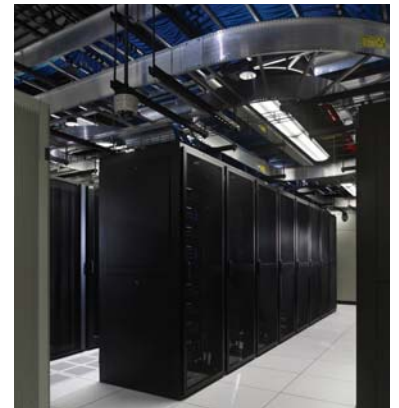




Data Center Experience

Select Clients

- AAA Mid-Atlantic
- Administrative Office of PA Courts
- BlackRock
- Bristol-Myers Squibb
- Cephalon
- Children's Hospital of Philadelphia
- Colorcon
- Cummins
- De Lage Landen
- General Services Administration
- Hewlett Packard
- Independence Blue Cross
- ING Direct
- Morgan Lewis
- New Jersey Manufacturers
- Nutrisystem
- Pennsylvania State Employees Credit Union
- Philadelphia Stock Exchange
- Radian Guaranty
- SAP America
- School District of Philadelphia
- Temple University Health System
- Time Warner
- Virtua Health System
- West Chester University
- Numerous Confidential Financial Firms'



With a distinguished 29 year record of engineering excellence for Data Centers nationwide, Bala provides cost effective solutions that focus on flexibility, reliability, scalability, and value for our clients. Data Centers are engineering intensive and engineering driven projects. Downtime is not an option in any facility.

Bala has been designing Data Centers since our first day in business, and Data Centers remain our main focus. We have completed hundreds of Data Center projects for global business leaders, healthcare institutions and universities throughout the United States.

Technology is an asset company's leverage for a competitive advantage, and is rapidly changing the way Data Centers are designed and utilized. Bala's expertise in adapting leading-edge technologies for our clients' benefit is a valuable resource. Our engineering solutions anticipate the specific demands of a project and are developed to sustain critical operations, as well as minimize construction chaos in new and existing Data Centers.

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Project Types

Risk Assessment

Site Selection

MEP/FP Engineering

Data Center Layout

Integrated Technology Systems / Security

Building Information Modeling

Computational Fluid Dynamics

Integrated Systems Testing

Data Center Migration/Relocation



Global Communications Firm

Key Facts

Location: Centennial, Colorado
Total Square Feet: 103,000
Data Center: 60,000
Outdoor Infrastructure Yard: 43,000
Completed: 2008
Construction Cost: \$24M
Services: MEP/FP, Structural, Voice/Data
Engineering, Security, Integrated
Systems Testing
Architect: Meyer Design
Construction Manager: Saunders Construction



Tier II+
N+1 Cooling Configuration
2N Electrical System
Double Interlock Pre-action Sprinkler
VESDA Early Alarm

The goals for this facility were to make it flexible, robust and scalable, for all of the company's business units. The client also wanted to follow their corporate commitment to green building, so many sustainable initiatives were reviewed, and incorporated into the design and build. Sustainable features include a fan wall system and free cooling capabilities, high efficiency lighting fixtures and controls, a new white TPO roof with .90 emissivity, low VOC emitting paint, and steel with high recycled content. The engineering design yielded an Annualized PUE of between 1.25 and 1.30.

The mechanical system for the Data Center access floor area was engineered for varying zones and has an average load density of 284 watts/SF. Cooling for these loads is delivered primarily through a 42" access floor, and is provided by a fan wall system, comprised of 7 -195 ton fan units. The fans are controlled by variable frequency drives, which respond to inputs from a feedback control system, with temperature, pressure and humidity monitoring. Cooling is delivered only as required to meet the demand, producing energy savings. The system's design also allows the client to capitalize on an expected 200 calendar days of free cooling each year.

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In addition to the primary Data Center cooling, higher density zones (16kW - 22kW/cabinet) have supplemental overhead cooling systems as well. The overhead trolley system allows the client to deploy supplemental overhead units, in an active server cabinet pod, without disrupting operations and adjacent equipment.



Global Communications Firm cont'd

ELECTRICAL SYSTEMS

The electrical power distribution is derived from a new 13.2kV, 12MW utility source, and the facility is designed to accept a second service in the future. The power is transformed with 4 MVA padmount oil-filled transformers. The oil is biodegradable soybean and seed oil. Power is delivered to the Data Center via UPS modules in a 2N configuration. To maximize the utility of the building space, an 8,000 SF mezzanine was added over the UPS rooms for battery rooms. Power is distributed to the Data Center cabinets overhead. This facility uses a Starline Bus system, chosen for its flexibility, and ability to rapidly deliver power to cabinets.

