

# ZDS DESIGN/CONSULTING SERVICES

91 Smiley Drive  
St. Albans, WV 25177

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

**DATE:** February 16, 2009

**TO:** Kristen Ferrell  
Department of Administration  
Purchasing Division  
Building 15  
2019 Washington Street  
Charleston, WV 25305

**PROJECT :** GSD096435: EOI for A & E Services Design of Bldg #9 Chiller Loop Changes

Copies	Document No.	Doc. Date	Description	Action Code
4		2/19/09	EOI for A & E Service Design of Bldg #9 Chiller Loop Changes	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) *EOI for your review on 2/19/09 @ 1:30 pm. We appreciate your consideration and look forward to working with you.*

RECEIVED

2009 FEB 17 PM 1:55

WV PURCHASING  
DIVISION

BY: Sherry Z. Powell

Mailed by  UPS Next Day Air

UPS

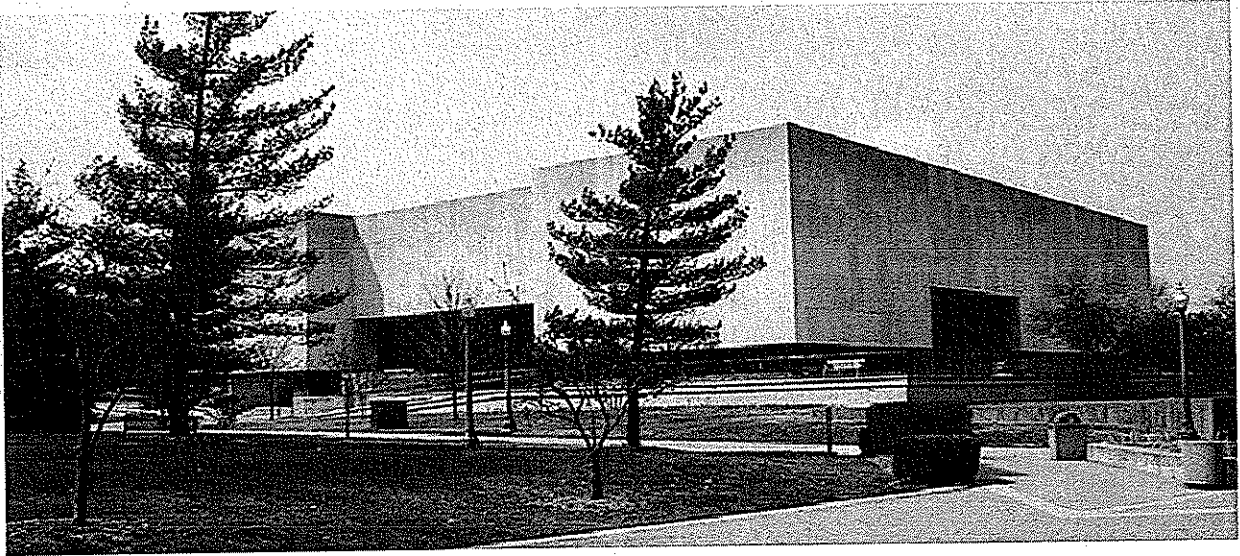
USA Priority Mail

USA Mail

# TRANSMITTAL LETTER

# Division of Culture & History

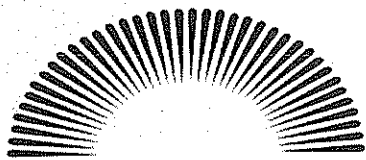
## CULTURAL CENTER



**Charleston, WV**  
**RFQ # GSD096435**

### QUALIFICATIONS

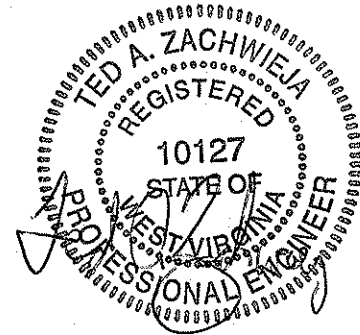
**February 19, 2009**



**ZDS**  
Design/Consulting Services

MECHANICAL • ELECTRICAL • IAQ • ENERGY • COMMISSIONING

91 Smiley Drive, St. Albans WV 25177 (P) 304-755-0075 (F) 304-755-0076  
Web site: ZDSDesign.aol.com



## Title Page

Expression of Interest

### **Subject:**

To provide an A/E design services and prepare bid documents for revisions and demolition of chilled water piping to decouple Building #9, WV Culture & History located at the Capitol Complex in Charleston, WV. Includes services to add space to existing boiler building & controls to allow automatic change over from the new chillers to the existing campus chilled water loop and return when chiller operation is restored.

**RFQ# DCH08118**

**ZDS Design/Consulting Services**  
91 Smiley Drive, St. Albans WV 25177  
(P) #304-755-0075 (F) #304-755-0076  
zdsdesign@aol.com

**ZDS Contact Person: Todd Zachwieja, PE**

**2-19-09**

RFQ No. GSD096435

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.

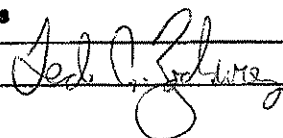
**CONFIDENTIALITY:**

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.

**ZDS**

Vendor's Name: Design/Consulting Services  
91 Smiley Drive

Authorized Signature: St. Albans, WV 25177  Date: 2/10/09

# TABLE OF CONTENTS

---

---

<b>ZDS Executive Summary - Approach</b>	<b>Section I</b>
<b>ZDS Design Services</b>	<b>Section II</b>
<b>Organization</b>	
<b>Design Services</b>	
<b>Indoor Air Quality Services</b>	
<b>Energy Management</b>	
<b>Commissioning Services</b>	
<b>Summary</b>	
<b>ZDS Personnel &amp; Team Qualifications</b>	<b>Section III</b>
<b>ZDS Team Principals &amp; Personnel</b>	
<b>CAS Structural Engineering</b>	
<b>Project Experience &amp; References</b>	<b>Section IV</b>
<b>ZDS Design Services</b>	
<b>Recognition and Publications</b>	<b>Section V</b>

## *CONFIDENTIAL*

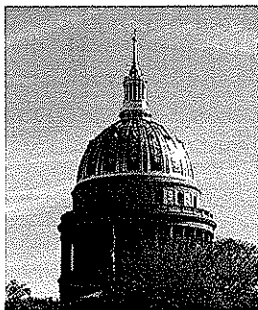
This qualification proposal contains information confidential and proprietary to **ZDS Design/Consulting Services** and is provided for your internal review only. No other distribution, reproduction, or description of its contents is authorized without the prior written approval of **ZDS**.

**ZDS Design/Consulting Services** is pleased and proud to submit this expression of interest and statement of qualifications for your consideration. We designed the existing boiler building, boiler plant and chilled water system for the building as part of overall HVAC renovations. We also designed the Cultural Center boiler plant tie-in to serve the Governor's Mansion and Holly Grove, which indicates an understanding of the Cultural Center heating plant upgrade needs. We were involved in all the DDC controls design and upgrades from the original HVAC Renovations through the Campus Heating Plant. ZDS is finalizing fire alarm and sprinkler upgrades for the remaining facility and will be able to extend these systems into the expanded boiler room as required. We believe our successful experience in these previous projects makes us uniquely qualified to address the proposed Bldg. #9 Chiller Loop Changes including providing the two backup boilers while expanding the boiler building as required to accommodate those upgrades.

The existing boiler building houses three heating hot water boilers, an emergency generator, distribution pumps, piping and accessories for the heating hot water system. We know how to maintain the variable water volume pumping system's integrity during the proposed upgrades to protect the Cultural Center while still providing heat to the Governor's Mansion and Holly Grove. The boiler building expansion needs to address the tie-in with the existing retaining wall, existing gas service and maintain access for the generator room. We will address the piping and pumping for an independent chiller system to meet your needs.



