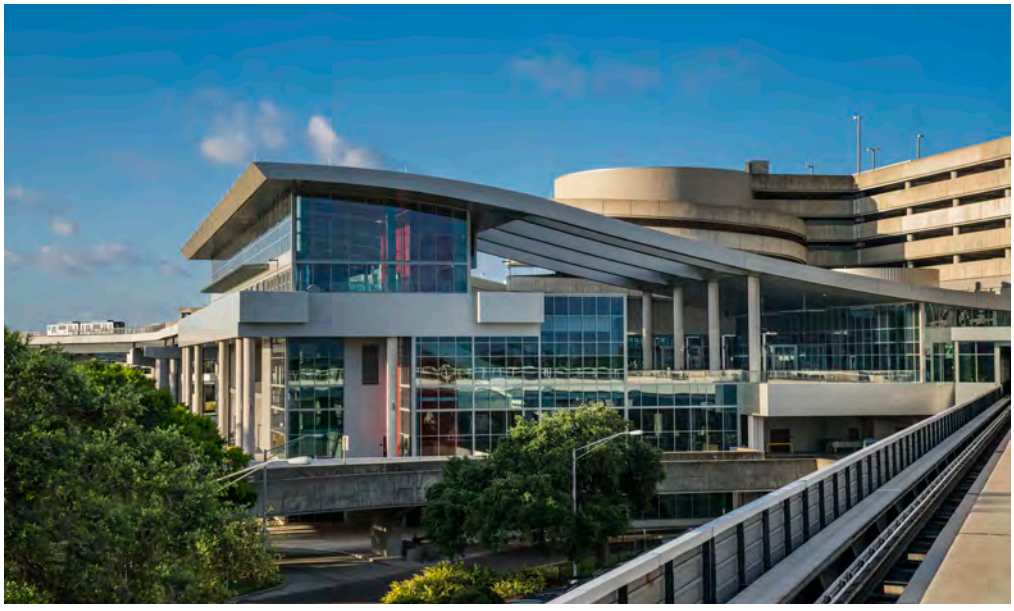
Arora was awarded special systems engineering services to provide an extension of existing systems including Public Address Paging System (PAS), and digital signage systems including the Electronic Video Information Display System (EVIDS), direct view LED dynamic signage, and touchscreen directory system. Also included is the design of all new telecom room layouts for both HCAA and Rental Car (RAC) tenants in the new facilities.

Scope of work included:

Telecommunication Room Design

There were almost 40 main and intermediate distribution frame telecommunication rooms throughout the ConRAC and 4 APM stations. Of these, in the ConRAC there are over 20 rooms dedicated to the RACs. Each room is unique in its size and requirements. Arora is providing design documentation for all telecom rooms including:

+ Coordinating equipment layouts between the disciplines and RACs.
+ Providing full rack/cabinet elevations to include telecom, security, PAS, digital signage and power management equipment.



Photos by Randy Van Duinen

HILLSBOROUGH COUNTY AVIATION AUTHORITY

CONRAC AND AUTOMATED PEOPLE MOVER

Tampa International Airport, Tampa, FL

+ Designing cable tray layouts per room layout and code.
+ Inter-discipline coordination for receptacle locations and cooling requirements.
+ Designing telecom room grounding plans for each individual communications room.
+ Coordination between RAC agencies for room requirements and RAC cabinet requirements.
+ Coordination of UCDS between facilities, telecom rooms and entrance facilities.

Public Address
The public address system for the new facilities is an expansion of the existing legacy analog IED system currently used at TIA. Arora's task is to provide the facilities with the latest network-centric announcement control system and an interface with the existing system in order to pass messages seamlessly from one platform to the other. In order to provide a complete system Arora's design includes the following:

+ Loudspeaker layout and selection in accordance to the architecture of each facility.
+ Speaker zone matrices, required wattage taps, and desired SPL for each zone.
+ Required head end equipment, network distributed amplifier frames, ambient noise sensor inputs, and interconnection details.
+ A hierarchy of announcement overrides including interfacing details with the APM announcement system.

Digital Signage
HCAA separates digital signage into three systems. The Electronic Video Information Display System's (EVID) duty is to display flight information. Arora is providing the facilities with 10 banks of 40 total LCD screens displaying this information. The interactive directories consist of large 70-inch touchscreen monitors that deliver passengers wayfinding information. Each of the five interactive directories Arora is designing also includes a scanner that allows a passenger to hold their boarding pass up to in order to find a direct route to their destination and stops along the way. Lastly, Arora is incorporating six high definition direct view LED signs spanning up to 20 feet in length that will provide passengers with welcome messages, visitor information and rental car information. Using a technical array of video hardware to manage and deliver content, Arora is expanding upon and improving the backend system to offer HCAA additional video capacity and control features not previously available. In order to achieve the distribution of information necessary throughout the facilities, Arora is providing the following services:

+ Coordination with existing EVIDS content provider and HCAA's data distribution process.
+ Structural coordination in constructing and installing the EVIDS/interactive directory bank structures to which the monitors mount as well as for installing large direct view LED dynamic signage.
+ Reconfiguring the Crestron video distribution system by replacing a 32 I/O port Matrix Switcher, video control processor and connection to the video wall system for cross platform sharing of video content. This includes a complete reprogramming of the entire video distribution system.
+ Research and Design of direct view LED system that fits HCAA's needs including specific sign control requirements.
+ Coordination of power and data requirements for all equipment.

