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- General Information**
- Contact
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- Document Information
- Clarification Request

Procurement Folder: 1199702	SO Doc Code: CEOI
Procurement Type: Central Contract - Fixed Amt	SO Dept: 0211
Vendor ID: 000000160802	SO Doc ID: GSD2300000008
Legal Name: PERFIDO WEISKOPF WAGSTAFF + GOETTEL LLC	Published Date: 4/6/23
Alias/DBA:	Close Date: 4/20/23
Total Bid: \$0.00	Close Time: 13:30
Response Date: 04/19/2023	Status: Closed
Response Time: 17:12	Solicitation Description: EOI: Building 10 Holly Grove Renovation
Responded By User ID: PWWG	Total of Header Attachments: 1
First Name: Sandi	Total of All Attachments: 1
Last Name: Eaton	
Email: seaton@pwwgarch.com	
Phone: 412-391-2884	

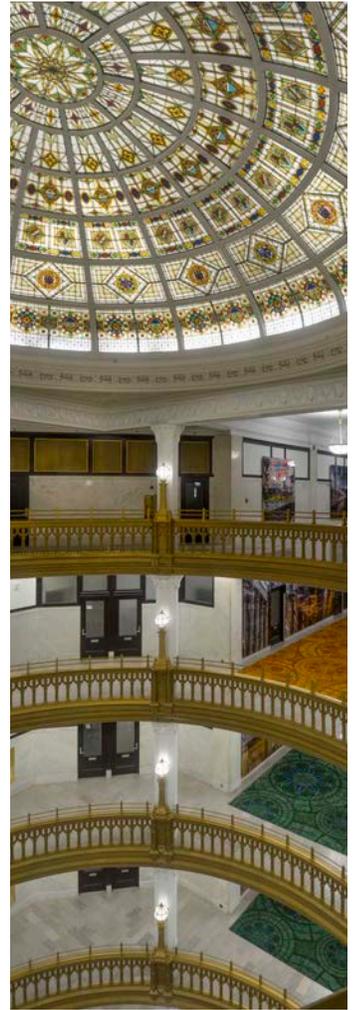
Line	Comm Ln Desc	Qty	Unit Issue	Unit Price	Ln Total Or Contract Amount
1	EOI: Building 10 Holly Grove Renovation				0.00

Comm Code	Manufacturer	Specification	Model #
81101508			

Commodity Line Comments:

Extended Description:

EOI: Building 10 Holly Grove Renovation



PROPOSAL FOR PROFESSIONAL A/E DESIGN SERVICES FOR
CEOI GSD2300000004
BUILDING 10 HOLLY GROVE
MANSION RENOVATION

Prepared for the
STATE OF WEST VIRGINIA GENERAL SERVICES DIVISION

APRIL 20, 2023

pwwg point of contact

Anthony L. Pitassi, AIA, NCARB, LEED AP

Managing Principal

412.391.2884 ext 225

apitassi@pwwgarch.com

PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL

ADDENDUM ACKNOWLEDGEMENT FORM

SOLICITATION NO.:

Instructions: Please acknowledge receipt of all addenda issued with this solicitation by completing this addendum acknowledgment form. Check the box next to each addendum received and sign below. Failure to acknowledge addenda may result in bid disqualification. Acknowledgment: I hereby acknowledge receipt of the following addenda and have made the necessary revisions to my proposal, plans and/or specification, etc.

Addendum Numbers Received:
(Check the box next to each addendum received)

- | | |
|--|--|
| <input checked="" type="checkbox"/> Addendum No. 1 | <input type="checkbox"/> Addendum No. 6 |
| <input type="checkbox"/> Addendum No. 2 | <input type="checkbox"/> Addendum No. 7 |
| <input type="checkbox"/> Addendum No. 3 | <input type="checkbox"/> Addendum No. 8 |
| <input type="checkbox"/> Addendum No. 4 | <input type="checkbox"/> Addendum No. 9 |
| <input type="checkbox"/> Addendum No. 5 | <input type="checkbox"/> Addendum No. 10 |

I understand that failure to confirm the receipt of addenda may be cause for rejection of this bid. I further understand that any verbal representation made or assumed to be made during any oral discussion held between Vendor’s representatives and any state personnel is not binding. Only the information issued in writing and added to the specifications by an official addendum is binding.

PWWG Architects

Company



Authorized Signature

4/20/2023

Date

NOTE: This addendum acknowledgment should be submitted with the bid to expedite document processing.



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PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL

April 20, 2023

Melissa Pettrey, Senior Buyer
Department of Administration, Purchasing Division
2019 Washington Street East
Charleston, WV 25305

RE: CEOI GSD 2300000008 Building 10 Holly Grove Renovation

Dear Ms. Pettrey and Members of the Selection Committee,

PWWG Architects is pleased to submit our qualifications for professional Architectural and Engineering design services in response to EOI: Building 10 Holly Grove Renovation and the goals described. We have carefully studied the RFP and we visited the building, to get a first-hand view of the scope and magnitude of the project. We are confident that the enclosed materials demonstrate that our team is well qualified to provide the best overall value to the State of West Virginia.

We are excited about the opportunity to continue working with your institution alongside our current and past work at the Capitol Complex campus at Building 4 and Building 3 respectively. We also want to underscore the specific qualifications of our team and the unique aspects that PWWG will bring to this project:

- Over 50% of PWWG's work is focused on re-use, re-purpose and renovation of historic era buildings including preservation projects across a variety of building typologies and scale in urban environments.
- PWWG's extensive experience working with State Historic Preservation Office entities across multiple states as well as the National Park Service in conjunction with implementing appropriate strategies in accordance with The Secretary of the Interiors Standards for Rehabilitation.
- PWWG's internal team for this project is comprised of our most senior and skilled staff with experience focused on historic projects - Joseph Filar, PM; Joe Roy, PA; and Jan Irvin, Specs/QA QC - this team has a knowledge and understanding of the Capitol Complex Campus given their extensive experience with WV Building 3 and WV Building 4.
- As a firm that provides architecture and planning only, we have composed a team of consultants that are expertly skilled in preservation, renovation, and upgrades to historic buildings.
- We are consensus builders. We are able to listen and distill goals across a wide range of stakeholder groups.

We appreciate your consideration of our credentials and look forward to the opportunity to discuss your project in detail.

We encourage you to reach out to our references to discuss how we have provided a high level of service to them in the past and we welcome the opportunity for an interview to elaborate on our capabilities and discuss with you our ideas for the project.

Sincerely,



Anthony L. Pitassi, AIA, NCARB, LEED AP
Managing Principal

| pwwg +
team

PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL



PWVG ARCHITECTS stewards of the community +

NAME OF FIRM: Perfido Weiskopf Wagstaff + Goettel, LLC (PWVG Architects)

TYPE OF BUSINESS OWNERSHIP: LLC

CERTIFIED SMALL BUSINESS ENTITY IN: PA

HISTORY AND DESCRIPTION OF THE FIRM

Since 1975, PWVG has served clients in the Ohio River Valley and beyond from our main office in downtown Pittsburgh.

PWVG is a diverse, versatile architectural practice, with experience in a wide variety of building types. Our portfolio includes projects, large and small, for cultural institutions, higher education, government, businesses, and individuals.

AREAS OF SPECIALIZATION

- Rehabilitation, preservation, and adaptive reuse of historic architecture and existing buildings.
- Commercial and civic architecture including parking structures, retail, theatres, hotels, and galleries.
- Facilities for education (labs, classrooms, offices, administrative, and workforce training buildings).
- Multi-family residential design (affordable and market rate, student and senior housing, and luxury condominiums).

MAIN OFFICE

PWVG Pittsburgh
408 Boulevard of the Allies, Pittsburgh, PA 15219

BRANCH OFFICE

PWVG Cincinnati
1432 Elm Street Unit 1A, Cincinnati, OH 45202

1975

Year Established

21

Total # of Employees

3

Principals

13

Registered Architects

8

LEED Accredited Professionals

2

WELL Accredited Professionals

3

Administrative & Support

PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL



PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL

work in west virginia +

- Hardway Hall Systems Upgrades, Fairmont State University
- Turley Center Renovation, Fairmont State University
- Campbell Hall Renovation, West Liberty University
- Shaw Hall Renovation, West Liberty University
- Main Hall, West Liberty University
- Science Building Study, West Liberty University
- West Virginia State Capitol Totunda
- West Virginia Building 3 Renovation
- West Virginia Building 4 Renovation
- Elevator Upgrades and Modernizations, WV Capitol Complex
- Downtown Loop Campus Expansion, West Virginia University
- Oglebay and Ming Hsieh Halls, West Virginia University
- Brooke Tower, West Virginia University
- Utilities and Infrastructure Improvements & Quad Design, West Virginia University Evansdale
- Old Main, West Virginia University Institute of Technology
- Applied Technology Center, West Virginia University at Parkersburg
- Child Development Center, West Virginia University at Parkersburg
- STEM Building Study, WVU Potomac State College
- National Center for Youth Science Education Masterplan
- Wheeling Heights II Housing, Wheeling
- Morgantown Event Center, Morgantown
- Holiday Inn Hotel & Suites, Beckley

FIRM OVERVIEW

ZDS Design/Consulting Services is a three-generation family owned MEP/Commissioning Engineering Firm located near Charleston, West Virginia. ZDS provides comprehensive professional services for Master Planning/Feasibility Studies, HVAC, Plumbing, Electrical, Indoor Environmental Quality, Energy Engineering, Forensic Engineering and Commissioning. ZDS has extensive proven high performance building design experience for commercial, governmental, educational facilities, and healthcare experience in 25 states across the country, the State of West Virginia, local government and Federal agencies. Specializing in renovation projects with **proven results of from 30% to over 50% reduction in energy/operating costs** earning Energy Star Certification and EPA Act qualified on government renovation projects!

- ◆ Mechanical
- ◆ Electrical
- ◆ Plumbing
- ◆ Forensic
- ◆ Energy
- ◆ Commissioning
- ◆ Indoor Environmental Quality (IAQ/IEQ)
- ◆ High Performance Sustainable Buildings

The ZDS team is made up of **seasoned professionals** who have dedicated their careers to engineering design excellence and quality. We pride ourselves in having the most up to date state of the art technology to provide our clients the very best possible services. We offer **comprehensive practical solutions** to our clients with proven World Class results.



COMPANY LEGAL NAME

ZDS Limited Liability Company
dba ZDS Design/Consulting Services

OFFICE LOCATION

135 Corporate Center Drive, Suite 532
Scott Depot, WV 25560

FOUNDERS

Todd A. Zachwieja, P.E., C.E.O.

Lori L. Zachwieja, C.P.A., C.F.O.

Daniel H. Kim, Ph.D.



“Family Owned & Operated Engineering Firm
providing Professional Design Services for over 29+ years”

Engineering for State & Local Government Facilities

ZDS engineering project experience includes facilities registered as official Historic Buildings



Jackie Withrow State Hospital

WVDHHR hired ZDS to engineer the upgrades for three historic hospital facilities in three separate locations. ZDS successfully completed the projects while meeting the requirements of the State Historic Preservation Office (SHPO).



Hopemont State Hospital



Mildred Mitchell-Bateman State Hospital

Renovations included HVAC, fire safety, energy efficient lighting, plumbing, indoor air quality and electrical power engineering.

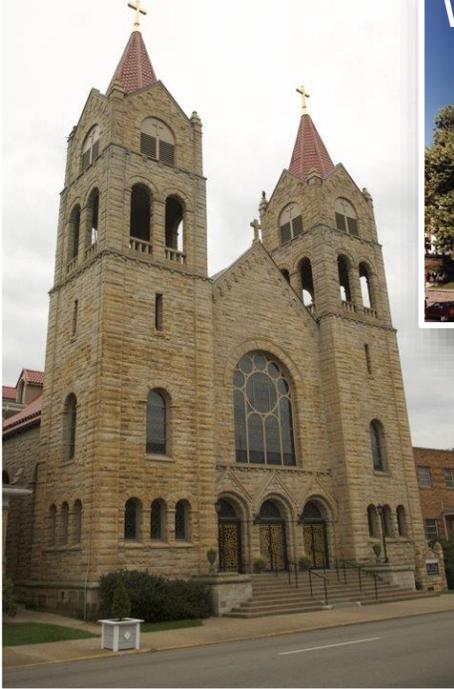


Design/Consulting Services

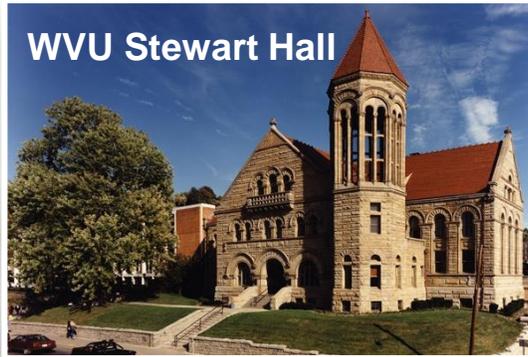
Engineering for State & Local Government Facilities

ZDS project experience includes historical facilities sensitive to finding solutions that address IEQ which includes acoustics, lighting, Indoor Air Quality and comfortable energy-efficient HVAC systems.

