

*West Virginia Division of Culture &
History
Great Hall Lighting Wiring System*

**CHARLESTON, WV
RFQ #DCH10030**

January 05, 2010



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ZDS
Design/Consulting Services

MECHANICAL • ELECTRICAL • IAQ • ENERGY • COMMISSIONING

DEPARTMENT OF CULTURE & HISTORY
STATE OF WV

91 Smiley Drive
St. Albans, WV 25177
Web Site: www.zdsdesign.com
Email: zdsdesign@aol.com
304-755-0075 Phone
304-755-0076 Fax

ZDS DESIGN/CONSULTING SERVICES

91 Smiley Drive
St. Albans, WV 25177

Phone: (304) 755-0075
Fax: (304) 755-0076

DATE: December 24, 2009

TO: Shelly Murray
Department of Administration
Purchasing Division
Building #15
2019 Washington Street, East
Charleston, WV 25305-0130

RFQ # : DCH10010: Division of Culture & History Great Hall Lighting Wiring System

Copies	Document No.	Doc. Date	Description	Action Code
5		1/5/09	RFQ for Great Hall Lighting Wiring System	J1-A

Action Codes

- A. Action indicated on item transmitted
- B. For your information or use
- C. For signature and return to this office
- D. Furnish as submitted
- E. Furnish as corrected--Resubmittal not required
- F. Furnish as corrected--Resubmittal required
- G. Revise and resubmit
- H. Rejected
- I. For your approval
- J. Remarks:

1) ***RFQ for your review on 1/5/2010 @ 1:30 pm. We appreciate your consideration and look forward to working with you.***

BY: Sherry Z. Powell

Mailed by UPS Next Day Air UPS USA Priority Mail USA Mail

TRANSMITTAL LETTER



PROJECT TEAM

Section I

ZDS Approach

Section II

ZDS Organization

Section III

ZDS Qualifications

Section IV

ZDS Project Experience

Section V

Publications & Recognition

CONFIDENTIAL

This qualification proposal contains information confidential and proprietary to **ZDS Design/Consulting Services** and is provided for your internal review only. No other distribution, reproduction, or description of its contents is authorized without the prior written approval of **ZDS**.

STATE OF WEST VIRGINIA
Purchasing Division

PURCHASING AFFIDAVIT

VENDOR OWING A DEBT TO THE STATE:

West Virginia Code §5A-3-10a provides that No contract or renewal of any contract may be awarded by the state or any of its political subdivisions to any vendor or prospective vendor when the vendor or prospective vendor or a related party to the vendor or prospective vendor is a debtor and the debt owed is an amount greater than one thousand dollars in the aggregate.

PUBLIC IMPROVEMENT CONTRACTS & DRUG-FREE WORKPLACE ACT:

If this is a solicitation for a public improvement construction contract, the vendor, by its signature below, affirms that it has a written plan for a drug-free workplace policy in compliance with Article 1D, Chapter 21 of the *West Virginia Code*. The vendor must make said affirmation with its bid submission. Further, public improvement construction contract may not be awarded to a vendor who does not have a written plan for a drug-free workplace policy in compliance with Article 1D, Chapter 21 of the *West Virginia Code* and who has not submitted that plan to the appropriate contracting authority in timely fashion. For a vendor who is a subcontractor, compliance with Section 5, Article 1D, Chapter 21 of the *West Virginia Code* may take place before their work on the public improvement is begun.

ANTITRUST:

In submitting a bid to any agency for the state of West Virginia the bidder offers and agrees that if the bid is accepted the bidder will convey, sell, assign or transfer to the state of West Virginia all rights, title and interest in and to all causes of action it may now or hereafter acquire under the antitrust laws of the United States and the state of West Virginia for price fixing and/or unreasonable restraints of trade relating to the particular commodities or services purchased or acquired by the state of West Virginia. Such assignment shall be made and become effective at the time the purchasing agency tenders the initial payment to the bidder.

I certify that this bid is made without prior understanding, agreement, or connection with any corporation, firm, limited liability company, partnership or person or entity submitting a bid for the same materials, supplies, equipment or services and is in all respects fair and without collusion or fraud. I further certify that I am authorized to sign the certification on behalf of the bidder or this bid.

LICENSING:

Vendors must be licensed and in good standing in accordance with any and all state and local laws and requirements by any state or local agency of West Virginia, including, but not limited to, the West Virginia Secretary of State's Office, the West Virginia Tax Department, West Virginia Insurance Commission, or any other state agencies or political subdivision. Furthermore, the vendor must provide all necessary releases to obtain information to enable the Director or spending unit to verify that the vendor is licensed and in good standing with the above entities.

CONFIDENTIALITY:

The vendor agrees that he or she will not disclose to anyone, directly or indirectly, any such personally identifiable information or other confidential information gained from the agency, unless the individual who is the subject of the information consents to the disclosure in writing or the disclosure is made pursuant to the agency's policies, procedures and rules. Vendor further agrees to comply with the Confidentiality Policies and Information Security Accountability Requirements, set forth in <http://www.state.wv.us/admin/purchase/privacy/noticeConfidentiality.pdf>.

Under penalty of law for false swearing (*West Virginia Code* §61-5-3), it is hereby certified that the vendor affirms and acknowledges the information in this affidavit and is in compliance with the requirements as stated.

Vendor's Name: 203 Design Consulting Services, Inc. dba 203design.com

Authorized Signature: [Handwritten Signature]

Date: 12/29/11

ZDS Design/Consulting Services is pleased and proud to submit this expression of interest and statement of qualifications for your consideration. We worked extensively in the existing building for HVAC and related electrical renovations, including the installation of the dimming system, for the Great Hall and know the areas both above and below the Great Hall. We also understand the *Culture Center* needs for proper electrical grounding to protect the electronics and for improved life safety. **ZDS** is in the construction phase for fire alarm and sprinkler upgrades for the facility room, which adds to our understanding of the facility's needs. We believe our successful experience in these previous projects makes us uniquely qualified to address the proposed electrical modifications for the Great Hall lighting systems to accommodate those upgrades.

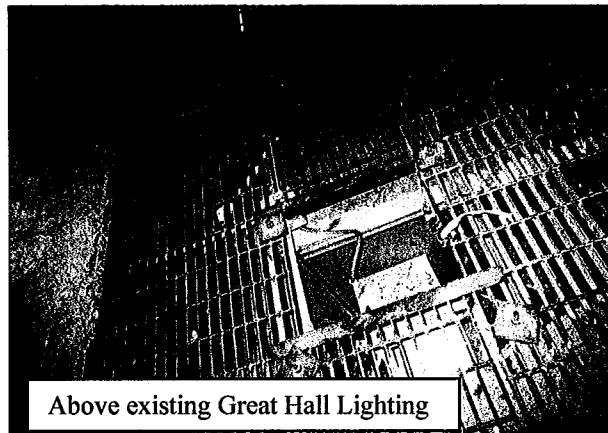
The existing electrical system was installed during an era when using the conduit as the ground was permitted. Since then the State Fire Marshal has recognized that this type of grounding can cause problems because any break in the conduit system results in a loss of the grounding. Electronics and computers are everywhere in the facility now that were not present when this building was built. A proper grounding system, proper sized wiring and conduit system for the electronics is very critical for today's needs. Ideally, a ground system from the dimming cabinet/transformer system is carried all the way back to the building ground and the building ground system is checked for integrity. We would present options and costs to meet your needs.



Great Hall Lighting



Pull Box for existing Great Hall Lighting



Above existing Great Hall Lighting

ZDS will lead all phases of the work, providing engineering and project management for the proposed work required. We have provided these types of upgrades for many clients, including Laidley Tower, Chase Tower, Kanawha County Commission, West Virginia University, Woodrow Wilson High School (Raleigh County), Elkins Middle School (Randolph County), Greenbrier West High School (Greenbrier County) and many other facilities. We understand the project needs.

Our office is located in Teays Point Industrial Park, 91 Smiley Drive, St. Albans, West Virginia 25177, a relatively short drive to the Culture Center, which will aid in the communications. Professional Engineers are licensed in West Virginia while **ZDS's** personnel have also worked in 24 different states. Couple this with our long-standing collaborations and our highly experienced consultants and you will see that our

team has the expertise and experience to affect all phases of the proposed renovations. We work with consultants when necessary for architecture and for structural engineering to preserve the existing architecture.

ZDS's work load is full into February with on-going projects with the State of WV, Federal work, work for Ohio University and multiple school projects; however, starting in late February, **ZDS** will have time that could go towards this project. Since we are currently performing work with the *Culture Center*, it is possible we could start sooner. We believe we have an excellent understanding of your facility and this project's needs, which will also allow us to start off running once we can commit staff towards the project. The typical State procurement procedure may take into February, so we believe we can accommodate your needs. This project is relatively small, which makes it an excellent project to fit between other larger projects.

Personnel Assigned: The project is assigned to Todd Zachwieja, **ZDS's** Principal in-Charge of planning/design who will follow the project from inception through design. We assign the production staff according to the nature of the project and the work force necessary to meet the schedule. Ted Zachwieja is **ZDS's** Principal-in-Charge of overseeing the construction administration process and would attend the construction meetings while coordinating the design intent with Todd Zachwieja and other engineers. Jim Watters will act as production project manager due to his expertise in both construction and design. A brief listing of key people includes:

Todd A. Zachwieja, P.E., CEM, LEED AP, CEO, Principal, BSME, MSEM with over 28 years of experience in M/E design, energy management, IAQ and commissioning. *Nationally recognized for expertise in Mechanical Design, Indoor Air Quality and Certified as an Energy Manager.*

Ted T. Zachwieja, Principal with over 45 years of experience in mechanical and electrical design. *Ted was one of three engineers selected by the Department of Energy to train those who manage buildings to conserve energy.*

Jim Watters, Production Manager with over 35 years of HVAC/Electrical/Plumbing design and construction experience.

Mark King, PE, Professional Electrical Engineer with **ZDS**, BSEE, over 9 years of experience in Electrical/Plumbing/Mechanical design.

The resumes of the team personnel are included in Section III. We can also subcontract with reliable companies, as needed, to meet your project needs (i.e., testing of the building ground system for integrity).

References: We have extensive renovation experience including phasing construction. We encourage you to call our references and ask how well we worked with their staff, about our technical strengths and our ability to work with contractors to provide the Owner with a quality project. **ZDS** references that we would encourage you to call, and which relate to this type of Project include:

1. Mr. Mark Lynch, Dir. of Facility Operations, WV Div. of Culture & History (304) 558-0220, ext 160
2. Mr. Tony Crislip, Manager, Physical Plant, Marshall University (304) 696-6241
3. Dr. Mark Manchin, Executive Director School Building Authority (304) 558-2541
4. Mr. Bill Elswick, Executive Director of Office of School Facilities (304) 558-2711. He has knowledge of **ZDS's** work at CAMC, OU, Washington and Lee University and others.
5. Ms. Jerie Whitehead, Purchasing Director, Kanawha County Commission (304) 357-0115
6. Mr. Racine Thompson, Assistant Superintendent, Raleigh County Schools (304) 256-4500, ext 3326

We believe that our combined specialties and experience with your facility provide the *Culture Center* with the best expertise to provide economical solutions to your specific project's needs. Our proposed

Team Members have knowledge of your existing facility, which will also aid in responding promptly to your needs.

Our team has been extremely effective in the past on acting in our clients' interests to determine availability of existing equipment, and pertinent existing conditions that may affect the design. Our approach to incorporate new proven technologies and management methods have saved our clients substantial money in the construction and operating costs. We pride ourselves on being viewed as an extension to our client's staff and successfully incorporating pertinent information about their facility into any proposed solution.

Our team has over four decades of experience in West Virginia, giving us the local understanding of your needs. We have code specialists as part of our team to help ensure that the proposed renovations also incorporate the State of WV Fire Marshal requirements, NFPA, NEC, International Building Code and other pertinent requirements. We also have an excellent reputation with the WV State Fire Marshal's office.

Many of our West Virginia County School's clients involved extensive electrical renovations totaling millions in construction costs. These include Raleigh County School's Woodrow Wilson High School, Park Middle School, Shady Springs Middle School, Trap Hill Middle School, Randolph County School's Elkins Middle School, Webster County High School and many others. Ask the West Virginia Department of Education and School Building Authority about our firm. Both have asked our participation in establishing design and construction guidelines for all schools in West Virginia.

We believe that our combined specialties provide *Culture Center* with the best Engineering expertise to provide economical solutions for your specific projects needs. We look forward to meeting with you to discuss our team's qualifications and your needs further. If there are any questions, please do not hesitate to call.

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ZDS offers an effective organizational structure; one that takes each project from inception through completion, working as an extension of the *Client* every step of the way.

In 1983, Todd A. Zachwieja founded ZECO Consultants. In 1994 ZDS Limited Liability Company was incorporated in WV using dba **ZDS Design/Consulting Services**. This company was founded to provide design and consulting services. Today there are four principals with over 100 years of technical expertise:

- **Todd A. Zachwieja**, PE, C.E.M., LEED AP, Chief Executive Officer, brings with him over 28 years in the design and consulting business.
- **Ted T. Zachwieja**, Principal over Construction Administration services with over 45 years experience in the design and consulting business, was owner of Ted T. Zachwieja & Company from 1962 to 1982.
- **Daniel H. Kim**, Ph.D., Manager of Strategic Planning, brings with him over 22 years in the design and consulting business and is one of the nation's leading experts in organizational management. He is also owner/founder of Pegasus Communications, Inc. from 1991 to present.
- **Lori Zachwieja**, CPA, Chief Financial Officer and cofounder of ZECO Consultants.

ZDS is a consulting engineering firm specializing in the following areas:

**MECHANICAL
ELECTRICAL
INDOOR AIR QUALITY
COMMISSIONING
ENERGY**

Each new project is assigned to a principal in-charge who will follow the project from inception through commissioning.

We assign the production staff according to the nature of the project and the work force necessary to meet the schedule. The Principal in charge of that project determines if consultants are needed and coordinates all areas. After bidding, a Principal of ZDS coordinates visits to the job site regularly, all the way through the post-warranty inspection.

“Excellent mechanical and electrical design results from an experienced team, as well as listening to the needs of the Client.”