HILLSBOROUGH COUNTY AVIATION AUTHORITY

CONRAC AND AUTOMATED PEOPLE MOVER

Tampa International Airport, Tampa, FL

+ Designing all systems to ADA standards including monitor display heights for interactive displays and character heights for legibility.

Construction Administration, Management, and Inspection
Arora was requested by Austin Commercial to provide on-site representation during construction of the Arora designed systems. These include Public Address Paging System (PAS), digital signage systems including the Electronic Video Information Display System (EVIDS), direct view LED dynamic signage, and touchscreen directory systems well as new telecom room layouts for both HCAA and Rental Car (RAC) tenants in the new facilities.

Photos by Randy Van Duinen

PROJECT DETAILS

Client

Los Angeles World Airports
Tyrone Jessamy
Airport Manager
6053 W. Century Blvd.,
Suite 200
Los Angeles, CA 90045
424-646-8295

Construction

Approx. $1 Billion

Project Start

2019

Project Completion

2024

Highlights

+ Special Systems Engineering
+ Additional services include Wi-Fi Design Support, Security, and Public Safety Radio DAS design support services
+ Total Car Capacity: 21,000
+ Building Concrete Area: 6.3 Million SF / Buildings Concrete Volume: 265,00 CY
+ Asphalt Paving Area: 703,000 SF
+ Photovoltaic Panel System
+ Utility Piping Length: 37,000 LF
+ Post Tension Tendon Length: 8,900,000 LF
+ Houses the World's Largest Gas Station, replete with 186 fueling dispensers
+ Reinforced Steel Weight: Over 56, 126,300 LBS

LOS ANGELES WORLD AIRPORTS

LAMP CONSOLIDATED RENT-A-CAR FACILITY (CONRAC)

Los Angeles International Airport, Los Angeles, CA

Arora Engineers (Arora), provided special systems design and engineering services for the new Consolidated Rent-A-Car Facility (ConRAC) at Los Angeles International Airport, a critical element of the Airports Landside Modernization Program (LAMP). This is a Private-Public Partnership (P3) contracting model, and Arora is a part of the LA Gateway Partners team. LAMP aims to alleviate congestion and provide better passenger movement within the existing Central Terminal Area (CTA), which the airport deemed necessary due to the nearly 6,000 vehicles which enter the LAX CTA each hour at peak traffic times. The major elements of the LAMP include the ConRAC, Intermodal Transportation Facilities, an Automated People Mover (AMP), improvements within the Central Terminal Area, a connection to the Metro Rail system, and various roadway improvements.

The ConRAC will include a Customer Service Building, access to an APM station, and employee and visitor parking areas. It will accommodate three levels of ready/return, quick turn-around, and vehicle storage for rental cars and a ground level bus plaza, with a vertical transportation core providing access to the Customer Service Building. The ConRAC will provide a range of amenities to customers including restrooms, food and beverage services, internet access and seating areas. The ConRAC is approximately a 5.3 million square foot facility, featuring 6,600 ready/return spaces, 10,000 idle vehicle storage spaces, 1,100 rental car employee spaces and Quick Turn Around (QTA) Facilities that allow for car washing, fueling and light maintenance.

Scope of work included:

Arora was responsible for Special Systems and Engineering design and support for project elements including:

LOS ANGELES WORLD AIRPORTS

LAMP CONSOLIDATED RENT-A-CAR FACILITY (CONRAC)

Los Angeles International Airport, Los Angeles, CA

- Audio Visual Systems Design for the public walkway, including:
  - All electronic video information displays, which were designed in close coordination with the architect and signage/wayfinding consultant in order to enhance customer experience and maintain consistency with other public facing systems and wayfinding tools design in the terminal.
- Public Address System, including:
  - Public address and emergency messaging
  - Speaker sections and locations coordinated with the architect
  - Ambient noise sensing system
  - Intelligibility modeling for all areas
  - Paging station requirements
  - Paging system zoning
  - Integration with EVIDS and visual paging systems for emergency notification
  - Wiring Diagrams
  - Elevations
  - Details
- Structured Cabling System design production and support for all related systems
- Wi-Fi Design support
- Security – Access Control and CCTV – design production
- Public Safety Radio DAS antenna layout and cabling infrastructure design
  - DAS antenna layout and cabling infrastructure design required to expand the system into and around the new ConRAC. Arora will complete all required design for this system as EOR.
- EVIDS and Public address were provided in the APM Public Platform, Walkway and courtyard areas

PROJECT DETAILS

Client

Clark/Weitz/Clarkson, A Joint Venture
Ben Bunge
Sr. Project Manager
7500 Old Georgetown Road
Bethesda, MD 20814
515-231-3101
ben.bunge@
Clarkconstructionjv.com

Construction

N/A

Project Start

2020

Project Completion

2021

Highlights

+ Arora provided Engineering Design Services (Special Systems & BIM) for the Kansas City International Airport (KCI) MCI Airport Terminal Modernization Project.
+ Project consists of a 1 Million square foot terminal facility.
+ Arora's scope specifically relates to the program's new vertical structures including the new single terminal and parking at KCI project.