**ZDS** will lead all phases of the work, providing engineering and project management for the proposed addition to the boiler building, new dedicated chiller plant, incorporating new boilers within the existing three-boiler plant and support work required. We have provided these types of upgrades for many clients including, Kanawha County Commission, WVU, Ohio University, Washington & Lee University, Raleigh County Schools, Randolph County Schools and multiple buildings at the WV Capitol Complex. 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 WV Capitol Complex which will aid in the communications. Professional Engineers are licensed in West Virginia while **ZDS's** personnel have also worked in 23 different states. Couple this with our long-standing collaborations with 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. Our teams experience in the specific area also includes knowledge of the existing building HVAC system, heating hot water system, chilled water system, and impact on the Capitol Complex campus heating and cooling plant systems.



**CAS Structural Engineering, Inc.**, a West Virginia Certified Disadvantaged Business Enterprise is located in the Charleston, West Virginia area. CAS will provide any structural design required for your project. Carol A. Stevens, PE, is the firm president and will be the structural engineer for this project. Ms. Stevens has over 19 years of experience with building structures in both West Virginia and Pennsylvania. Projects for CAS involving the West Virginia State Capitol Complex include: exploratory evaluation and design for corrections to the Capitol dome (during the gilding project), evaluation of existing conditions and structural design for renovations at the Governor's Mansion, evaluation and

recommendations for the renovations to the Main Capitol Building façade, Buildings #3/#5 central boiler plant structural design.

**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 mgt., 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**, Project Manager, over 35 years of HVAC/Electrical/Plumbing design & Construction experience.

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

**James Lowry**, EIT, BSME specializes in HVAC, Fire Protection and plumbing Engineering design.

**David Dial**, P.E., Senior Engineer, BSME, MSEE, over 28 years of HVAC/Electrical/Plumbing & Structural design experience.

**Carol Stevens**, P.E., President of CAS Structural Engineering, BSCE, MEES, over 25 years of Structural design experience with extensive knowledge of the Main Capitol Complex.

The resumes of the teams personnel are include in Section III. We can also subcontract with reliable companies, as needed, to meet your project needs.

**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. Mr. John Daniels, Director, Randolph Co Schools, Phone (304) 636-9150, ext. 145
4. Dr. Mark Manchin, Executive Director School Building Authority, phone (304) 558-2541
5. Mr. Bill Elswick, Executive Director of Office of School Facilities, phone, (304) 558-2711 who has knowledge with ZDS's work at CAMC, OU, Washington & Lee University and others.
6. Ms. Jerie Whitehead, Purchasing Director, Kanawha County Commission, (304) 357-0115
7. Mr. Keith Chapman, District Two Manager, Huntington, WV (304) 528-5625
8. Mr. Racine Thompson, Assistant Superintendent, Raleigh Co Schools (304) 256-4500, ext 3326

We believe that our combined specialties and experience with your facility provide the Cultural Center with the best expertise to provide economical solutions to your specific projects 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 costs 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 4 decades of experience in West Virginia giving us the local understanding of your needs. The Department of Transportation, Kanawha County Commission, Marshall University, WV County Schools, Ohio University (Athens & Chillicothe campuses), Concord University, Raleigh County Schools and the WV Capitol Complex all found **ZDS** to be successful in comparable infrastructure retrofits to their facilities. 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, ASHRAE, NEC, International Building Code and other pertinent requirements. We also have an excellent reputation with the WV State Fire Marshal's office.

**ZDS** provided engineering for upgrades for the WV Capitol Complex including Buildings #1, #3, #4, #5, #6, #7, #8 and #10 as part of a Performance Contracting team. We designed the recent Building #11 HVAC Renovations and understand the campus chilled water loop system. We believe our knowledge and involvement in the Capitol Complex's facilities will help with the proposed renovations. Our work at Ohio University at both its Athens campus and Chillicothe campuses involved saving over \$2.5 million annually. Please review the enclosed article in Section V from the *College Planning & Management* on our work at Ohio University which states "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, then Associate Vice President for Facilities and Auxiliaries.

We also recently provided comparable chiller plant/HVAC engineering for the eight-story Judicial Annex facility in Charleston and comprehensive chiller, HVAC and electrical renovations for Harris Hall at Marshall University. Many of our WV County Schools clients involved extensive boiler and chiller 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 WV 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 WV.

We believe that our combined specialties provide *WV Division of Culture and History* 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.

Sincerely,



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



**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. He 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 *ENVIRONMENT<sup>o</sup> 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 *ENVIRONMENT<sup>TM</sup> 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 *ENVIRONMENT<sup>TM</sup> Professional*
- Editorial Advisory Board member of *POWER PRESCRIPTIONS<sup>TM</sup>* 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
- Determine, quantify and assist 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 contractors 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 Owners 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 40 years of experience in mechanical and electrical design bring 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 is in the process of opening 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. 10,127  
Certified Energy Manager (C.E.M.), National Certification  
LEED® Accredited Professional, National Certification through USGBC  
Professional Engineer, Pennsylvania, No. PE-040929-R  
Professional Engineer, Virginia, No. 0402 025427  
Professional Engineer, Ohio, No. E-53587  
Professional Engineer, North Carolina, No. PE-017445  
Professional Engineer, Kentucky, No. PE-17961  
Professional Engineer, Georgia, No. 18253  
Professional Engineer, South Carolina, No. 25985

**Qualifications** Todd has more than 27 years of experience; in the design, construction management, and specifications for mechanical engineering, heating, ventilating, air conditioning, plumbing, electrical, and lighting; 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 projects 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, #5, #7, #8, #9, #10 at the WV State Capitol complex, Cultural Center HVAC Renovation, 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, 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, Mercy Medical Center, Wayne Memorial and Webster Memorial Hospital.

He also has experience in providing M/E design for the following College and Universities including:, Alderson Broadus College, Bluefield State College, Concord University, Fairmont State College, 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 design for the following schools: Clay, Grant, Hardy, Harrison, Jackson, Kanawha, Logan, Marion, McDowell, Mercer, 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 saving millions per year and managed a profitable regional office for one of the countries 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's 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 Architecture  
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 40 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 regarding Chase Towers, Charleston, formerly Charleston National Bank, including 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 Library Commission Cultural Center as part of a total \$4.5 million HVAC and Electrical Renovations, Charleston, WV. The indoor air quality, temperature and humidity each were not in accordance with good design practices for this type of structure. ZDS is 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 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.****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 nations 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 are 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, and Institute for Healthcare Improvement, The Conference Board. Speaker at Hofstra University, Monmouth College, University of Houston, and U.C. Berkeley.

**LORI L. ZACHWIEJA, CPA**  
**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, December 2006.
- 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.

**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 8 years of experience in electrical engineering, lighting, plumbing, technology, mechanical engineering, heating, ventilating, 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, 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 Center 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, 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-seven 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 & 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. T.****HVAC, Plumbing & Fire Protection Designer**

- Education** BS in Mechanical Engineering from West Virginia University Institute of Technology, Montgomery, WV in 2004
- Registration** EIT 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). Some of his education experience included; Sterling Engine Design where he was responsible for design calculations and project organization; Brick Lift Design where he was responsible for motor/pulley system & controls.
- 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 in design.
- 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 & Master Planning for Security/Fire Alarm/Life Safety systems and others
- Some of his educational project experience includes: Concord University Technology Center, Elkins Middle School Renovations, James Monroe High School renovations, Man/Central Elementary Addition, Park Middle School renovations, Tucker County High/Career Center renovations, new McDowell County Southside K-8 School, and Woodrow Wilson High School HVAC/Electrical renovations.
- Professional Affiliations** American Society of Mechanical Engineers
-

**JAMES E. WATTERS**  
**Project Manager**

**Qualifications**

Jim has over 35 years experience in design and implementation of HVAC, plumbing and electrical systems including 9 years in the construction industry. He has a comprehensive knowledge of construction documents, contracts, and development of cost estimates, budgets & 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: 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; WV DOT Burnsville Rest Area and domestic water pumping station; Tucker County Board Office Boiler Retrofit; Kanawha County Commission Judicial Annex Renovations, new Iaeger/Panther Elementary School, 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.