ZDS believes in the team approach when providing engineering design and consulting services. We start with *our client* as the number one member on our team. We listen to the **needs** and **concerns** of our client and that becomes the basis for our design. Our design expertise includes:

MECHANICAL DESIGN

- Heating & Ventilation
- Air Conditioning
- Piping
- Environmental Controls
- Process Controls
- Refrigeration
- Plumbing
- Medical Gases
- Sprinkler-Fire Protection
- Master Planning

ELECTRICAL DESIGN

- Power Distribution
- Interior Lighting
- Exterior Lighting
- Emergency Power
- Communications
- Technology
- Fire Alarm
- Security
- Life Safety
- Master Planning

ZDS provides comprehensive design services. We have experience and specialties in indoor air quality, energy management and commissioning, along with traditional mechanical and electrical design experience dating back as far as 1958. We offer a complete package.

We work with all levels of the client's staff: the building owner, the budget supervisor, the operating and maintenance staff and others impacted by the project. We recognize the maintenance and operating staff live with the design long after the project's completion. We listen to and work with those who will continue to operate and maintain the equipment. We find that proper communication benefits the client throughout the design process and beyond.

ZDS design team provides a total system evaluation for cost-effective selection, installation, and ease of maintenance for both new systems and retrofit of in-place systems.

Design begins with *our client*. Our staff meets with our client to review their concerns, budgets and schedules. The **ZDS** design team reviews the *entire* picture, and ends with “A Total Design.”

ZDS provides consulting engineering services for the indoor air quality (IAQ) environment. These services include; strategic planning for renovation and new construction projects; technical research and writing; specialized applications software development; corporate and professional training programs; publications support and fulfillment; and site-specific engineering and scientific consultation.

Todd Zachwieja, **ZDS** Principal, is contributing editor for the following IAQ publications:

- Contributing Editor and Technical Review Panel for the publication of the *ENVIRONMENTTM Handbook of Building Management and Indoor Air Quality*, by Chelsea Group and published for Powers Educational Services.
- Technical Review Panel for the Quarterly publication of the *ENVIRONMENTTM Newsletter*, by Chelsea Group for Powers Educational Services.
- *Ventilation for a Quality Dining Experience: a Technical Bulletin for Restaurant Owners and Managers*, released in January 1993.
- *The New Horizon: Indoor Environmental Quality*, published as a supplement to the June 1993, issue of *Consulting Specifying Engineer* magazine, a trade magazine distributed to roughly 50,000 engineers.
- Editorial Advisory Board member reviewing the articles of the monthly publication *ENVIRONMENTTM Professional*
- Editorial Advisory Board member of *POWER PRESCRIPTIONSTM Indoor Air Quality Publication* by *Electric Power Research Institute*.

ZDS provides IAQ services for major corporations, government organization, and property owners to resolve their specific facility problems:

- Resolve the building's "sick building syndrome" complaints.
- Identify solutions to extensive biological contamination building related illnesses in renovated office buildings.
- Develop solutions for HVAC systems, temperature controls, equipment, operating and maintenance practices causing IAQ problems in schools and commercial buildings.
- Commission new and renovated facilities to minimize or eliminate IAQ issues before they become problems.
- Develop and establish master plans as well as conduct training seminars for IAQ of schools and commercial buildings.

As one of the Nation's leaders in Indoor Air Quality, **ZDS** produces sophisticated technical expertise that enables *Our Client* to be proactive in solving and preventing indoor environmental problems.

At **ZDS**, our engineering staff integrates energy efficiency into each project design to provide you, our client, with the added value that you expect and deserve. The **ZDS** team approach represents a tremendous amount of experience in designing energy efficient facilities. **ZDS** offers a comprehensive range of energy management services that includes:

- Providing detailed analysis of facilities.
- Recommending sound and proven energy saving solutions.
- Implementing energy management improvements
- Determining, quantifying and assisting in securing available Utility & Government grants.
- Evaluating and documenting utility savings.

Todd Zachwieja received *AEE's LEGENDS IN ENERGY AWARD* in 2007 and 2008 for lifetime achievements in energy. The **ZDS** team members take pride in the quality of their projects and have been responsible for designing and implementing numerous energy management programs. These programs are providing significant energy improvements and include optimizing, central utility plant equipment, control systems, air handling systems, lighting systems, and other energy consuming equipment. Recent projects include:

- Interconnecting boilers and chiller plant systems.
- Designing Geothermal HVAC systems.
- Optimizing HVAC equipment and operating sequences.
- Installing Direct Digital Control (DDC) Energy Management Systems.
- Replacing inefficient lighting equipment with energy efficient ones.
- Converting constant speed air handling equipment and pumping systems to variable speed operation.
- Modifying air handling equipment from 100% outside air to return air operation.
- Implementing heat recovery units into HVAC equipment.
- Improving laundry, kitchen and other process application efficiencies.

In addition to the energy management projects outlined above, the **ZDS** team members have extensive experience in identifying and implementing energy efficient operating and maintenance measures. These are typically low cost or no cost measures that include:

- Inspecting, calibrating temperature controls and adjusting outdoor air dampers.
- Commissioning economizer cycle operation.
- Testing steam traps and pressure relief equipment operation.
- Enabling heating and cooling equipment only when required.

The **ZDS** team is trained and experienced in advising you of program options to incorporate energy efficiency and operational saving features into the design of your new construction and renovation projects. At **ZDS**, we view our role as helping you to define your own energy efficiency needs and goals through identifying energy saving options and providing supporting financial information. We then help you to fit your energy efficiency needs and goals into a workable budget and schedule, and then design a program to fill those needs.

Sustainable "Green Building" design, including LEED's certification, recognizes the importance of commissioning. The design and construction industry have had start-up problems when a facility is occupied and constructions' deficiencies that were not discovered until the contractor's traditional one-year warranty period expires. The mechanical and electrical systems have continued to become more complex with sophisticated control systems and equipment, and a mountainous amount of changing technology. If not properly addressed, building Owners could face numerous operational problems from "Sick Building Syndrome," excessive energy costs, and uncomfortable indoor environments. Commissioning is the missing link between design and implementation.

Subsequent to joining **ZDS**, Todd Zachwieja established commissioning services for one of the nation's largest energy service companies. He is also a **LEED's Accredited Professional**. Many utility companies and building Owners now require commissioning for the new or renovated facilities in order to maximize the use of their investments in their facilities and to obtain LEED's certification. The commissioning process offers the following benefits:

- Improved comfort, serviceability and Owner understanding of systems and design intent.
- Added technical support for the Owner and being proactive in preventing new problems.
- Reduced maintenance and decreased expenses related to operating deficiencies.
- Early identification and resolution of system discrepancies while designers and contractors are still under contract and on the job.
- Verification of system performance while meeting financial restraints.
- Commission new and renovated facilities to minimize or eliminate IAQ issues before they become problems.

ZDS and its consultants offer commissioning services for their commercial and institutional clients, including meeting LEED's enhanced commissioning requirements. These services include strategic planning operations assistance for renovation and new construction projects. Commissioning services consists of construction document review, equipment performance testing, documentation of design criteria, value engineering, operational fine tuning, professional operations training programs and site-specific engineering consultation. Our project team has the unique experience of in-depth design knowledge and hands-on operations knowledge that fills in the gap between traditional design services and the building Owner's operational needs.

NATIONAL RECOGNITION

The National Conference on Building Commissioning invited Todd Zachwieja, **ZDS's** owner, to speak. He jointly presented a paper with the Director of Maintenance of Charleston Area Medical Center's Memorial Division. The Tampa, Florida Conference involved experts nationwide.

The principal owners of **ZDS** and their consultants have extensive experience in building commissioning and have saved their customers hundreds of thousands of dollars in construction costs and operating costs through their efforts.

The design team at **ZDS Design/Consulting Services** is the best to provide engineering services for **your** project. Satisfying *our Client's* individual needs and distinct requirements is the foremost concern of **ZDS**.

The most important member of the design team is the client. We make every effort to involve our clients throughout the entire process, from the planning through the construction and beyond.

The ZDS design staff continuously provides engineering design services value well into the millions of dollars on a variety of project types. Designing expertise goes as far back as 1958. Through the efforts of our staff, project locations include:

West Virginia	Virginia	North Carolina	Georgia
Kentucky	Ohio	Pennsylvania	Florida
Illinois	Connecticut	Texas	Michigan
New York	Wisconsin	Massachusetts	Indiana
Colorado	Tennessee	Maryland	Washington, DC
California	Hawaii	South Carolina	

Our clients can rest assured that the design team will be available. Not just for the year or two that we are involved in the initial design and construction, but also for years that follow as questions arise about your facility. A good-engineered system and its equipment should last 15 to 40 years. Why not select a design firm with experienced staff committed to their projects with a comparable track record.

Our design team will provide comprehensive services utilizing experienced staff through planning, cost estimating, engineering, coordination of bidding, regular site visitation during construction and specifications for equipment. You, *our Client*, will greatly benefit from a *single point of responsibility* for every need your project may have.

Our staff has the expertise with codes and standards. We have extensive experience in conducting engineering code surveys of existing facilities. Our staff has excellent working relationships with the West Virginia Fire Marshal's Office and the West Virginia Department of Health.

In addition to comprehensive Engineering services from an experienced design team, another major consideration in the selection of your engineer and design staff should be their track record. ZDS organization has an unbeatable, long running, and well-known track record for meeting *our Client's* needs, on time and within budget with outstanding quality.

We view these characteristics as the foundation of Quality. We look forward to the opportunity to discuss our ideas with you and assist you by providing solutions for your needs with a full range of services from Planning to Commissioning.

Primary MEP Contact: Todd Zachwieja, Principal, mobile phone (304) 545-4550

Secondary MEP Contact: Ted T. Zachwieja, Principal, mobile phone (304) 552-5724

ZDS was formed to provide quality engineering and consulting services specializing in:

- Design of mechanical systems and electrical systems
- Building indoor air quality survey and analysis
- Energy management and conservation services
- Commissioning for new and renovated systems in commercial, educational, industrial and health care facilities

ZDS approaches engineered systems improvements from the building owner/operator's perspective, focusing on practicality, cost effectiveness, energy efficiency, reliability, operability, maintainability of the systems and timely implementation of projects to minimize disruption on existing facilities. We concentrate on optimizing and utilizing the existing systems prior to recommending the purchase of new equipment when upgrading a facility. Actual requirements of existing systems are analyzed and considered in addition to the "design" requirements. Our staff listens to their clients' needs through their extensive interaction with the facility operators and the key decision-makers. We believe this approach enhances the design of new systems and ensures that the systems will be practical and functional.

ZDS is a team of professionals capable of meeting a diverse range of needs of facility professionals in the building design, construction and operations. The principals each have specialties in certain aspects that relate to meeting the needs of the building owners and operators. Mr. Ted T. Zachwieja's over 45 years of experience in mechanical and electrical design brings the depth of skills necessary to make the construction and design process operate effectively. Mr. Todd A. Zachwieja's project management skills, with his extensive technical strengths in mechanical/electrical engineering and experience in indoor air quality, energy management and commissioning, complement the traditional design needs. Mr. Daniel H. Kim's extensive management experience with some of the nation's largest companies provides us with important conceptual planning and organizational understanding. Ms. Lori Zachwieja's accounting and financial management skills provide the in-house experience to operate an efficient and effective company to better serve our clients.

ZDS continues to grow and has a Morgantown Office with a Professional Engineer heading that office. Our current project team includes the following to meet the challenges of our client's building design and operating needs.

TODD (TED) A. ZACHWIEJA, PE, C.E.M., LEED AP**Chief Executive Officer****Principal-in-Charge, M/E/P Design Project Manager**

- Education** Bachelor of Science in Mechanical Engineering from West Virginia Institute of Technology in 1982
Masters of Science in Engineering Management from the University of West Virginia College of Graduate Studies in 1989
- Registrations** Professional Engineer, West Virginia, No. 10127
Certified Energy Manager (C.E.M.), National Certification
LEED® Accredited Professional, National Certification through USGBC
Professional Engineer, Georgia, No. 18253
Professional Engineer, Kentucky, No. PE-17961
Professional Engineer, North Carolina, No. PE-017445
Professional Engineer, Ohio, No. E-53587
Professional Engineer, Pennsylvania, No. PE-040929-R
Professional Engineer, South Carolina, No. 25985
Professional Engineer, Virginia, No. 0402 025427
- Qualifications** Todd has more than 28 years of experience in the design, construction management, and specifications for mechanical engineering, heating, ventilating, air conditioning, plumbing, electrical, and lighting, and indoor air quality analysis and building system commissioning for educational, commercial, industrial and health care facilities. His specialties include mechanical engineering, HVAC systems master planning, conceptual design, energy conservation program development, commissioning and IAQ analysis relating to HVAC systems. He has extensive experience in industrial, commercial facilities, hospitals and educational design, including preparation of construction documents for millions in renovations and additions to facilities. Some of his project experience includes: new Mercer County Courthouse, Princeton, WV; Kanawha County Commission - 120,000 sf additions/renovations for the Judicial Annex/Kanawha County Courthouse, Charleston, WV; Laidley Towers, Charleston, WV; renovations to Buildings #1, #3, #4, #5, #6, #7, #8, #9, and #10 at the WV State Capitol complex; Cultural Center HVAC Renovations; Union Carbide; United Center, Charleston, WV; Phillip Morris USA; Rhone-Poulenc; Toyota; Olin Corporation; Walker Machinery; WV Air & Army National Guard; Bank One, WV; Kohl's; Sears; WV Public Service Commission Headquarters; and Yeager Airport. He also designed one of the largest geothermal heat pump applications in the mid-Atlantic region and commissioned HVAC systems and mechanical engineering at many General Motors facilities in North America.
- Some of his health care experience includes millions in renovation and new construction design for Charleston Area Medical Center, including commissioning of Charleston Area Medical Center's \$41 million Surgery Replacement Center and many projects at General Division, Memorial Division, and Women & Children's Hospital. Other health care experience includes Bluefield Regional Medical Center, Hopemont Hospital, Monongalia General Hospital, Montgomery General Hospital, United Hospital Center, St. Mary's Hospital, Summersville Memorial Hospital, Thomas Memorial Hospital, Webster Memorial Hospital, Cabell Huntington Hospital, Welch Emergency

Hospital, Surgicare Center, VA Hospital - Clarksburg, VA Hospital - Huntington, Mercy Medical Center, Wayne Memorial and Webster Memorial Hospital.

He also has experience in providing M/E design for the following colleges and universities including: Alderson Broadus College, Bluefield State College, Concord University, Fairmont State College, Harvard University, Marshall University, Ohio University's Athens & Chillicothe campuses, Southern WV Community & Technical College, University of California-Davis, University of Charleston, Washington & Lee University, WV Wesleyan College, and West Virginia University. He was recognized nationally for his work with Ohio University in development of a performance contracting program that is anticipated to save \$2.5 million annually in energy and operating costs.