KANSAS CITY AVIATION DEPARTMENT

AIRPORT TERMINAL AND PARKING GARAGE MODERNIZATION

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

The New Single Terminal and 6,000-spot parking garage at Kansas City International Airport (MCI) project consists of a 1 Million square foot terminal facility including curbside, ticketing lobby, TSA compliant security screening checkpoint, TSA compliant in-line Checked Baggage Inspection System and associated support areas, baggage claim areas, baggage make-up area and associated support functions. The parking garage is located directly in front of the new building. The terminal will include two concourses attached by a 634-foot connection with moving walkways above and baggage handling systems below. Officials expect to open 18 security lanes to service the 39-gate facility, which will replace the airport's current configuration with gates spread across separate terminals.

The new terminal at Kansas City International Airport new terminal is the largest single infrastructure project in Kansas City history. The facility will include secure concourses providing concessions and customer amenities. The facility supports 39 aircraft gates, but facility systems are designed to ultimately support 42 gates. The new single terminal project improves the passenger experience, particularly for those waiting out delays or making connections in Kansas City. It includes dozens of retail and restaurant options beyond security checkpoints. It also doubled the number of restroom facilities available with 120 toilets spread throughout the terminal.

Scope of work included:

This project is a great example of executing Arora's full suite of services and helping a client through the life cycle of an asset through design standards and planning, design, construction management, asset management including BIM-FM integration, and Operations and Maintenance support though Arora Technology Group and our ATLAS and Smart Restroom Technologies. Arora's scope specifically relates to the

Photo credit Clark/Clarkson/Weitz JV

KANSAS CITY AVIATION DEPARTMENT

AIRPORT TERMINAL AND PARKING GARAGE MODERNIZATION

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

program's new vertical structures including the new single terminal and parking at KCI project.

Special Systems:

Arora provided Special Systems Engineering Services to the Clark/Clarkson/Weitz (CWC) Joint Venture (JV) Team as a subconsultant to Siemens for the Systems Integrator role. Arora's Special Systems services included the following systems:

+ Access control system (ACS)
+ Video Surveillance System (VSS)
+ Public Safety Radio Distributed Antenna System (DAS) and Wireless Access Points (WAP or WiFi)
+ Converged Communications Network
+ Voice Over Internet Protocol (VOIP) Telephone System
+ Audio Visual (AV) Systems
+ Information Display System (IDS)
+ Visual Paging
+ IPTV
+ Common Use System (CUS)
+ Transportation Security Administration (TSA) and Customs and Border Protection (CBP) IDS/VSS

BIM and Maximo Ongoing Support:

Arora, along with their wholly-owned subsidiary, Electronic Data, Inc. (EDI), are also providing Building Information Models (BIM) for Facilities Management (FM) services to the CWC JV team. CWC is acting as Design Builder, on behalf of Kansas City Aviation Department (KCAD).

BIM-FM Model Strategy:

The project team finalized the overall BIM-FM Modeling Strategy and delivered an approved set of BIM Project Delivery Standards documents. Tasks involved reviewing KCAD's previously provided BIM documentation and drafting a new set of delivery standards, which included:

+ Overall Project Approach
+ Roles and Responsibilities
+ Processes and Software and Tools
+ The BIM-FM Model Strategy deliverable was achieved by:
+ Facilitating on-site workshops that reviewed existing documents
+ Performing follow-up interviews and discussions
+ Drafting a set of Delivery Standards Documents, and facilitating review of the standard documentation as well as incorporating feedback
+ Delivering a final set of Project Delivery Standards Documents

KANSAS CITY AVIATION DEPARTMENT

AIRPORT TERMINAL AND PARKING GARAGE MODERNIZATION

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

+ Presenting final content to KCAD and project management

Asset List, BIM-FM/EAM Asset Data Standard:

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

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

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

COBie Creation and Delivery Plan:

The project team reviewed the applicable BIM project delivery standards documents included as part of earlier deliverables, and developed a detailed COBie Creation and Delivery Plan, which included:

+ COBie Data Standard Definition (including nomenclature)
+ Process for Generating and Finalizing COBie Files
+ Roles and Responsibilities
+ Software and Tools
+ The COBie Creation and Delivery Plan was achieved by:
+ Facilitating on-site workshops to review existing documents
+ Performing follow-up interviews and discussions
+ Drafting a COBie Creation and Delivery Plan, and facilitating review of the plan as well as incorporating feedback
+ Delivering the final COBie Creation and Delivery Plan
+ Presenting the final plan to KCAD and project management

PROJECT DETAILS

Client

WSP | Parsons Brinckerhoff / HOK Joint Venture
Camille Bechara, PE
WSP | Parsons Brinckerhoff
75 Arlington Street, 9th Floor
Boston, MA 02116
Camille.Bechara@wsp.com
617-960-4854