**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 2005. 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 state of Utah, Ohio, Virginia, Pennsylvania and West Virginia: determining HVAC equipment layout, CFM's to size ductwork, HVAC load calculations, plumbing design, computer rooms, gymnasiums, and auditoriums. He determined 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 County, Grant, Hardy, Harrison, Jackson, Kanawha, Logan, Marion, McDowell, Mercer, Monroe, Raleigh, Randolph, Putnam, Pocahontas, Summers, Tucker, Webster, and Wyoming County. 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 the 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, the WV Capitol Complex central boiler plant.



# **Structural Engineering, Inc.**

---

## **Firm Profile**

**CAS Structural Engineering, Inc.** – CAS Structural Engineering, Inc. is a West Virginia Certified Disadvantaged Business Enterprise structural engineering firm located in the Charleston, West Virginia area.

Providing structural engineering design and/or analysis on a variety of projects throughout the state of West Virginia, CAS Structural Engineering has experience in excess of 18 years on the following types of building structures:

- Governmental Facilities (including Institutional and Educational Facilities)
- Industrial Facilities
- Commercial Facilities

Projects range from new design and construction, additions, renovation, adaptive reuse and historic preservation (including use of The Secretary of the Interior's Standards for Rehabilitation) to evaluation studies/reports and analysis.

CAS Structural Engineering utilizes AutoCAD for drawing production and Enercalc and RISA 3D engineering software programs for design and analysis. Structural systems designed and analyzed have included reinforced concrete, masonry, structural steel, light gauge steel and timber.

Carol A. Stevens, PE is the firm President and will be the individual responsible for, as well as reviewing, the structural engineering design work on this project. While CAS Structural Engineering, Inc. has only been in business for four years, Carol has over 18 years of experience in the building structures field, working both here in West Virginia and in the York, Pennsylvania vicinity. Her experience has included a number of governmental and historic office building projects, including those underway and recently completed at the Capitol Complex in Charleston.

CAS Structural Engineering, Inc. is covered by a \$1 million errors and omissions liability policy.

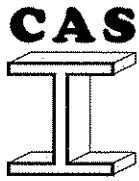
P.O. Box 469

Alum Creek, WV 25003-0469

(304) 756-2564 (voice)

(304) 756-2565 (fax)

A West Virginia Certified DBE Consultant  
Structural Engineering Certification Board



# Structural Engineering, Inc.

## **Carol A. Stevens, P.E.** **Structural Engineer**

### **EDUCATION**

West Virginia University, BSCE, 1984  
Chi Epsilon National Civil Engineering Honorary  
The Pennsylvania State University, ME Eng Sci, 1989

### **PROFESSIONAL REGISTRATION**

P.E. 1990 Pennsylvania  
P.E. 1991 West Virginia  
P.E. 1994 Maryland

### **BACKGROUND SUMMARY**

2001 – Present President, Structural Engineer  
CAS Structural Engineering, Inc.

1999 – 2001 Structural Engineer  
Clingenpeel/McBrayer & Assoc, Inc.

1996 – 1999 Transportation Department Manager  
Structural Engineer  
Chapman Technical Group, Inc.

1995 – 1996 Structural Engineer  
Alpha Associates, Inc.

1988 – 1995 Structural Department Manager  
Structural Engineer  
NuTec Design Associates, Inc.

1982 – 1988 Engineer  
AAI Corporation, Inc.

### **PROFESSIONAL ASSOCIATIONS**

American Society of Civil Engineers, WV Section  
Past President  
National Society of Professional Engineers  
American Concrete Institute  
American Institute of Steel Construction  
West Virginia University Department of Civil and  
Environmental Engineering Advisory Committee  
West Virginia University Institute of Technology  
Department of Civil Engineering Advisory Comm

### **CIVIC INVOLVEMENT**

ASCE Christmas in April Project  
Engineer's Week Speaker

### **EXPERIENCE**

**West Virginia, State Capitol Complex, Capitol Cafeteria:** Investigated problems with support of structure above glass window walls and developed repair solution.

**West Virginia, State Capitol Complex, Dome Structure:** Exploratory investigation, preparation of construction documents for repairs to structural steel in Capitol Dome.

**West Virginia, State Capitol Complex, Building 3:** Structural design and construction administration of repairs and renovations to limestone canopy.

**West Virginia, State Capitol Complex, Main Capitol Building Parapet:** Exploratory investigation of limestone/brick parapet/balustrade of Main Capitol Building to determine cause of movement/cracking/leaks. Project also included preparation of construction documents for repairs.

**West Virginia, State Capitol Complex, Governors' Mansion:** Structural investigation to determine feasibility of enlarging openings and introducing skylights in existing historic residence.

**West Virginia, Westmoreland Apartments:** Designed structural additions and renovations to existing closed multi-story school for use as elderly apartments. Work included restoration of exterior masonry components.

**West Virginia, Upshur County Courthouse Main Entrance:** Designed repairs to failing entrance structure in 1899 structure.

**West Virginia, Kanawha County Schools:** Structural design of additions and renovations to George Washington, Sissonville, Herbert Hoover, South Charleston and Nitro High Schools.

**West Virginia, Eastern West Virginia Regional Airport Authority:** Designed foundations, floor and roof framing for new two-story airport terminal building.

**West Virginia, Mercer County Airport:** Designed foundations, floor and roof framing for additions and renovations to existing airport terminal building.

P.O. Box 469

Alum Creek, WV 25003-0469

(304) 756-2564 (voice)

(304) 756-2565 (fax)

A West Virginia Certified DBE Consultant  
Structural Engineering Certification Board

## **PREVIOUS EXPERIENCE**

**West Virginia, State Capitol Building:** Designed structural system to replace deteriorated reinforced concrete slab at landing on north side of Capitol steps.

**West Virginia, Upshur County Courthouse Annex:** Performed structural evaluation and design for repairs to existing multi-story Annex addition.

**West Virginia, Sissonville Library:** Structural design of new 7,000 SF branch library. Structure consisted of wood framing.

**West Virginia, Cabell Huntington Hospital Boiler Mezzanine:** Structural analysis and testing of existing reinforced concrete mezzanine with significant degradation from brine tank leakage. Developed new structural system to replace existing concrete mezzanine utilizing steel framing and steel grating.

**West Virginia, Farrell Law Building:** Performed analysis of existing deteriorated structural sidewalk over parking area. Recommended repair solutions for reinforced concrete and aged terra cotta façade of 1920's building.

**West Virginia, Beckley Wastewater Treatment Plant:** Designed reinforced concrete tanks and masonry support structures for new wastewater treatment plant.

**West Virginia, Morgantown High School Additions:** Designed steel framing and foundations for science classroom, cafeteria and gymnasium additions to existing education complex.

**West Virginia, Grafton High School Addition:** Designed steel framing and foundations for new science classroom addition to existing high school.

**Pennsylvania, York County Government Center:** Structural analysis and design of 1898 former department store converted to county government offices. Interior renovations included adding floor framing at mezzanine level, analyzing and redesigning deficient floor framing, and adding new elevators. Exterior renovations included complete façade rework to recreate original appearance.

**Pennsylvania, Metropolitan Edison Company, Headquarters:** Structural design of new 80,000 SF two-story office addition and cafeteria addition to existing complex. Cafeteria addition was semi-circular in shape.

**Pennsylvania, Defense Distribution Region East:** Structural engineering and design for a 33,000 SF Hazardous Materials Storage Warehouse.

**Maryland, U.S. Army Corps of Engineers, Baltimore District, Administration Building:** Seismic design of new 10,000 SF masonry building.