St. Patrick's Church



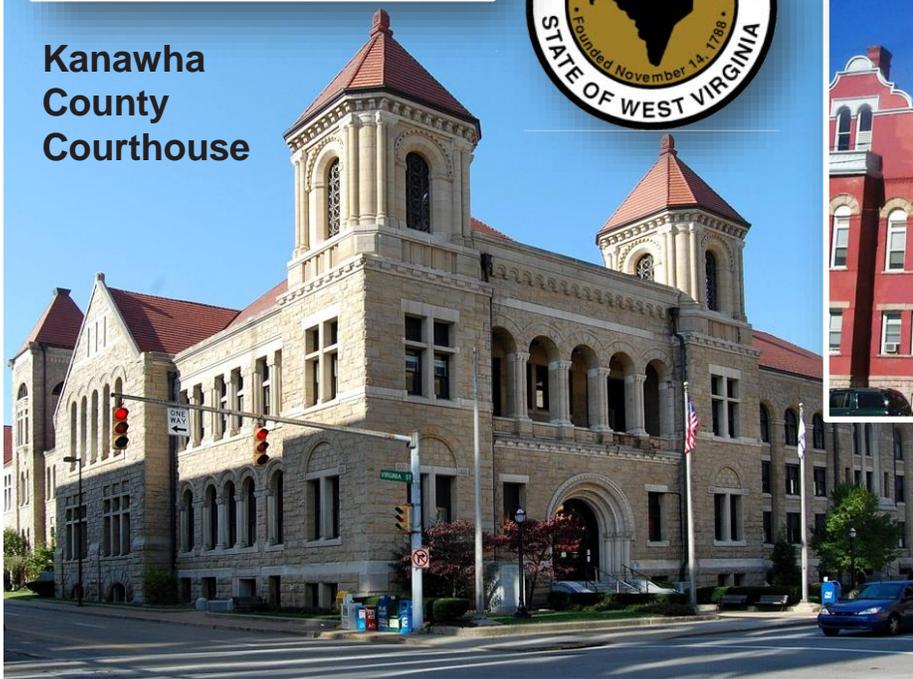
WVU Stewart Hall



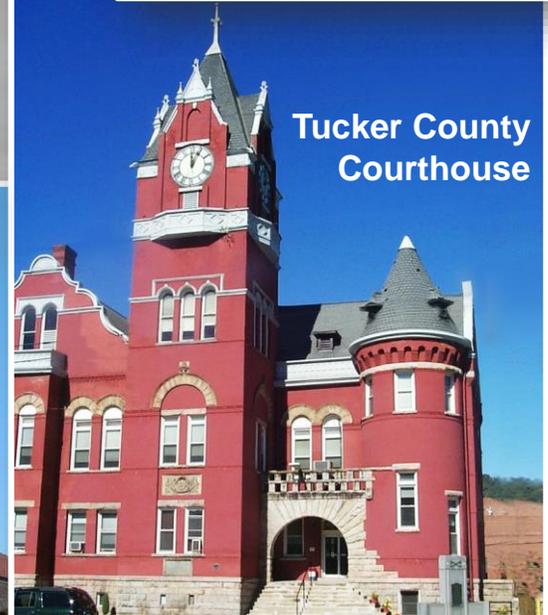
Tyler County Courthouse



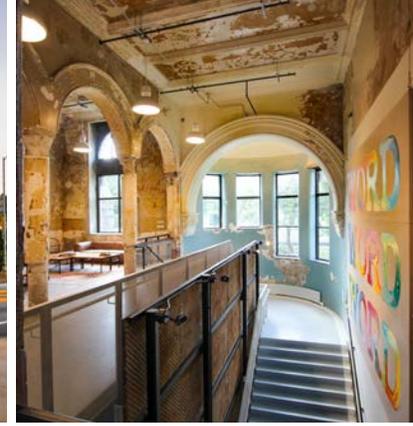
Kanawha County Courthouse



Tucker County Courthouse



Design/Consulting Services



STRUCTURAL FIRM OVERVIEW

Atlantic Engineering Services (AES) provides structural engineering consulting services throughout the United States. Established in 1986, AES is widely respected for its expertise and services, and is located in Pennsylvania, West Virginia, and Florida. Our clients benefit from proactive, skilled engineers engaging other disciplines and sharing regional experience.

Synergy, creativity, and timeliness are the principles that drive our firm. Continuous interaction between designers and field observers ensures that your design's intent can be accurately translated and properly executed, and specialized BIM technology enriches collaboration between A/E/C firms, fabrication facilities, and other consultants for any type of project, regardless of its complexity or difficulty.

For our clientele, every project has required more than efficient structural support. Depending on the client and their surrounding community, we have helped facilities remain operational during construction, expedited steel design and fabrication services for fast-tracked projects, and implemented droning services to improve visual access.

Most importantly, our professionals listen. For every project our engineers digest everything that is most important to the owners, the goals of the design team, and input from other vital sources to develop structural options that fit your design's framework. We become invested in your goals, crafting ours around the visions and needs provided to us.

Professionals at our firm enjoy what they do and so they do it well, dedicated to producing lasting structures where people can live, work, play, learn, heal, worship, and more. At AES, we take great pride in **bringing architectural visions to life.**

650 aggregate years of structural design experience **\$17** billion in total construction costs **30,000+** total projects

this many clients have returned for this many projects 100s / 10 25 / 100 8 / 200 1 / 500

INDUSTRIES assisted living civic clubhouse commercial federal + municipal film industry healthcare higher education historic preservation hospitality industrial + energy k-12 education marina multi-family museum + library parking + transportation residential retail

SERVICES adaptive reuse constructability reviews BIM cold-formed steel concrete delegated design design-build elements & connections facade & cornice forensic engineering historic restoration military facility design specialized medical equipment steel designs surveys + inspections sustainability tilt-up unmanned aerial services wood framing + design

TESTIMONIAL
Michael J. Cain, Project Executive @ MASCARO CONSTRUCTION COMPANY

"AES performed all of the structural engineering and structural detailing for the project and performed these services in an exemplary fashion. Mascaro has worked with AES on many signature projects since the early 1990's in every instance... AES proved to be extremely professional, cooperative and a true pleasure to work with. I certainly would not hesitate to use AES's professional design services on any project and I look forward to working with them again soon."



MORGAN
PROPERTY &
CONSTRUCTION
CONSULTANTS

RELIABLE COST ESTIMATES FROM THE EARLIEST STAGES OF DESIGN

The development and control of a realistic budget is essential to project feasibility, and cost projections need to be reliable from the earliest stages of design. Morgan Property and Construction is a professional independent construction cost estimating firm that works with architects and engineers as part of their team, active in each phase of design. Estimates are prepared in CSI Divisional format from the schematic phase forward with updates at each major submission. The firm does not rely on 'comparables' or 'square foot' costs, because projects are nearly always unique in multiple ways, and comparables are never truly comparable.

By making active use of the valuable information generated from the cost estimating process, Morgan is constantly "value engineering" projects as they go through the design phases. At the close of the design phases the firm can selectively use "add" and "deduct" bid alternates to give the owner flexibility and a range bid numbers to pick from to mitigate the uncertainties of the bidding process. The combination of these strategies greatly reduces the likelihood of going through a painful process of cost cutting (as opposed to intelligent value engineering), redesign and rebidding.

KEY COMPETENCIES

- Cost Estimating
- Inspection
- Value Engineering
- Facility Assessments
- Administration/Management

DIFFERENTIATORS

- 40+ years of professional construction management and administrative skills.
- Provides realistic, practical and valuable tools to clients which empower them with knowledge and in-depth understanding to execute their desired construction goals.
- Specific expertise in cost estimating to clearly communicate with clients about cost savings, feasible alternative solutions, and avoiding costly delays and unforeseen expenses.
- Commercial/institutional/multi-family construction experience.
- Services are beneficial to both architects and owners in understanding their costs and supporting their projects throughout construction.



organizational chart +

PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL



pwwg project leadership team



Anthony L. Pitassi,
AIA, NCARB, LEED AP
Managing Principal

Role:
Principal-in-Charge



Joseph Filar,
RA, LEED AP
Senior Associate

Role:
Project Manager



Joseph Roy,
AIA
Associate

Role:
Project Architect



Tonya Markiewicz
Graduate Architect

Role:
Interior Design



Jan Irvin,
AIA, LEED AP
Senior Associate

Role:
Specs / QA QC

design consultants

MEP ZDS

Todd Zachwieja, PE, CEM, LEED AP
CEO, Principal, MEP PM

Ted Zachwieja III, PE, CEM
CTO, Principal, MEP PM

Jim Watters
Production/Construction Admin Manager

David Cotton, PE, LEED AP BD+C
Mechanical Engineer

Mark Estep, PE
Mechanical Engineer

Paul O'Dell, PE
Mechanical Engineer

Vineel Busa, PE
Mechanical Engineer

Meher Meka, MSEE, EI
Electrical Engineer

STRUCTURAL Atlantic Engineering Services

Evan A. Rowles, PE
Principal Engineer

COST ESTIMATING Morgan PCC

Morgan Kronk
Principal Cost Estimator

commitment of capacity and dedicated staff +

Based on the project schedule provided and our current workload and backlog, PWWG and our consultant team have the availability and capacity to staff the project. We will be dedicated to your project from concept to completion, providing continuity through all phases with the senior staff and project team in this submission.



anthony pitassi +
aia, ncarb, leed ap
MANAGING PRINCIPAL

Tony has been with PWWG for 20+ years, and is a leader in the firm's practices in hospitality, adaptive reuse and renewal, and historic preservation for commercial, cultural, and non-profit clients. Tony leads every project—from concept studies to new construction--by aligning practical solutions, sound project management, and exemplary design and detailing, with the values of stakeholders and clients. He is recognized for clear communication and uncommon skill facilitating creative dialogue between clients, consultants, architectural partners, and contractors, throughout design and construction. Tony has managed many projects to successful completion with LEED, Universal and Inclusive Design, WELL, and 2030 standards of sustainability, and contributed to establishing the groundbreaking isUD standard for museums. His projects as Principal-in-Charge have won awards from local and national chapters of the AIA and major design entities, and been featured in regional and international publications covering architecture, interiors, and hotel design.

JOINED PWWG
1998

EDUCATION
Bachelor of Architecture,
Kent State University, 1989

BA Architectural Studies,
University of Pittsburgh, 1986

REGISTRATION
Architect in PA, OH,
WV, KY & MO

PROFESSIONAL ASSOCIATIONS
American Institute of
Architects (AIA) Member

LEED Accredited Professional

Green Building
Council Institute

NCARB Certificate Holder

RELEVANT PROJECT EXPERIENCE

Old Economy Village, Multiple Historic Renovation Projects, Ambridge, PA—A wide variety of improvements and preservation for site features and 20 structures at a national historic site; envelope, accessibility and finish upgrades, and new public amenities. *Principal-In-Charge*

Children's Museum of Pittsburgh Restroom Upgrades, Pittsburgh, PA—For a repeat client, holistic assessment of 22 group and single restrooms in a historic building for code compliance, MEP systems, FF&E, and lighting. A spectrum of upgrades will help the client prioritize improvements and implement small upgrades with big impact. *Principal-In-Charge*

21c Museum Hotel St. Louis, St. Louis, MO—Rehab and transformation of the 10-story historic YMCA building in downtown for an innovative hybrid art museum and 170-room boutique hotel with galleries, a signature restaurant, and event spaces; earned Historic Tax Credit funding. 163,500 sf. *Principal-In-Charge / Project Manager*

21c Museum Hotel Cincinnati, Cincinnati, OH—Rehab and transformation of a historic downtown hotel for an innovative hybrid art museum and 156-room boutique hotel with galleries, a signature restaurant, meeting and event spaces; earned Historic Tax Credit funding. 159,000 sf. *Project Manager*

21c Museum Hotel Lexington, Lexington, KY—Rehab and transformation of a 15-story historic bank and department store in downtown for an innovative hybrid art museum and 88-room boutique hotel with galleries, a signature restaurant, and event spaces; earned Historic Tax Credit funding. 103,500 sf. *Project Manager*

Cincinnati Club Renovation, Cincinnati, OH—Rehabilitations and conversion of a listed historic high-rise structure with highly-ornate traditional design features into a mixed-use project of 100 market rate apartments and renovated event spaces. Historic Tax Credit project. 200,000 sf. *Principal-In-Charge*

Church of the Ascension Envelope Assessment and Restoration, Pittsburgh, PA— forensic evaluation of sandstone envelope of an iconic National Register church in an urban neighborhood; study helped secure foundation funding for PWWG to also coordinate phased cleaning, stabilizing, and repointing sanctuary, parish hall, and bell tower. *Principal-In-Charge*

Henry W. Oliver Building Facade Rehabilitation and Embassy Suites Hotel Conversion, Pittsburgh, PA—Forensic analysis and rehab of stone exterior for the historic 25-story building, and adaptive reuse of 9 stories for an upscale hotel. 198,000 sf. *Project Manager*

key personnel +



Joseph Filar +

ra, lead ap
SENIOR ASSOCIATE

Joe began his professional career working in New York City. He moved back to Pittsburgh in 1999, joined Perfido Weiskopf Architects as an intern architect, and became an associate of the firm in July 2003. Joe has a broad range of design and contract management experience and experience as a Project Manager on higher education, market rate and subsidized housing, corporate offices, and historic rehabilitation of landmarks buildings. Several of his projects have received awards from the Pittsburgh and Pennsylvania chapters of the AIA.

RELEVANT PROJECT EXPERIENCE

West Virginia State Capitol Office Building Four Renovation, Charleston, WV—third project on the capitol campus renovates site, exterior, and interior of a 1950s office building; updates to layout, systems and finishes address life safety and accessibility, and preserve mid-century architectural character. 96,000 sf. *Project Manager*

WV State Capitol Complex Building 3 Restoration and Reuse, Charleston, WV—Comprehensive masonry envelope and tile roof restoration and interior redesign of a historic building for contemporary office space, with flexible layouts, updated systems and AV/IT, new amenities and FF&E. 165,000 sf. *Project Manager*

Old Economy Village, Multiple Historic Renovation Projects, Ambridge, PA—A wide variety of improvements and preservation for site features and 20 structures at a national historic site; envelope, accessibility and finish upgrades, and new public amenities. *Project Manager*

Bayard School Lofts, Pittsburgh, PA—Salvage and transformation of a vacant historic school in a dense urban neighborhood for 9 market rate and 2 affordable apartments. Complex envelope, structural, and interior scope; earned historic tax credit funding. 10,000 sf. *Project Manager*

Union Trust Building Transformation, Pittsburgh, PA—Comprehensive interior rehab and transformation of a historic 11-story shopping arcade in downtown for new Class-A office space, co-working space, ground floor commercial, and new underground parking; LEED Certifications—BD+C, Core and Shell-v3, O+M, Existing Buildings-v2. 517,000 sf. *Project Manager*

Oglebay Hall Rehab & Transformation and Ming Hsieh Hall Addition, West Virginia University, Morgantown, WV—Salvage and transformation of a vacant historic classroom building for labs, classrooms and offices, and addition with tech intensive lecture halls; the ensemble supports interdisciplinary STEM learning; Oglebay masonry envelope and roof rehab, new pedestrian bridge, outdoor terrace, and rooftop parking at Ming Hsieh; both buildings are LEED Certified. Oglebay Hall Reuse— 50,000 sf; Ming Hsieh Hall Addition – 16,000 sf. *Project Architect*

Church of the Ascension Envelope Assessment and Restoration, Pittsburgh, PA— forensic evaluation of sandstone envelope of an iconic National Register church in an urban neighborhood; study helped secure foundation funding for PWWG to also coordinate phased cleaning, stabilizing, and repointing sanctuary, parish hall, and bell tower. *Project Manager*

Pennsylvania State Capitol Peristyle Envelope Restoration, Harrisburg, PA—Investigation, analysis, and design for waterproofing the deck surrounding the 52M ton granite peristyle and dome of the 1906 state capitol building on the National Register; pilot project confirmed proposed design improvements; building remained fully operational. *Project Manager*

Becht Hall Reuse for Student Success Center, Clarion University, Clarion, PA — Historic dorm reimaged as a “modern” historic building, consolidating services for 15 departments; flexible office, conference and classroom spaces for future needs; envelope restoration; PASSHE open-end project. 53,000 sf. *Project Architect*

JOINED PWWG 1999

EDUCATION

Bachelor of Architecture,
Pennsylvania State University,
1995

Sede di Roma Foreign Studies
Program, 1993

REGISTRATION

Architect in PA

PROFESSIONAL ASSOCIATIONS

LEED Accredited Professional

National Historic Trust
Pittsburgh History &
Landmarks Foundation

PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL



joseph roy +
aia
ASSOCIATE

Since joining PWWG in 2021, Joe has demonstrated his natural ability to work on a range of tasks simultaneously, as a team member on projects for market rate housing, a private gallery and residence, and a mixed-use commercial addition. His prior experience in NYC and Boston spanned building renovations, new construction, and interiors, with responsibilities for design and detailing for large scale affordable housing, a high-end apartment, and historic rowhouses.