He also has experience in providing M/E/P design for the following schools: Clay, Grant, Greenbrier, Hardy, Harrison, Jackson, Kanawha, Lewis, Logan, Marion, McDowell, Mercer, Mingo, Monroe, Ohio, Pocahontas, Putnam, Raleigh, Randolph, Ritchie, Summers, Taylor, Tucker, Upshur, Webster, and Wyoming County Schools. Some of his project experience includes the development and design of a pilot geothermal heat pump HVAC with variable speed pumping system at Webster County High School which reduced electric bills by more than 40% while meeting IAQ requirements.

Prior to joining **ZDS**, Todd Zachwieja coordinated millions in comprehensive energy conservation programs, resulting in annual energy savings of millions per year and managed a profitable regional office for one of the country's largest energy service companies. He also developed computer programs for building energy analysis and monitoring, and presented technical papers at regional and national conferences.

Professional Affiliations

Charter member Mountaineer Chapter of American Society of Heating Refrigeration and Air conditioning Engineers (ASHRAE)
Served as ASHRAE Energy and Technical Affairs Chairman for 6 years
Recognized by the International Who's Who of Professionals
Recognized nationally as West Virginia's Business Man of the Year
Recognized nationally in 2007 as a "Legend in Energy"
Charter life member of the Association of Energy Engineers
Professional Affiliate Member of the American Institute of Architects
Member of the American Association of Hospital Engineers
Member of the National Society of Professional Engineers
Member of National Society of Plumbing Engineers
Member of the International Code Council
Contributing editor and served on the Editorial Review Panel for "The Handbook of Building Management and Indoor Air Quality," "Ventilation for a Quality Dining Experience," INvironment Professional, Power Prescriptions and other publications and articles dealing with Indoor Air Quality (IAQ) and MEP engineering systems
Presented at regional and national conferences including the National System Commissioning Conference

TED T. ZACHWIEJA**Principal-in-Charge Construction Administration**

Education Bachelor of Science in Mechanical Engineering, West Virginia Institute of Technology, 1958.

Qualifications Ted's responsibilities include over 45 years of experience in mechanical and electrical systems design and construction administration. His specialties include the design and development of mechanical and electrical systems, master planning and budgeting for mechanical and electrical systems, and management of complex design and construction projects. He is also a Codes and Standards Specialist.

He has been involved in West Virginia since 1958 in all aspects of mechanical and electrical design and construction, including machine design, structural design and design of heating, ventilating, air conditioning, plumbing, fire protection and electrical systems. His experience includes work for U. S. Steel, Union Carbide, Rhone-Poulenc, Bluefield Regional Medical Center, Charleston Area Medical Center, United Hospital Center, Kanawha County Schools, Marshall University, most buildings on the West Virginia Capitol Complex, West Virginia Institute of Technology, West Virginia University, Bank One and many others in the private sector.

Ted's design at Chase Towers, Charleston (formerly Charleston National Bank) included conducting a comprehensive energy audit, design of a Building Automation Energy Management System, HVAC renovations of floors LM and LM1, design of flat plate heat exchanger system for the perimeter fan coil units and design of the boiler replacement.

Ted has been involved in the planning, design and construction administration of Concord University's Technology Center and Concord's campus medium voltage upgrades; Marshall University's Harris Hall renovations; Southern WV Community & Technical College's renovations; West Virginia University's White Hall and Armstrong Hall; WVU's Wise Library Sprinkler System; WVU's Chilled Water Loop Interconnect, Morgantown, WV; Charleston Area Medical Center (CAMC) Memorial Division Chiller Replacement; CAMC's General Division Chiller Replacement; Variable Pumping System and Chillers Interconnect, Charleston, WV; and many others. He has worked on new and renovation projects such as West Virginia University Stadium and Forestry Building, Morgantown, WV; Addition and Renovation of the Air Conditioning System for the West Virginia State Capitol Building, Charleston, WV; Conley Hall and Science Building HVAC Renovations and Additions, West Virginia Institute of Technology, Montgomery, WV; Indoor Air Quality (IAQ) and HVAC Renovations of Andrew Jackson Junior High School for Kanawha County School Systems; Fume Hood Design and HVAC Additions and

Renovations for Union Carbide, Charleston, WV and Rhone Poulenc, Institute, WV; HVAC renovation for the Benedum Student Center at West Virginia Wesleyan College, Buchannon, WV; Greenbrier East and Greenbrier West Schools; Mingo County Schools; Raleigh County Schools including Shady Springs Middle School, Trap Hill Junior High School, Academy of Career and Technology Center, Marsh Fork Elementary, Park Middle School, Woodrow Wilson High School and others; Pocahontas County High School (Geothermal); Wyoming County Schools; Tucker County Schools; Webster County High School & Webster Springs Elementary School HVAC Renovations (Geothermal) and Exterior Renovations; and various other secondary schools throughout the years.

Ted was involved with the mechanical and electrical renovations for the State of West Virginia Culture Center as part of a \$4.5 million HVAC and Electrical Renovations project. The indoor air quality, temperature and humidity were not in accordance with good design practices for this type of structure. ZDS was commissioned to correct these deficiencies while conserving energy.

Ted was selected as one of three engineers to train and teach a course designed by the Department of Energy and American Society of Heating, Refrigeration and Air Conditioning Engineers for emergency building temperature restrictions.

Prior to forming ZDS, Ted was regional manager for a hospital design firm and responsible for designing, construction management and project management for over \$200 million in hospital and health care facilities. The facilities were located over the eastern United States. Some of his health care experience includes millions in renovation and new construction design for Charleston Area Medical Center's Special Care Facility. Other local health care experience includes Bluefield Regional Medical Center, Hopemont Hospital, Monongalia General Hospital, Montgomery General Hospital, United Hospital Center, St. Mary's Hospital, Summersville Memorial Hospital, Thomas Memorial Hospital, Webster Memorial Hospital, Cabell Huntington Hospital, Welch Emergency Hospital, Surgicare Center, VA Hospital - Clarksburg, Mercy Medical Center, and Webster Memorial Hospital

**Professional
Affiliations**

Construction Specifications Institute (Charter Member)
American Society of Mechanical Engineers
American Society of Heating, Refrigeration & Air Conditioning Engineers
WV Mountaineer Chapter ASHRAE Past President and Charter Member
Association of Energy Engineers
Association of Hospital Engineers
WV Society of Hospital Engineers
Professional Affiliate Member of AIA
WV Association of Physical Plant Administrators

DANIEL H. KIM, PH.D.**Principal - Management Services**

Education Ph.D. in Management from Massachusetts Institute of Technology Sloan School of Management in 1993
Bachelor of Science in Electrical Engineering from Massachusetts Institute of Technology in 1987

Qualifications Daniel brings with him a strong design and management experience with over 24 years of experience in consulting ranging from traditional electrical and mechanical systems design to being one of the nation's leading experts in organizational issues including Total Quality Management and Systems Thinking.

His specialties include the management and design of HVAC systems for new building construction in the \$50 - \$150 million range including the One Hundred and Fifty, Federal Streets, Boston, MA; the Becton-Dickinson World Headquarters, NJ; Marketplace Center, Boston, MA.

Daniel has been an organizational consultant and public speaker who is committed to helping problem-solving organizations transforming into learning organizations. He has worked with numerous companies including DuPont, Ford Motor, Harley Davidson, Hanover Insurance, Healthcare Forum, CIGNA, Life Technologies, Ameritech Services, Brigham & Women's Hospital and General Electric among others.

Publications "Learning Laboratories: Designing Reflective Learning Environments," *Proceedings of 1989 International System Dynamics Conference*, Stuttgart
"Experimentation in Learning Organizations: A Management Flight Simulator Approach," *European Journal of Operations Research*, May 1992
"Systems Archetypes: Diagnosing Systemic Issues and Designing High-Leverage Interventions" 1992, Cambridge, MA: Pegasus Communications
"Toward Learning Organizations: Integrating TQC and Systems Thinking," *Special Report Series*, Cambridge, MA: Pegasus Communications
"The Leader with the "Beginner's Mind," *Healthcare Forum Journal*, July/August 1993

Lectures Keynote speaker and/or concurrent session at several conferences, including those hosted by The Planning Forum, The Healthcare Forum, Institute for Healthcare Improvement, The Conference Board. Speaker at Hofstra University, Monmouth College, University of Houston, and U.C. Berkeley.

LORI L. ZACHWIEJA, CPA**Principal - Chief Financial Officer**

- Education** Bachelor of Science in Accounting, Bachelor of Science in Business Management and a Bachelor of Science in Computer Management; all three degrees were with Honors, West Virginia Institute of Technology in 1983 Master's Degree at Marshall University
- Registrations** Certified Public Accounting in 1988, No. 2542
Member of West Virginia Society of CPAs since 1985
Certificate Number 1949
- Qualifications** Lori has over 25 years experience in finance, business, and accounting including being a Partner in a consulting firm, a Senior Financial and Tax Analyst for the Corporate Financial Services and Small Systems Support Department at Blue Cross and Blue Shield of West Virginia, Inc. and Staff Accountant for Simpson and Osborne, a CPA firm located in Charleston WV. Lori also has worked with an architectural firm located in Charleston, WV.

SHERRY Z. POWELL**Office Manager - Specification Coordinator**

- Education** Bachelor of Art Degree. Education Major WV state licensed K-12 with Minor in Psychology through Marshall University, Huntington, WV 1992. Order of Omega honorary member. National AE Association. Marshall University Dean's List.
- Qualifications** Sherry is the ZDS Specifications Coordinator. She has over 10 years experience working with various state contracts with 3 years specifically in Engineering Design contracts. She has also provided assistance with AIA contracts and job specific Construction Administration documents. She coordinates day-to-day operational office management activities and has 12 years experience with various office settings. She has a diverse background through previous volunteer and charity work activities. She has served as co-coordinator and officer for numerous local groups and charitable organizations.

KEVIN MARK KING, P.E.**Electrical Engineer**

Education BS in Electrical Engineering from West Virginia University Institute of Technology, Montgomery, WV in 2003
BS in Computer Science from Bluefield State, Bluefield WV in 1994
AAS in Computer Information Systems from Wytheville Community College, Wytheville, VA in 1990

Registration Professional Engineer, West Virginia, No. 18222
WV Master Electrician License No. M2302761640800

Qualifications Mark has more than 16 years of experience in electrical engineering, lighting, technology, heating, ventilating and air conditioning for educational, commercial and health care facilities. He has vast experience in the electrical field as a master electrician and in managing teams of people within different companies to ensure projects are within budget and completed within a timely fashion. He researches and applies International Building Codes, NFPA, Illuminating Engineers Society Standards and National Electric Code in design. Magna Cum Laude Graduate in 1990 & Cum Laude Graduate in 1994.

Mark specializes in electrical power, security, fire alarm, and lighting. Technology expert experienced in all forms of data, cabling, wireless networking, patch panels, and coordinating with IT personnel to meet the projects requirements.

Educational experience includes: Greenbrier County Schools additions and renovations to Eastern Greenbrier Middle/Greenbrier West High Schools, New Sissonville Middle School, HVAC Electrical Upgrades to Shady Spring High School, HVAC/Electrical Upgrades to Clearfork Elementary School, HVAC Upgrades to Independence High School, HVAC Upgrades to Summersville Middle School, HVAC Upgrades to Liberty High School, New Talcott Elementary School, WVU Tech - Printing Innovation Center, WVU Tech - Davis Hall Auditorium HVAC Upgrade, and HVAC/Electrical upgrades to Woodrow Wilson High School.

Commercial experience includes: New Raleigh County 911 Call Center, New Putnam County PSD Maintenance Garage, New Firehouse for WVANG, New Mason County 911 Call Center, Chief Logan State Park Lodge, Silver Tree Suites, St. Timothy's in the Valley, Tri-County YMCA Natatorium Addition.

Industrial experience includes: Stuart Forest Products, Elkem Metals - New Controls for Powerhouse, Elkem Metals - New Controls for Trolley System, Andritz Bird Addition, Weyhauser - Chester, South Carolina - Installed new charges on Lathe System, Steckman Ridge Gas Compressor Station, Big Mountain Gas Extraction Station & Helenwood Gas Extraction Station.

JAMES E. WATTERS**Production Manager - HVAC, Plumbing & Electrical****Qualifications**

Jim has over 35 years experience in design and implementation of 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 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, Ohio, Kentucky, Virginia, Georgia, New York, Arizona, Illinois and Massachusetts. He has extensive experience in energy savings' programs for HVAC, plumbing and electrical systems in hospitals, state & government office buildings, school systems, and manufacturing facilities as well as managing performance contracts for the state of Georgia totaling \$10,000,000 in construction costs on various projects.

Some of Jim's HVAC, plumbing, fire protection and electrical project experience includes: Greenbrier County's additions/renovations to Eastern Greenbrier Middle/Greenbrier West High Schools, Eleanor Maintenance Facility for the WV Department of Military Affairs and Public Safety in Eleanor, WV; Kings Daughters Medical Center in Ashland, KY (multiple projects exceeding \$12,000,000 in construction costs); Charleston Area Medical Center in Charleston, WV; St. Mary's Medical Center in Huntington, WV; Paul Blazer High School in Ashland, KY; Marshall University Student Housing in Huntington, WV; Pleasant Hill Elementary plumbing renovations in Calhoun County, WV; Boyd County Judicial Center in Boyd County, KY; Ritchie County Middle/High School; Elkins Middle School HVAC and electrical renovations; Woodrow Wilson High School HVAC/Electrical Renovations, WV DOT Burnsville Rest Area and domestic water pumping station; Tucker County Board Office Boiler Retrofit; Kanawha County Commission Judicial Annex Renovations; and West Virginia Division of Culture and History Fire Alarm/Sprinkler upgrades.

Through the years Jim has researched and implemented into practice International Building Codes, National Electrical Codes (includes NFPA), Life Safety Codes, IES standards, AIA Guidelines for Design and Construction, and the evolving ADA standards and guidelines.

MARK A. MOORE, P.E.**Project Manager: Electrical, Mechanical & Plumbing**

Education BS in Electrical Engineering from West Virginia University Institute of Technology, Montgomery, WV in 2001

Registration Professional Engineer, West Virginia, No. 17286

Qualifications Mark has more than eight years of experience in electrical engineering, lighting, plumbing, technology, mechanical engineering, heating, ventilating and air conditioning for educational, commercial and health care facilities. He researches and applies, International Building Codes, NFPA, Illuminating Engineers Society standards and National Electric Code in design. Mark has a strong background in microprocessor and microcomputer design. He is also responsible for Information Technology functions for ZDS and our customers.