**Pennsylvania, Carlisle Syntec:** Design of foundation supports for 800,000 lb rubber vulcanizing machine; enlargement of foreman's office including new framing to support mechanical equipment on roof; new monorail installation; extension of existing gantry rail.

**Pennsylvania, Engel Worldwide:** Steel framing and foundations for new 12,000 SF two-story office building; design of crane beams and columns for adjacent 60,000 SF crane building.

**Pennsylvania, AMP IMF:** Structural design for the renovation and conversion of a stamping facility into an integrated manufacturing facility (IMF) housing operations for stamping as well as blow molding processes.

**Texas, York International:** Structural survey of existing building structure for modifications to incorporate large testing and manufacturing areas for mechanical equipment.

**Maryland, Columbia 100:** Design of structural steel framing for new two-story 43,000 SF office building.

**Pennsylvania, York Federal Savings and Loan Association/New Service Corporation:** Design of steel framing, reinforced concrete retaining wall and foundations for new 14,400 SF two-story office building.

**Pennsylvania, Yorktowne Parking Garage:** Study of reinforced concrete/steel framed parking garage.

**Pennsylvania, Blakey Yost Bupp & Schaumann:** Re-construction of a 3-story 10,200 SF, fire damaged urban building and conversion into law offices.

**Pennsylvania, College Misericordia:** Structural design of new 50,000 SF student resident hall utilizing precast concrete planks and masonry bearing walls.

**Pennsylvania, Homewood Suites:** Structural and foundation design for new two-story hotel.

**Pennsylvania, Comfort Inn:** Structural and foundation design of new 5-story hotel.

**Pennsylvania, Glatfelter Insurance:** Design of steel framing and foundations for new 30,200 SF building.

**Pennsylvania, M&M Mars:** Multi-level steel structure to support dust collectors positioned over existing building, steel framing for motor control center within existing silo building, design of 4-story Alkalizing and Roasting Addition with accommodations for existing functioning railroad siding which remained operations beneath new building.

*ZDS Design/Consulting Services*

**Project Name:** *The Museum of Cultural & History - HVAC Renovations*

**Client:** *State of West Virginia Charleston, WV*

**Client Contact:** Mr. Mark Lynch, Director of  
Facility Operation  
Phone (304) 558-0220  
The Cultural Center - Bldg 9  
WV Capitol Complex  
Charleston, WV 25305

**Services:** Engineering Master Planning,  
Indoor Air Quality evaluation, energy  
analysis, and Mechanical/Electrical/Fire  
Protection design, bidding and  
construction administration services for  
retrofitting the 228,500 ft<sup>2</sup> museum and  
protecting the artifacts.



*Museum of Culture & History*

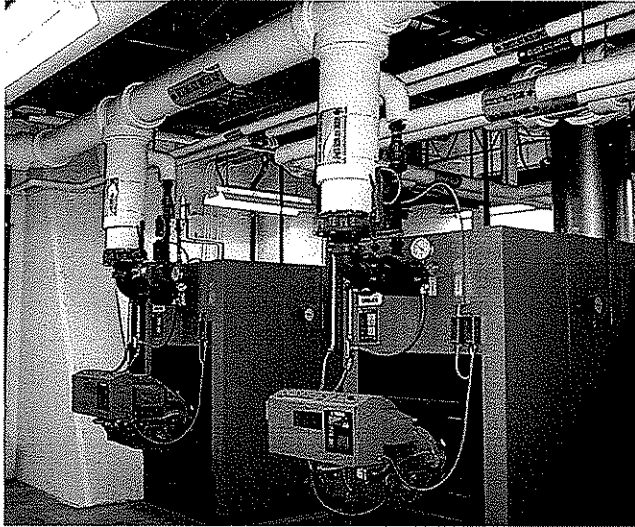
***Project Description***

*ZDS* principals and personnel have been involved in numerous design and recommissioning projects for WV State Capitol Complex while at *ZDS* and through other employment over their careers. These projects required the engineering planning, design, supervision, preparation of construction documents, specifications, construction administration, and commissioning of HVAC systems, sprinkler systems, plumbing systems, electrical power, lighting, fire alarm, security, technology and communications. *ZDS* completed the design for the WV Division of Culture and History correcting their long term HVAC and Indoor Air Quality problems in 2001 and were contracted again in 2008 for providing fire alarm and fire protection upgrades..

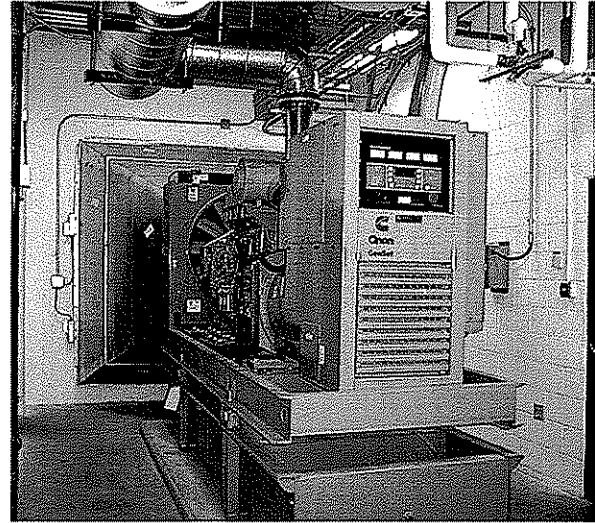
Lack of humidity control damaged many of the State's priceless artifacts. Books and other State collections were deteriorating rapidly due to lack of proper control of temperature, humidity, and filtration. The occupants had also experienced allergic reactions and discomfort from the long

---

term high humidity conditions. ZDS identified and designed the solutions. Conserving energy without sacrificing comfort or indoor air quality was a major consideration. The design included converting an all electric resistance heating system to natural gas, comprehensive DDC controls for central monitoring and control, converting AHU's from constant air volume to variable air volume while meeting stringent ASHRAE Indoor Air Quality requirements, provide variable water volume pumping and interfacing with the facility into the new District campus chilled water system to reduce long term operating cost. The design also included providing new boiler plant with redundancy heating and piping distribution system and an emergency generator to help protect the States priceless collections.



*New Boiler Plant*



*New Emergency Generator*

The mechanical and electrical renovations for the State of West Virginia Library Commission stacks and office spaces were also part of a \$4.5 million dollar HVAC and Electrical Renovations for the Division of Culture and History. The retrofits saved energy, improved indoor air quality, and comfort within the building. The Cultural Center renovations are estimated to save near \$153,000 annually over the costs of operating the old system.

ZDS is also involved with master planning and design for the District heating system through a Performance Contracting program for the WV Capitol Complex and was selected to provide engineering planning and design services directly through the WV Division of Protective Services for the WV Capitol Complex and all State of WV owned or operated facilities for security, intercom, emergency power, HVAC systems as they relate to security, fire alarm and related systems. This multiyear agreement could be in effect for 10 years.