RELEVANT PROJECT EXPERIENCE

Allegheny Branch House Lofts Renewal & Reuse, Pittsburgh, PA—For a repeat client, conversion of a landmark four-story heavy timber and masonry industrial building for 36 unique apartments. Design incorporates distinctive existing architectural elements and resolves difficult parking and access on the dense urban site. 47,000 sf. *Project Manager*

William Pitt Union Porch Repairs, University of Pittsburgh, Pittsburgh, PA—Forensic and design services to mitigate water infiltration at the grand entry porch of a beaux-arts historic campus building, the hub for student activities. Scope removes elements added in the 1980s, redesigns structural slab and membrane, and improves life safety, lighting, and accessibility, setting the stage for future upgrades. *Project Manager*

West Virginia State Capitol Office Building Four Renovation, Charleston, WV—PWWG's third project on the capitol campus renovates site, exterior, and interior of a 1950s office building; updates to layout, systems and finishes address life safety and accessibility, and preserve mid-century architectural character. 96,000 sf. *Team Member*

3 Butler Art House (Unbuilt), Pittsburgh, PA—Rehab, re-use, and addition to a vacant historic social hall for a private art collector; climate controlled reconfigurable gallery and vault, areas for study and research, an apartment for the client, and indoor/outdoor amenities for events. Historic architectural features integrated into the contemporary aesthetic. 9,400 sf. *Team Member*

Garden Theater Block Apartments, Pittsburgh, PA—New five-story building anchoring a prominent corner in a historic neighborhood; 50 market rate apartments with parking nearby, and first floor commercial space. Includes renovation of two historic townhouses into nine apartments. 50,000 sf. *Project Architect*

Friendship Circle Addition, Pittsburgh, PA—Exterior and interior renovation of a 3-story property in the heart of Squirrel Hill. Provides supplemental space to repeat client's existing adjacent building as a community hub with supportive programming. Features a cafe restaurant, teen wellness center, and offices. 5,100 sf. *Team Member*

125 Amory Street Residences, Boston MA—Extensive, 32 million dollar, occupied rehab of a 6 story affordable apartment building for seniors. The project consisted of renovating 190 apartments, creating 11 new apartments and designing & building out the first floor community space for the residents. The exterior shell of the building was upgraded to have new brick and metal panel façades, sidewalks and courtyards were redesigned and roof scoping/potential replacements were studied. With Davis Square Architects. *Job Captain*

Downing Square Residences, Arlington MA—Design/Construction of 3 new affordable apartment buildings on two separate sites, consisting of 48 units. The project included remediation/redevelopment of a brownfield site to house two wood frame buildings which connected to the pedestrian bike path by a new bridge. The second site was a podium style building with commercial tenant on the first with apartments above. With Davis Square Architects. *Job Captain*

JOINED PWWG
2021

EDUCATION
Bachelor of Architecture,
Certificate in
Classical Architecture,
University of Miami

REGISTRATION
Architect in NY

PROFESSIONAL
ASSOCIATIONS
American Institute of
Architects (AIA) Member

key personnel +



jan irvin +

aia, leed ap
SENIOR ASSOCIATE

Jan has 30+ years of experience as a successful planner, designer, and senior project manager for education and multi-family housing, renovations, and adaptive reuse. He has focused throughout his career on exploring the connections between design, constructability, and durability. Jan combines these interests, and his ongoing study of sustainable design and preservation, and emerging building technologies, to writing specifications for PWWG's multi-million dollar projects for academic, commercial, and non-profit clients. Jan enriches PWWG firm culture with workshops for staff and local architects on construction, and he develops and implements many of the firm's quality control initiatives.

RELEVANT PROJECT EXPERIENCE

West Virginia Capitol Complex Building Four Renovation, Charleston, WV—third project on the capitol campus renovates site, exterior, and interior of a 1950s office building; updates to layout, systems and finishes address life safety and accessibility, and preserve mid-century architectural character. 96,000 sf. *Specifications / Project Support*

WV State Capitol Complex Building 3 Restoration and Reuse, Charleston, WV—Comprehensive masonry envelope and tile roof restoration and interior redesign of a historic building for contemporary office space, with flexible layouts, updated systems and AV/IT, new amenities and FF&E. 165,000 sf. *Specifications / Project Support*

21c Museum Hotel St. Louis, St. Louis, MO—Rehab and transformation of the 10-story historic YMCA building in downtown for an innovative hybrid art museum and 170-room boutique hotel with galleries, a signature restaurant, and event spaces; earned Historic Tax Credit funding. 163,500 sf. *Specifications / Project Support*

21c Museum Hotel Nashville, Nashville, TN—Restoration and re-use of seven-story historic commercial building in downtown Nashville for an innovative hybrid contemporary art museum and boutique hotel, with 124 guest rooms, galleries, signature restaurant, event and meeting spaces; project earned Historic Tax Credit funding. 120,000 sf. *Specifications / Project Support*

21c Museum Hotel Durham, Durham, NC—Rehab and transformation of the historic 17-story Hill Building in downtown for an innovative hybrid art museum and 125-room boutique hotel with galleries, a signature restaurant, and event spaces; earned Historic Tax Credit funding. 134,000 sf. *Specifications / Project Support*

21c Museum Hotel Lexington, Lexington, KY—Rehab and transformation of a 15-story historic bank and department store in downtown for an innovative hybrid art museum and 88-room boutique hotel with galleries, a signature restaurant, and event spaces; earned Historic Tax Credit funding. 103,500 sf. *Specifications / Project Support*

Union Trust Building Transformation, Pittsburgh, PA—Comprehensive interior rehab and transformation of a historic 11-story shopping arcade in downtown for new Class-A office space, co-working space, ground floor commercial, and new underground parking; LEED Certifications—BD+C, Core and Shell-v3, O+M, Existing Buildings-v2. 517,000 sf. *Specifications / Project Support*

Becht Hall Reuse for Student Success Center, Clarion University, Clarion, PA—historic dorm reimaged as a “modern” historic building, consolidating services for 15 departments; flexible office, conference and classroom spaces for future needs; envelope restoration; PASSHE open-end project. 53,000 sf. *Specifications / Project Support*

JOINED PWWG
2003

EDUCATION

Masters of Arts, Pittsburgh
Theological Seminary, 1996

Bachelor of Architecture,
Kent State University, 1980

REGISTRATION

Architect in PA

PROFESSIONAL ASSOCIATIONS

American Institute of
Architects (AIA) Member

LEED Accredited Professional

PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL



tonya markiewicz +

GRADUATE ARCHITECT

Tonya has been working in the architecture field in various capacities since 2009. Before joining PWWG, she worked at Morris Adjmi Architect in New York City for 3 years on a variety of high-end residential and hospitality projects. Here she worked to approve a project through NYC Landmarks and Preservation Board, and conducted construction administration on a project requiring some of the strictest preservation standards in the city. Before that she worked at Massaro Corporation in Pittsburgh in their Design-Build Department. Here she worked on a range of architectural projects, and acted as Sustainability Coordinator for the Corporation, providing support for LEED jobs, and hosting Continuing Education courses. Tonya has also worked in the non-profit sector at Braddock Redux, most notably managing the design and installation of a Green Roof garden, and acting as owners rep. for the Nyia Paige Community Center.

JOINED PWWG 2018

EDUCATION

Master of Architecture,
Certificate of Ecological
Architecture, University of
Pennsylvania, 2008

Bachelor of Industrial Design,
Pratt Institute, 2003

PROFESSIONAL ASSOCIATIONS

Carnegie Mellon University,
Adjunct Associate Professor of
Architecture

Braddock Redux, Board of
Directors

RELEVANT PROJECT EXPERIENCE

Lofts on Mt. Washington, Pittsburgh, PA—Interior and envelope upgrades to historic market rate apartment building with 67 units; phased scope includes repair and water mitigation of art deco limestone and masonry façade and roof, new finishes and lighting in lobby and corridors, and right-sizing and modernization of amenities for tenants. *Team Member*

Garden Theater Block Apartments, Pittsburgh, PA—New five-story building anchoring a prominent corner in a historic neighborhood; 50 market rate apartments with parking nearby, and first floor commercial space. Includes renovation of two historic townhouses into nine apartments. 50,000 sf. *Project Architect*

Guest House Renovation, Allegheny College, Meadville, PA—Reconfiguration of single family home into gathering space and 5 guestrooms with private bathrooms for college VIPs. Selection of finishes, furniture, fixtures, equipment and exterior site enhancements with parking. *FF&E*

Laborer's District Council Office Renovation, Pittsburgh, PA—Interior fit out for 3 unfinished floors of an existing office building, including new finishes and fixtures throughout. 15,124 sf. *Project Architect*

Historic Window Replacement Projects, Carnegie Mellon University, Pittsburgh, PA—Energy efficient retrofits of monumental historic windows with profiles that replicate original wood windows. *Project Architect*

Eighth & Penn Apartments, Pittsburgh, PA—Rehab of two historic high-rise buildings and design of two contemporary ones for an ensemble of 135 market rate rental apartments in the Cultural District. Street level commercial wraps around the building; earned Historic Tax Credit funding. 190,000 sf. *Team Member*

Todd has over 40 years of experience involving the analysis, design, construction management and specifications for mechanical engineering, heating, ventilating, air conditioning, plumbing, fire protection, electrical and lighting, as well as indoor environmental quality analysis, building system commissioning and forensic engineering for educational, governmental, military, commercial, industrial and health care clients. He is also recognized as a campus master planner for utility infrastructure providing master planning at many Universities, hospitals and the State of WV Capitol Complex.

Prior to starting a consulting engineering firm, Todd Zachwieja coordinated comprehensive energy conservation programs resulting in annual energy savings of millions of dollars. He has managed a profitable regional office for one of the country's largest energy companies that service the southeastern United States. Todd also developed computer modeling programs for building energy analysis and monitoring. He has been invited as an industry leader to present technical papers and speak at professional conferences both regionally and nationally.

Todd selected and designed the pilot project for one of the largest geothermal heat pump applications in the Eastern US including designing custom geothermal rooftop AHU's. He has retro-commissioned HVAC systems for millions of square-feet for facilities located in 10 states. He has been involved with many commercial structures including high-rise commercial building renovations. Todd designed renovations to many existing schools which received **Energy Star Certifications** placing them in the nation's top 25% of energy efficiency schools. *The College Planning and Management Magazine* featured Todd and his work with a major University for the performance contracting programs that save millions of dollars in energy and operating costs. Most projects also qualified for EPA's Act which requires buildings use over 50% less energy than buildings designed using ASHRAE 90.1.



PROFESSIONAL REGISTRATIONS

Professional Engineer:

Florida

Georgia

Kentucky

Maryland

North Carolina

Ohio

Pennsylvania

South Carolina

Virginia

West Virginia

Fire Investigation Certification under the direction of Peter Vallas, Sr.



Certified Energy Manager

(C.E.M.) National

Certification No. [REDACTED]



LEED Accredited Professional,
National Certification through

USGBC No. [REDACTED]

EDUCATION

Masters of Science in Engineering
Management from West Virginia University
College of Graduate Studies.

Bachelor of Science in Mechanical
Engineering from West Virginia
Institute of Technology.

GOVERNMENT/HISTORIC/COMMERCIAL PROJECT EXPERIENCE

- Bank One
- Bayer Material Science
- Calvert County Aquatic Center, MD
- Charleston Area Medical Center
- Cass Scenic Railroad Clubhouse, WVDNR
- Coal Heritage Discovery Center
- Culture Center, HVAC & Fire Protection, WV State Capitol Complex
- General Motors Corp. Re-commissioning
- Hopemont Hospital, WVDHHR
- Jackie Withrow Hospital, WVDHHR
- Jackson County Courthouse Annex
- Kanawha County Commission: 120,000 sf Judicial Annex additions/renovations
- Kanawha County Courthouse
- Kanawha County Metro 911
- Kanawha County Public Library
- Kanawha County Schools
- Kohl's
- Laidley Towers
- Marshall University
- Mercer County Courthouse Annex
- Olin Corporation
- Phillip Morris USA
- Public Service Commission of WV
- Redmond House, WVDOT
- Rhone-Poulenc
- Robinson Grand Performing Arts Theatre
- Santa Anna Federal Building, CA
- St. Patrick's Church
- Tyler County Courthouse
- Tyler County Schools
- Toyota Motor Manufacturer, WV Inc.
- Union Carbide/DOW
- United Center
- University of Charleston Innovation Ctr
- William R. Sharpe, Jr. Hospital, WVDHHR
- Word Trade Center, MD
- WV Air National Guard including Cx \$45M Fuel Cell/ Maintenance Hangars at Yeager Airport – **LEED Silver Certified**
- WV Army National Guard
- WV Capitol Complex Central Heating Plant
- WV Children's Home, WVDHHR
- WV Department of Transportation/DOH
- WV Division of Protective Services
- WV Higher Education Authority
- WV General Services Division
- WV State Capitol Complex renovations
- WVU Stewart Hall & Wise Library
- Yeager Airport

Todd Zachwieja, PE, CEM, LEED AP

PROFESSIONAL AND COMMUNITY AFFILIATIONS

Past President 2013-14, current Governor - WV ASHRAE Chapter, Served as ASHRAE's Energy and Technical Affairs Chairman for six years. Recognized by ASHRAE Region VII in 2014 with the David Levine Award of Excellence, Presidential Award of Excellence,

Recognized by the International Who's Who of Professionals

Recognized nationally as West Virginia's Business Man of the Year

Recognized by AEE nationally in 2007 as a Legend in Energy

Recognized by AEE nationally in 2008 as a Charter Legend in Energy

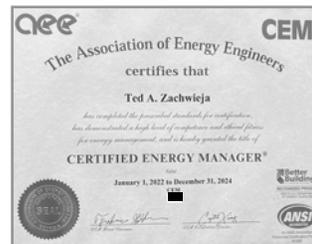
Charter Life Member of the Association of Energy Engineers

Professional Affiliate Member of the American Institute of Architecture

Associate Member West Virginia Society for Healthcare Engineering

Member of the International Code Council

Member of the National Society of Professional Engineers



OTHER RECOGNITIONS

Selected by WVU and the WV Division of Energy to train Code officials and the design community on ASHRAE 90.1 State Energy Code

Presented at regional and national conferences including the annual National System Commissioning Conference

Contributing editor and served on the Editorial Review Panel for *"The Handbook of Building Management and Indoor Air Quality"*

Contributing editor *"Ventilation for a Quality Dining Experience"*

Contributing editor and served on the Editorial Review Panel for *INvironment Professional, Power Prescriptions* and other publications and articles featuring Indoor Air Quality (IAQ) and MEP engineering systems

Energy Star Certified for facilities in the nation's top 25% of energy efficiency

1st Place 2014 ASHRAE Technology Award, Region VII

LEED Silver Certified WVANG Fuel Cell/Maintenance Hangar, Charleston, WV

LEED Gold Certified Harvard Arboretum, Boston, MA

First ASHRAE bEQ certified building in West Virginia, 2015



Ted Zachwieja III, PE, CEM

Ted has over 19 years of experience in building construction design industry. His strategic thinking and development of technical resources at ZDS has helped streamline design processes and improve quality of work office wide. Ted is an innovative problem solver in engineering design, communication methods and management of BIM models between stakeholders during a design project. As a pioneer and a believer in technological processes Ted has championed Integrated Design Practices that has become the fabric of ZDS's day to day operations.