Mark is also an information systems and technology specialist and provides networking solutions and Windows based programming system solutions.

Mark specializes in electrical power, security, fire alarm, lighting, plumbing, HVAC piping, and fire protection. Some of his educational and health care project experience includes: Charleston Area Medical Center, Bluefield High school renovations/Performing Art Center, Clay Elementary School HVAC Renovations, Concord University Technology Center, Elkins Middle School Renovations, H. J. Keiser Elem renovations, Hopemont State Hospital Fire Alarm renovations, James Monroe High School renovations, Ohio University Bennett Hall M/E Renovations, Park Middle School renovations, Ravenswood High Renovations, Ritchie Middle/High School renovations, Tucker County High/Career Center renovations, Webster Springs Elementary School geothermal heap pump system, Winfield High School HVAC/Electrical renovations, Pocahontas Co High School Renovations/Science Center additions, new McDowell County Southside K-8 school, Woodrow Wilson High School HVAC/Electrical renovations, United Hospital Wound Center and others.

His commercial experience includes; Cass Railroad Clubhouse renovations, DOT Rest Area and Welcome Center prototypes for the WV Department of Transportation, 4-H Camp Muffly Training/Dining facility, Hardy Co. Daycare facility, Jackson County Courthouse Annex renovations, Kanawha County Judicial Annex Renovations, Mason County Courthouse renovations, new Mercer County Courthouse Annex, multiple branch bank facilities, Camp Dawson Barracks security renovations, award winning Webster County IMC office facilities, Pendleton County Courthouse additions/renovations, new Webster Co. Multi-tenant Bldg., WV Capitol Complex Performance Contracting HVAC retrofits, WV Capitol Complex Master Planning for Security/Fire Alarm/Life Safety systems and others.

DAVID G. DIAL, P.E.**Senior MEP Engineer**

- Education** Bachelor of Science Mechanical Engineering, WV University, 1978
Masters of Science Environmental Engineering, WV University, 1980
- Registration** Professional Engineer, West Virginia, No. 11692
- Qualifications** David has over twenty-eight years of experience in the design and commissioning of Mechanical and Electrical systems. He provides HVAC, electrical and plumbing design services for a variety of clients in West Virginia. His background also includes managing operating and maintenance repair and construction services for HVAC, plumbing, electric, and maintenance. David has managed grounds maintenance, security staff, information technology, IT NASA network, video surveillance and telephone systems. These areas provide inherent coordination expertise.
- David has experience in Maintenance Engineering in plumbing, HVAC, clean room design, dust collector selections, steam and condensate flow measurement, transfer of steam production from in-house to private contractor, athletic field lighting design, farm pump water design, and even completed a successful energy grant application from the US Department of Energy.
- Environmental Design experience includes PCB remediation, Air Pollution Control Commission annual reporting, removal of underground fuel storage tanks/pumps, installation and testing for radioactive material, conversion of a fleet of vehicles to operated dual fuel (gasoline and natural gas) including training, designing a filling station, custom built compressor station, cylinder operations area, filling post and monitoring of natural gas usage.
- He has been involved in the design, document development, contract administration and recommissioning of the structural, mechanical, and electrical disciplines of several WVU projects including: Downtown Steam Tunnel Assessment, Coliseum Tunnel Redesign, Towers exercise room, Brooks Clean Room, lighting retrofits at Brooks Hall, exterior lighting for Mountainlair Parking Garage, cooling towers replacement at the Chemistry Annex, replacement of electric hot water boilers with natural gas pulse steam boilers, HVAC controls for Allen Hall, measure flow for sub metering/billing for campus steam/condensate systems, PCB removal from electrical equipment on campus, and power/cooling for a data Center at the WVU/NASA facility.
- Other project experience includes design for Trinity High School's HVAC, plumbing and electric system, industrial dust collector system for the Percival Dust Collector, replacement of rigging of a 2500 seat Auditorium. As a production engineer, David optimized design of medical quality cryogenic freezers, incubator and shaker including scheduling the freight trucks, quality assurance of sheet metal shipments, writing repair manuals and set up insulation.

JAMES W. LOWRY, E. I.**HVAC, Plumbing & Fire Protection Designer**

- Education** BS in Mechanical Engineering from West Virginia University Institute of Technology, Montgomery, WV in 2004
- Registration** EI West Virginia #8376
West Virginia State Board of Registration for Professional Engineers
- Qualifications** James has completed extensive HVAC design training at Carrier Training Center, Syracuse, NY and hydronic design/applications at the B&G training center, Chicago, IL. He also had special courses in Finite Element Analysis, Vibration Analysis, Fluid Power, Automatic Controls, Industrial Instrumentation, and Programmable Logic Controllers (PLCs).
- James' experience includes the design for mechanical engineering, heating, ventilating, air conditioning, plumbing, electrical, and lighting for educational and commercial facilities. He specializes in HVAC, Fire Protection and Plumbing design. He researches and applies International Building Codes, NFPA, ASHRAE standards and the AIA Guidelines for Design and Construction of Health Care Facilities. He recently assisted Harvard University on HVAC for LEED Gold Weld Hill Research and Administration Facility located in Boston.
- His commercial experience includes Cass Railroad Clubhouse renovations, DOT Rest Area prototype, DOT Welcome Center prototype, 4-H Camp Muffly Training/Dining facility, Kanawha County Judicial Annex renovations, Jackson County Courthouse Annex renovations, Mason County Courthouse renovations, Pendleton County Courthouse additions/renovations, Pt. Pleasant River Museum Addition, Hardy Co. Daycare Center, multiple branch bank facilities, Webster Co. Multi-tenant build-out, WV Capitol Complex Performance Contracting HVAC retrofits and Master Planning for Security/Fire Alarm/Life Safety systems and others. Also experience in health care including multiple projects for Veterans Administration.
- Some of his educational project experience includes: Concord University Technology Center, Elkins Middle School Renovations, Greenbrier West High School additions/renovations, Eastern Greenbrier Middle Addition/renovations, James Monroe High School HVAC renovations, Man/Central Elementary Addition, Park Middle School HVAC renovations, Ritchie County Middle/High School HVAC/Plumbing renovations, Tucker County High/Career Center HVAC renovations, new McDowell County Southside K-8 School, and Woodrow Wilson High School HVAC/Electrical renovations.
- Professional Affiliations** American Society of Mechanical Engineers

MARSHALL COCHRAN**MEP CAD Designer/Technical Analyst****Education**

Associate Degree in Computer-Aided Drafting, ITT Technical Institute, Murray, Utah, 1990. Has completed various courses at Parkersburg Community College, Parkersburg, WV and at Arch Moore Vo-Tech, Frozen Camp, WV.

Qualifications

Marshall has specialized in Computer-Aided Drafting and design since 1988 and is presently working with AutoCAD 2008. He has a comprehensive knowledge of AutoCAD and Integraph.

Marshall has been involved with the design and production of mechanical and electrical drawings including HVAC, plumbing, fire protection, lighting, power and piping systems. He has worked with Engineers in the design of HVAC systems for health care, educational and commercial buildings in the states of Utah, Ohio, Virginia, Pennsylvania and West Virginia, determining HVAC equipment layout, CFMs to size ductwork, HVAC load calculations, plumbing design, computer rooms, gymnasiums, and auditoriums. He determines type, size and directional flow of diffusers, ductwork sizing, equipment selection and details. He has also worked on architectural and structural design of buildings, the design of blowout panels to be installed in hazardous buildings and civil drawings for layout of new roadways.

Some of Marshall's HVAC, plumbing, fire protection and electrical design project experience includes Kanawha County Judicial Annex HVAC renovations, M/E renovations for schools in Clay, Grant, Greenbrier, Hardy, Harrison, Jackson, Kanawha, Lewis, Logan, Marion, McDowell, Mercer, Monroe, Raleigh, Randolph, Putnam, Pocahontas, Summers, Tucker, Webster, and Wyoming Counties. Some of his college and university experience includes Bluefield College, Bluefield State College, Concord University, Marshall University, Ohio University, Southern WV Community & Technical College, WV Wesleyan College, Washington & Lee University, and West Virginia University. Some of his health care and commercial experience includes Bank One of Charleston, Charleston Area Medical Center, Hopemont State Hospital, General Motors, Toyota, United Hospital Center, WV Cultural Center HVAC renovations, Webster Memorial Hospital, WV Public Service Commission Headquarters Building, and the WV Capitol Complex central boiler plant.

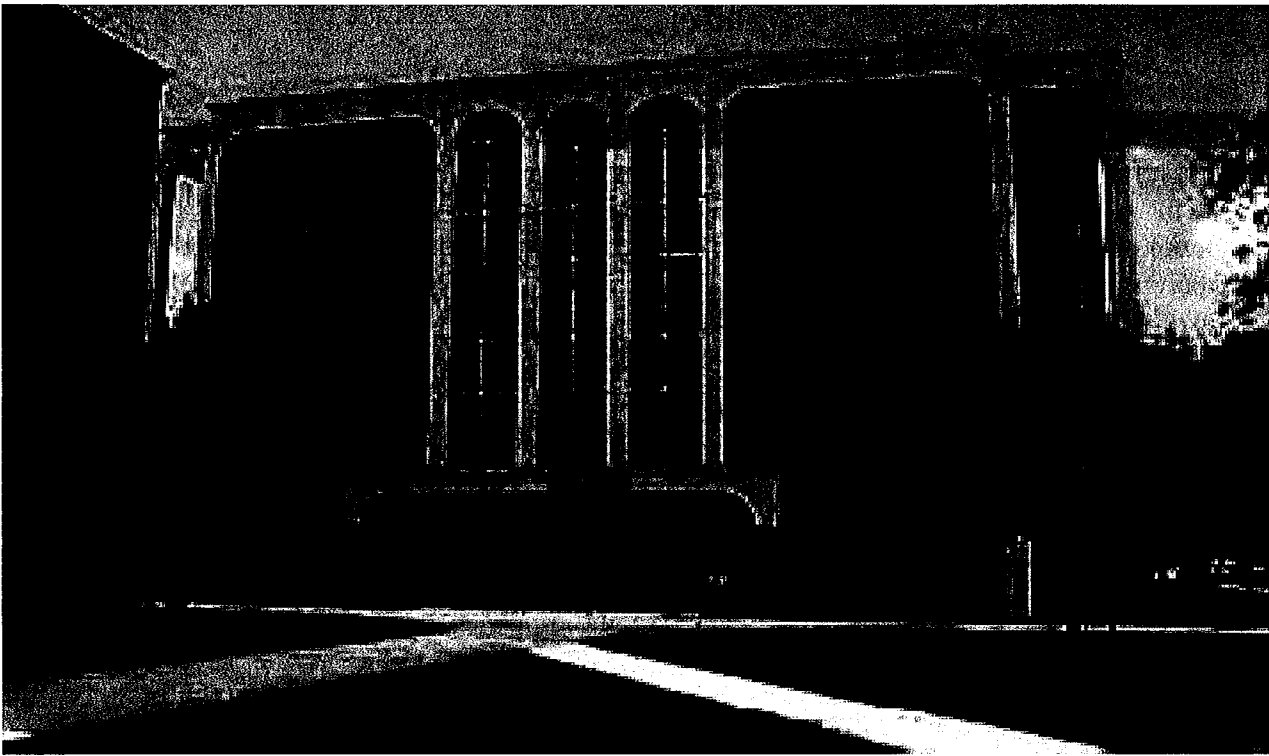
ZDS Design/Consulting Services



Project Name: *Harris Hall - HVAC and Electrical Retrofits*
Client/Location: *Marshall University, Huntington, WV*

Client Contact: Mr. Tony Crislip,
Project Manager,
Mechanical/ Electrical Trades
One John Marshall Drive
Huntington, WV 25755-2450
Phone (304)-696-6241

Services: Engineering planning, design, bidding and construction administration services HVAC, Plumbing & Electrical retrofits, DDC Controls, AHU's replacement, chiller replacement, VVW pumping, new electrical service, switchgear and fire alarm systems.



Project Description

Harris Hall, on Third Avenue, was originally constructed in 1976. The four-story building houses the departments of classical studies, geography, history, religious studies, philosophy, psychology, counseling and rehabilitation, adult and technical education, and administrative education. Marshall University recognized that the HVAC and electrical systems were at the end of their expected service life and were experiencing frequent equipment failures, power outages and numerous complaints on comfort and “stuffy air”. The plumbing was also wasteful with an opportunity to incorporate water saving features into the existing plumbing systems.

PROJECT EXPERIENCE

Marshall University initially contracted **ZDS** to evaluate Harris Hall's existing mechanical/electrical/plumbing systems and prepare an extensive report. **ZDS's** cost estimates showed it would take \$3 million to meet their needs. The planning document covered multiple HVAC approaches with advantages and disadvantages for each to provide a comfortable environment while addressing Indoor Air Quality, energy efficiency, operating costs and meeting the Owner's goals. The report also covered related work including roof replacement, lighting upgrades, and energy/operating conservation measures.

We worked with the University on different approaches to fit the project within available funding while defining alternates that would permit the Owner to complete the HVAC/Electrical/Plumbing retrofits if more funding could be found or to phase the work as funding was found. With the aid of **ZDS's** planning, Marshall University was able to phase the project. The facility was vacated for less than 60 days in the summer of 2006 to allow the contractor to perform the major construction efforts without working around the occupants. The project was successful through careful planning and coordinating construction efforts between the University, the design and the installation.

The HVAC system had a direct impact on the health and safety of the college students and staff. Previously, occupant comfort was not being maintained and recommended levels of outside ventilation air were not being introduced to the classrooms. **ZDS** designed a VAV air handling system with reheat HVAC system to address health, safety, and IAQ issues by increasing outdoor ventilation air rates, higher filtration, strict humidity control, DDC monitoring/control, carbon monoxide demand control ventilation, outside air measuring/monitoring and other design strategies. Multiple HVAC options with their associated opinion of costs for modifying, updating and replacing the existing equipment were reviewed with the Owner for their preferences to find the best fit with the existing maintenance staff. A ground mounted air cooled chiller with antifreeze and variable water volume pumping was also designed. All HVAC equipment was designed for full DDC controls for remote monitoring, trouble shooting and energy efficiency. Plumbing fixtures were upgraded with water conserving low flow auto flushing devices to reduce water/sewer costs.