<b>Total Cultural Center Project Cost:</b>	<b>\$6,800,000</b>
<b>Size:</b>	<b>228,500 FT<sup>2</sup></b>
<b>Completion</b>	<b>2001 for HVAC, 2009 for FA/Sprinklers</b>
<b>Estimated Energy Savings:</b>	<b>Reduce HVAC Operating Costs up to 50%.</b>



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, VAV 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!*"

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

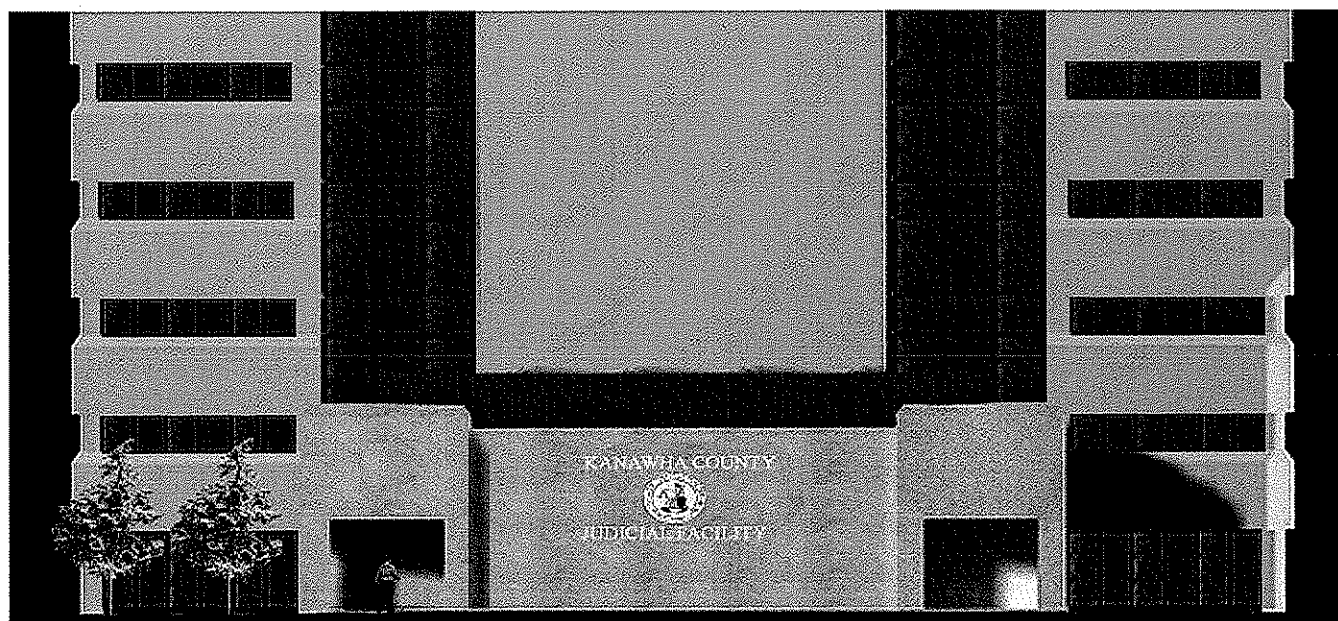
### ZDS Design/Consulting Services

**Project Name:** *Kanawha County Judicial Annex - HVAC Retrofits*

**Client/Location:** *Kanawha County Commission, Charleston, WV*

**Client Contact:** Ms. Jerie Whitehead, Director,  
PO Box 3627  
Charleston, WV 25336  
Phone (304)-357-0115

**Services:** Engineering planning, design, bidding and construction administration services comprehensive HVAC retrofits, DDC Controls, smoke control system, sprinklers and plumbing retrofits.



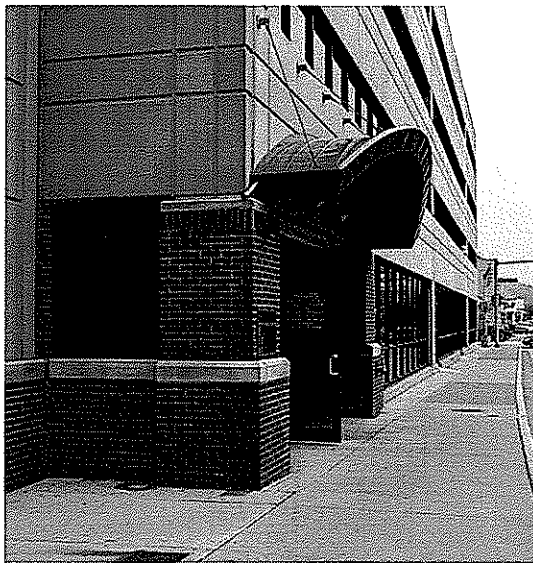
### ***Project Description***

The Judicial Annex, located across the street from the Kanawha County Courthouse in Charleston, WV, was originally constructed in 1982. The original eight-story building is attached to a multilevel parking garage.

The Kanawha County Commission initially contracted ZDS in 1998 to evaluate the Judicial Annex's existing mechanical and electrical systems. ZDS prepared an extensive report which showed opinion of costs for many options. The report covered multiple HVAC approaches with advantages and disadvantages for each. Some of the HVAC equipment was in poor condition and while the Owner was deciding on when to proceed with the recommended work, the primary chiller failed. The weather was hot so ZDS was commissioned under emergency conditions to

find a solution as soon as possible to avoid closure of the facility. ZDS designed/project managed a replacement chiller within **days** of the equipment failure which prevented extended closure of the building.

The Kanawha County Commission then hired ZDS to provide engineering design/construction administration services for renovations for the facility and significant additions. The renovations included seven Circuit Court courtrooms; jury deliberation rooms; attorney conference rooms; witness rooms; Court Clerks offices, public research area; adult probation offices; Maintenance Shops, Prosecutors offices, Voter's Registration, Court Administration offices; and all public areas. The engineering for the additions included a new entrance, security checkpoint, and lobby to alleviate a very overcrowded situation and a building expansion for Juvenile Probation and a newly established Family Court.



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. All HVAC equipment was designed for full DDC controls for remote monitoring, and energy efficiency.

Other support services and building infrastructures improvements installed concurrently include complete voice and data wiring systems, including wiring for LAN; new power distribution for clean and normal power; and new lighting systems that complement the computer environment. Building security improvements included a central security control room, staffed twenty-four hours a day; security vestibule with screening stations; closed circuit monitoring and card access admission systems; secured private judges suites connected to a private elevator; secured prisoner transfer from sally port to courtrooms; emergency call system from courtrooms, chambers and other public-interface points.

<b><i>Total Project Costs</i></b>	<b>\$10,270,000</b>
<b><i>Mechanical Project Cost:</i></b>	<b>\$3,200,000</b>
<b><i>Project Size:</i></b>	<b>Renovations 93,000 ft<sup>2</sup> plus 23,000 ft<sup>2</sup> addition</b>
<b><i>Completion Date:</i></b>	<b>Completion 2004</b>

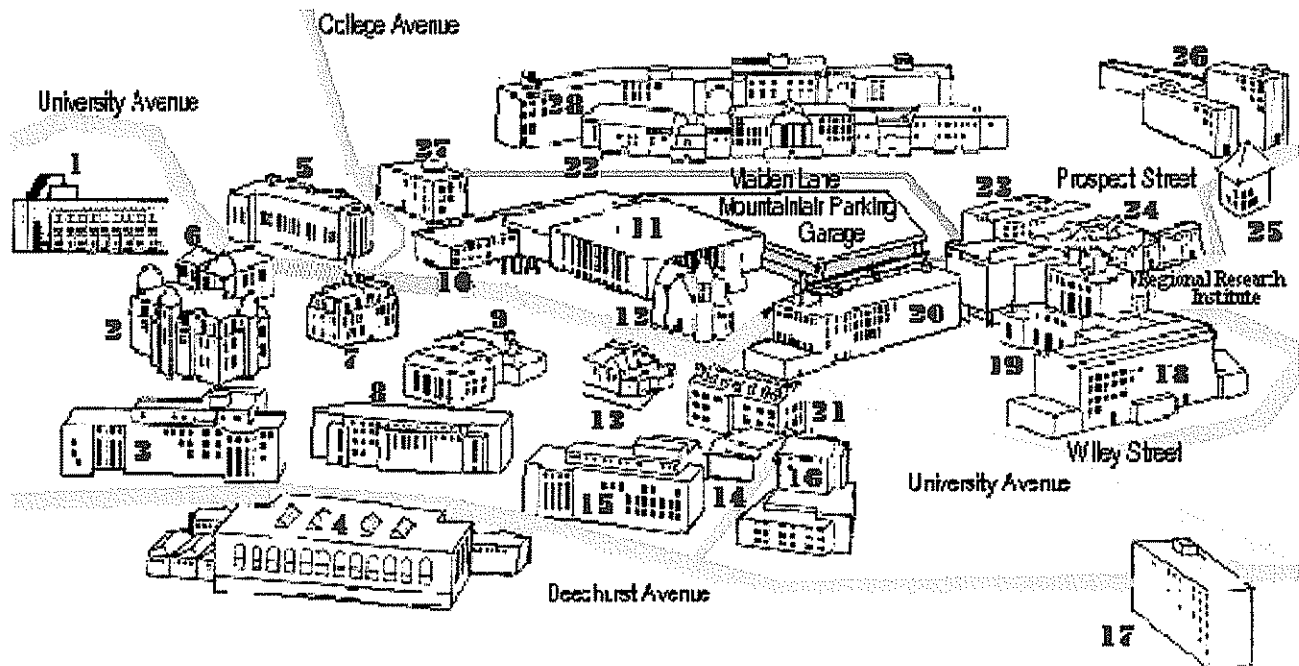
*ZDS Design/Consulting Services*

**Project Names:** *WVU Downtown Campus: Chiller Loop, White Hall Additions & Renovations and others as listed on next page*