STRUCTURAL SYSTEMS

The building's existing roof structure was not designed to accommodate the added loads of the overhead equipment and conveyance systems. Screw piles, columns, and a lattice of frame steel members was added to the structure to support the new loads of approximately 125 lbs/SF.

INTEGRATED TECHNOLOGY SYSTEMS

The technology systems in this facility were distributed in a multi-level, overhead support system, utilizing 2 distinct topologies for both the optical and UTP cable plant. Access floor systems included DMZ, SAN, high-density server farms and core business operations servers.

In addition to completing this project, we also created a Corporate Standards document governing technology infrastructure and Data Center deployment for all future Data Center projects, as well as standards to retrofit existing on-line facilities, for this global communications industry leader.

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Financial Services Firm

Key Facts

Location: Wayne, PA
Square Feet: 125,000
Ongoing Services
Services: MEP/FP, Structural, Voice/Data
Engineering, Security, Integrated
System Testing

Tier IV
2(N+1)
Primary Data Center
Disaster Recovery Data Centers
Corporate Campus



Bala has provided engineering services to this financial firm since 1985, and continues to today. Multiple Data Centers, print mail centers, and office spaces have been engineered by Bala. Their facilities range in level from Tier III to Tier IV. Because of the sensitivity of their business, the design of their facilities consistently requires uninterrupted operation of their existing Data Centers. To date Bala has successfully executed the design and implementation of all of their projects without interruption to existing service.

Most recently we provided the complete engineering services for the recent renovation and upgrade of their 125,000 square foot Operations Center upgrading it to a Tier IV facility. Electrical design involved the addition of multiple diesel generators and separate electrical services from two PECO substations to provide a 2(N+1) level of redundancy. Two (2) independent UPS systems serve power centers through static transfer switches. The new UPS system comprises two (2) 600 kW/750 KVA modules in parallel redundant configuration, which were added to the existing three (3) 270kW/338 KVA modules. The new standby generator system comprises four (4) 1250 kW/1565 KVA diesel engine generators in parallel redundant configuration, which were added to the existing three (3) 1000 kW diesel engine generators.

Bala also designed a Commissioning/Integrated Systems Testing plan that details the inspection and documented testing of a Tier IV, Class A fault tolerant 2(N+1) facility for redundant critical systems in the Data Center. Test procedures were written and executed for UPS, generator and electrical distribution systems, HVAC, double-ended substation, humidification, RO System, Building Automated Systems, EPO System and other systems.

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Pennsylvania State Employees Credit Union

Key Facts

Location: Susquehanna Township, PA
Total Square Feet: 229,000
Data Center Square Feet: 5,000
Completed: 2012
Services: MEP/FP, Structural, Voice/Data
Engineering, Security and LEED
Commissioning
Architect: Crabtree Rohrbaugh & Associates



Seeking LEED-NC Gold Certification

Two Data Centers in the facility: Primary
Tier II Data Center and Synchronous Disaster
Recovery Site

Supplemental Power via Cogeneration and
Photo Voltaic Array

PSECU's new Greenfield Headquarters and Data Center facility is seeking LEED-NC Gold Certification. The facility includes two separate Tier II Data Centers, one being a synchronous Disaster Recovery Site, in addition to an offsite DR Data Center. The facility includes 200kW PV solar array and 800kW Co-Generation turbine plant with an absorption chiller and heat recovery package. The Data Center IT infrastructure includes Fiber Channel Over Ethernet with dual path redundancy.

The cooling system features AHUs for the Data Centers, CRACs units for the UPS and IDF rooms, air cooled chillers, absorption chillers as part of the cogeneration system, air side and water side economizers, high density cold aisle containment, and other scalable components. Two 225kVA UPS modules for each DC, for a total of Four UPS modules, one generator, 2.5MW for the office component and 800kW cogeneration turbine system for primary peak load shaving as well as the DC backup power. Pre-action sprinkler fire protection with a total flooding clean agent system, both are separate systems for each DC. Data Center IT infrastructure includes top of rack switching and Fiber Channel Over Ethernet with dual path redundancy. The facility will have a 100kW UPS for critical workstation power, hot water and steam boilers. The facility will also have a 2kW windmill power generator. The building mechanical systems will utilize under floor air distribution on a portion of the first floor and all of the 2nd and 3rd floors for better comfort, displaced ventilation, individual user adjustability of space temperatures and increased free cooling periods. The remaining portion of the 1st floor will utilize an overhead VAV system.

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The main power system will be supplemented by a solar photo voltaic array and a Co-Generation, Combined Heating and Power System (CHP). The solar photo voltaic array is expected to provide 20% to 28% of the daytime energy required for the facility.