A new addressable fire alarm system, electrical service, electrical switchgear and additional panelboards were also included in the design. A section of the original aluminum bussed switchgear had previously "melted" which caused an extensive outage while a custom replacement part could be manufactured. The electrical retrofits addressed this & energy efficient lighting with motion detectors were also incorporated into the building.

Tony Crislip, Manager, Marshall University stated "*This building serves as a pilot for how all our buildings should be constructed. This building is the most comfortable one on campus!*"

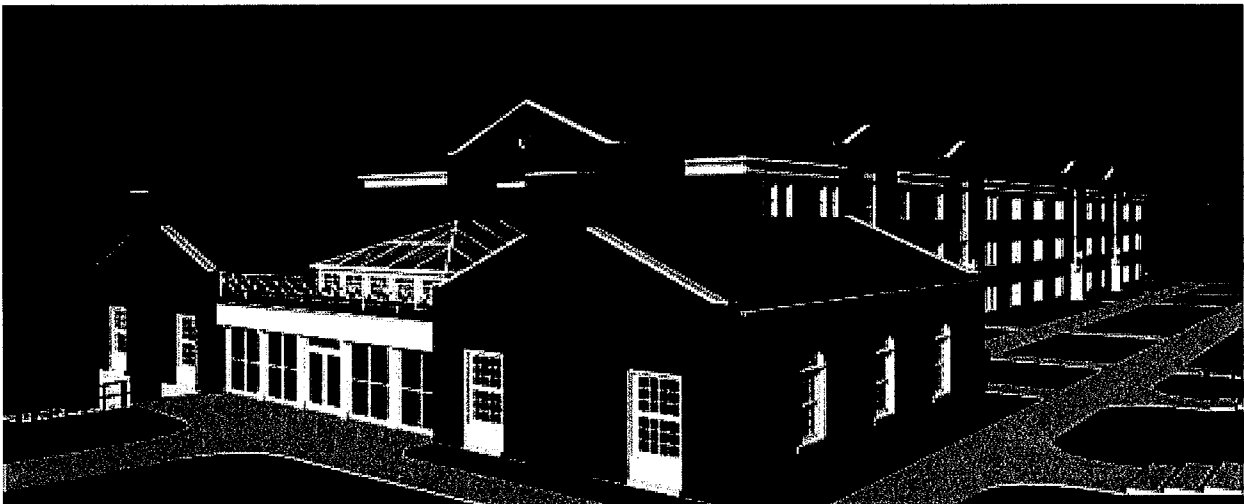
MEP Project Cost:	\$2,856,000
Project Size:	56,680 square-feet
Completion Date:	Completion fall 2006

ZDS Design/Consulting Services

Project Name: *Nick J. Rahall II Technology Center*
Client/Location: *Concord University, located in Athens, WV*

Client Contact: Mr. John Ferguson,
Chief Procurement Officer
PO Box 1000
Athens, WV 24712-1000
Phone: (304)-384-5233

Services: Engineering planning & design for HVAC, Electrical, Plumbing, compliance with ADA, Fire Protection, Technology, DDC Controls, VAV AHU's, variable water volume pumping, UPS, Emergency Power, energy efficient lighting, & information technology.



Project Description

Concord University had an existing building, White Hall, that they wanted converted to a new state-of-the-art technology center. Working through E. T. Boggess Architects, ZDS evaluated the potential mechanical, electrical, plumbing, fire protection and technology needs for significant infrastructure upgrades for an existing building that was not ideally suited for a technology center. After careful analysis, the design team and Owner decided it was best to demolish most of White Hall and construct a 50,000 ft² three-story building attached to the existing remaining structure. Congressman Nick J. Rahall II helped in obtaining the necessary funding to make the project possible and Concord University named the building after him in appreciation.

The quality of HVAC system was crucial to Concord University since they had just spent over a \$1 million correcting Indoor Air Quality (IAQ) problems in an existing relatively new building in which they believed the HVAC system contributed to the problem. ZDS designed around a centralized heating/cooling plant for greater efficiency in overall system operation and provided centralized control and maintenance of primary heating/cooling equipment, with the added benefit of supplemental capacity in the event of a boiler failure. The planning and design

PROJECT EXPERIENCE

services included providing a quality HVAC system and electrical equipment, and their sub-systems to provide a comfortable environment while addressing Indoor Air Quality, energy efficiency, operating costs and meeting the Owner's needs.

HVAC systems were enhanced to meet applicable codes and standards and improved indoor air quality through higher filtration, strict humidity control, ultraviolet light purification air flow measuring/monitoring and other design strategies. The business incubator area was equipped with flexible HVAC zoning and additional power to meet potential varying uses for the space.

The electrical systems included providing uninterruptible power supply, redundant HVAC and emergency power to the central computer center where all of the University's internet/intranet systems resided. Classrooms were equipped with the latest in technology including provisions for some of the future 3-D imaging instruction tools being developed.



The MEP design aids Concord University to operate their facilities efficiently and effectively and the state-of-the-art technology will greatly benefit the faculty and students for many years to come.

ZDS also designed, bid and provided construction administration services for completing the Campus Medium Voltage Loop involving every building on the campus which was completed in 2005 under budget and ahead of schedule. The \$375,000 electrical upgrades also provided the electrical service capability for the new technology center.

MEP Construction Cost: \$3,675,000 out of a \$10,300,000 total costs
Size: Approximately 50,000 square-feet
Completion Date: Completed in 2008

ZDS Design/Consulting Services

Client: *Webster County Schools, West Virginia*
Project: *Webster County High School Renovations*

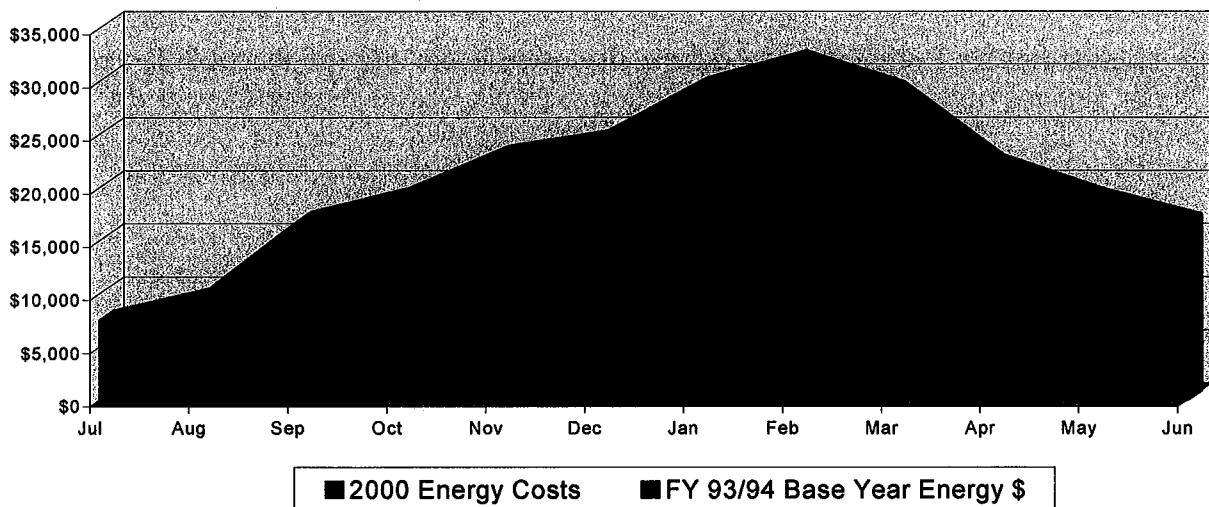
Client Contact: Mr. Harry Given, Retired Dir. of Maintenance.
Webster County Schools
Webster Springs, WV 26288-1123
Home Phone (304) 226-5288

Project Description

Initially Webster County Schools solicited bids from several Performance Contracting firms to make upgrades at the high school and pay for the improvements. Performance contracting approach could only partially pay for the improvements and a pure performance contracting approach was dropped. Webster County Schools then hired **ZDS Design/Consulting Services** to evaluate their options, design their recommended solutions for Webster County High School, and establish an approach to address the county HVAC needs with low operating costs.

Multiple Heating Ventilating and Air Conditioning (HVAC) systems were evaluated and a geothermal heat pump system proved to have the lowest life cycle cost. This system was projected to reduce their HVAC electric cost by nearly 50% over usage of the existing system. **ZDS** assisted Webster County Schools in obtaining funding for the project from the State's School Building Authority and receive additional grants from the Geothermal Heat Pump Consortium and Allegheny Power for the project which was the first major geothermal heat pump system in the State of West Virginia.

**Webster County High School
Geothermal Heat Pump Energy Savings**



Webster County High School used a 500 ton geothermal heat pump loop consisting of 240 wells; 307 foot deep, with over 28 miles of underground piping spread in an adjacent practice football field. A 20% propylene glycol/water solution is pumped through the closed loop with a variable water volume (VWV) pumping system for energy and operation systems. The HVAC system is fully automated through a central Direct Digital Control (DDC) system. Indoor air quality issues are addressed in the new design through increased ventilation, improved filtration, customizing the design of the AHU's to address current Indoor Air Quality (IAQ) practices, and cleaning/coating existing ductwork. Operating costs for the increased ventilation were minimized through incorporating air-to-air energy recovery systems into the new rooftop air handling equipment. The combining of the air-to-air heat recovery together with the primary air handling equipment is receiving national attention and may be the first of its kind for geothermal applications.



*Drilling for the ground
loop for Webster County
High School's 500-ton
Geothermal system.*

*It is the largest
GeoExchange installation to date in
West Virginia
and the surrounding region.*

Systems for Control of Energy Use: Geothermal Heat Pump system, DDC controls, customized rooftop AHU's with air-to-air heat recovery, and variable water volume pumping.

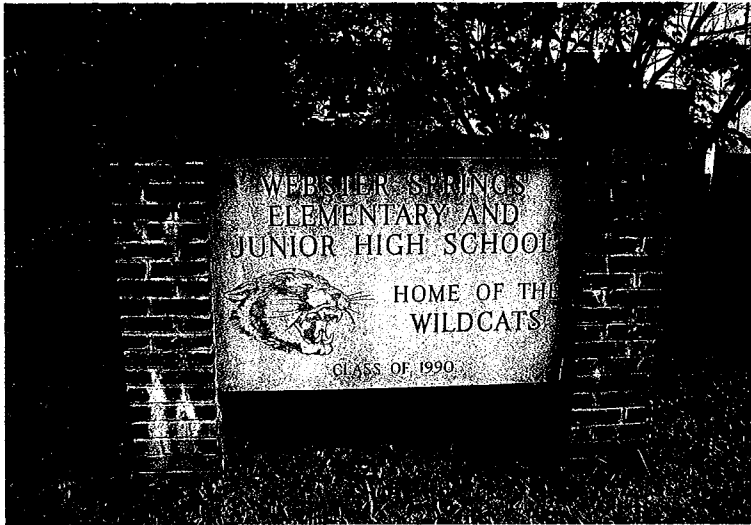
The interior lighting, ceilings and bricking the exterior are part of the overall upgrades to Webster County High School. Webster County Schools was so impressed with the results at Webster County High School that the approach was applied to Webster Springs Elementary School and is proposed for Glade Elementary School when funding becomes available.

<i>Total Project Cost:</i>	\$5,083,000
<i>SBA Funds:</i>	\$5,083,000
<i>Potential Annual Energy Savings:</i>	50% Reduction HVAC & Lighting Operating Costs.

ZDS Design/Consulting Services

Client: *Webster County Schools, WV*
Project: *Webster Springs Elementary School HVAC Renovations*

Client Contact: Mr. Harry Given, Retired Dir. of Maintenance.
Home Phone (304) 226-5288
Webster County Schools
Webster Springs, WV 26288-1123



Project Description

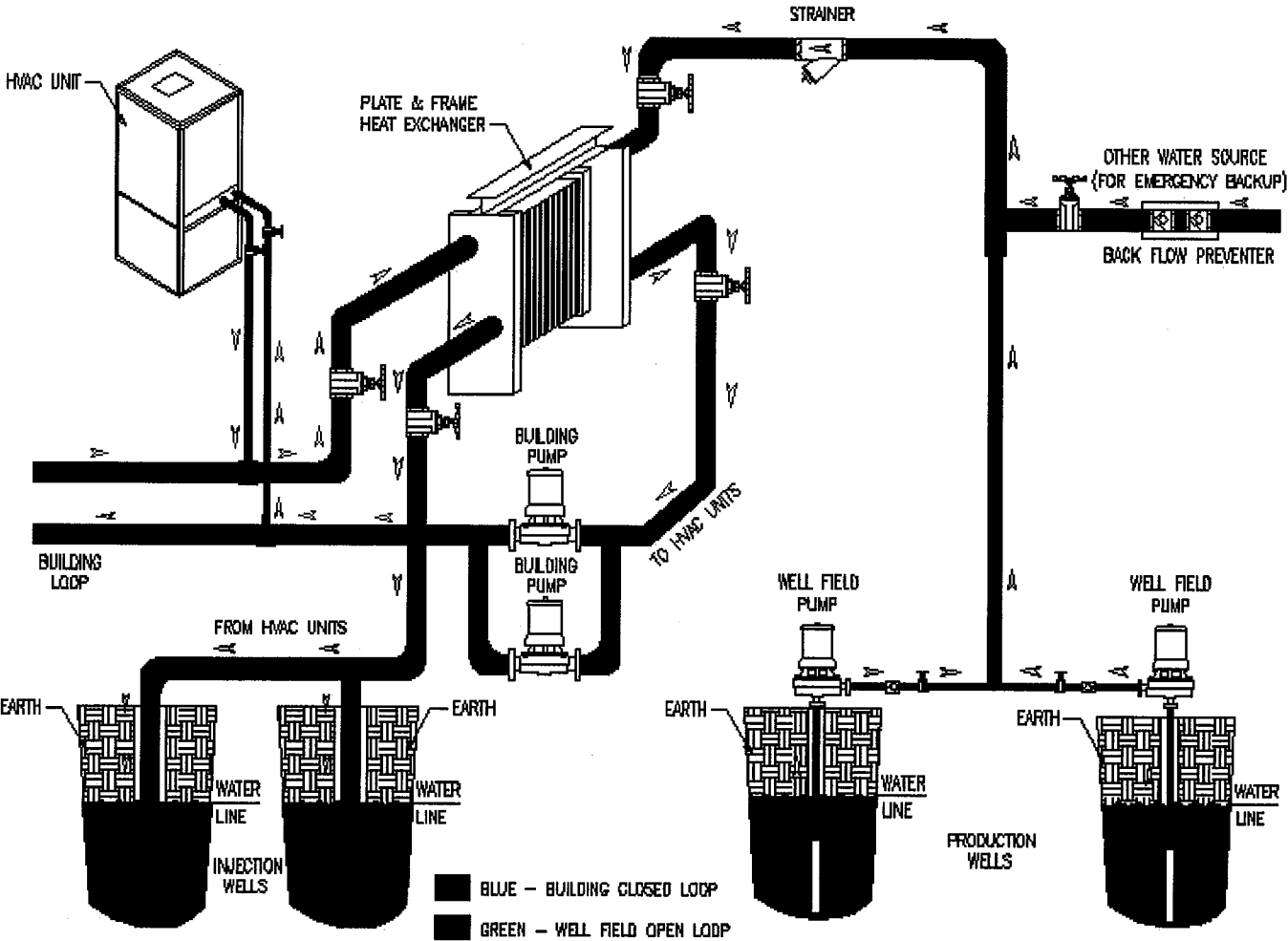
ZDS assisted Webster County Schools in obtaining funding for the project from the State's School Building Authority to upgrade Webster Springs Elementary's HVAC systems. The elementary school is a two story structure and was using coal fired steam boilers. Natural gas was not available and the labor and emissions from using coal fire boilers were no longer acceptable. Geothermal heat pump systems were designed and constructed for the school's new HVAC system. The football field beside the school was selected to install the well field. Once construction started, a tremendous amount of water was encountered below the grade which made installing a closed loop well field impractical. Since this large underground aquifer was found an open-loop well field was designed and installed. Multiple production wells and injection wells were installed that extract water from the ground which is piped through a plate and frame heat exchanger then injected back into the ground. *See the diagram on the next page for more details.*