Ted developed ZDS's 3D Scanning services which have assisted in collecting key existing conditions for renovation projects, forensic engineering, historical preservation, and high definition reality capture. Ted has in depth experience on collection, registration, and scan to BIM processes. He has provided training and developed materials for best practices when using 3D scan data. Ted's 3D scanning experience includes governmental, educational, health care, industrial, and commercial facilities. He also has experience in speaking on how 3D laser scanning impacts our industry today.

Ted develops, designs and manages the IT systems. The experience encompasses development and deployment of central server systems to networked client computer systems, strategic development for ZDS' Integrated Design Processes, and research and development into new technologies to continue staying on the cutting edge for ZDS and others.

Ted's project experience includes design and commissioning for heating, ventilating, air conditioning, plumbing, fire protection, electrical and lighting systems for educational, health care, industrial and commercial facilities. His experience encompasses working both on new construction and renovation projects. He also is experienced in historical facilities including theatrical.

Ted maintains an active membership to the ASHRAE professional society and also has a lifetime membership to the Association of Energy Engineers. He maintains an active continuing education towards today's standards and codes as well as participates in ASHRAE at both a local and society level. He was recently appointed to the Electronic Communications Standing Committee with ASHRAE. Ted has designed renovations to existing K-12 schools which received **Energy Star Certifications** placing them in the nation's top 25% of energy efficiency schools.



PROFESSIONAL REGISTRATIONS

Professional Engineer:

Florida

West Virginia

Certified Energy Manager (C.E.M.)

National Certificate

No.



EDUCATION

Bachelor of Science in Mechanical Engineering from Rochester Institute of Technology, Rochester, NY

AWARDS AND RECOGNITIONS

Awarded 2012 Legend in Energy by the Association of Energy Engineers

Awarded acceptance into ASHRAE's 2015 Leadership University

ASHRAE Blue Ribbon Award of Excellence
Co-Author at Autodesk University



Energy Star Certified for facilities in the Nation's top 25% of energy efficiency

GOVERNMENT/HISTORIC/COMMERCIAL PROJECT EXPERIENCE

- WV Air National Guard Maintenance Hangar and Fuel Cell Hangar, Charleston, WV – **LEED Silver Certified**
- Adams Morgan Historic Hotel, DC
- Bayer Material Science
- Catholic Church of Ascension, Parish Hall Renovations
- Coal Heritage Discovery Center
- Culture Center, WV State Capitol Complex
- Highland Museum, KY
- Hopemont Hospital, WVDHHR
- Jackie Withrow Hospital, WVDHHR
- Kanawha County Judicial Annex HVAC Renovations
- Laidley Towers
- Meadowbrook Rest Areas
- I-70 Welcome Center
- CASCI Building, Charleston WV
- Morgantown Welcome Center
- Pocahontas County Community Center
- Redmond House, WVDOT
- Robinson Grand Performing Arts Theatre
- Servia Rest Areas
- St. Patrick's Church, Weston WV
- Stonewall Jackson Marina
- Tyler County Courthouse
- University of Charleston Innovation Center Additions/Renovations
- William R. Sharpe, Jr. Hospital Additions/Renovations, WVDHHR
- World Trade Center, Renovations, MD
- WV Children's Home, WVDHHR
- WV Parkways Authority, Toll Booth Plazas
- WV State Capital Complex Central Heating Plant
- WVU Wise Library
- White Sulfur Springs Rest Area
- Numerous K-12 School Renovations
- Kanawha Co. Judicial Bldg. Commissioning
- WV State Capitol Complex Bldgs. 3 & 4 Commissioning

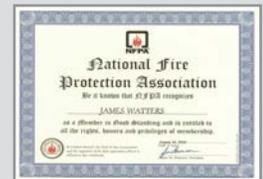
Jim has nearly 50 years of experience in design and implementation of lighting, HVAC, plumbing and electrical systems including nine years in the construction industry. He has a comprehensive knowledge of construction documents, contracts, and development of cost estimates, budgets and schedules. Jim's strengths reside in his ability to manage projects and people in an organized and cost-effective manner. Jim has been involved with the design and production of mechanical and electrical drawings including HVAC, plumbing, fire protection, lighting, electrical power, fire alarm and specialized systems. He has worked with and managed engineers in projects for health care, educational and commercial buildings in the states of West Virginia, Florida, Maryland, Pennsylvania, Ohio, Kentucky, Virginia, Georgia, New York, Arizona, Illinois and Massachusetts.

Jim has extensive experience in energy savings' programs for lighting, HVAC, plumbing and electrical systems in hospitals, state and government office buildings, school systems, and manufacturing facilities, as well as managing performance contracts for a large facility's campus totaling \$10,000,000 in construction costs on various projects, including the conception, design and construction administration for the installation of a 1.5 Megawatt emergency generator. The propane-fired generator and associated switchgear in conjunction with 60,000 gallons of propane fuel storage served to provide peak shaving/load shedding to save on the campus utility costs as well as emergency power functions. Through the years, Jim has researched and implemented into practice International Building Codes, NFPA Codes, National Electrical Codes, Life Safety Codes, IES standards, AIA Guidelines for Design and Construction, and ADA guidelines. His involvement in construction through the years has been mainly from the design side of the industry with a 9 year stint working for a contracting firm at the turn of this century. His experience includes coordinating with Architects, Owners and Agencies including an excellent relationship with the office of State Fire Marshal.



PROFESSIONAL AFFILIATIONS

Member of the National Fire Protection Association (NFPA)



Member of the Health Care Section of the NFPA

Past Member of the Illuminating Engineering Society (IES)

Past member of the American Society of Plumbing Engineers (ASPE)

Past member of the Institute of Electrical Engineers (IEE)

OTHER RECOGNITIONS

Energy Star Certified for facilities in the Nation's top 25% of energy efficiency



GOVERNMENT/HISTORIC/COMMERCIAL PROJECT EXPERIENCE

- Bluefield Area Transit Authority Administration and Maintenance Facility
- Kentucky Judicial Center, Boyd County
- Coal Heritage Highway Authority
- Chase Towers (formally Charleston National Bank)
- Culture Center Fire Alarm/Sprinklers, WV State Capitol Complex
- Department of Transportation Rest Area prototype
- Department of Transportation Welcome Center prototype
- Fenway Park Lightning Protection/ Grounding Study, Boston
- Glenville State College
- Hopemont Hospital, WVDHHR
- I-70 Welcome Center
- Jackie Withrow Hospital, WVDHHR
- Jackson County Libraries Renovations
- Kanawha County Commission Judicial Annex Renovations
- Laidley Towers
- Meadowbrook Rest Areas
- Morgantown Welcome Center
- Redmond House, WVDOT
- Rhone-Poulenc New Admin. offices
- Robinson Grand Performing Arts Theatre
- Sacred Heart Pavilion and Daycare Ctr
- St. Patrick's Church
- Shawnee Park Clubhouse
- Stonewall Jackson Marina Renovations
- Tucker County Board Office Boiler Retrofit
- Tucker County Courthouse
- Tyler County Courthouse
- University of Charleston Innovation Ctr
- William R. Sharpe, Jr. Hospital, WVDHHR
- World Trade Center, MD
- WV Air National Guard including Cx \$45M Fuel Cell/ Maintenance Hangars at Yeager Airport – **LEED Silver Certified**
- WV Children's Home, WVDHHR
- WV Department of Military Affairs, Public Safety Maintenance Facility, Eleanor
- WV Department of Transportation Burnsville Rest Area and Domestic Water Pumping Station—**AIA Merit Award Recipient**
- WV State Capitol Complex Renovations to Buildings 1, 3, 4, 5 & 7
- White Sulphur Springs Welcome Center

David is a professional Mechanical Engineer with over 16 years of experience in the design and construction of over 500 projects having construction values up to \$35 million. His design experience ranges from commercial, industrial, institutional, healthcare, education, restaurant, retail, government, airport, and recreational facilities.

David collaborates well with fellow engineers, architects, owners, commissioning agents, contractors, and vendors to define project scope and develop conceptual designs. As a project manager he successfully manages projects from start to finish in design, bidding, and construction administration.

PERSONAL PROJECT EXPERIENCE

- Dominion Office Building—LEED Gold, Bridgeport, WV
- Mon General Hospital Echo Renovations, Morgantown, WV
- Mon Health LTAC for Acuity, Morgantown, WV
- UHC POB 4th Floor Fitout, Clarksburg, WV
- Clarksburg Comprehensive Care Clinic Renovations, Clarksburg, WV
- Jerry Dove Medical Office Building, Bridgeport, WV
- Medbrook Building HVAC Replacement, Bridgeport, WV
- Mylan Pharmaceuticals, Morgantown, WV
- Total Dental, New Multi-Tenant Building for PCE, LLC, Bridgeport, WV
- Beckley Police Station, Beckley, WV
- Doddridge County Athletic Complex, Doddridge County, WV
- Boy Scouts of America, Rex W. Tillerson Leadership Center, Fayette County, WV
- White Hall Public Safety Building, White Hall, WV
- Beitzel/Pillar Innovations Office Building, Garrett County, MD
- Shady Spring Middle School HVAC Renovations, Shady Spring, WV
- Maxwell Hill Elementary School HVAC Renovations, Beckley, WV
- Percival Hall Absorption Chiller and Cooling Tower Replacement, Morgantown, WV
- Thrasher Engineering Office Building, Bridgeport, WV
- WVU Creative Arts Center Rehearsal Hall, Morgantown, WV
- WVU Towers Dining Hall Renovations, Morgantown, WV
- WVU Athletic Performance Center, Morgantown, WV
- HP Hood Addition/Renovations, Winchester, VA
- Dominion Office Building, Delmont, PA
- University of Pittsburgh Softball Practice Facility, Pittsburgh, PA
- Westmoreland Community and Technical College, Indiana, PA
- WVU Alumni Center, Morgantown, WV
- WVU Biomedical Research Facility, Morgantown, WV
- WVU Milan Puskar Locker Room Renovations, Morgantown, WV
- NOAA GOES-R Supercomputing Center, Fairmont, WV
- Columbia Gas Transmission Compressor Station, Mathias, WV
- Mabscott Elementary School HVAC Renovations, Beckley, WV
- Independence Middle School HVAC/Roof Upgrades, Coal City, WV



PROFESSIONAL REGISTRATIONS

Professional Engineer:

West Virginia

Maryland

Virginia

Ohio

Pennsylvania

LEED AP BD+C Professional Accreditation

NCEES Record Certificate

EDUCATION

Bachelor of Science

Mechanical Engineering

WV Institute of Technology

MEMBERSHIPS

WV ASHRAE, Current President

National Fire Protection Association

WV Society of Healthcare Engineers

Mark has over 18 years of experience and is responsible for the design of commercial, institutional, and industrial mechanical and electric projects. He works with architects, civil and structural engineers to coordinate design and construction documents. He is responsible for project specifications and submittal review. Mark holds Degrees in Engineering and Architectural Technology which provide more than engineered solutions. He designs solutions that incorporate essential and functional needs, as well as aesthetic, life-safety, and constructability considerations.

Before joining ZDS, Mark was the President and Principal Engineer of another firm where he provided mechanical and electrical engineering design and analysis for commercial construction projects and was responsible for acquiring new projects.

He analyzes systems to determine best value solutions. He evaluates contractor equipment and material submittals as well as conduct on-site review of construction progress and quality.



PERSONAL COMMERCIAL/GOVERNMENTAL PROJECT EXPERIENCE

- General Motors Dealerships; Lewisburg, Charleston & Beckley.
- Toyota Manufacturing Facility; multi-purpose addition containing office spaces, medical treatment area, and weight room.
- Berkeley County EMS; New Facility.
- Buzz Food Processing Facility; New 12,000 sf processing facility includes offices, refrigeration, and abattoir spaces.
- Princeton War Memorial; HVAC Renovations.
- Brickstreet Insurance Headquarters; 86,100 sf renovation.
- Beckley PSD; 3 Water Storage Tanks; Sweeneysburg Water Treatment Plant.
- Shops at Kanawha Plaza; extensive renovation and tenant fit-up project of 195,000 sf shopping center.
- Huntington Museum of Art; HVAC Renovations.
- New Automobile Showrooms; two new showrooms with office and/or repair facilities.
- First Bank of Charleston; New Building.
- Hargis Laundry Facilities; laundry facility renovations.
- Harley Davidson; Store Renovations.
- Shawnee Sports Complex; Six multi-purpose fields and four baseball field complex with amenities.
- Charleston Housing Authority; Lee Terrace Boiler; Jarrett Terrace HVAC; Lee Terrace HVAC; Carroll Terrace Boiler; Little Page Boiler; Washington Manor Boiler; Switzer Center.
- Clay County PSD; Water Storage Tank; Water Treatment Plant.
- Putnam County Courthouse Complex; HVAC Replacement at the Sherriff's Office Building and the Main Courthouse Building.
- Trans Canada; New Control Building.
- Willow I & II and Elk Village Senior Centers; Three new two-story senior apartment buildings in multiple locations.
- Raleigh County Airport; Runway Lighting Upgrade.
- Yeager Airport; Runway & Tarmac Repairs.
- Upshur County Commission; Upshur County Courthouse Addition.
- Huntington Housing Authority; New 50 Unit Apartment Building; Administration Building Renovations.
- Maranatha Fellowship Church; New Annex Building.
- Mount Olive Correctional Facility; Foundation Verification.
- State of West Virginia Bioterrorism Lab; Upgraded existing mechanical and electrical systems to Bioterrorism facility to current federal standards.
- WV Department of Transportation; Kelly Creek Bridge; Marmet Bridge.
- WV Water Development Authority; New Facility.
- Dunbar Housing Authority; Dutch Hollow HVAC Replacement.
- WV Hygienic Lab; HVAC & Electrical Upgrades.
- WV Division of Motor Vehicles; Kanawha City.

PROFESSIONAL REGISTRATIONS

Professional Engineer:

West Virginia

Maryland

Virginia

Kentucky

Ohio

EDUCATION

Bachelor of Science

Mechanical Engineering

WV Institute of Technology

Bachelor of Science

Architectural Engineering Technology

Associates of Science

Mechanical Engineering Technology

Fairmont State College



Paul has 30 years of engineering experience involving the analysis, design, project management, specifications' writing and construction management on many projects throughout the region. This experience includes heating, ventilation, air conditioning (HVAC), plumbing, electrical systems and lighting for governmental, commercial, educational, healthcare, industrial and military facilities. He also has knowledge and experience with indoor environmental quality assessment, recommended remedial work and design of the necessary modifications in various types of buildings.