Construction

$350,000,000

Project Start

2016

Project Completion

2017

Highlights

+ New seven-level, 3100 space parking garage
+ Provided fire suppression and fire alarm design
+ Provided data/ communication and signage design
+ Peer review of MEP designs

PORT AUTHORITY OF NEW YORK AND NEW JERSEY

CENTRAL TERMINAL BUILDING, WEST PARKING GARAGE

LaGuardia International Airport, New York, NY

Arora Engineers (Arora) performed engineering and construction administration services under the Public Private Partnership (P3) team led by Skanska/Walsh and HOK/WSP for the construct a new seven-level West Parking Garage (WPG) to accommodate 3,100 vehicles. The proposed garage structure was linked to the new Central Terminal Building (CTB) Headhouse via the West Garage Connector. Arora's scope included engineering and design services for special systems, fire protection, fire alarm systems, and MEP peer design review for the WPG. The garage was mainly considered a storage type occupancy with ancillary support occupancies for mechanical, electrical, toll collection, support personnel and pedestrian walkways, bridges, and connectors to the various components of the CTB.

Scope of work included:

Arora's scope of work included the design of the clean agent fire suppression systems for data rooms and similar critical assets, an automatic fire alarm system providing detection and notification as required, and an overall building lightning protection system.

Special systems (low voltage) design included data and communications elements associated with the WPG entry and exit tolling and revenue control and collection, design of the variable message signage associated with proposed Intelligent Parking System, and an overall peer review of the WPG's MEP/ design and plans This included the design of the systems and the production of the associated design plans, details, and specifications.

PROJECT DETAILS

Client

Frankfurt Short Bruza (FSB)
Mark E. Timbrook, AIA, DBIA, LEED AP BD+C
Principal, Aviation Market
5801 Broadway Extension
Suite 500
Oklahoma City, OK 73118
405-840-2931
mtimbrook@fsb-ae.com

Construction

$250,000,000

Project Start

September 2021

Project Completion

Est. April 2024

Highlights

+ A new terminal with up to eight contact gates
+ New aircraft ramp area
+ New parking garage and surface parking
+ On and off-site roadway improvements
+ New Rental Car Facility

THE MOBILE AIRPORT AUTHORITY

NEW TERMINAL & AIRSIDE / LANDSIDE FACILITIES

Mobile Downtown Airport, Mobile, AL

Arora Engineers (Arora), as a subconsultant to Frankfurt Short Bruza (FSB), provided Special Systems, Fire Alarm, and Fire Protection engineering services for the The Mobile Airport Authority (MAA) Mobile Downtown Airport New Terminal and Airside/ Landside Facilities project. The project includes a new terminal with up to eight contact gates, a new aircraft ramp area, a new parking garage and surface parking, on and off-site roadway improvements, and a new Rental Car Facility.

Scope of work included:

Design Services (Terminal and Parking Garage)

+ **Fire Protection:** Basis of Design (BOD) Scope of Work included fire protection systems to comply with applicable Codes and Standards. These included standard wet and dry water-based sprinkler and standpipe systems. In addition to the scope, Arora also deluged sprinkler, pre-action sprinkler and gaseous suppression system for high value or high challenge assets.
+ **Fire Alarm:** BOD Scope of Work to include the fire alarm systems to comply with applicable Codes and Standards. The Terminal and Parking Garage were protected throughout by a voice evacuation fire alarm system with automatic and manual fire detection as required by applicable codes and standards.
+ **Special Systems / Communication:** BOD Scope of Work included the low voltage systems of structured cabling, security (access control, CCTV), telecom, Wi-Fi, Data Closets, tolling, and electronic signage parking and flight kiosks and interface with smart parking guidance system of some sort.

Photo credit Mobile International Airport

PROJECT DETAILS

Client

HKS | Fitzgerald | Walker Parking | Thornton Tomasetti Joint Venture
Tony Brocato, AIA, NCARB, LEED GA
Vice President, Aviation Group
191 Peachtree Street NE, Suite 5000
Atlanta, GA 30303
tbrocato@hksinc.com
404-442-7878

Construction

$213,600,000

Project Start

2016

Project Completion

2020

Highlights

+ Full service MEP design for 6,000 vehicle parking expansion
+ Interface coordination with site utilities, telecommunications and civil contractor
+ Stakeholder (Atlanta Fire, City of Atlanta, City of College Park, Georgia Fire Commission, etc.) Management
+ Permitting Support
+ Procurement Support
+ Construction Support

CITY OF ATLANTA

DOMESTIC TERMINAL PARKING DECKS RECONSTRUCTION & REPLACEMENT, WEST PARKING DECK

Hartsfield-Jackson Atlanta International Airport, Atlanta, GA

Hartsfield-Jackson Atlanta International Airport, the world's busiest airport by passenger volume, provides more than 29,000 public parking spaces, 13,030 of which are in parking decks. The airport increased parking capacity to accommodate future growth.