The HVAC system in the building remained a closed loop system by circulating fluid through the plate-and frame heat exchanger. A 20% propylene glycol/water solution is pumped through the building closed loop using a variable water volume (VWV) pumping system for energy

PROJECT EXPERIENCE

efficiency and operational flexibility. The building water never comes in direct contact with the well water because the heat exchanger keeps these two water streams separated. A special permit was required in order to use this type of system. This was the first system installed according the State Department and **ZDS** help establish a procedure to minimize the risk of cross contamination with underground aquifers as part of this project.

Indoor air quality issues are addressed in the new design through increased ventilation, improved filtration, customizing the design of the HVAC units to address current Indoor Air Quality practices. Ultraviolet lights are installed to reduce the risk of mold growth and also kill air born germs. Operating costs for the increased ventilation required to meet Indoor Air Quality were minimized through incorporating carbon dioxide outdoor ventilation air control. The open loop geothermal heat pump system is the first of its kind for a West Virginia School.



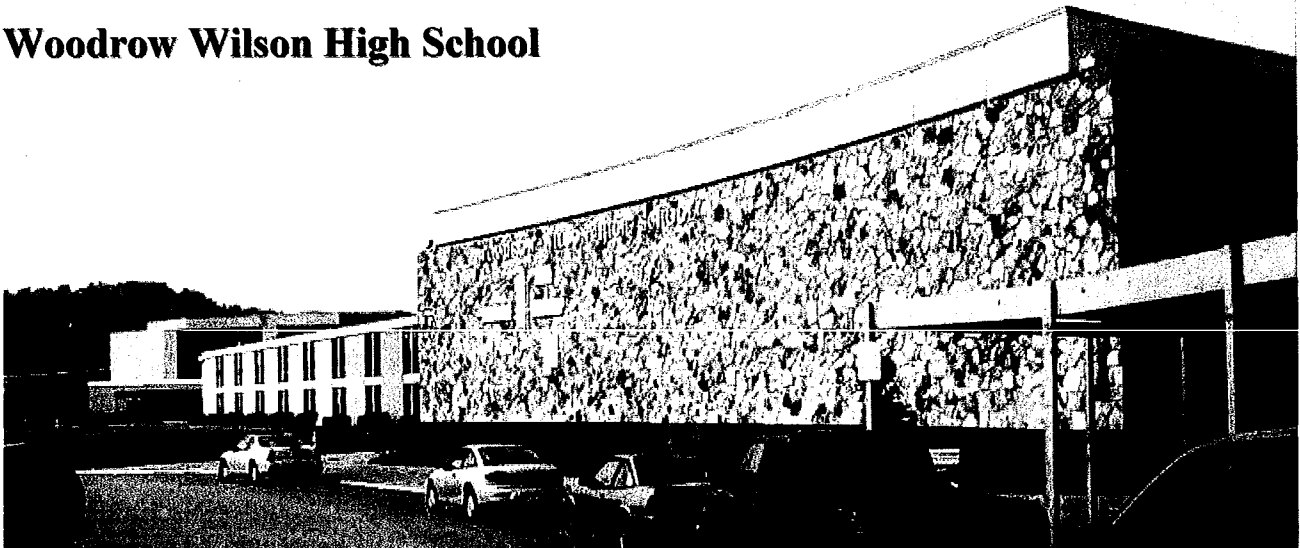
Total Project Cost: \$1,430,000
SBA Funds \$1,300,000
Potential Annual Energy Savings: 40% Reduction in HVAC energy usage

ZDS Design/Consulting Services

Client: *Raleigh County Schools, West Virginia*
Projects: *Woodrow Wilson High School & Academy of Career & Technologies Renovations*

Client Contact: Mr. Racine Thompson, Assistant Superintendent
Phone (304) 256-4500,
Raleigh County Schools
Beckley, WV 25801-3791

Woodrow Wilson High School



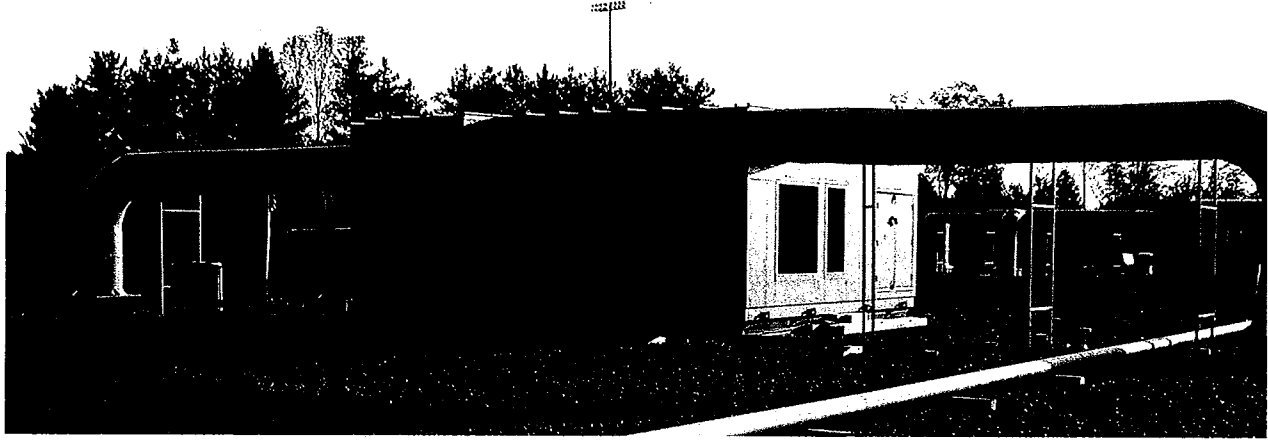
Project Description

Woodrow Wilson High is rich in tradition with over 180,000 sq-ft. and space for over 1500 students. The building was constructed in 1965 and the HVAC systems are well past their expected life. When it was time to renovate these facilities Raleigh county Schools hired **ZDS** to evaluate the HVAC and electrical needs for Woodrow Wilson High School and the Academy Career and Technology center to bring the schools up to current codes and standards. The renovation work needed implemented in phases. The first phase involved HVAC upgrades for the Administrative wing of WWHS and the main area of ACT which was completed in 2001. All within budget while saving over \$122,000 through breaking out portions of the work to be purchased directly by the school. The next phase involved lighting upgrades, ceiling plenum cleaning and tile replacement which was completed in 2003.

The next phase involves \$10 million to complete the HVAC and related upgrades for the remainder of Woodrow Wilson High School. ZDS evaluated the facility and developed the preliminary opinion of construction costs used for the Bond Levy that was overwhelming passed

in January 2004. ZDS then designed the solutions. The project is under construction and expected to be completed in the fall of 2008.

Academy of Career & Technology – Rooftop Units



Across the street from Woodrow Wilson High School is the Academy of Career and Technology's Center (ACT) that was also retrofitted concurrently with the high school. ACT's primary HVAC system was not providing comfort or meeting the stringent Indoor Air Quality codes and standards enforced by the WV Department of Education. Two custom roof-top HVAC units were designed and installed to bring 60,000 square-feet of the vocational facility up to today's current technology. High efficient filtration was incorporated into the custom variable air volume air handling units. All of the HVAC equipment was also under Direct Digital Control for remote central monitoring and control. ZDS separate out the rooftop HVAC equipment for direct purchase by Raleigh County Schools which saved the county over \$122,000.

Space comfort and indoor air quality in Academy of Career and Technology's Center were brought up to levels; the students and staff are now saying

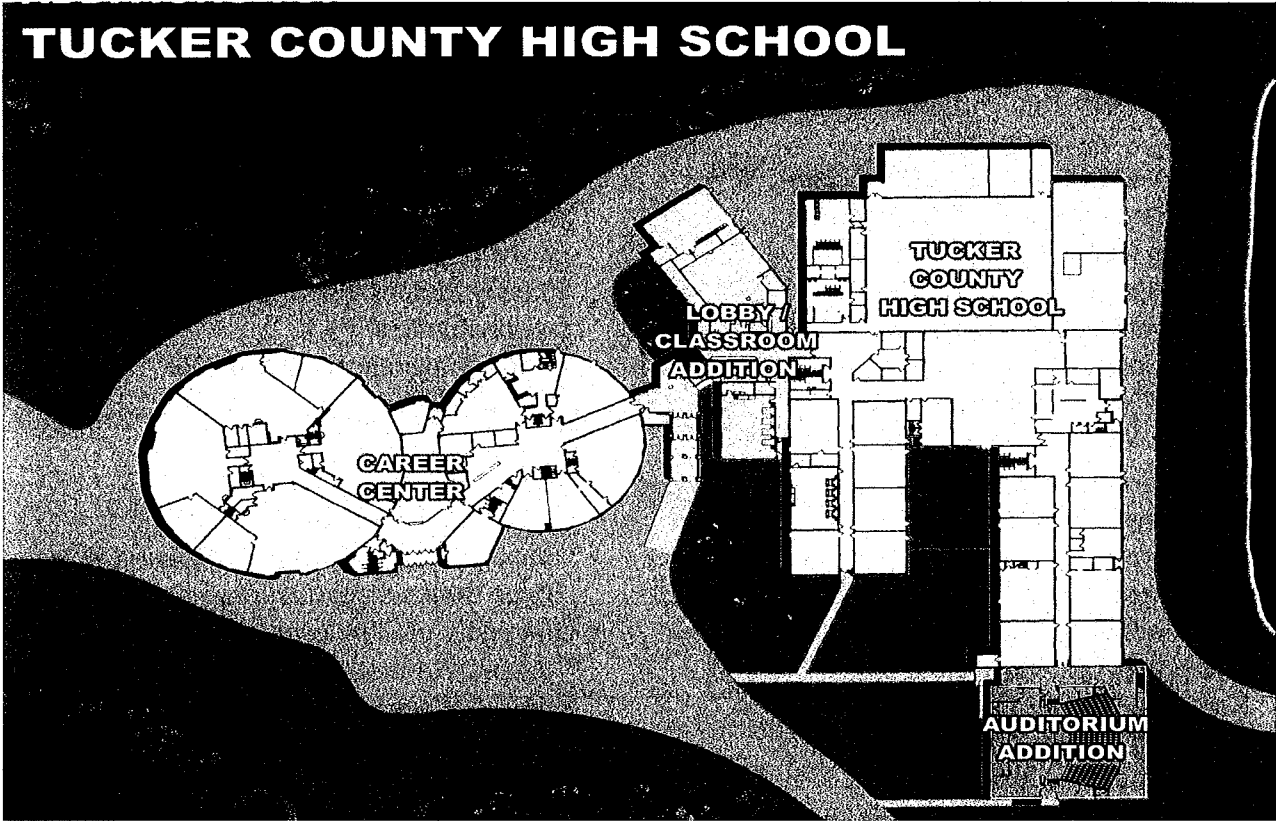
***“We have never been comfortable until now!
We can now focus our attention on teaching and learning.”***

<i>Total Project Cost:</i>	\$12,050,000
<i>School Building Authority Funds</i>	\$900,000
<i>School Size:</i>	240,000 Square-Feet

ZDS Design/Consulting Services

Client: *Tucker High Schools, Tucker County, WV*

Client Contact: Tucker County BOE.
Phone (304) 478-2771,
Tucker County Schools
Parsons, WV 26287-1005



Project Description

Tucker County High School and Career Center were originally two separate structures. Two additions were made to the campus including an interconnecting lobby/classroom addition that tied the two buildings together and a new Auditorium addition. The HVAC, lighting and plumbing systems in the high school were also renovated. **ZDS** provided all of the HVAC, plumbing, fire protection and electrical engineering design for this multi-phased project.