Paul assisted in the design and implementation of the pilot project for one of the largest geothermal heat pump systems in the mid-Atlantic region. He has also been involved in the design of facilities that have received the Energy Star Certification placing them in the nation's top 25% in energy savings for similar buildings and systems as well as his contribution as part of a large team effort performing mechanical systems' retro-commissioning at numerous automotive manufacturing facilities in North America.

His project experience is wide-ranging and includes the development of scope, design criteria and budget conscious designs. Working with other design professionals and through rapport with the clients he has conducted design peer reviews, construction budget and project schedule overview, Construction Administration and closeout of projects.

GOVERNMENT/HISTORIC/COMMERCIAL PROJECT EXPERIENCE

- WVARNG Armory/Annex
- Bruceton Bank
- Bank One
- Culture Center, WV State Capitol Complex
- Cuissets Residence
- Camp Dawson barrack/mess hall
- DOT Huntington District II Headquarters Renovations
- Yeager Airport Terminal Expansion/Renovation
- DOH Testing Lab
- GMC Lordstown Assembly Plant
- GMC Janesville Assembly Plant
- GMC Pontiac East Assembly Plant
- GMC Bowling green Assembly Plant
- GMC Arlington Assembly Plant
- Harrison County Bank
- IMC Office Bldg.
- Kanawha County Commission, Judicial Annex
- WV Capitol Complex Central Boiler Plant
- Appalachian Tire
- Laidley Towers
- Robinson Grand Performing Arts Theatre
- USDA Forestry Building
- University of Charleston Innovation Center Additions/Renovations
- World Trade Center, MD
- William R. Sharpe, Jr. Hospital Additions/Renovations, WVDHHR
- Numerous K-12 School Renovations



PROFESSIONAL REGISTRATIONS

Professional Engineer:
West Virginia [REDACTED]

EDUCATION

Bachelor of Science in Mechanical Engineering from WV Institute of Technology, Montgomery, WV (Graduated Cum Laude)

PROFESSIONAL AFFILIATIONS

Member American Society of Mechanical Engineers

Member ASHRAE

Vineel is a professional Mechanical Engineer with a Masters Degree in Mechanical Engineering and nearly 6 years experience in HVAC & Refrigeration. Technically sophisticated engineering professional with solid history of effective integration, and deployment of HVAC systems. Significant experience in designing, commissioning and implementing efficient HVAC systems for various commercial, healthcare and educational facilities.

Vineel is knowledgeable on HVAC systems, Heat Transfer, Refrigeration and Thermodynamic specializing in HVAC heating and cooling load calculations, Psychrometric and hydronic analyses and Energy modeling. He has applied that foundation in the MEP industry, manufacturing industry and the commercial industry. Vineel has a comprehensive knowledge of mechanical principles and drafting techniques.

He is experienced hands-on in designing Variable Refrigerant Flow systems, Steam Systems, hydronic systems, Geothermal systems and Building Automation System. He is also proficient in Revit, AutoCAD, IESVE, Navisworks, and Autodesk Recap. Vineel is experienced in utilizing point clouds in the development of Scan to Building Information Modeling (BIM) and performing 3D scanning. Vineel is well-versed in technical specification writings and development of construction drawings. He has hands-on experience in performing Functional Performance Testing in leading Commissioning projects.

PROJECT EXPERIENCE

- New Bluefield Elementary School Commissioning
- Clay County High School Commissioning
- North Fork Elementary School HVAC/Roof Renovations, 3D Scanning, Scan-to-BIM and Commissioning
- Pendleton County Middle/High School HVAC/Roof Renovations, 3D Scanning, Scan-to-BIM and Commissioning
- New 911 Center high performance “Net Zero” facility and Commissioning
- Tyler County Courthouse Additions/Renovations and Commissioning
- Riverside High School HVAC/Lighting Renovations
- Roane General Hospital Commissioning
- Kanawha County Judicial Building Renovations & Commissioning
- New Clendenin Elementary School Commissioning
- Marshall University—Jomie Jazz HVAC Renovations
- Veteran Administration Clarksburg Hospital Mechanical BIM
- Veteran Administration Huntington Hospital Mechanical-Electrical BIM
- WVARNG Brushfork Armory HVAC Renovations
- WV Capitol Complex Campus Heating System Renovations Buildings #1, #3, #4, #5 and #7 over multiple phases
- WV State Capitol Complex Bldgs. 3 & 4 Commissioning
- St. Marys High School
- Raleigh County Schools: 4 Schools - Renovations & Commissioning
- New Stratton Elementary School Commissioning



PROFESSIONAL REGISTRATIONS

Professional Engineer:
West Virginia [REDACTED]

EDUCATION

VIT University
Bachelor of Science
in Mechanical Engineering

Southern Illinois University Edwardsville
Master of Science
in Mechanical Engineering

University of Cumberland
Working on PhD in Project Management

AWARDS AND RECOGNITIONS

Certified by ASHRAE in
HVAC Design Essentials & Applications

Meher Meka, MSEE, EI

Meher is a graduate Electrical Engineer with a Masters Degree in Electrical Engineering and nearly 5 years of experience in Power Distribution & Protection, Lighting design, Lightning protection, Fire Alarm, Communications and Schematics. He also is experienced in plumbing design for educational, commercial and governmental facilities.

He leads solar power applications including WV's first net zero 911 Center involving aggregate net metering where the additional solar power generated at a new 911 Center is credited towards the County's Courthouse. Knowledgeable in High performance building design.



PROJECT EXPERIENCE

- St. Marys High School
- CEA office
- Blennerhassett Island Dock Study
- Coney Island Hot Dogs Central Kitchen
- Brushfork Armory Renovations
- C.R. Hipp Industrial Warehouse
- Eucalyptus Wellness Company
- Ed Harleys Private Garage
- High Wire Distillery
- Kanawha County Judicial Bldg.
- Jones Trading Upfit office space
- Kimley Horne Charleston Buildout
- HSGS Solar Office Space
- IX Artistry Salon
- JW Aluminum upfit office space
- J McLaughlin Upfit Retail Outlet
- Maple Street Office Building
- North Fork Elementary Retrofit
- Northwood Middle School
- River Oaks Storage
- Raleigh County Schools
4 Schools Renovations
- Riverside High School Renovations
- Orange Theory Fitness, Acworth
- Orange Theory Fitness, Milton GA
- Pack Rat Storage Bees Ferry road
- Pendleton County Middle/High School Renovations
- Sherwin Williams
- South State Bank Renovations
- Steel City Pizza Cranes
- Stella Nova Cigar Factory
- Trimnal Mayers Law office
- Tyler County Schools
- Tyler County 911 Center
- Tyler County Courthouse Retrofit
- VA Hospital - Clarksburg
- VA Hospital - Huntington
- WV Capitol Complex Renovations Bldg. #1, #3, #4, #5 and #7
- WVDOT - Servia Rest Area
- Airforce Base Clinic
- Canadian Consulate office
- JBL Harman office space
- HP Office Space

PROFESSIONAL REGISTRATIONS

Engineer in Training (E.I.T)
Fundamentals of Engineering (F.E)

EDUCATION

Bachelor of Technology, Electrical and
Electronics Engineering

UNC Charlotte
Master of Science
Electrical & Computer Engineering



PERSONAL SUMMARY

Mr. Rowles is a recognized leader in the design, rehabilitation, and repair of concrete structures. His work extends from the design of new cast-in-place construction to the evaluation of existing distressed concrete parking garages. The latter often involves the detailed assessment of potential reduction in their service life as the result of various environmental factors, and the development of appropriate repair methods for each structural condition. His years of experience as a practicing engineer provide him with a wide range of skills, but his unique expertise in concrete structures places him in a position as a specialist. As a firm leader at AES, he has mentored a group of young engineers in concrete knowledge, establishing a team of professionals with the ability to address structural issues across a wide technical and geographic range.

REFERENCES

Greg Heddaeus

Senior Project Manager
Carl Walker Construction
412.490.2924
gheddaeus@carlwalkerconstruction.com

Jeff Konkle

Construction Rep
MAK Construction Products Group
412.952.1737
jeffk@mak-cpg.com

EDUCATION

Bachelor of Architectural Engineering
Pennsylvania State University, 1984

PROFESSIONAL REGISTRATIONS

Licensed Professional Engineer in Alabama, Massachusetts, Michigan, New York, Ohio, Pennsylvania, Virginia, and West Virginia

PROFESSIONAL MEMBERSHIPS

American Institute of Steel Construction
International Concrete Repair Institute
Founding Member & Board Member

EXPERIENCE

With over 38 years of experience, Mr. Rowles is one of the region's leading structural engineers. He has compiled a long list of successfully completed projects for many building types including educational, medical, corporate headquarters, adaptive reuse buildings, and parking garages.

Mr. Rowles has developed a specialty in concrete design, rehabilitation, and repair over the years, and has demonstrated creative solutions for projects involving many structural services. His efforts with on-site structural evaluations, load surveys, condition surveys, building inspections, feasibility studies, and construction observation have contributed to his expertise on new and existing structures. He has also been involved as an expert witness in numerous forensic investigations regarding building deficiencies.

Mr. Rowles is responsible for inspiring our other engineers and for driving the success of the firm. He is integrally involved in day-to-day project supervision, project scheduling and coordination with other consultants, project delivery and development, resourcing and budgeting, and project team management.

FEATURED PROJECTS

MuseumLab | Pittsburgh, PA

The Children's Museum of Pittsburgh created a new learning environment with unique interactive experiences in the former Carnegie Free Library of Allegheny. The historic building received a new elevator and exterior stair, new floor openings, the infilling of an existing floor opening, new mechanical equipment, and modifications for suspended artwork.

46,000 SF | \$18.5M Adaptive Reuse

Oglebay & Ming Hsieh Hall | Morgantown, WV

Home of the Department of Forensic and Investigative Science at West Virginia University, this project added state-of-the-art classrooms, labs, and support spaces, in addition to restoration of brick, limestone, and terracotta for the exterior façade. The structure also included the addition of Ming Hsieh Hall, containing two lecture halls and a rooftop parking deck.

66,000 SF | \$20M Renovation

CMU Alumni House | Pittsburgh, PA

Rehab and transformation of a historic residence for flexible office, conference, and social space; envelope, site, and interior design.

7,000 SF | \$1.54M Renovation



morgan kronk

PRINCIPAL COST ESTIMATOR

Morgan Kronk has developed cost estimates for PWWG for 30+ projects totaling more than \$50M in construction costs. He has over 35 years of commercial construction experience and has been beneficial to both architects and owners in understanding their costs and supporting their projects throughout construction. As an owner's representative, cost estimator or construction consultant and manager, he brings tangible value to projects.

PROJECT EXPERIENCE WITH PWWG

- 4700 Fifth Avenue, Carnegie Mellon University, Pittsburgh, PA
- Pedestrian Bridge, Western Pennsylvania School for Blind Children, Pittsburgh, PA
- Margaret Morrison Renovations, Carnegie Mellon University, Pittsburgh, PA
- Margaret Morrison Elevator Addition, Carnegie Mellon University, Pittsburgh, PA
- Palumbo Science Center, LaRoche University, Pittsburgh, PA
- SEI Space Study, Carnegie Mellon University, Pittsburgh, PA
- STEM Study, WVU Potomac State College Keyser, WV
- Crawford County Courthouse Planning, Meadville, PA
- Old Economy Village Rehabilitation and Upgrades of Historic Buildings, Ambridge, PA
- The Garden Room at the National Aviary, Pittsburgh, PA
- President's House Study, Carnegie Mellon University, Pittsburgh, PA
- Campbell Hall 4th Floor, West Liberty University, West Liberty, WV
- Manchester School Window Replacement, Pittsburgh Public Schools, Pittsburgh, PA
- Downtown Campus Library Gallery and Atrium Study, West Virginia University, Morgantown, PA
- West Virginia Building 4, Charleston, WV
- Frame Gallery Bathroom, Carnegie Mellon University, Pittsburgh, PA
- William Pitt Union Porch Repairs, University of Pittsburgh, Pittsburgh, PA
- National Aviary Masterplan Refinement, Pittsburgh, PA
- Warner Hall Study, Carnegie Mellon University, Pittsburgh, PA
- 21c Museum Hotel Lexington, Lexington, KY
- Child Development Center, West Virginia University, Parkersburg, WV
- Cambell Hall, West Liberty University - West Liberty, WV
- Historic Shaw Hall Study and Renovation, West Liberty University, West Liberty, WV
- Glen Hazel High Rise, Housing Authority of Pittsburgh, Pittsburgh, PA
- Vermeire Manor Phase II, Sharon, PA

PROFESSIONAL ASSOCIATIONS

Morgan has taught Construction Estimating at community colleges throughout the Pittsburgh region

Rebecca Residence, Board of Directors (Secretary, Executive Committee)

American Institute of Architects (Affiliate Member)

Building Officials & Code Administrators (Affiliate Member)

Pro Bono Estimating and Consulting for the Community Design Center of Pittsburgh



MORGAN
PROPERTY &
CONSTRUCTION
CONSULTANTS

| relevant +
projects

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alumni house renewal/re-use : carnegie mellon university, pittsburgh, pa

This historic residence was reinterpreted as Alumni House, integrating all of the university's alumni outreach and fundraising departments. The building functions as both work space and social space for gatherings to cultivate engagement and philanthropy within Carnegie Mellon's global community.

APPLYING THE ART & SCIENCE OF ADAPTIVE REUSE REVIVED AN ARCHITECTURAL JEWEL

- PWWG led consultants in a broad scope of structural, functional, and aesthetic work inside and out to restore the building and upgrade for 21st century use.
- Outside — Existing porch replaced with elegant composition of columns and entablature; unsightly ADA ramp replaced with a wooden ramp in the style of the historic building; new windows and shutters enhance the classical facade; new site planting creates a calming screen between the building and busy street.
- Inside — The building's plan geometry was restored; first floor was outfitted with new FF&E consistent with the Colonial Revival style of the building, with fresh architectural presence. Upper floors were renovated for flex office space with a refined, contemporary aesthetic, successfully melding old and new.
- MEP and lighting upgrades enhanced the environment and improved energy efficiency.
- Intention & vision were synthesized in a successful renovation—staff and visitors express approval for this “stunning transformation.”

CLIENT: Carnegie Mellon University

SIZE: 7,000 sf

COST: \$1.54M

COMPLETION: 2014

FIRM RESPONSIBILITY:

Programming
Architectural Design
Interior Design for Public Areas
Contract Documents
FF&E
Contract Administration

REFERENCE

Jill Berger, Asst. VP,
Advancement Operations
jb83@andrew.cmu.edu



Exterior before renovation.



before

View of Living Room toward Parlor, before restoration (above) and after (right) the original framed opening was reinstated so the spaces flow once again.