As part of the Joint Venture Team, Arora Engineers (Arora) provided electrical (power and lightning), plumbing, fire protection, and fire alarm design services for the West Parking Deck to provide additional parking for approximately 6,000 vehicles in order to compensate for the loss of parking during the demolition and reconstruction of the North and South Domestic Terminal parking garages include approximately an additional 12,000 spaces.

This project included a Bronze level Park Smart infrastructure with the latest technology for Digital signage and wayfinding, lighting and controls, parking occupancy, security, and parking revenue systems as well as many user amenities not typically found in these facilities. The electrical system also provides emergency power backup to maintain full operations during loss of power.

Scope of work included:

ELECTRICAL

This Bronze level Park Smart infrastructure comprised of the latest technology for Digital signage and wayfinding, lighting and controls, parking occupancy, security, and parking revenue systems as well as many user amenities not typically found in these facilities. The electrical distribution system was provided with significant emergency and standby power backup to maintain full operations during loss of power and included complete OCP selective coordination, short circuit and arc flash analysis from the utility point of service to the last OCP device in the electrical distribution system to assure enhanced reliability

CITY OF ATLANTA

DOMESTIC TERMINAL PARKING DECKS RECONSTRUCTION & REPLACEMENT,

WEST PARKING DECK

Hartsfield-Jackson Atlanta International Airport, Atlanta, GA

FIRE ALARM

The ATL West Deck project included the design of a new addressable fire alarm system to provide code compliant fire detection, building system interconnection and occupant notification. Based on Arora's code analysis the occupancy of the open deck parking garage did not require general area smoke detection however it did require complete occupant notification and fiber optic interconnection to the facility wide campus fire alarm network. The fire alarm system consisted of one head end panel located in a secure electrical room and an additional eight sub-panels with power supplies located levels on levels 2 and 5 to distribute circuiting to the field devices.

The fire alarm system included initiation, interconnection, and notification field devices throughout. A fire smoke detector was located above each fire alarm panel and sub-panel to meet the NFPA-72 requirement to protect the fire alarm equipment and each IDF room was provide with a heat type fire detector. Each elevator lobby was provided with a heat detector to initiate primary and alternate level elevator recall and pull stations were located at all exits. In addition to the initiation devices input/output modules were installed to supervise the building fire protection systems as well as interface with the elevator and HVAC systems.

In the event of a fire the fire alarm system would initiate the notification appliances on all six levels of the parking garage and activate all 440 horn/strobes. Upon activation the fire alarm system would also display the address of the device in alarm at the fire alarm panel display as well as transmit the information across the facility wide fiber network to the operations center. The design team coordinated with the existing facility vendor to identify the most efficient means and methods of interconnecting with the existing fire alarm network to ensure minimal disruption to facility operations

FIRE PROTECTION

The new West Deck parking garage project was designed in accordance with NFPA-14 and all local codes, standards and client guidelines. Due to the open nature of the parking garage the structure did not require sprinkler protection however due to its height it did require a fire protection standpipe system. The fire standpipe system was designed as a Class I manual dry type system (piping is empty except when filled by the fire department) due to the unconditioned nature of the structure. The standpipe consisted of 16 interconnected risers with isolation control valves and 96 fire hose valves located at level of each egress stairwell. Each riser was interconnected by an 8-inch fire main allowing all risers to be filled simultaneously. To fill the manual dry standpipe system two remotely located fire department connections were designed to be within 100 ft of the nearest fire hydrant and coordinated with the Authority Having Jurisdiction.

PROJECT DETAILS

Client

HKS, Inc.
Tony Brocato, AIA NCARB
Vice President, Aviation Group
191 Peachtree Street, NE
Suite 5000
Atlanta, GA 30303
404-442-5436
tbrocato@hksinc.com

Construction

N/A

Project Start

2021

Project Completion

2024

Highlights

+ Design and construction administration services for the Hartsfield-Jackson Atlanta International Airport (ATL) Domestic Terminal Parking South Deck.
+ Scope of work included Fire Suppression, Fire Alarm, BIM.

CITY OF ATLANTA DEPARTMENT OF AVIATION

DOMESTIC TERMINAL PARKING SOUTH DECK

Hartsfield-Jackson Atlanta International Airport, Atlanta, GA

Arora Engineers (Arora), servings as a subconsultant to HKS, Inc., provided design and construction administration services for the Hartsfield-Jackson Atlanta International Airport (ATL) Domestic Terminal Parking South Deck. The project included Schematic Desig, Design Development, and Contract Documents followed by Construction Administrative phase services. The new South Deck will provide 6,600 spaces serving airport patrons to compensate for the loss of parking during the demolition and reconstruction of various on-going projects at ATL.

