

Final Report



The Pennsylvania Academy of Music
Lancaster, PA

David Smith
Lighting/Electrical Option

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The Pennsylvania Academy of Music

Lancaster, PA

David Smith

Lighting/Electrical Option

Design and Construction Team

Owner / Occupant - The Pennsylvania Academy of Music
Architect - Philip Johnson Alan Ritchie Architects
MEP - Cosentini Associates, **Structural** - Robert Silman Assoc.
Lighting - HLB Lighting Design, **GC** - Benchmark Construction

Building Information

65,000 square feet in three stories above grade and one story below grade. Current cost is \$21 million as a Design-Bid-Build project. The building is used as a music school, conservatory, library, and concert venue.

Building Architecture

The building is a contemporary, limestone-clad structure with a two-story, curved glass atrium. The interior spaces include a library, a 364-seat recital hall, smaller performance spaces, classrooms, a recording studio, a roof terrace, and offices.

Structural System

The structural foundation system consists of 8" slab on grade with 3' piers and 5' caissons. Columns are all steel ranging in size from W8 to W10. Composite decking system consists of 2" steel deck with 3.5" concrete slab. Shear walls take up the lateral loads.

Mechanical System

The mechanical system utilizes twelve air conditioners and eight air handling units. Variable air volume air distribution is used. The boiler and heating systems are gas-fired. The building employs sound trap and attenuation systems for performance spaces.

Electrical System

The electrical distribution to the building is at 12.47 KV. A 30 KVA UPS system in conjunction with a 250 KW emergency generator are used to keep the communications and safety systems online. Both 480Y/277V and 208Y/120V distribution are used within the building.

Lighting System

The lighting system consists of both direct and indirect 120V lighting systems using compact and linear fluorescent, incandescent, and HID sources. Atrium glows at night from wallwashers on walls. Recital hall has DMX512 control system for dimming and theatrical control

<http://www.arche.psu.edu/thesis/eportfolio/2007/portfolios/DBS176/>



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EXECUTIVE SUMMARY

This is the final report of my Architectural Engineering Capstone Project. It is a culmination of five years of study and reflects aspects from many of the varied subject areas that I have received instruction in during my tenure as a student in this program.

I analyzed and redesigned several systems for The Pennsylvania Academy of Music in Lancaster, PA. I focused on two areas of focus deeply, and two additional areas of focus more broadly. First, I analyzed the lighting needs of four spaces – the Building Entrance, the Grand Foyer, the Library, and the Roof Terrace. After establishing this criteria, I generated lighting layouts and renderings of the solutions that I felt best met the criteria I had laid out. Some of these systems reduced the amount of lighting equipment required significantly.

After gathering information on the correct equipment to create a working system, I analyzed the impact these designs would have on the power distribution system. For the Grand Foyer, my lighting redesign ended up using a fraction of the energy the original design called for, and this had far reaching impacts on the electrical system as well.

One area of my breadth work focused on architecture. I modified the Roof Terrace space by creating a Pergola for this space to help define the use of the space. The other area of my breadth work was in the structural system of the building. I analyzed the impact that adding this structure to the Roof Terrace would have on the structural system and whether or not it would have an impact on other systems.

Each of these four areas of focus are incredibly interrelated, as I have learned throughout the course of this project. It was very important to keep this in mind when designing any portion of this project.

BUILDING STATISTICS

Part I

Building Name - The Pennsylvania Academy of Music

Location - 42 North Prince Street, Lancaster PA (Urban Setting)

Building Occupant - The Pennsylvania Academy of Music

Occupancy Type - Music school and conservatory

Size - 65,000 square feet of new construction (not including small portion of old building not being demolished)

Stories - 3 above grade, 4 total stories

Primary Project Team

Owner - The Pennsylvania Academy of Music

General Contractor - Benchmark

Architect of Record - Philip Johnson Alan Ritchie Architects

Associate Architect - Hickey Architects (Lancaster, PA)

Landscape and Site Architect - Derck & Edson Associates

Structural Engineer - Robert Silman Associates

MEP Engineer - Cosentini Associates

Acoustical Consultant - Cyril M. Harris, Ph.D. (New York, NY)

Lighting Consultant - Horton Lees Brogden Lighting Design

Noise Control & AV Consultant - Hoover & Keith

Construction Dates - April 14, 2006 to First Quarter 2008

Delivery Method - Design-Bid-Build

Architectural Features - Architectural Features include demolition of existing building on site but retaining some parking, rerouting some parking, rerouting an adjacent road and its utility lines, and building a new structure that includes a 364 seat recital hall, smaller performance spaces, classrooms, practice rooms, library, and offices. The building is a contemporary light stone structure with a three-story curving glass atrium. The building on the south side overhangs the sidewalk and has square two-story columns creating an outdoor space on the sidewalk.