**Client:** *West Virginia University, Morgantown, WV*

**Client Contact:** Mr. Gary Boyd                      Mr. Bradley Field  
Mechanical Operation Mgr.          Capital Projects Inspector  
Phone (304) 293-8123                  Phone (304) 293-2855

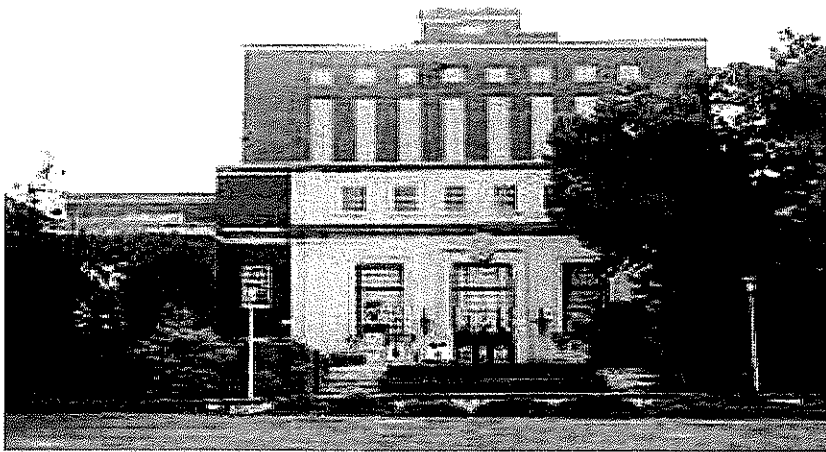
**Services:** Engineering planning, mechanical and electrical design, bidding and construction administration services for multiple projects involving 12 separate buildings at the Morgantown Campus and one at WV Tech Campus.



***Project Description***

ZDS Design/Consulting Services and its principals Ted and Todd Zachwieja prior to forming ZDS have been involved in numerous mechanical/electrical design projects for WVU. A project completed in 2000 involves the mechanical and electrical systems design for a three-story Computer Center located in the “west end high bay” of White Hall to serve WVU’s downtown campus. ZDS also designed a new chiller plant located at “east end high bay” of White Hall. The new White Hall chiller plant serves the newly renovated and expanded Wise Library and the new White Hall Computer Center. The piping and pumping was designed so any chilled water

not required for Wise Library and the White Hall Computer Center was diverted to serve the existing “chilled water loop” system. The chilled water loop system interconnects approximately 3,800 tons of distributed chiller plant systems in White Hall, Mountainlair, Clark Hall, Chemistry Annex, with provisions to serve Stewart Hall and Boreman Hall in the future. The chiller loop concept has proven to be successful in maximizing cooling capacity and reducing operating costs at WVU. Todd Zachwieja was also the design engineer for the original chiller loop.



*The White Hall Chiller project includes providing a new 750-ton electric drive centrifugal chiller with provisions for a future 1000-ton electric centrifugal chiller.*

The White Hall chiller project eliminates the requirement of a new chiller plant in Wise Library by providing the capacity in White Hall and allowing the chilled water to be shared with other buildings tied into the chiller loop piping system. When one chiller is down for planned or unplanned repair, the chilled water loop system still meets the cooling requirements for all the buildings on the loop under most conditions. Variable speed pumping ensures maximum available energy savings and diversity by only utilizing all the required pumping energy to meet the load. The chiller plants, variable speed pumping and tower free cooling are all automated and monitored through a direct digital facility management system. The system allows for WVU to operate the most efficient chillers the longest and allows for flexibility when utility rates vary since the chilled water loop includes both electric centrifugal chillers and steam absorption “Tower free cooling” system with an indoor sump tank was incorporated to save energy and provide a stable winter operation for the chilled water system.

***Total MEP Project Cost for projects listed:***  
***Estimated Annual Savings:***  
***White Hall Chiller Plant:***

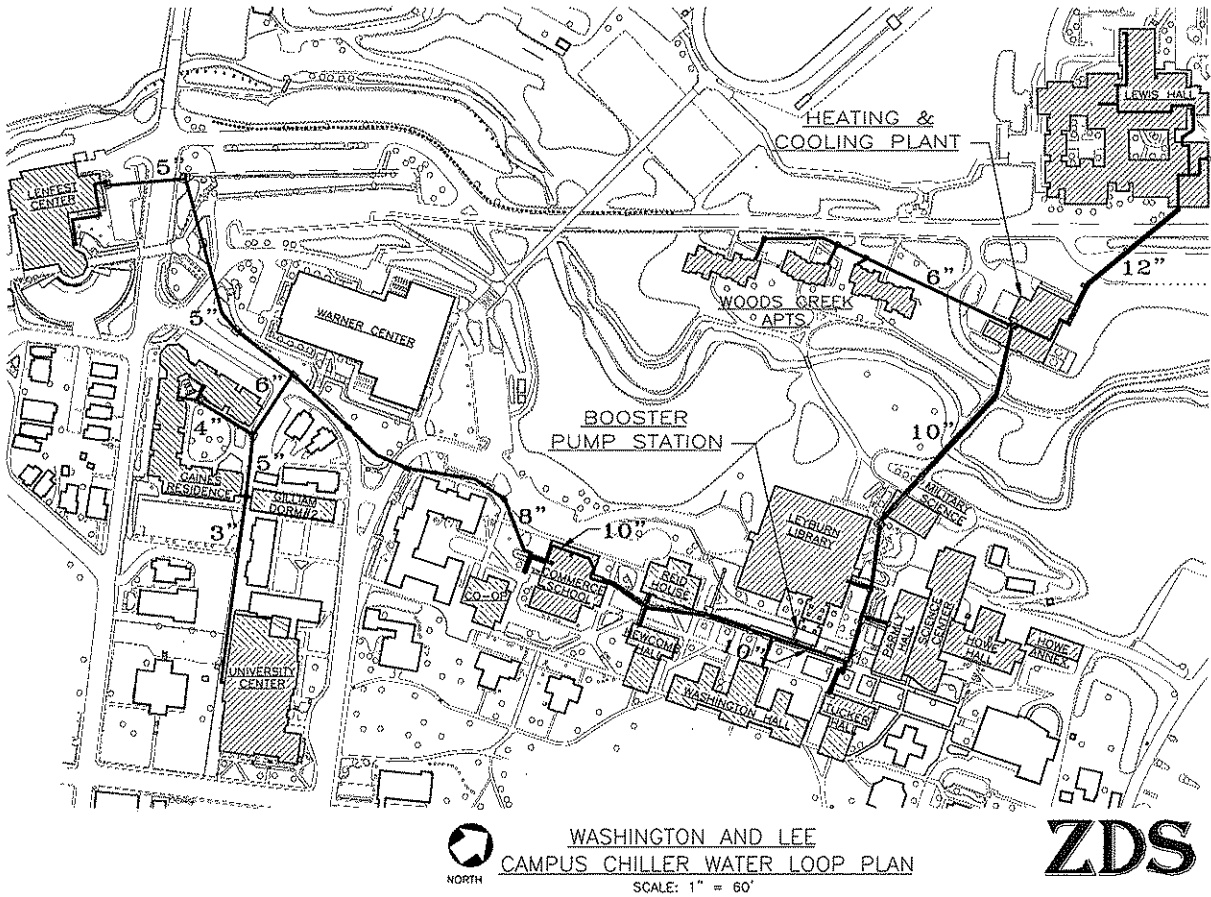
**\$4,410,000**  
**Between \$200,000 and \$300,000**  
**Completed in 2001**

**ZDS Design/Consulting Services**

**Project Names:** *District Cooling/Chiller Plant Renovations*  
**Client:** *Washington & Lee University, Lexington, Va.*

**Client Contact:** Scott Beebe  
Dir. of Building & Grounds  
Phone (540) 463-8491  
Washington & Lee University  
Lexington, VA 24450

Services: Engineering planning, design,  
commissioning and construction  
administration for District Cooling  
Renovations and other HVAC and  
Electrical systems.