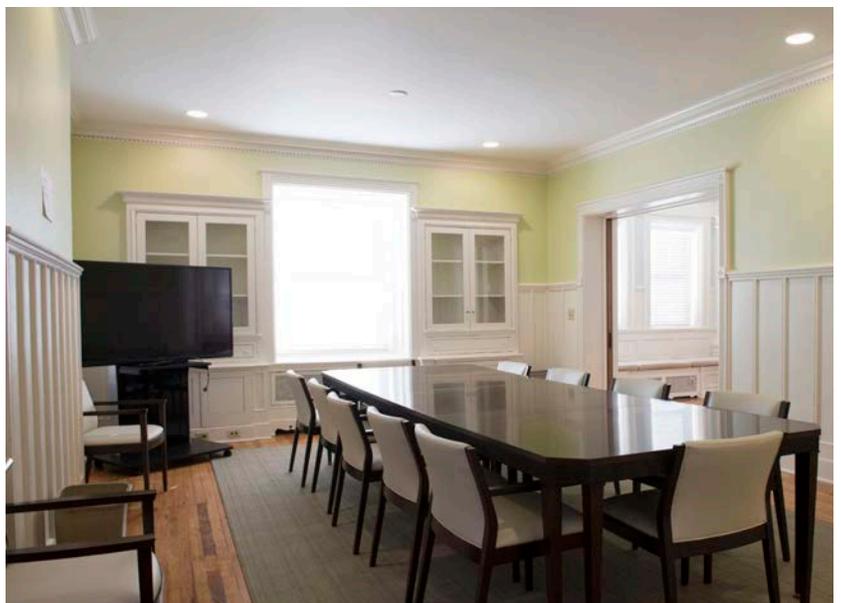
before

Entry staircase before (above), and after restoration (right).



before

View of Dining Room before restoration (above), and after (right) the framed opening was reinstated and original casework was restored.





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bayard school lofts : pittsburgh, pa

restoration/reuse preserves the rapidly changing neighborhood's distinct, authentic architectural character

The project salvaged and reinvented Bayard School, an 1874 architectural and cultural landmark, into an 11-unit apartment building in a neighborhood often viewed as ripe for demolition and redevelopment. Starting with a vacant eyesore that had deteriorated through 15 years of neglect, PWWG, along with engineering and preservation consultants, collaborated on an exceptionally complex restoration that remedied functional and structural obsolescence to make the project an architectural and financial success.

Design strategies maintain and restore the integrity of the existing historic structure and seamlessly weave in contemporary design elements and technical upgrades to transform the building for a new program of housing. With financing that included historic tax credits, every design move had to meet stringent National Park Service (NPS) standards for renovation, and gain PA State Historic Preservation Office (SHPO) approval.

Exterior work included masonry restoration, re-opening blocked in windows, and crafting recreations of historic trims and ornament. Fresh site amenities and finishes were enthusiastically supported by the NPS, the PA SHPO, and neighborhood stakeholder groups. The total interior transformation used skillful triage to preserve foursquare symmetry while creating favorable layouts for apartments. To infuse the interior with the spirit and charm of the building's original use, the team incorporated salvaged elements like blackboard slate for apartment signage.

The project is a model for inclusive placemaking, with two affordable units as part of the mix. The Bayard School restoration/reuse proves that history, sustainability, fairness, and economic vitality can go hand-in-hand. It is a complete success in terms of stakeholder support, leasing, low turnover, and maintaining full occupancy with almost no marketing since it opened in 2018.

CLIENT: Q Development

SIZE: 10,000 sf

COST: \$2.3M

COMPLETION: 2018

FIRM RESPONSIBILITY:

Managing the Application process
to secure Historic Tax
Credit funding
Forensic Investigation
Programming
Architectural Design
Contract Documents
Coordination of Consultants
Contract Administration

REFERENCE

Rick Belloli, Principal
rick@qdevelopment.com



Exterior before renovation.



Exterior before renovation.





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old economy village rehabilitation, renovation and upgrades : ambridge, pa

Old Economy Village is a historic Harmonist site, kept nearly fully intact that serves as a museum facility for tours, school visits, and special events where people can learn about Harmonist life in Pennsylvania during the site's interpretive period (early to mid 1800s). The site's collection of buildings have a variety of materials, but many commonalities between them. Primary materials are brick, stone, and wood shake roofs. Most of the buildings were built during the 1800s, although there are a few modern structures, including the Visitor's center located 1 block from the historic site.

PWWG took on the collection of smaller projects that are bundled into one larger \$5.1 million project. Much of the work involved the preservation of historic structures. This work had to conform to the Secretary of the Interior's Standards for the Treatment of Historic Properties preservation standards.

WORKING WITH OVER 20 SEPARATE SCOPE LOCATIONS AND SEVERAL DIFFERENT SCOPES OF WORK AT EACH LOCATION:

- Masonry repairs (pointing)
- Exterior Carpentry and Painting (trim, and windows)
- Replacement of existing wood shake roofs
- Mechanical additions and upgrades, including adding air conditioning to the Rapp House (historic building), radiant barriers to aid the heating system at the Mechanic's Building, and mechanical upgrades to the Geothermal system at the Visitor's center.
- Electrical Infrastructure Upgrades to electrical site infrastructure, the addition of emergency lighting and lighted exit signage in historic structures, and electrical work associated w/ mechanical upgrades
- Accessibility Improvements including Ramp Additions to the Store, Feast Hall, and Baker House, re-grading at entrances to the Granary and the Warehouse, and a lift to be built inside Feast hall for access to the 2nd floor.

CLIENT: PA Department of General Services & PA Historical and Museum Commission

SIZE: .77 acres

COST: \$5.1M

COMPLETION: Summer 2022

FIRM RESPONSIBILITY:

Forensic Investigation
Architectural Design
Permitting
Construction Documents
Construction Administration

REFERENCES

Michael Knecht
PHMC Site Administrator
miknecht@pa.gov

Ron Veyo
DGS Project Coordinator
rveyo@pa.gov



Many of the historic structures required repairs to carpentry, windows, and paint through-out the site.



Accessibility Improvements including Ramp Additions to the Store, Feast Hall, and Baker House, re-grading at entrances to the Granary and the Warehouse



wv state capitol building #3 renovation : charleston, wv re-use/renewal of a landmark historic office building

PWWG restored one of the most prominent buildings on the WV Capitol campus— with preservation, historic Building 3 – for use as a modern, well-functioning and welcoming office space. The services needed to successfully implement this project included: code and life safety compliance evaluations, feasibility evaluations, space programming, coordinating complex MEP/FP system upgrades in an integrated process, and developing 3D visualizations of design options.

EXTERIOR WORK RESTORED FROM THE OUTSIDE IN

- Replaced existing Ludowici clay tile roof to match existing, and coordinated QC with the manufacturer; replaced all flat roofs, gutters and flashing.
- Conducted masonry testing to develop the least invasive cleaning methods for all brick, limestone, Virginia Greenstone and granite masonry.
- Repointed failed vertical mortar joints, and replaced all sky-facing mortar joints with sealant and backer rod.
- Refinished all existing bronze window frames and sashes. Existing single pane glass was replaced as necessary.
- Remediated water infiltration issues at balustrade piers and copings
- Refinished existing bronze windows.
- Restored and cleaned limestone, brick, and granite masonry.
- Restored original bronze doors, and integrated increased security.

CLIENT: Dept of General Services, State of West Virginia

SIZE: 165,000 sf

COST: \$37.5M

COMPLETION: 2017

FIRM RESPONSIBILITY:

Lead Architect coordinating large consultant team
Programming
Architectural Design
Contract Documents
Contract Administration

REFERENCE:

William Barry, Director
West Virginia General Services Division
304.352.5532
William.D.Barry@wv.gov

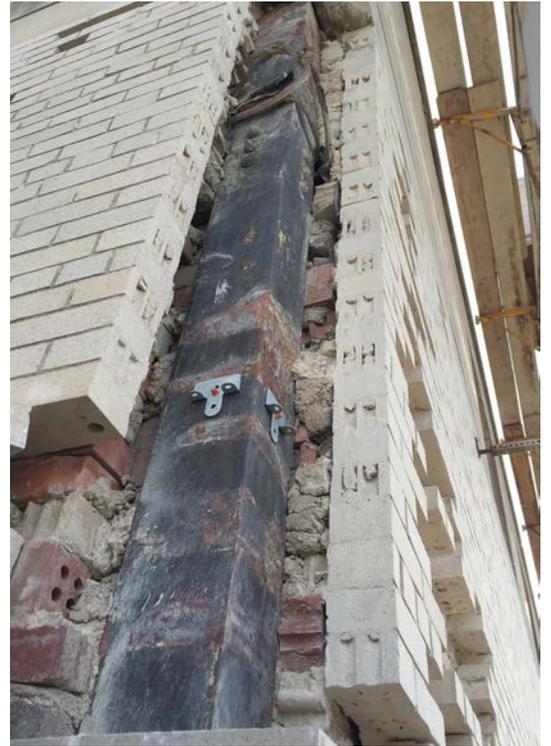
 Design Award Winner



Mockup of new roof as part of QC



Ludowici tile fabricated to match original signature color; roof restoration in progress



Corner removed to add expansion joint



Parapet existing condition



Parapet during exploratory demolition



Reconstructed parapet mitigates water infiltration



Existing window (l), window restoration mockup (r)



Existing main entry door (l) and historic bronze door restored (r), with state-of-the-art access controls and ADA hardware



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wv state capitol building #4 renovation : charleston, wv re-use/renewal of a landmark historic office building

This is the third project on the capitol campus, which renovates the site, exterior, and interior of a 1950s office building. It updates the layout, systems and finishes, addresses life safety and accessibility, and preserves the mid-century architectural character.

The goal of this project is to provide flexible, state-of-the-art open office space for multiple agencies and users. Although Building Four is not listed on the National Register of Historic Places, the client wanted to maintain the existing style and historic character of the building in a manner consistent with the National Park Service Historic Preservation Standards.

CLIENT: Dept of General Services, State of West Virginia

SIZE: 7 stories plus basement, 82,000 sf including basement

COST: Confidential

COMPLETION: 2023 (Est.)

FIRM RESPONSIBILITY:

Lead Architect coordinating large consultant team
Existing Conditions Doc
Programming
Architectural Design
Finishes
Contract Documents
Contract Administration

REFERENCE:

Scot Casdorph, PE
Architecture & Engineering Manager
WV General Service Division
Architectural and Engineering
304.957.7145
Scot.R.Casdorph@wv.gov



21c Museum Hotel Cincinnati



21c Museum Hotel Nashville

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21c Museum Hotel Durham

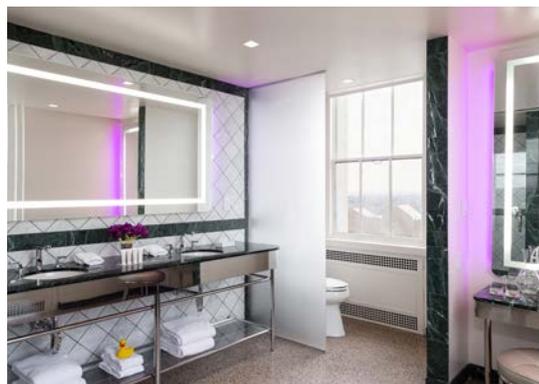


21c Museum Hotel Lexington

21c museum hotels renewal/re-use of landmark properties in Cincinnati, Nashville, Durham, Lexington

Each 21c Museum Hotel project is renewal/reuse of an existing historic building—bank, office, department store — to create a unique hybrid hotel and museum. Each includes guest rooms outfitted with high-end amenities, galleries of world class art open to the public 24/7, spaces for meetings and events, and a destination restaurant. PWWG has completed four of these complex projects as executive architect working closely with the client and with design architects Deborah Berke Partners (NYC). For each project, PWWG coordinates the design and production work of consultants in MEP, envelope forensics, site design, interiors, food service design, lighting, and other specialties, and coordinates contract administration.

Each project has unique ambiance, inspired by the character of the historic building in a skillful mix of old and new, incorporating art and local craft to inspire interior design. This project page features the range of interior design work PWWG has implemented to transform these existing historic buildings into signature destinations helping to revive cultural life in their city's downtowns.



CLIENT: 21c Museum Hotels

LOCATION: Cincinnati, OH
SIZE: 159,000 sf **COST:** \$28M
COMPLETION: 2012

LOCATION: Nashville, TN
SIZE: 120,000 sf **COST:** \$29M
COMPLETION: 2017

LOCATION: Durham, NC
SIZE: 134,000 sf **COST:** \$27M
COMPLETION: 2015

LOCATION: Lexington, KY
SIZE: 103,500 sf **COST:** \$23.5M
COMPLETION: 2016

REFERENCES, ALL PROJECTS
Molly Swyers, Chief Brand Officer,
21c Museum Hotels
mswyers@21chotels.com

Terrence Schroeder, Partner,
Deborah Berke Partners
tschroeder@dberke.com

★ All are Multiple Design Award Winners



MuseumLab at the Children’s Museum



Allegheny County Courthouse Facility Plan & Restoration

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envelope restorations in landmark buildings sites in pennsylvania & west virginia

PWWG has led renewal and reuse of some of the most iconic landmark buildings in the tri-state area. Our scope typically includes both exterior and interior work. This page presents a selection of envelope restoration projects on campuses, and for private and institutional clients.

APPLYING THE ART & SCIENCE OF PRESERVATION TO RESTORE ARCHITECTURAL TREASURES

- Investigations typically verify composition of masonry substrates, chemical analysis to determine composition of original materials; and selective structural deconstruction.
- Forensics are completed to National Park Service standards, and work proceeds hand-in-glove with the SHPO. PWWG coordinates all field work and production of experts in facade and structural restoration.
- “Restoration to modern standards” typically includes repair and replacement to address persistent problems with water infiltration, structural systems, roofing, and energy efficiency.
- PWWG designs all details for needed repairs in an integrated process with consultants.
- Experience with evaluation, cleaning, and repair of all facade types: brick, limestone, terra cotta, granite, etc.

Continued on next page...