Scope of work included:

Arora's Scope of Services include the following disciplines:

Fire Protection:

+ Incoming Fire Service/Available Water Supply
+ Fire Pumps (as required)
+ Fire Standpipes and Hose Valves
+ Critical Asset Protection (Pre-Action Sprinkler, Clean Agent, etc.)
+ Areas to omit Sprinkler Protection (elevators, elevator machine rooms, etc.)
+ System Zoning
+ Interior Sprinkler Systems (extension of existing vs. new)
+ Adjust existing sprinkler layout as needed to meet code coverage requirements
+ Install new fire protection line(s) and heads as required to ensure coverage requirements are meet

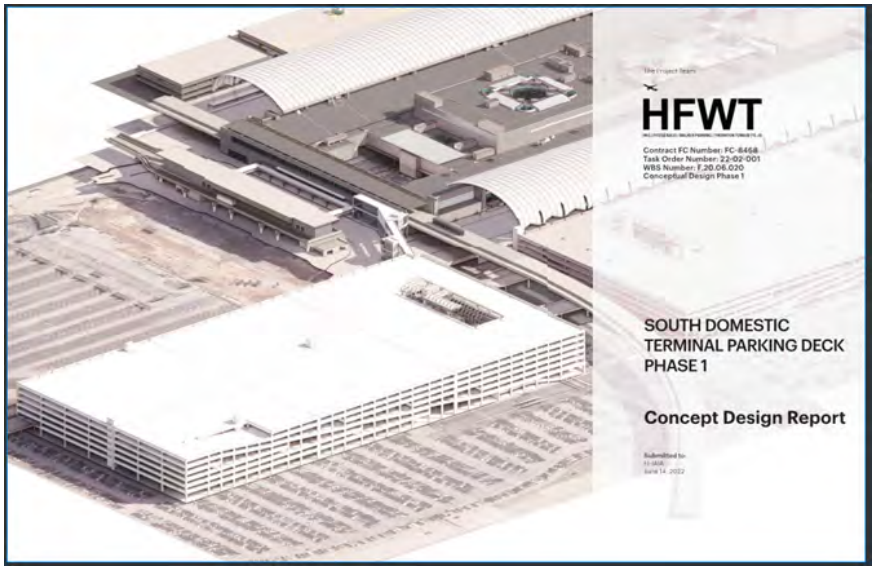


Photo credit HFWT JV

CITY OF ATLANTA DEPARTMENT OF AVIATION

DOMESTIC TERMINAL PARKING SOUTH DECK

Hartsfield-Jackson Atlanta International Airport (ATL), Atlanta, GA

- New wet fire protection system to include the following:
  - Combined standpipe/sprinkler riser
  - Drain Riser
  - Zone Control Assembly
  - Distribution Piping with the following:
    - Cross main
    - Branch lines
    - Sprinkler Head Coverage in accordance with NFPA 13
- New dry-type fire protection system included the following:
  - Combined standpipe/sprinkler riser
  - Drain Riser
  - Zone Control Assembly
  - Air compressor or nitrogen generator
  - Distribution Piping with the following:
    - Cross main
    - Branch lines
    - Sprinkler Head Coverage in accordance with NFPA 13

Fire Alarm:

- Primary and Back-up Power for Fire Alarm Systems
- Fire Alarm Panels (new system interconnect to existing campus wide system)
- Interface to existing networks
- Central Station and on-site Monitoring/Reporting
- Manual Pull Stations
- Fire Detection (smoke, heat, etc. and locations, all areas) included the following components:
  - Pull Stations located at every emergency egress door
  - Smoke Detectors: quantities and locations
  - Combination Horn/Strobes
- Critical Asset Fire Detection (Aspirating type smoke detection)
- Audio/Visual Notification
- PA System Interconnection
- Mass Notification Systems
- Interconnection with off-site monitoring (Fire department monitoring)
- System Zoning

PROJECT DETAILS

Client

WSP
Camille Bechara, PE, CCM,
Vice President, PPM
75 Arlington Street
Boston, MA 02116
Camille.Bechara@wsp.com
(617) 960-4854

Construction

$250,000,000

Project Start

2018

Project Completion

2021 (On-Hold)

Highlights

+ Project aims to add 5,000 new parking spaces at BOS
+ Technical studies for the initial conceptual design phase, as well as design drawing development for the subsequent preliminary design phase
+ Anticipated to include final design work for the garage, and special systems work for the Automated Parking Space Identification and Tolling Systems
+ Future Asset Management integration associated with the overall garage construction

MASSACHUSETTS PORT AUTHORITY

5,000 PARKING SPACES

Logan International Airport, Boston, MA

Arora Engineers (Arora) provided planning and design services to the WSP team for the design of 5,000 new parking spaces at Logan International Airport (BOS). Project goals included the design and construction of new parking spaces distributed between the existing Terminal E surface parking lot and existing economy parking structure. The project will be executed in two phases, with phase 1 consisting of adding 2,000 new spaces at Terminal E and phase 2 entailing the addition of 3,000 spaces at the Economy Garage. BOS's goal is to reduce greenhouse gas emissions and congestion with these additional parking spaces which aim to lessen pickup and drop-off passenger traffic.

Considerations for the Terminal E surface parking lot included coordination with the existing utility tunnel below the site, protecting and connecting the existing elevated walkway to Terminal E, and options to connect the original West Garage via an elevated vehicle bridge. Considerations for the economy parking structure site included constructability for building over the existing garage, and the ability to accommodate a future people mover, which will provide direct access to Terminal E via the walkway. Arora was subcontracted to provide fire alarm system and special systems (communications, digital signage & parking technology) engineering and design.