**Project Description**

ZDS Design/Consulting Services has been involved in numerous mechanical/electrical designs, Indoor Air Quality and recommissioning projects for Washington & Lee University. The project shown involved the master planning for the Campus Chilled Water Systems and the design,

supervision, preparation of construction documents, specifications, construction administration, and commissioning of a 3,100 ton chiller plant and distribution system with variable water volume (VWV) pumping for energy and operation systems. Ice storage, absorption chillers, direct gas fired chillers, and electrical centrifugal chillers were evaluated as part of W&L overall chiller plant strategies. The concepts implemented saved on construction costs by taking advantage of the diversity of the air conditioning requirements of the campus buildings enabling the distribution piping and pumping systems to be sized for 75% of their peak requirements.



*The Washington & Lee University District Cooling project was fast tracked. ZDS design and served as the construction manager, managing over 14 separate bid packages to complete the project under budget and on time.*

Life cycle cost analysis was performed in evaluating different chiller types (e.g. absorption, electric centrifugal, ice storage) to determine the best system to fit W&L needs. A utility grant was also secured as a result of ZDS's analysis to help pay for the improvements.

The hybrid chiller plant consists of a two-stage absorption chiller and electric centrifugal chillers which are staged to take advantage of time of day rates and demand load shedding. The chillers are automated through a central DDC control system. The new electric centrifugal chillers are also interfaced with the building automation system through BACNET interface panels.

The chiller project has received national recognition for pioneering series VWV pumping and for using a combination mixer-air separator in the main chiller plant piping system. Other projects include Commerce School mechanical system analysis for Indoor Air Quality and the Natatorium mechanical system analysis for Indoor Air Quality.

<b><i>Project Size:</i></b>	<b>Entire Campus for District Cooling</b>
<b><i>Total District Cooling Project Cost:</i></b>	<b>\$2,100,000</b>
<b><i>Estimated Annual Energy Savings:</i></b>	<b>\$283,000</b>
<b><i>Completion Date of last project:</i></b>	<b>2001</b>



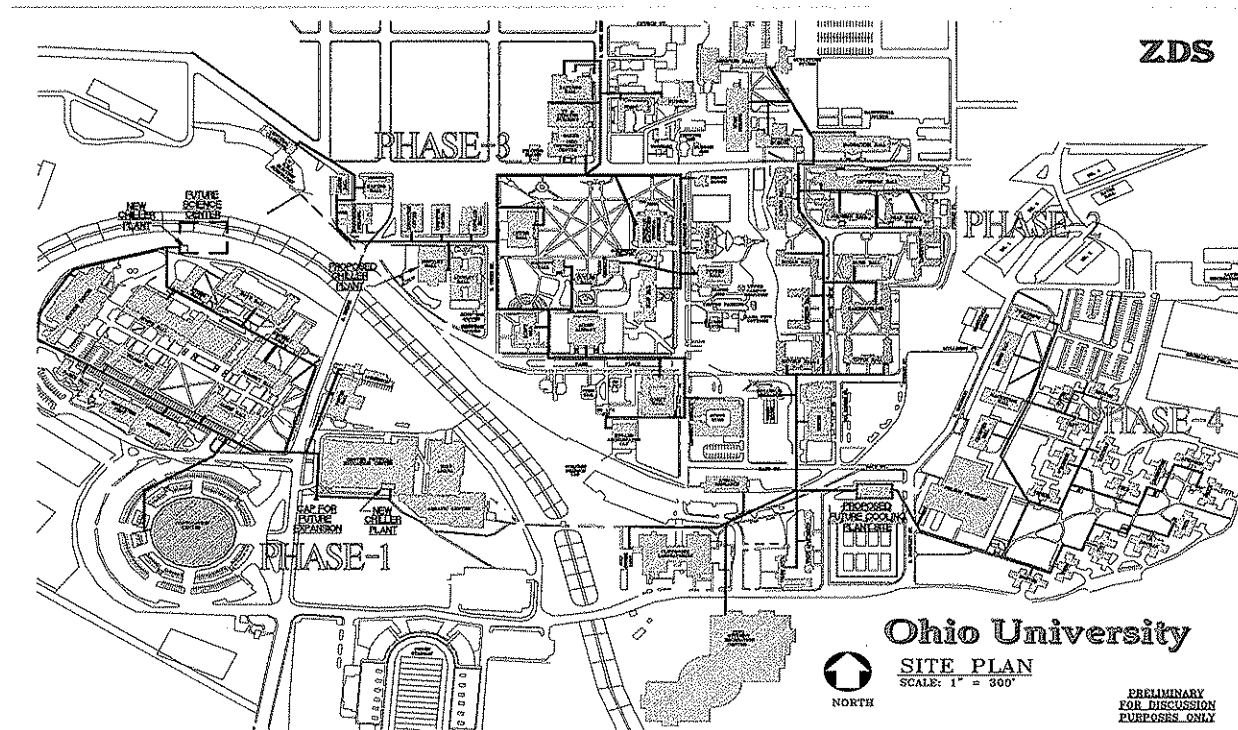
*ZDS Design/Consulting Services*

**Project Names:** *General & Auxiliary Services Performance Contracting and Campus District Cooling*

**Client:** *Ohio University, Athens, Ohio*

**Client Contact:** *Dr. Sherwood Wilson, Phone: (540) 231-4416, Vice President for Administrative Services for Virginia Polytechnic Institute of Blacksburg, VA. Former Associate Vice President for Administration, Ohio University, Athens, Ohio*

**Services:** *Engineering planning, mechanical and electrical design, consulting for establishing comprehensive Performance Contracting program & Master Planning for District Cooling System covering entire campus.*



**Project Description**

ZDS developed a hybrid comprehensive performance contracting program and capital upgrades projects for Ohio University's Athens's Campus. The Chilled Water Project upgrades and expands campus air-conditioning systems, creating a central cooling infrastructure (similar to the central heating system on campus). Ultimately, this project will allow all University facilities to

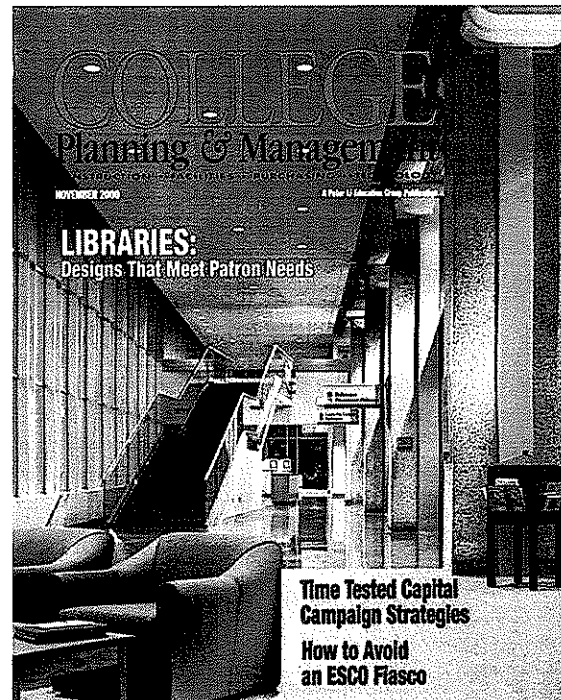
be air-conditioned from central locations. In addition, it will streamline operations, reduce costs, and improve the reliability of existing air conditioning systems.