MUSEUMLAB

CLIENT: Children’s Museum of Pgh

LOCATION: Pittsburgh, PA

COST: \$28M

COMPLETION: 2012

REFERENCE:

Jane Werner, Executive Director
jwerner@pittsburghkids.org

ALLEGHENY COUNTY COURTHOUSE

CLIENT: Allegheny County/
City of Pittsburgh

LOCATION: Pittsburgh, PA

COMPLETION: 2020

REFERENCE:

Kevin Halaja, Deputy Director of
Operations County of Allegheny
Kevin.Halaja@AlleghenyCounty.US

★ Design Award Winners



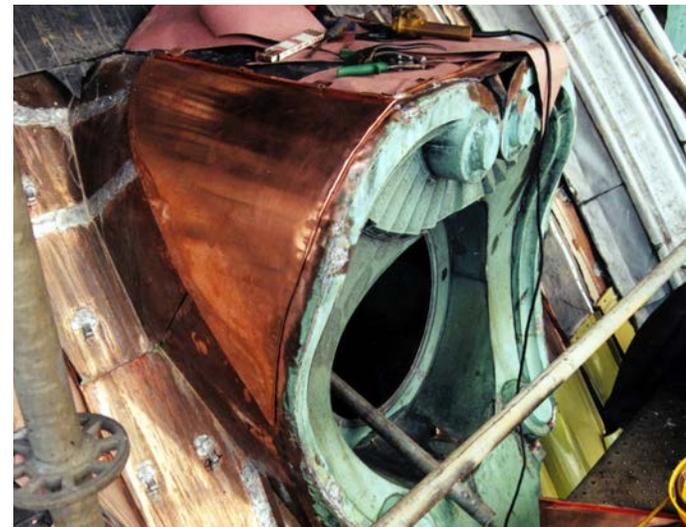
Margaret Morrison Facade Restoration & Waterproofing

★ Design Award Winner



★ Design Award Winner

PA Capitol Exterior Restoration



Historic Shaw Hall Exterior Restoration



MARGARET MORRISON FACADE RESTORATION

CLIENT: Carnegie Mellon University
LOCATION: Pittsburgh, PA
COST: \$2.2M
COMPLETION: 2012
REFERENCE:

Adam Homer, Project Manager,
ahomer@andrew.cmu.edu

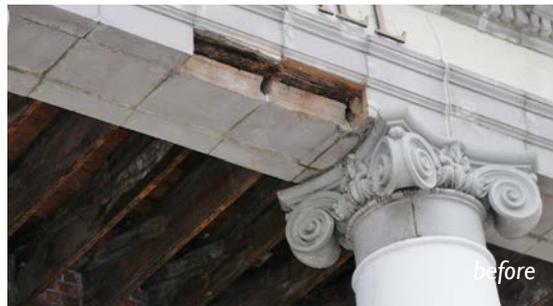
PA CAPITOL

CLIENT: PA Dept. of General Services
LOCATION: Harrisburg, PA
COST: \$2.5M
COMPLETION: 2005
REFERENCE: N/A (Retired)

SHAW HALL

CLIENT: West Liberty University
LOCATION: West Liberty, VA
COST: \$4M
COMPLETION: 2012
REFERENCE:

Joseph R Mills,
Director of Physical Plant
jmills@westliberty.edu



historic shaw hall exterior and interior restoration & reuse, west liberty university : west liberty, wv

Shaw Hall, constructed in 1919, is listed on the National Register of Historic Places. The building was in sound structural condition, at a prominent site on the campus of West Liberty University. The university wanted to transform it from a dormitory to administrative offices, conference and work rooms, and a student health center. PWVG was selected to first complete a facility study, and then the full renovation of the historic building.

EXTERIOR SCOPE OF WORK

- Full roof replacement
- Restoration of 14 ornate masonry columns and pilasters at three porticoes;
- Restoration of terra cotta entablatures at each portico and pointing and cement parging necessary to preserve the brick masonry and above ground foundation walls of the building

INTERIOR SCOPE OF WORK

- Forensic investigation, programming, architectural design, contract documents, coordination of full consultant team, furniture selections, designing custom casework and storage solutions for all interior spaces, and Accessibility upgrades throughout.
- PWVG coordinated the full MEP systems, AV/IT and lighting upgrade, collaborating with an engineering consultant.
- All work was done in conformance with strict Secretary of the Interior Standards for the adaptive reuse of historic structures.
- Renovation restored finishes lost to “modernization” in the 1950s-70s, and introduced contemporary aesthetics while complimenting the historic features of the building.
- PWVG used a building information modeling process (BIM/Revit) to explore MEP and building layout options, and document the design to conform to SHPO standards.

CLIENT: West Liberty University

SIZE: 32,000 sf

COST: \$4M

FACILITY STUDY COMPLETION: 2009

RENOVATION COMPLETION: 2012

FIRM RESPONSIBILITY:

Facility Plan
Programming
Architectural Design
Furniture and Office
Systems Layout
Contract Documents
Contract Administration

REFERENCE

Joseph R Mills,
Director of Physical Plant
jmills@westliberty.edu



3D models (left and below) helped PWVG's team plan locations for vertical risers for new MEP systems, and a new elevator shaft in the historic building to limit architectural interventions.





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roxian theatre restoration/modernization : mckees rocks, pa hybrid restoration/modernization spurs social impact & equity

Revival of the Roxian Theatre as a live music venue establishes McKees Rocks as a destination for arts and entertainment. The project skillfully blends restoration of the architectural splendor of this former vaudeville theatre — a community landmark that sat vacant for 16 years — with cool contemporary finishes, industrial details, new amenities, and state-of-the-art sound and lighting that complete the rock and roll vibe.

- To attract national acts who've bypassed Pittsburgh, green rooms and an enlarged stage were integrated into the existing fabric of the theater.
- The house was outfitted with amenities including standing/sitting options on three levels for 1,470 patrons, and spacious bars at each level.
- Since it opened in May 2019, the Roxian revitalization has deepened connections among residents, welcoming thousands of new visitors each week, and catalyzing economic opportunity along this important commercial corridor as an integral part of the broader revitalization of McKees Rocks.

CLIENT: McKees Rocks Partners, LLC

SIZE: 32,000 sf
(1,470 seat capacity)

COST: \$9M

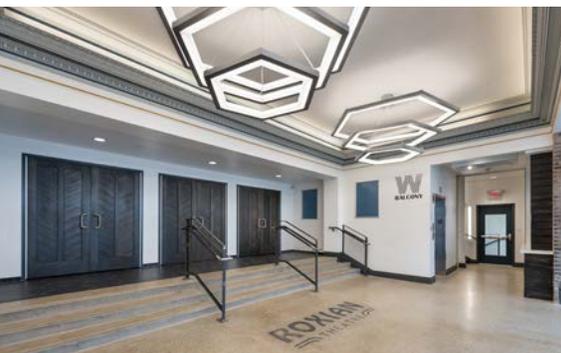
COMPLETION: 2019

FIRM RESPONSIBILITY:

Forensic Investigation
Programming
Architectural Design
Contract Documents
Contract Administration

REFERENCE

Taris Vrcek, Executive Director
tvrcek@mckeesrocks.com



Renovated Lobby



New bar with overlook to the stage

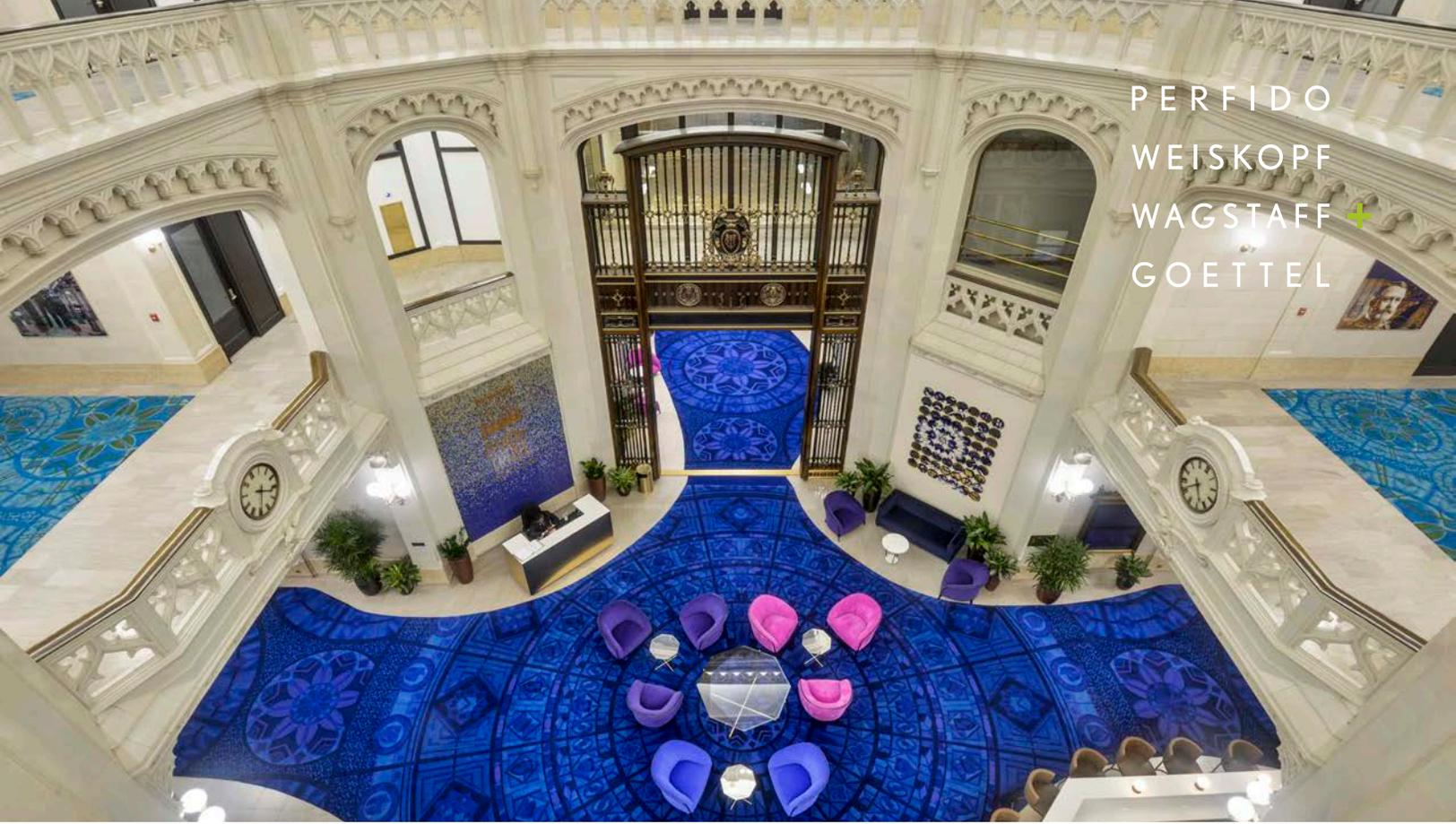
★ Design Award Winner



Demo of existing house complete



Demo of existing house complete



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union trust building : pittsburgh, pa

neglected icon to amenity-rich commercial center

The Flemish-gothic-style structure ranks among the city's most architecturally significant buildings and is listed on the National Register of Historic Places. In recent years the building was largely unoccupied. PWWG partnered with Elkus Manfredi Architects for this restoration of the landmark's ornate exterior and interior. The project transformed Union Trust into a Class-A, LEED-certified center of high-tech innovation, collaborative co-working, and entrepreneurship in the city's burgeoning downtown, with 40,000 sf of ground-floor retail and restaurant space open to the public.

CLIENT: The Davis Companies
SIZE: 517,000 sf
COST: \$36M
COMPLETION: 2016

FIRM RESPONSIBILITY:
Forensic Investigation
Architectural Design,
including Structural Changes
Parking Garage Design
Contract Documents
Contract Administration

REFERENCE
Chris Lasky, Vice President
clasky@thedaviscompanies.com



 LEED Silver Certified
 Design Award Winner



The atrium before (top) and after renovations (right/bottom).



Fitness Center interiors include exposed trusses and traces of existing plaster moldings and materials.



Before restoration, elevator lobbies at each floor were stark, monochromatic spaces.

| project +
| approach

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project understanding

We understand the importance and sensitive nature of the Holly Grove Mansion renovation, and have assembled a team of senior architects ideally suited to the challenges. The core of our team will consist of Anthony Pitassi as the Principal-in-Charge and Senior Associate Joe Filar as the Project Manager. Tony and Joe both have extensive experience with the renovation of historic buildings for modern use. Tony and Joe's complementary skills bring the necessary attention to the diverse range of challenges the project presented, including day to day project management and collaboration with the client and coordination of consultants.

For this project, Tony and Joe will be supported by Joe Roy, Project Architect who holds a Certificate in Classical Architecture from University of Miami (FL), Tonya Markewicz for interior design, and Jan Irvin, who is our specifications writer and quality control specialist. We have also assembled an expert team of consultants for structural engineering and MEP systems engineering to bring all the necessary expertise to the project.

project approach +



goal / objective 1: initial assessment

In the assessment category, we include:

- the **building structure and enclosure** – roof, walls, floors, windows, doors, chimneys, porches, basement, crawl spaces,
- the **building interiors** – walls / floors /ceiling finishes, wood casings details, railings / balusters, plumbing, heating and lighting fixtures,
- and the **building systems** – HVAC, plumbing, electrical, communications, sound, security, elevator

For the building, we will start with an effort to thoroughly **understand what you have**, with a vigorous site visit to survey existing conditions, review of existing documentation and prior project plans to develop a scope of work and budgetary cost

estimate to address items such as deterioration or failure of enclosure components, moisture infiltration, and indoor air quality. At the same time, we will be defining the performance criteria that you require for the building to meet the demands and program requirements serving as the offices for the State Historic Preservation Offices. All this work will be done utilizing an integrated design approach where we work with our team of engineers from the start to maximize the durability and energy efficiency of the building systems and the comfort of occupants and visitors. As with all our work in existing buildings of high architectural quality, the goal is to sensitively integrate new or replacement components and new systems so that they enhance rather than compromise the quality of the building's exterior and rooms.