Total Project Cost:	\$7,068,000
School Building Authority Funds	\$6,850,000

Additional ZDS Team Members Experience Includes Working With

Air National Guard – USA American
Electric Power Company
Alderson-Broadus College, WV
Allegheny Power Company
Appalachian Tire Co., WV.
Arlington Assembly Plant, TX
Army National Guard - USA
Bank-One, Charleston, WV
Bluefield Community Hospital
Bowling Green Assembly, KY
Cabell County Court House, WV.
Cabell Huntington Hospital, WV.
CAMC, Charleston, WV
Canaan Valley State Park/Ski Resort, WV.
Charleston National Bank, WV
Chelsea Group Ltd., Chicago, IL
CMA Associates, Charleston, WV
Clermont Mercy Hospital, Batavia, OH
Eagle-Convex
General Motors – North America
General Services Administration - USA
Grant County Schools, WV
Greenbrier County Schools, WV
Hope Gas Company
Ile de France, Charleston, WV.
Jackson County Schools, WV
Janesville Assembly Plant, WI.
Kanawha County Commission
Kanawha County Schools, WV
Laidley Towers, WV
Lewistown Outpatient Surgery, PA.
Logan County Schools, WV.
Lordstown Assembly Plant, OH
Marion County Schools
Marshall University, WV
McDowell County Schools, WV.
Mercer County Schools, WV
Mercy Medical Center, Springfield, OH
Montgomery General Hospital, WV.
Mountaineer Gas, WV
Ohio County Schools, WV
Ohio University, OH
Olin Corporation, WV
Pocahontas County Schools, WV
Pipestem State Park, WV.
Public Service Commission of WV.
Putnam County Library, WV
Raleigh County Airport, WV
Raleigh County Schools
Raleigh County Public Library
Ritchie County Schools, WV
Saint Joe's Hospital Parkersburg, WV.
Sears - USA
Spencer State Hospital, Spencer, WV.
Summersville Memorial Hospital, WV.
Surgi-Care Center, WV
Taylor County Schools
Thomas Memorial Hospital, WV.
Twin Falls State Park, WV
Toledo Transmission Plant, OH.
Toyota - USA
Tucker County Schools, WV
Union Carbide Corporation
United Building, Charleston, WV.
United Hospital Center, Clarksburg, WV.
United States Steel Corporation
University of Charleston, WV
Veterans Administration - USA
Virginia Electric Power Company
Walker Machinery Company-Mid Atlantic
Wayne Memorial Hospital, NC
Webster County Schools, WV
Webster County Memorial Hospital
Welch Emergency Hospital, WV.
West Pan Restaurant, NY
West Virginia University, WV
WVU Institute of Technology
WV State College, Institute, WV.
WV Wesleyan College, Buckhannon
Wyoming County Hospital, WV
Wyoming County Hospital, WV
Yeager Airport, WV

MONEY & MANAGEMENT

Paying for Performance

A growing number of colleges sign contracts with guarantees of savings of energy and money

BY MARTIN VAN DER WERF

TECHNICIANS are crawling over the campus of Ohio University, charting the use of electrical current in every office and dormitory room, measuring the brightness of lighting, the consumption of water, the air temperature in every room and alcove. They are trying to document every way that the university can cut its energy costs.

The answers are in little places. Ohio will replace 9,000 exit signs with exit lights that use 80 percent less energy and last 25 times longer. It will replace windows. It will put smaller, more efficient fluorescent tubes in the light fixtures. It will probably be watering its lawns and fields with well water rather than water from the tap. And, as a symbol of its turn away from a longtime reliance on coal, the university is considering buying its own natural-gas field, in the nearby hollows of the Appalachians.

It will be a 20-year project that will save millions of dollars per year in energy costs. Yet, to do it, the university won't have to come up with any new money up front.

In April, it signed a \$25-million "performance contract" with Vestar, a subsidiary of Cinergy Corporation, a Cincinnati-based energy company.

HOW IT WORKS

Performance contracts are an innovative financing method that is increasing in popularity on campuses. The process works like this: A contractor or energy company explores a campus and recommends ways to save money on energy bills. Then the contractor makes the changes or hires others to make them, and guarantees, in writing, that the savings the college will realize will cover the costs of the changes, usually within 10 years. The company can also arrange financing, so the college does not have any upfront costs. The college pays the company for construction and equipment in installments that roughly equal the amounts by which the college is cutting its energy bills.

The companies benefit by selling more of their products. For many colleges, the greatest appeal of the contracts is that they can use the savings to help eliminate backlogs in deferred maintenance. Many of them use the savings to buy more-efficient chillers, ventilation systems, and other utility-related equipment.

"This is a way for many institutions to get capital quickly," says Mohammad H. Qayoumi, vice chancellor for administrative services at the University of Missouri at Rolla, who leads sessions on utilities policy at institutes sponsored by the Association of Higher Education Facilities Officers.

"Are we going to see more? Definitely. We are going to see things going in that direction, especially with the deregulation of energy companies. They are increasingly going to want to sell electricity not only as a commodity, but all kinds of services along with it," he says.

University officials who have entered into the contracts point out, however, that the deals are immensely complicated. Any institution that is considering such a contract should consult with outside

<http://chronicle.com/money>



Todd A. Zachwieja, a Consultant with ZDS Design/Consulting Services: "Some schools have moved forward with contracts without fully understanding what they were doing."

CHRISTOPHER FOR THE CHRONICLE



Sherwood G. Wilson of Ohio U. says its new energy contract will help it cover the costs of deferred maintenance.

CHRISTOPHER FOR THE CHRONICLE

experts, says Joe Kelley, executive director of facilities at Louisiana State University at Baton Rouge, which signed one of the first performance contracts by any college, an \$18.8-million deal in 1990.

"We sort of had to find a pathway through the jungle on this one," says Mr. Kelley. His advice: "Get every word of it in writing."

Todd A. Zachwieja, principal of ZDS Design/Consulting Services an Ohio and West Virginia-based consultant on performance contracting, says there are now more than 100 companies in the business. The traditional market leaders are Fortune 500 companies like Honeywell, Johnson Controls, and Sempra Energy. Many of the newest ones are utilities trying to broaden their services.

AN UNTAPPED MARKET

The size of the market is difficult to quantify. Johnson Controls alone has about \$1.6-billion in contracts, about 100 million worth with colleges, says Tom Proffitt, marketing manager for performance contracting at the Milwaukee-based company.

The college market, however, remains relatively untapped. Mr. Proffitt estimates that fewer than 20 percent of institutions have signed such contracts. But higher education has been a steadily growing segment of his company's business, he says.

Performance contracts were born in the 1970's, during the Arab

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oil embargo, when energy savings were at a premium. But they were not widely used until the mid to late 1980's, when they became particularly popular at hospitals, which could get some Medicaid and Medicare reimbursement for facilities improvements, says Mr. Zachwieja, chief executive officer of ZDS Design/Consulting Services, in St. Albans, W.Va.

Slowly, as states have passed laws allowing multiyear financing, elementary and secondary schools and local governments are beginning to sign the contracts. About 35 states have now enacted the laws, says Mr. Proffitt.

In 1994, President Clinton signed an executive order allowing federal agencies to make the agreements, and the contracts have begun to proliferate, mostly at military bases and at office buildings owned by the General Services Administration.

STAYING ON THE SIDELINES

Other than pioneers like Louisiana State; however, most higher-education institutions have stood on the sidelines.

Many were scared away by earlier performance contracts, in which hospitals and some government agencies didn't save as much as they expected. In the 1980's and early 1990's, the contracts were usually structured to give the company a share of the savings. Those incentives encouraged companies to maximize profits by doing the least amount of work to save the amount of money specified in the contract. But the long-term benefits for the institution were dubious.

Mr. Zachwieja, the West Virginia consultant, says that if colleges are careful about what they specify in their contracts, the real savings will come after the contract expires, as newly installed equipment continues to cut energy costs for years.

"Some companies are structuring contracts that only give benefits during the life of the contract," he explains. "You really aren't saving any money unless you get benefits that are lasting."

Louisiana State, for example, decided that it wanted all of the energy savings rather than sharing them, and, in 1992, bought out its contract with CES/Way International, an energy-contracting company, which has since been acquired by Houston-based Sempra Energy.

"We didn't really need the savings guarantee, because the savings were there, the technology was proven, and it was, in our minds, a low-risk project, so we took it over ourselves," says Mr. Kelley, the facilities director.

Colleges also feared losing control of the operation of their buildings, something that indeed came about in early contracts.

"Some schools have moved forward with contracts without fully understanding what they were doing," says Mr. Zachwieja. "Let's say they agree to a shutdown schedule — the lights shut down at a certain time, as opposed to before, when a custodian just shut down the lights on a room-by-room basis. Then the college decides to go to a nighttime-use schedule. Then it won't be able to produce the savings that were projected in its contract. How do you deal with that? All those possibilities must be considered."

Some college officials say they think such kinks have been worked out.

Sherwood G. Wilson, associate vice president for facilities and auxiliaries at Ohio University, believes that more institutions will sign the contracts as an answer to deferred-maintenance problems.

"We are faced with a backlog of deferred maintenance," says Mr. Wilson, who estimates Ohio's total at \$55-million. "We have resources that fall a long way short of covering all of our needs." The contract will allow Ohio to take care of more than \$10-million of the backlog.

Nationally, deferred-maintenance costs for colleges reached an estimated \$26-billion, according to a 1996 report by the facilities-officers association. Chipping away at that total will become a big selling point as more companies approach colleges about the contracts, says Mr. Proffitt, of Johnson Controls.

"Everyone has looked at the K-12 market, and this has worked at K-12," he says. "You look at universities. There are greater bureaucracies, they may have credit issues, they have more-complex systems. Quite frankly, you go where the low-hanging fruit is, and that has been the school systems. The more-complex clients usually come later."

At Ohio, it took three years to get the administration, the Board of Trustees, and the state Board of Regents to approve the contract, mostly because of bureaucratic problems, says Mr. Wilson. When key financial people left, he had to explain and justify the contract to their replacements. It is one of the largest performance contracts ever signed by a university.

Then there is the cultural shift for a region where the economy is centered on energy consumption.

Ohio University has always been run by burning the very ground beneath it. Like clearing a forest to build a log cabin, the university has counted on nearby coal mines to stoke the boilers in the bowels of its sprawling campus.

But then came the Clean Air Act, and black-lung disease, and acid rain, and unemployment for many of the miners who dug up the ore that, in this part of the world, is particularly high in pollution-causing sulfur.

"We have tried to support the local industry, but this is even better," says Gene Mapes, an associate professor of environmental and plant biology and director of environmental studies. "I think this is a real leadership role, because we are modeling behavior." The university is trying to get area residents to acknowledge that the local economy must shift its emphasis from coal to tourism and small industry.

CREATING A LONG-TERM RELATIONSHIP

Construction is set to begin in June on the first phase of the contract with Vestar, in which the company will make changes in nine of the 200 or so buildings on campus.

"Our math building is a huge building, with lots and lots of lights that are inefficient," says Mr. Wilson. "Our library is the same way." In addition, showerheads and perhaps toilets will be changed in two residence halls to models that use less water. The power plant will get new controls, which will more closely match energy production to demand.

This is the beginning of a relationship that is expected to last for 20 years, says Mr. Wilson. The project will comprise five phases, with one starting every two years. Each phase will have a guarantee that the costs will be repaid by energy savings over the ensuing 10 years. Ohio can terminate the contract after any of the phases.

SAVING \$25-MILLION

If the university goes through with all of the phases, the contract guarantees that Ohio will save \$25-million, although Mr. Wilson and Vestar officials have analyzed only about half of the seven million square feet of building space on the campus.

Construction costs in the first phase are estimated at \$4.2-million. Ohio University is financing the project itself, probably with bond issues. Financing costs for the first phase are estimated at \$23 1,000. If the changes in the first phase save \$700,000 a year, as projected, the savings will have paid for the costs, including financing, in a little more than six years. Each succeeding phase will involve more-complex projects, with longer payback schedules. Plans are still being drawn up for those phases.

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Mr. Wilson says he has not calculated how much all of the work will eventually save the university. In the first phase alone, he says, the equipment being installed will continue to save Ohio \$700,000 annually for 20 years. The total savings after subtracting the cost of the equipment and financing would exceed \$9-million.

At Louisiana State, the annual energy bill before the performance contract was \$12.5-million. Now it is about \$8.5-million, even with 10 percent more students on the Baton Rouge campus, says Peter N. Davidson, director of energy services.

The contracts are structured to guarantee that the savings will cover not only the costs of construction, new equipment, and financing, but also, in some cases, a fee, generally ranging from 1 to 4 percent of the size of the contract, for a guarantee that the contractor will make up the difference if the college's projected savings fall short of expectations.

Usually, the savings guaranteed in the contract are about 80 percent of the company's estimated energy-cost reductions, says

Michael Besspiata III, director of facilities management at Georgetown College, in Kentucky.

Johnson Controls last year paid out about 1 percent of the total savings it guaranteed but could not meet in its \$1.6-billion worth of contracts, says Mr. Proffitt.

As performance contracts become more common, Mr. Besspiata says, any size institution can benefit. Georgetown College, for example, signed a \$750,000 performance contract last year with Enertech, a subsidiary of LG&E Energy Corporation.

Mr. Besspiata moved to Georgetown in May 1998, from the Southern Baptist Theological Seminary. Both institutions have fewer than 2,000 students. And each one now has modern energy-management systems, which tightly control energy use across the campus, paid for by the savings produced in performance contracts.

"I think a lot of colleges think they are too small to really get much benefit," says Mr. Besspiata. He projects savings in the current fiscal year of \$85,000 on a typical annual utility bill of \$1-million. "That's real money," he says. ■

For More Information contact:

Todd A. Zachwieja, PE, CEM
Principal
ZDS Design/Consulting Services
91 Smiley Drive
St. Albans, WV 25177
Phone (304) 755-0075
Fax (304) 755-0076

July/August 1999

First in Line in West Virginia

Webster County High School in Upperglade, W. Va., is the first school in West Virginia to "go Geo" and has - in just eight months - realized energy costs savings of more than \$34,000 and cut its electrical demand nearly in half. **Update - 2000 annual energy savings exceed \$74,500.**

In 1997 the Webster County Board of Education requested funds from the School Board Authority (SBA) of West Virginia to replace several rooftop heating units at Webster County High School. Upon inspection, SBA officials recognized that restoring the existing electrical HVAC system wasn't the best solution. They recommended a qualified mechanical engineering firm review the system and develop better options.

School officials were leaning towards a propane gas heating system when Allegheny Power, Greensburg, PA, and **ZDS Design/Consulting Services**, St. Albans, WV, introduced them to GeoExchange, which could provide greater energy efficiency, cost savings, temperature control, reliability and safety.


Webster's 500-ton system is the largest GeoExchange installation to date in West Virginia and the surrounding region. School officials estimate that the system will save about \$50,000 a year in heating and cooling costs. **Update - Energy savings increasing every year and now exceed \$74,500 annually.** In addition, it provides a healthier environment for Webster's 600 students, its faculty and staff by incorporating a cost-effective, outside air ventilation system.

"We're very pleased with the system," said Harry Given, facilities manager for Webster County schools. **"We've seen energy savings, had zero maintenance problems, and we believe that the savings will be even greater over time."**

Investing in the Future

"GeoExchange offers schools the best return on investment with the lowest environmental impact," said Gary Valli, an HVAC engineer with Allegheny Power. "In most cases, the life-cycle costs of a geothermal heat pump system are lower than any other system available today."

The Geothermal Heat Pump Consortium (GHPC) helped Webster County school officials by providing additional training to **ZDS** through its Design Assistance Program. "We were not sure how comfortable the school personnel would be with this type of system," said Todd Zachwieja, owner of **ZDS**. "A commercial geothermal system of this size had never been installed in our area, and the system cost was higher than HVAC systems customarily funded for schools."