Scope of work included:

Arora assisted the team in conducting technical studies for conceptual design elements including traffic, construction, and sustainability. The technical study established the layout, disposition, and functioning of the program elements on the site in building structures. For the subsequent preliminary design phase, Arora assisted in the preparation of preliminary design documents and drawings for fire alarm and special systems engineering.

Rendering Courtesy of Massport

MASSACHUSETTS PORT AUTHORITY

5,000 PARKING SPACES

Logan International Airport, Boston, MA

Arora designed a comprehensive fire alarm and detection system throughout the parking garage. The system included control panels, sub panels, annunciators and associated equipment, wire and conduit to provide a fully addressable fire alarm system, and layouts of all smoke detectors, heat detectors, duct smoke detectors, pull stations, monitor modules, relay modules, horn, strobes and all other field devices pertaining to the fire alarm system. This multi-faceted system interconnected with the garage and overall fire/life safety, elevator recall, and pedestrian walkway systems. Arora's work included the design of the systems and the production of the associated design plans, details, and specifications. The fire alarm system tied into the existing Massport BOS fiber optic ring and provides notifications to the BOS wide area network at each MDF demarcation. Arora also provided close coordination with the public address system during this phase of work.

Arora's design services also included low voltage, data, and communications cabling, networking, and equipment associated with Wi-Fi systems, the CCTV system, DPIPs, the support infrastructure for the Automated Parking Guidance Systems (APGS) and the Electronic Payment Collection and Tolling Systems. This included the design of the systems and the production of the associated design plans, details, and specifications. In addition, Arora provided special systems design for revenue collection systems for the garage. This required infrastructure design which accommodated the payment collection systems at the garage and parking exits and entrances.

The project was put on hold in March 2020 due to COVID-19 related factors just prior to completing the final design phase. Arora was also tasked with coordinating and assisting with Asset Management (AM) and MAXIMO Integration associated with the overall garage construction. The scope under this work order involved development of a project specific AM plan to establish project protocols for the identification, tagging, data collection, and migration of this data into Massport's Maximo platform.

Rendering Courtesy of Massport

PROJECT DETAILS

Client

AECOM
Roger Gagnier
Vice President
One Federal Street, 8th Floor
Boston, MA 02110
Roger.Gagnier@aecom.com
617-371-4409

Construction

N/A

Project Start

2017

Project Completion

2021

Highlights

+ Provided peer review services for mechanical, electrical, and plumbing of the South Station bus terminal and parking garage.
+ Performed a general HVAC and ventilation review, plumbing review, and fire protection review.
+ Performed a platform lighting review, bus loading area lighting review, and a concourse lighting review.

MASSACHUSETTS BAY TRANSPORTATION AUTHORITY

SOUTH STATION DESIGN REVIEW

Boston, MA

Arora Engineers (Arora) was tasked with providing peer review services to the Massachusetts Bay Transportation Authority (MBTA) for the expansion of their South Station bus terminal and parking garage. The expansion was built over South Station's rail tracks and platforms that served both the MBTA's commuter rail service and Amtrak. This work was part of a larger private developer air rights project that constructed multiple high-rise office and residential towers and additional parking garage levels over the bus station expansion.

Scope of work included:

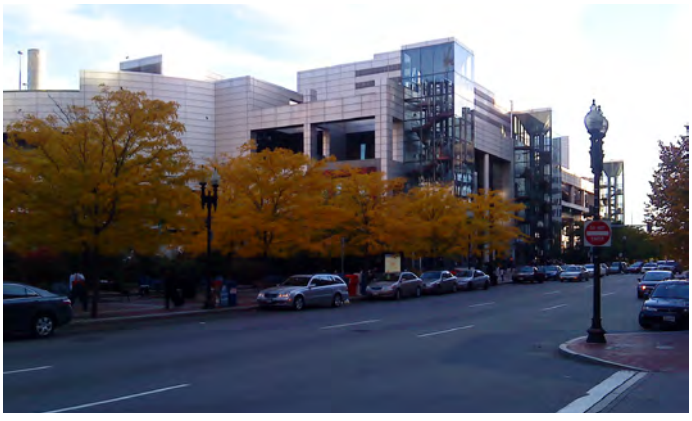
Arora's scope of work involved general engineering support for mechanical, electrical, and plumbing designs including technical reviews of plans and specifications and other project documentation for compliance with the MBTA's requirements.

Mechanical and Plumbing

+ General HVAC and ventilation review
+ Plumbing review
+ Fire protection review
+ Platform ventilation review
+ Bus loading area ventilation review
+ Track hood calculations review
+ Heating system performance review

Electrical

+ Platform lighting review
+ Bus loading area lighting review
+ Bus concourse lighting review
+ Indoor and outdoor parking level lighting review
+ Telephone and fire alarm systems review



EV CHARGING STATION EXPERIENCE

Electric Vehicle (EV) Charging Stations

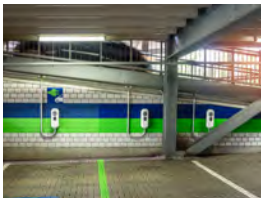
For over 38 years Arora Engineers (Arora) has concentrated on the Aviation industry as a core client, and during this time we have challenged ourselves to rethink the role of the traditional engineering firm. As a result, we've evolved our practice to emphasize the technology and processes that provide communication and interoperability between land and asset infrastructure-based systems to improve operations, performance, and longevity and make life safer and easier for those who use it. The firm employs 200+ staff members in 13 offices across the nation.