Major Model Codes - BOCA 1996, ADA, NFPA, ASHRAE 90.1, NEC

Zoning - Commercial. No major zoning issues to work around.

Historical Aspects - Not applicable to this project

Building Envelope - Roof includes a lead-coated copper fascia on the parapet, a vinyl tile outdoor patio area, and impervious membrane roofing material. The walls are stone veneer over steel columns. The atrium has a 47' curving glass window with aluminum frame.

Part II

Construction - The Design-Bid-Build contract was awarded to Benchmark Construction and construction began on April 14, 2006. Construction is expected to last until the first quarter of 2008.

Electrical - There is 12.47 KV electrical service to the building. A 30 KVA UPS system in conjunction with a 250 KW emergency generator are used to keep the

communications, safety, and lighting systems online. Both 480Y/277V and 208Y/120V electrical distribution systems are used within the building.

Lighting - The lighting system consists of both direct and indirect 120V light fixtures. The system primarily uses incandescent lamps, though there are some fluorescent, compact fluorescent, and HID sources used. The recital hall space is controlled by a DMX512 control system designed for theatrical performance.

Mechanical - The mechanical system utilizes twelve air conditioners and eight air handling units. The HVAC system utilizes a variable air volume system to distribute the air throughout the building. The boiler and heating systems are gas-fired.

Structural - The foundation system of the building consists of 8" slab on grade supported by 3' piers and 5' caissons. The columns of the building are all steel and are either W8 or W10. The composite decking system used throughout the building is a 2" steel deck with a 3.5" concrete slab on top. Lateral loads in the building are taken by shear walls that surround the recital hall at the heart of the building.

Transportation - A single, freight-sized elevator is located just off of the lobby. The large size elevator is primarily needed to transport pianos and other large pieces of equipment throughout the building.

Telecommunication - The telecommunications systems in the building include CATV, standard PBX voice system, fiber optic data interconnections, and an integrated security and video surveillance system. Additionally, there are audio and video recording and broadcasting capabilities within the building.

Acoustical - The recital hall has triangular plaster triangular planes along the walls and ceiling that scatter and distribute sound produced on stage. The walls behind the stage

as well as the ceiling above the stage are hard wood panels that project sound toward the audience. The recital hall is surrounded by a pair of massive, masonry shear walls for increased attenuation and sound isolation. Additional sound traps and attenuation systems are located in the mechanical system.

BUILDING BACKGROUND AND ARCHITECTURE

The Pennsylvania Academy of Music's mission is to foster the growth of musical instruction and the appreciation of fine music in south-central Pennsylvania. This is accomplished through individual and group instruction of technique, principle, interpretation, and expression to both children and adult learners. This mission also extends into the surrounding community as a center for public performance.

This non-profit institution was founded by Julliard graduates Michael Jamanis and Frances Veri in 1991. Within a decade, enrollment in the Academy has grown from 50 students to several hundred, and additional space was needed for growth. The influential firm Philip Johnson Alan Ritchie Architects was commissioned to design their new building. The new structure, which will be five times the size of the current facility, will be centrally located in Lancaster, PA.

The contemporary architecture of the building will make it a signature building of the city of Lancaster. Its limestone and glass façade stand out from and complement the existing structures in the area. A two-story grand foyer completely surrounds a wood-enclosed recital hall. Overlooking this space are instruction spaces and a musical library. Amongst the other spaces in the building are a recording studio, a kitchen for events, a gift shop, an enclosed terrace on the roof, additional group and individual instruction and practice spaces, lounges, and the Academy's office spaces. The facility is currently under construction and the building will be complete in early 2008.