Financial Firm

Key Facts

Location: Bala Cynwyd, PA; New York, NY;
Chicago, IL

Completed: 2009

Services: MEP/FP, Structural, Voice/Data
Engineering, Security

This Global Trading Firm's operations on Five (5) continents are served by this Global Operations Data Center. The multi-phased project included upgrades and expansion of the existing Data Center, infrastructure upgrades to support the expansion, and a new Data Center designed for high density server applications (250watts/sq.ft.).

Existing Data Center expansion and upgrades were designed to maintain ongoing operations. Infrastructure upgrades include reconfiguring a regular reserve service to bring it into 2N compliance, with a new dual 15kV utility service, paralleling switchgear, a new 4,000 kVA double-ended unit substation, two (2) 2,000kW/2,500kVA, 13.2 kV emergency generators, two (2) 675 kW/750 kVA UPS modules in a parallel redundant configuration, and a flooded cell battery plant. PDUs were added in a 2N configuration to support dual-corded loads. HVAC distribution switchboards support new CRAC units and extreme density cooling units, chillers and pumps.

In addition to their global operations data center, we have also engineered multiple regional data center expansion projects on Wall Street and in Chicago. The projects included adding access floor server space to the existing Data Centers, and upgrading the infrastructure to include A & B UPS systems, with dedicated CRAC units and pre-action sprinkler system. All upgrades were designed for implementation without interruption to daily trading operations.

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Temple University Health System

Key Facts

Location: Philadelphia, PA
Data Center Square Feet: 29,000
Completed: 2009
Services: MEP/FP, Structural,
Voice/Data Engineering, Security

Tier III



Temple's new mission critical Data Center was engineered to support advanced technology functions for the health system and hospitals. The new Access Center provides real-time access to patient information and imaging during patient procedure; keeping this top-rated teaching hospital ahead of the technology curve.

The Data Center's electrical system is designed for Tier III distribution, with two (2) 2000 kVA substations, redundant 500 kVA/450 kW UPS modules, and one (1) 2000 kW diesel generators. Both the Data Center and the Access Center are supplied by the new electrical distribution system. The Data Center has a 30" access floor, and is cooled by redundant CRACs in an N+1 configuration. The Data Center has a pre-action sprinkler system, a clean agent fire suppression system, leak detection system and site monitoring system.

The new Data Center utilized 100% optical fiber for their structured cabling system. Utilizing fiber was more cost-effective, and offered more flexibility and scalability, which was critical to Temple. The fiber also required significantly less overhead cable tray routing and allowed them to switch from a three tier cable tray to a single tier. New equipment can be layered into the Data Center with minimal impacts or upgrades required to the existing core infrastructure. The optical infrastructure was designed to anticipate future bandwidth enhancements with regards to 10/40 and 100 Gigabit Ethernet transmission speeds.

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Communication Service Provider

Key Facts

Location: Multiple Locations
Data Center Square Feet: 4,000 -
Completed: 2009
Services: MEP/FP, Structural,
Voice/Data Engineering,
Integrated System Testing

Tier II

This fortune 1,000 company provides data, voice and internet solutions to financial services, government, healthcare, higher education, and hospitality customers nationwide. We are engineering multiple data center locations and performing feasibility studies for future sites across the nation. With over 1.4 million square feet of revenue producing data center space, PAETEC demands reliable and efficient systems for their data centers.

Their Andover, MA Data Center connects to a diverse OC-48 fiber ring, has redundant power to the grid, backed-up by five 1400 horsepower, one-megawatt generators with 30,000 gallons of diesel fuel. To keep the Data Center at an optimum temperature for customer equipment, the center boasts 2000 tons of cooling capacity, which will pull from outside air in winter months to help reduce energy costs and overall consumption for increased efficiencies.

The new Bethlehem, PA Data Center will have 4,000 SF of access floor, expandable to 7,500 SF. The Data Center expansion area will be scalable and flexible, so that certain components of the expansion can be integrated into the facility in a phased approach, with minimal disruption. The design will include N+1 electrical distribution (after the new utility service), switchgear and a standby generator. The indoor electrical distribution equipment will include redundant UPS modules and batteries, PDUs/RDCs, and branch distribution to the cabinets. The UPS modules will have dedicated CRAC units.

Feasibility studies and conceptual engineering services were provided for PAETEC to build/expand a hosting Data Center in two locations, Milwaukee and Boston. The study will outline the potential to build/expand the Data Centers at these two sites, identify the systems, capacities, room sizes, and evaluate the existing MEP/FP systems serving the Data Center and associated spaces. We provide a statement of the systems' ability to serve the expanded Data Center in a Tier II, (N+1) configuration, and provide suggestions for systems enhancements if the current systems are not adequate.

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