project approach +



goal / objective 2: mep systems, security, interior, and exterior finishes

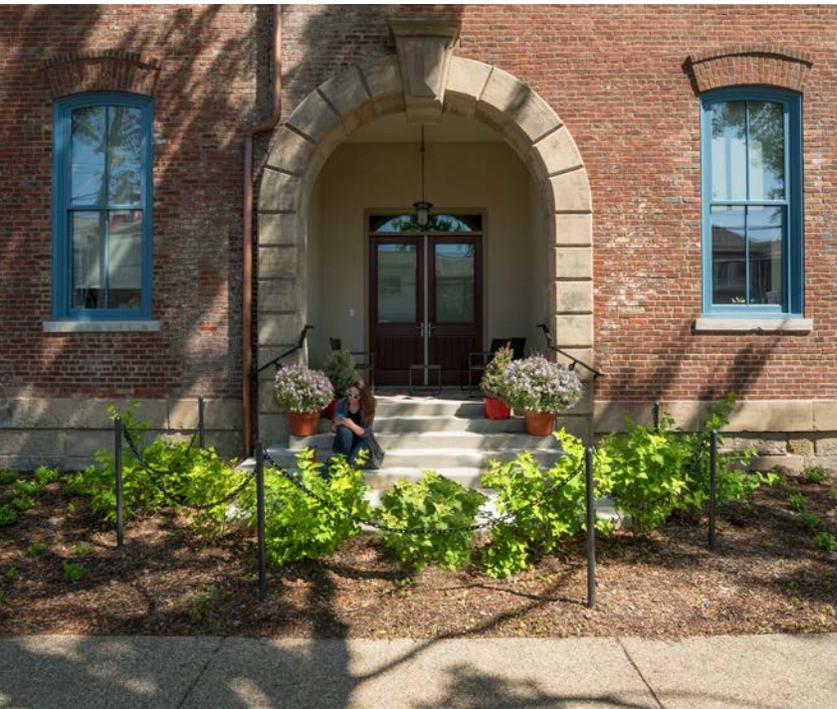
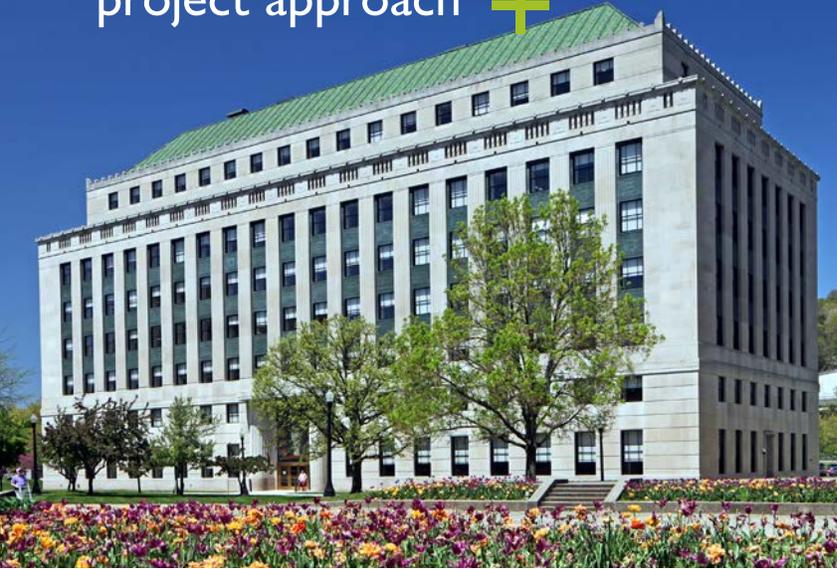
Given the dual-purpose goals of returning the Holly Grove Mansion to its former glory and providing the necessary enhancement to bring its functionality into the 21st Century for use as the SHPO's offices, we will start with **understanding what you want**. While the existing house will impose some constraints and present some opportunities, we will really listen to you to understand how the house needs to function and what that means for the specific rooms and spaces that are required. We see the interiors as falling into three types of space: 1) the public interaction space on the first floor, 2) the SHPO offices on the second floor, and 3) the Storage and Utility function at the Basement level.

INTEGRATED MEP & SECURITY SYSTEMS, INTERIOR & EXTERIOR FINISHES

Following the Initial Assessment, we will take our understanding of what you want to develop a new plan for each level of the house that meets your programmatic needs (both public and private), capitalize on the best aspects of the existing interior, has the right adjacencies and connections, and meets current life safety and accessibility requirements. Following this, the interior design develops the vision for the look and feel of each room. Concurrently, the engineering of modern building systems will be developed to be integrated with creative ways to preserve the historic character of the spaces and remain innocuous, while functional and delivering high performance. We will explore options for exterior material and color selections that are appropriate to the historic character of the mansion. Our team is deeply experienced with this design process as collaboration works to achieve a shared vision and meet the project goals.



project approach +



goal / objective 3: gsd division of culture and history and us department of interiors restoration standards

Over the course of PWVG's nearly 50 years of operation, our foundational principles have been founded in preservation and restoration efforts in buildings and are heavily based on historic structures in urban environments. Our work begins with understanding the building's story and evolves to modernize in historically respectful ways for generations ahead. Nearly half of PWVG's work includes working with SHPOs and NPS on Historic Tax Credit projects, historic landmarks, and constructing buildings in historic districts.

PWVG has worked with WV GSD on historic projects at the Capitol Complex including Building No.4 (in progress) and Building No.3, which involved historically compatible comprehensive interior and exterior renovations. PWVG has had three 5-year Term Services contracts with The Pennsylvania Historical Museum Commission (PHMC) and has executed several significant projects such as The Drake Well Museum and Old Economy Village. In addition, PWVG has worked with several SHPOs across states such as Pennsylvania, Ohio, Kentucky, Tennessee, and North Carolina and in conjunction with the National Park Service on respective projects and locations. We are very adept to understand the Secretary of the Interior Standards for Renovations and working with respective agencies to develop amicable solutions that preserve while modernizing. PWVG has had the opportune pleasure to be responsible for the successful restoration of national and global historically significant structures, including the Cincinnati Music Hall (c 1878), The Allegheny County Courthouse (c 1890), and The Carnegie Library (c 1890), among many other building types.



goal / objective 4: effective project management and quality control

Our goal following the Initial Assessment and design process is to deliver **what you need**, which accounts for a project that meets your needs and one that you can afford. PWWG has worked with WV GSD regulations and AIA General Conditions as amended by the State on projects at the Capitol Complex including comprehensive renovations of Building No.4 (in progress, construction phase) and previously completed comprehensive renovation and restoration of Building No.3.

PWWG has a strong record of delivering Construction Documents for complex renovations, additions and alterations that are useful, easy to bid and use for contractors, and reliable in what they deliver to Owners. PWWG can point to deep experience with producing designs and documents for projects that combine new and existing construction.

We design for a 'loose fit' so that when unforeseen conditions are exposed new work can be adjusted to existing work without substantial changes, and normally without additional cost. We perform selective demolition during design to understand the history of a building and probe and uncover actual conditions. Actual conditions often vary significantly from recorded conditions. We interview Maintenance and Facilities personnel to understand their direct experience with buildings, and to probe their memory of past problems.



maintaining quality throughout the project

The key to our approach is checking documents throughout the process and avoiding last-minute changes. We have a quality control plan that lays out the process step-by-step, ensuring that the entire team is coordinated in this mission. QC reviews are conducted at each major phase of the project with the following measures:

- QC begins at concept: Ensure that the design scheme adheres to its program and budget. Early reviews of the design also focus on phasing logic, constructability, code compliance and cost estimates.
- Capability of Core Consultants: Meticulous coordination between an interdisciplinary team is achieved when all members understand and respect each other's work. Our relationship with our consultants enable us to refer to other projects and experiences as precedents in communicating clearly with each other
- QC Coordination: Our QC Coordinator ensures consistency between our drawings and those of our consultants and with code issues.
- Quality Assurance Efforts: Throughout design our internal team works with MasterSpec Drawing Coordination Checklists that tie to the specifications that are written for the project, ensuring the proper information is relayed in the proper place. The team also refers to checklists prepared by the AIA to safeguard that each design phases contains the relevant and proper detail of information.
- Incorporate QC time into the Schedule: As we develop a more detailed work schedule, we incorporate QC review time into each phase, allowing time to review the drawings based on the review.

Quality Management
Project Administration and Design
PWWC 2012

PREDESIGN PROJECT PHASE CHECKLIST Project #/Name: 2175.00 DGS IUP Science Building

PWWG ADMIN: STAFFING, FEE ALLOCATION, GOALS/STRATEGY

Project Identification: Assign project number. Load master project folder in project directory - use PWWG standard project folder tree.

Contract: Review contract for scope of services and fee.

Scope of Services: Verify if any scope of services beyond traditional services are required:
 Structural studies Existing build analysis Electric load studies Environmental Studies
 Feasibility studies Planning applications Needs assessment Related Programming
 Specialty Lighting Security Elevator Traffic Food Service Medical
 Other: utility investigation, site survey.

Consultants: Determine types of consultants, determine consultant fees (see Owner requirements).
 MEP Civil Structural Estimator Technology Lighting Food Service
 Interiors Lab Landscape, Geotechnical, Dispersion Consultant, Associate Architect/LEED, Environmental (hazard), site survey, utility markout

Project Budget Worksheet: Allocate fees overall and for each phase, expenses and profit. Based budget on agreed upon scope of work, schedule and delivery method. Review at PM meetings.

Staff Roles: Identify and determine project staff roles and level of principal involvement. Verify that staff assigned have abilities for the roles or will be equipped with training/time/additional skills that could affect profitability. Set staff goals i.e. intern SD or CA experience.

Principal in charge: KW (Initials)
 Responsibilities: Client contract Principal Client Contact/Client Manager thru project
 Additional services contracts Consultant contracts Attend all primary client design meetings
 Attend selected client design meetings Principal Designer Selected design role
 SD/DD design presentations - role: DD/CD specs Available for regular consult and review Other _____

Principal Design Responsibilities - _____ (Initials)
 Principal in-charge Project Manager Architect
 Responsibilities: Site and Vehicular Building Thermal Envelope and Aesthetics Interior layout
 Design Detailing

Project Manager/Architect: LC (Initials)
 Responsibilities: Client contract Principal Client Contact/Manager through project
 Additional services contracts Consultant contracts Consultant management/review of drawings Principal Designer Selected Design Role Attend all primary client design meetings Attend selected/secondary client design meetings Primary Architect role
 DD/DD design presentations Job captain role/drawing organization SD/DD/CD CAD layouts/design detailing QA Drawing reviews DD/CD spec writing Other _____

Primary or Staff Architect(s): Manchik Sridhar
 Responsibilities: Principal Designer Selected Design Role: _____ Attend all primary client design meetings Attend selected/secondary client design meetings SD/DD design presentations Job captain role/drawing organization SD/DD/CD CAD layouts/design/detailing QA Drawing reviews Other: LEED SD/DD/CD spec writing

Quality Management
Project Administration and Design
PWWC 2012

OWNER/CLIENT DESIGN, GOALS, CONST. BUDGET, SCHEDULE, AND DELIVERY METHOD

Job Captain: JP (Initials) Drawing organization/management
 Responsibilities: DD/DD/CD CAD design and detailing QA Drawing reviews DD/CD spec writing Physical model production

Interests: _____
 Responsibilities: DD/DD/CD CAD design and detailing QA Drawing reviews DD/CD spec writing

Goals/Strategy: (based upon fees, profit allocated, marketing potential, new tech or prototype investment, other)
 1. *to strengthen our portfolio of non-construction/science buildings*
 2. *to provide high design yet contextual to campus (capital A' architecture) within budget*
 3. *to successfully land/coordinate the extensive project team*

PWWG Project staff meeting: Schedule/conduct an internal project team staff meeting to review roles.

Other: _____

General: Review overall project info. Review client/owner program

Contacts: Create project contact list

Client contact/responsibilities:
 Primary client and staff contact person(s): Richard Manslow (IUP), Barbara Laraia (DCS)

Determine what design/data information is required and how information is to be gathered:
 Additional Program info/meetings (estimate type, participants, number): _____
 SD meetings (type, participants, number): _____
 DD meetings (type, participants, number): _____
 CD meetings (type, participants, number): _____

Owner Provided Existing Condition Information: Determine/gather any outstanding info required from owner.
 Land survey - Type: _____ Aerial survey Borings/Geotech report Latent botting
 Phase Environmental Existing Building Drawings Physical Need Assessment (HLD)
 Under presentation requirements _____

Owner Provided Performance Requirements: See Pre-design Decision matrix for list.
 Owner/Developer Specifications, e.g. DCS: DGS Project Procedure Manual
 Under Requirements, e.g. PHEA:
 Existing: *Are Drawings to be created by PWWG?* Not required (see B.C. requirements or A/H) Site Building exterior Building interior HAZS quality level. *For Deviation purposes*

Determine relevant Codes, regulations, owner specification A/H's:
 Preliminary Code Identification - CC 2009 Not required (see B.C. requirements or A/H)
 Municipality reviewer: _____ Historic Review
 ADA Zoning: _____ Planning Commission: _____ Board of Health
 Commission: A/H (Authority having jurisdiction) Indiana Bond for stormwater Punder requirements: _____ Community: _____ Other: _____

Quality Management
Project Administration and Design
PWWC 2012

CONSTRUCTION QUALITY

Identify number of non-owner presentations: Zoning Board Planning commission
 Community Historic Review Commission C-5s Other _____

Owner presentation of design and/or document review: Program SD DD Board of Trustees

Third party design/document reviews: Punder: _____

Verify client construction conceptual budget w/ respect to scope of work requested.
 Construction Allotted Budget: \$63,320,000
 Est. SF: _____ New Construction: 181,944 of _____ Renovation: 0 of _____
 Est. Cost per SF: New Construction: Arch: _____ MEP: _____ Total: _____
 Renovation: Arch: _____ MEP: _____ Total: _____
 Site: _____ Total: _____ Unit: _____

Realistic budget Yes No Needs further verification

Anticipated Construction Quality
 Austere Economical Moderate Excellent Grand Mixed

Owner or PWWG Design focus or limitations required
(Example: Entry and Lobby (Moderate), site fence, perimeter (Economical), all else (Austere))

Construction Contract: Verify form of general conditions to be used AIA Other: _____

Construction Delivery approach: Direct Selection Competitive Bid Negotiated
 Single Prime Multiple Prime Construction Management Design Build

Schedule: Create initial project milestones and submissions schedule based upon above, verify with consultants, in-house.
 Est. Design Period: 2/2018 - 6/2019
 Est. Bid Date: 2/2018
 Est. Const. Period: 11/2018 - 1/2023 (IUP move in 6/2022)

Project Schedule: Distribute schedule to all project parties.

Project Kickoff meeting: If determined to be necessary schedule/conduct meeting w/client and/or engineers

Other: _____

CONSULTANT COMMUNICATION AND COORDINATION.

Ensure that consultant has program information and any special requirements.

Verify MEP staff names/positions assigned to project and appropriateness of MEP staff i.e., an EIT on complicated project, or if project is HVAC intensive and the MEP PM is an electrical eng.

Clarify communication procedures and coordination i.e. PM.

Number of design meetings with PWWG: SD DD CD CD
 Owner MEP design or review meetings: SD DD CD

Execute and distribute consultant agreements.

Send project schedule to consultant.

Examples of QA/QC forms from a recent project



effective schedule management

Through our work with many institutional clients, PWWG understands the paramount importance of schedule. We have an excellent track record in schedule control, which is maintained by keeping timing issues at the forefront of the project process and by resolving key issues at appropriate times. Classroom buildings, for example, have critical schedules with inflexible opening dates.

Our internal organization helps ensure that each project meets its schedule and budget:

- Significant Involvement by senior staff: We are selective in our work and project assignments. Our target is for senior staff to be active on no more than five projects at a time in order to ensure that they can be significantly involved in the design.
- Making correct decisions the first time: By approaching decisions with rigor, and through the use of computer models to carefully study options, we avoid late design changes that might lead to delays.
- Schedule Control is Collaborative: We keep timing issues at the forefront of the design process, resolving key issues at the appropriate times, keeping changes to a minimum, and predicting where changes are likely to occur. At the onset of the project, we establish a clear understanding of the client's project goals and building on that knowledge, we develop a specific project approach that defines each phase of the project and outlines the most appropriate ways to implement each phase.

| references +

PERFIDO
WEISKOPF
WAGSTAFF +
GOETTEL

references +

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