We are airport people who understand that aviation facilities are among the most complex and dynamic environments for systems design. Continuously evolving user needs, security concerns, and technology demands that airport system architectures be open to facilitate change, as well as the exchange of information with users and other systems. Arora consistently ranks amongst the top airport engineering firms, earning #6 on Building Design+Construction's (BD+C) 2021 Airport Sector Giants list, and ranking overall as #27 on BD+C's 2021 Giants 400 report.

Arora's national engineering practice is built on the principles of quality, innovation, and hyper-responsiveness, and includes not only electrical, but special systems and communications, mechanical, plumbing, and airfield electrical. From the initial design process, bid services, and cost estimation to construction and ongoing facility maintenance and management, Arora's team of professionals is equipped to address any problem, and most importantly, to find the right solution. Our team can plan and design, as well as perform construction management, inspection, and mastern systems integration services (MSI) to provide a complete EV program solution.

Arora has provided Electric Vehicle (EV) charging station electrical infrastructure design for clients across the country. One example of our EV charging experience is our engineering services for the installation of 24 new electrical vehicle charging stations at the Philadelphia International Airport garages, and other various garages in center city Philadelphia locations in conjunction with the Philadelphia Parking Authority. Services included generation of the EV charging station installation Basis of Design documents, field investigations of the various locations to determine the adequacy of available power supplies, assessment of the proposed locations for constructibility issues, and analysis of cellular connection capabilities for EV charging station wireless payment interface. Design and construction phase services included load calculations, EV charging station layout, engineering design, preparation of drawings and specifications, and construction cost estimates. Additionally, Arora has provided EV charging station design as electrical Infrastructure for ATL and their new West Parking Garage as well as numerous other projects.

Selected Project Experience



Philadelphia Parking Authority, Electric Vehicle Charging Stations, Philadelphia, PA

Provided engineering design services for twenty four Level II EV charging stations at the PHL airport and other various garages in center city Philadelphia locations in conjunction with the Philadelphia Parking Authority. Design services included generation of the EV charging station installation Basis of Design documents, field investigations of the various locations to determine the adequacy of available power supplies, assessment of the proposed locations for constructibility issues, and analysis of cellular connection capabilities for EV charging station wireless payment interface.

Allegheny County Airport Authority – Multimodal Center/Consolidated Rental Car Facility, Pittsburgh International Airport, Pittsburgh, PA

The TMP Landside projects include a new, billion-dollar 700,000 SF terminal that consolidates ticketing, security checkpoints and baggage claim, and multimodal complex that includes a new 3,300-space parking garage connected to the Landside Terminal by two pedestrian bridges, rental car facilities and entrance roadways designed to improve the passenger experience. Arora's scope of work included the Parking Garage electrical distribution and equipment/system power connections to provide a fully functional electrical system including thirty three Level II EV charging stations. Arora was also responsible for the coordination of Charger equipment and installation.

Port Authority of New York and New Jersey, New Terminal One, John F. Kennedy International Airport, Queens, NY

Arora is providing professional engineering and project controls services to the Carisle Development team for the construction of the new Terminal One at John F. Kennedy International Airport (JFK). Arora's scope of work includes a 1200KW Level 3 EV charger system that we are specifying, a 1000KW Level 3 Electric Bus Charging system as well as the 2000KW eGSE Level 3 system for 120 vehicles.

City of Atlanta, Domestic Terminal Parking Decks Reconstruction & Replacement, West Parking Deck, Hartsfield-Jackson Atlanta International Airport, Atlanta, GA

As part of the Joint Venture Team, Arora provided electrical (power and lightning) design services for the West Parking Deck to provide additional parking for approximately 6,000 vehicles. Arora's scope of work included EV charging station design and electrical Infrastructure as well as coordination of Electric Vehicle equipment and installation.

City of Atlanta, Facility, Asset Management and Sustainability (FAMS) On-Call, Hartsfield-Jackson Atlanta International Airport (ATL), Atlanta, GA

Arora was subcontracted to provide engineering assessment and planning services to the Haley Aldrich Jacobsen Daniels Joint Venture team in the development, support, and implementation of programs in support of ATL's 100% Renewable Energy Plan. Tasks under this on-call agreement included electrical engineering services for EV charging station telemetrics, as well as an electrical evaluation and interior electrical routing services for an EV charging station infrastructure plan. Arora reviewed existing electrical infrastructure conditions and facilities and provided schematics of electrical utilities and provided plans for EV charging station options and locations with strategic 'smart growth' and design for future installations and anticipated parking demand considerations. In addition, our team provided a review of existing electrical infrastructure near two re-charger locations that could accommodate future electric shuttle buses.

Rethinking Infrastructure®

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