Drilling for the ground loop for Webster County High School's 500-ton GeoExchange system. It is the largest GeoExchange installation to date in West Virginia and the surrounding region.

The Webster County project was funded as a pilot project through a \$3.25 million grant from the SBA, which is responsible for overseeing all school construction in the state. The SBA is giving strong consideration to the GeoExchange system's positive performance at the school, Zachwieja noted. Significant lifecycle cost savings could allow more schools to benefit from funding for GeoExchange projects in the future.

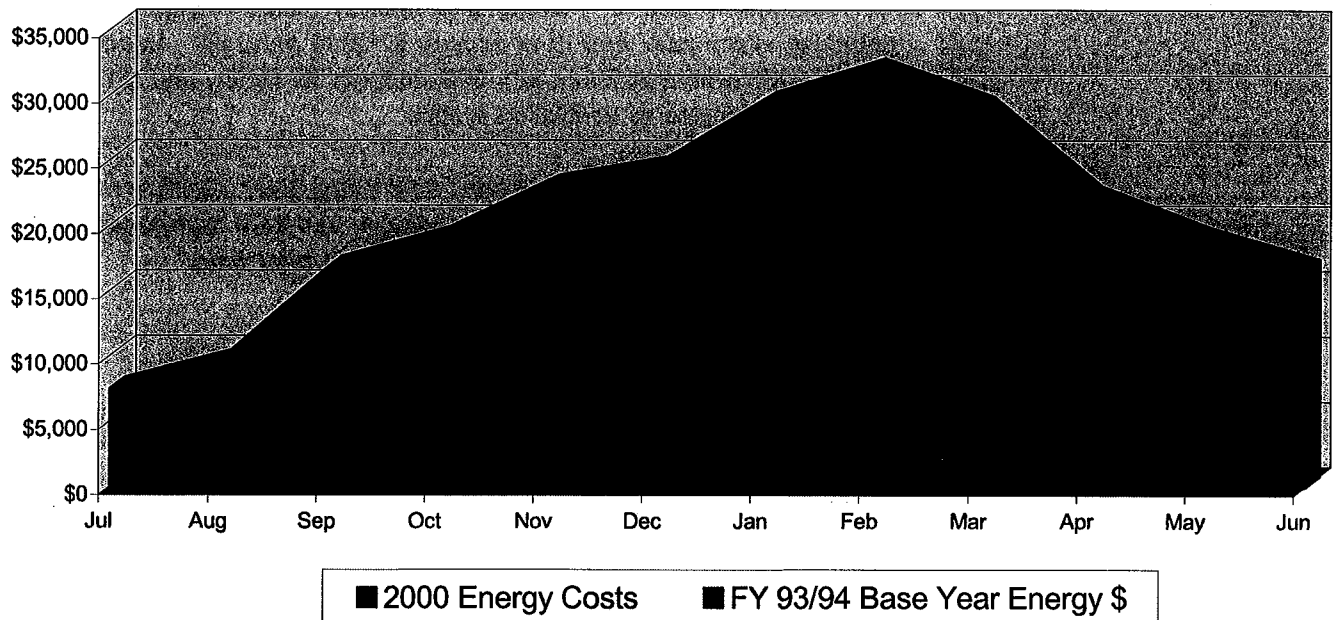
Improved Comfort and Efficiency

The Webster County High School system includes 240 vertical loop heat exchangers inserted 304 feet into the ground. The new units that replaced the old multizone units incorporate exhaust air heat recovery for the incoming outdoor air. "That's another benefit of the system -bringing the outdoor air indoors," Given said. ***"We've improved our indoor air quality; everyone appreciates that."***

"Schools are definitely realizing the benefits of GeoExchange for comfort and energy-efficiency," Valli said. To help, Allegheny Power is producing a technically detailed video on the step-by-step GeoExchange installation at the Webster County High School.

"Many schools have HVAC systems that are reaching the end of their useful life," Valli said. "These schools will look at a lot of options. Our job is to educate the decision-makers that GeoExchange is a viable and cost effective solution."

Webster County High School Geothermal Heat Pump Energy Savings



For More Information contact: **Todd A. Zachwieja, PE, CEM, Principal**
ZDS Design/Consulting Services
91 Smiley Drive, St. Albans, WV 25177
Phone (304) 755-0075, Fax (304) 755-0076

NOVEMBER 2000

A Peter Li Education Group Publication

LIBRARIES: Designs That Meet Patron Needs

Time Tested Capital
Campaign Strategies

How to Avoid
an ESCO Fiasco

How to Avoid an ESCO Fiasco

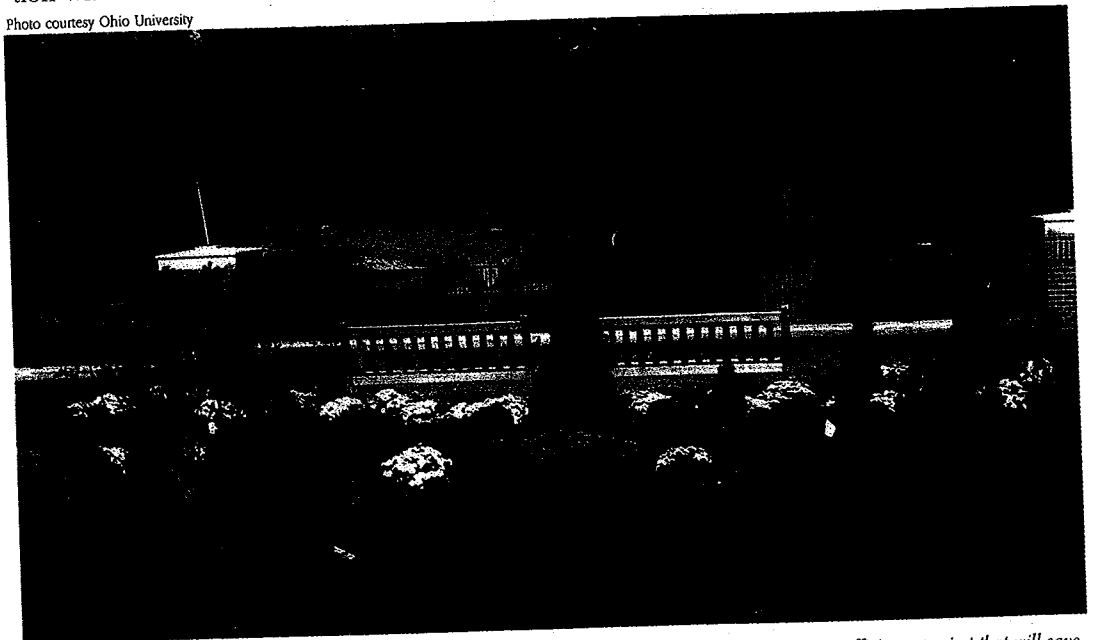
Facility managers at Ohio University used a performance contracting consultant to assist them in hiring an energy services company that could implement an energy conservation project.

by Dorothy Wright, staff writer

Performance contracting seems like a win-win proposition: Work with an energy services company (ESCO) to implement an energy conservation project that will improve facilities and lower energy and operating costs. Pay the ESCO using the energy savings — not capital funds. After the payback period, keep the savings. Yet many college and university facilities planners are reluctant to do so. Some lack experience with this approach to funding and implementing a facilities project. Others have heard of cases in which a project simply did not deliver results or, worse yet, an educational institution became embroiled in litigation with the ESCO.

Photo courtesy Ohio University

Facility managers at Ohio University in Athens, Ohio, found an effective solution: They relied on an independent consultant experienced in performance contracting to guide them through the process of selecting an ESCO. Now the university and its ESCO are in the first phase of implementing an energy efficiency project comprising new and upgraded lighting, heating and ventilation systems; enhanced building controls; and water conservation measures, including low-flow plumbing fixtures. When the project is completed, the university will save \$2 million to \$2.5 million a year in energy and operating costs, which will pay for the project within 10 years. After the payback period, the



Ohio University's independent consultant helped administrators select an ESCO to implement an energy efficiency project that will save \$2 million to \$2.5 million a year in energy and operating costs.

university will retain the annual savings.

Founded in 1804, today Ohio University is an educational community of 20,000 students and 3,500 faculty and staff. The 1,700-acre campus has some 190 buildings comprising a total 6.7 million square feet. In the 1970s the university created an energy management fund to carry out energy conservation projects, implementing a number of effective initiatives through the years. In the mid-1990s, with utility costs projected to rise to \$19.1 million by 2020, the university knew it was time to make a major investment in upgrading its infrastructure and increasing energy efficiency.

The university's facility managers first identified performance contracting as a means to implement a new central chilled water plant. "Initially, the university saw no way to do this with existing resources, so we started looking for alternatives," says Terry Conry, director of Facilities Management. "While we have an outstanding staff, we didn't have anyone who personally had gone through a performance contract selection or implementation process. We were concerned about it, and we looked for help."

Selecting a Consultant

The consultant's key service would be to assist the university in selecting an ESCO. Through open advertisements and direct invitations, consultants were invited to submit their qualifications for consideration. After an evaluation of the RFQs, the university's facilities management team developed a short list of consultants, who were asked to provide the university with a proposal detailing their experience in the field of performance contracting. References were carefully checked, and interviews were conducted with finalists. All members of the consultant's staff who would be assigned to work with the university were required to be present for the interview.

The consultant's past experience with similar projects in colleges and universities was essential to Ohio University. "The consultants were asked to provide a list of at least five performance-based energy projects completed in the higher education environment," explains Ted Fares, director, Engineering and Technical Services, Ohio University.

Candidates were required to prove their expertise in design, planning, specifications, implementation and monitoring of energy conservation projects. "They had to be capable of analyzing energy use at our facilities and making recommendations for energy

conservation projects which, if implemented, would provide guaranteed energy savings to Ohio University," Fares says.

Most important, they needed past experience in awarding similar contracts to ESCOs. "Knowledge of the legal and financial issues surrounding performance contracting was essential," Fares says.

In addition, the consultant needed to be able to train the university's staff in operation, final inspection and commissioning.

As a result, the university selected ZDS DESIGN/CONSULTING SERVICE. Based in St. Albans, W.Va., and Cincinnati, Ohio, ZDS is a consulting engineering firm specializing in mechanical and electrical engineering, indoor air quality, commissioning and energy conservation projects.

ZDS had previously worked with the university in a traditional design and mechanical/electrical engineering role. "Our role in this project was to assist the university in defining its needs, ensure that the structure of the program met these needs and guide the university in its selection of a performance contractor," says Todd Zachwieja, principal, ZDS.

Selecting the ESCO

The ESCO was selected through a two-step, RFQ/RFP process. The university advertised internationally, nationally and locally in trade magazines and newspapers. The advertisement required all candidates to attend a meeting at Ohio University to obtain the RFQ document, walk through the campus and participate in a question-and-answer session.

RFQ submittals from 14 ESCO candidates were evaluated and candidates short-listed by a committee of 12, comprising the university's architect, facility engineers, energy managers, administrators and service personnel, and ZDS. The two ESCOs who made it past the first cut were required to submit a detailed RFP.

The two-step process lengthened the selection process by about eight months, Conry says, while at the same time streamlining it. "ZDS provided a template that the companies had to respond to, to keep them from burying us in paper," he explains. "We asked everyone clear, concise questions, then limited the amount of additional information they could add. Nevertheless we got two- to three-inch-thick binders back from each firm. We took a lot of time going through those and checked references carefully."

Conry says one of the advantages of the two-step process is that it effectively narrows

the field for the RFP. "If we had had the complete RFP done by 14 companies we would have had a mountain of paper," he says. "This streamlined the process even though the initial step took extra time."

Conry says there were a lot of similarities among candidates, but some distinct differences revealed by the RFQ. "One is the level of experience in performance contracting in higher education," he says. "Second, some had more solid in-house engineering teams and wouldn't need to go to subcontractors as much — we liked that accountability. Third, they differed in their philosophies of project staging and customer service."

The RFP got to the nitty gritty. "We said, 'Here are sample buildings: We want you to bring in your engineering team and give us specific proposals for improvements, tell us what the cost savings are, and explicitly show us how you calculated these cost savings,'" Conry says. "That allowed us to see how creative their engineering teams were, how sensitive they are to occupants during the implementation/construction, and how conservative or liberal they were in calculating the energy savings on a given measure. It was good to have that type of in-depth analysis of fewer firms."

As a result, the university selected as its energy services partner Vestar, an energy efficiency design, engineering, construction and facility operation firm with headquarters in Cincinnati, Ohio, and Toronto, Ontario.

Ironically, design and construction of the chilled water plant, which initially drove the university to explore performance contracting, is not part of the performance contract with Vestar. Conry says it did not have a quick enough payback — 10 years, as required by Ohio state law. That project is proceeding in phases under a separate contract, funded with Ohio University operating money, revenues accrued in its energy man-

agement fund and bonds, he says, "but coordinated with the energy performance contract to make sure that the system we are building is efficient and that we have controls in place that allow it to be operated efficiently in the future."

Consultant Proves Beneficial

Considering that the energy efficiency program implemented under the performance contract will save the university more than \$2 million a year, Ohio University's facility planners and managers are convinced that their consultant, **ZDS**, is worth the monies the university paid for their services. "It was important to have somebody guide us through the process," says Sherwood Wilson, associate vice president for Facilities and Auxiliaries. "It is also important when you are doing something new to have an independent consultant to help convince trustees and administrators of the validity of the approach. Performance contracting was a new concept here."

Indeed, it's still a new concept. "Many universities really don't understand performance contracting, and they are scared to death of it," he says. "Performance contracting can be as little or as much as you want it to be — it is a concept, not a template. It can be styled and adjusted to meet the needs of your own campus."

But many administrators and planners shy away from hiring consultants. "They see consultants wanting to charge fees to guide them through a process they think they can already do themselves," Wilson says. "Our energy management program was very successful through the years, but it only picked the 'low fruit.' We still identified a need for a \$25- to \$30-million performance contract."

That's why hiring a consultant is smart business, Wilson says. "Having a professional to get you started is worth every penny." ▲



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91 Smiley Drive
St. Albans, WV 25177
Phone: (304) 755-0075
Fax: (304) 755-0076

E-mail: ZDSDesign@aol.com

E-mail: Todd.Zachwieja@ZDSDesign.com

Todd A. Zachwieja
Principal, P.E., CEM
Chief Executive Officer