The first phase of the Campus Chilled Water Systems covers the Western Campus is estimated to be near 6,000 tons of chiller plant and distribution system with variable water volume (VWV) pumping for energy and operation systems. Ice storage, absorption chillers, and electrical centrifugal chillers were all to be evaluated as part of O.U.'s overall chiller plant strategies. The chillers will be automated through a central DDC control system and lay the foundation for the remainder of the campus.

The Performance Contracting program involves Facilities Management Buildings and Residence and Auxiliary Services facilities. Equipment that is beyond their service life and operating very inefficiently will be replaced. The campuses coal fired boiler system that generates low cost steam (\$2.62 per MLbs) will be extended to replace the building boilers reducing energy and operating costs.



*"ZDS is worth the monies the University paid for their services. It was important to have somebody guide us through the process. ZDS was not just an important part of the process; it was one of our most valuable assets," says Sherwood Wilson PhD, Associate VP for Administration.*



*Published in the "College of Planning & Management - November 2000"*

<b>Projected Performance Contracting Cost:</b>	<b>\$25,000,000 saving over \$2,500,000 annually</b>
<b>Total Projected Capital Project Cost:</b>	<b>\$33,500,000 for District Cooling</b>
<b>Project Size:</b>	<b>Multiple Projects covering entire campus</b>
<b>Project Completion:</b>	<b>2001 for ZDS's work</b>

***ZDS Design/Consulting Services***

**Project Names:** ***Stevenson Library and Bennett Hall ME Renovations***  
**Client:** ***Ohio University, Chillicothe Campus, Chillicothe, Ohio***

**Client Contact:**      **Mr. David Scott,**                      **Ms. Pamela Callahan, AIA**  
Director of Physical Plant                      Architect, Facility Planner  
Phone: (740)-774-7243                      Phone: (740)-593-2727  
571 West Fifth Street                      Building 19, The Ridges  
Chillicothe, Ohio 45601                      Athens, Ohio 45701-2979

**Services:**                      Engineering planning, mechanical and electrical design, consulting for establishing comprehensive Performance Contracting program coordinated with HVAC and electrical renovations to Stevenson Library, Bennett Hall and proposed renovations to Shoemaker gym.

***Project Description***

ZDS Design/Consulting Services was originally hired to provide master planning for all HVAC, lighting, power and utilities on campus and provide a comprehensive audit of available remaining life of mechanical and electrical equipment and expected savings for implementing capital upgrades while reducing operating costs. A hybrid comprehensive performance contracting program and capital upgrades projects for OU's Chillicothe Campus evolved from that process. The planned upgrades were phased to allow for funding to be in place as the upgrades needed to occur over the 5 to 10 year plan.



**Stevenson Library – Renovations**

The initial phase addressed indoor air quality concerns in the Stevenson Library. Mold and lack of humidity control caused concern by the faculty and students. The HVAC and electrical

renovations addressed the Indoor Air Quality concerns, reduced operating costs while improving comfort. HVAC equipment was retrofitted or replaced to extend the life of the equipment for at least another 20 years.

The next phase involved upgrading the chiller plant and cooling tower that served most of the campus and the installation of variable water volume pumping and DDC controls. The chiller plant upgrades were in Bennett Hall.



**Bennett Hall**  
100,000 square-foot classroom  
facility with science labs

The Bennett Hall renovations included comprehensive HVAC renovations which include a new boiler plant to serve both Bennett Hall and Stevenson Library and incorporating of the chilled water plant upgrades. The capital upgrades for this phase came in under budget and were completed in 2003. Asbestos abatement was also part of the needs for this project. The building also had to remain in use during construction.



**Shoemaker Gym** is the final phase of the program and is expected to be addressed in the near future. Comprehensive DDC controls and lighting upgrades along with the HVAC upgrades produced significant operating savings and addressed many of the Universities IAQ concerns.

<b><i>Project Size:</i></b>	<b>Approximately 127,000 FT<sup>2</sup> thru 2004</b>
<b><i>Total Capital Project Cost thru 2003:</i></b>	<b>\$4,400,000</b>
<b><i>Estimated Annual Savings:</i></b>	<b>Between \$200,000 and \$300,000</b>
<b><i>Project Completion:</i></b>	<b>2004</b>

**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 ft<sup>2</sup> 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:***

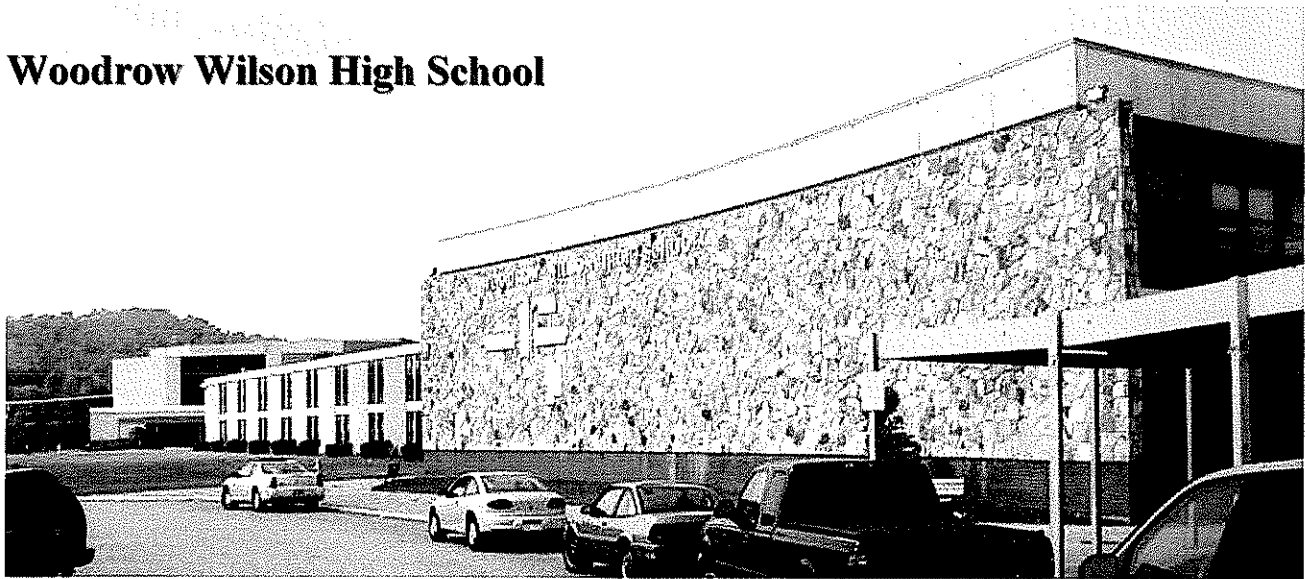
**Completed in 2008**

***ZDS Design/Consulting Services***

***Client:** 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

---

---

## PROJECT EXPERIENCE

---

---

in January 2004. All HVAC renovations except for the gymnasium facility were completed in 2008 which included a new boiler plant and chiller plant to serve the campus.

### 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 Woodrow Wilson High School and the 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.”***

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



## MONEY &amp; 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."

CHRIS DOWD FOR THE CHRONICLE



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

GEORGE BUTLER 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

*Continued on Following Page*

*Continued From Preceding Page*

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.

*Continued on Following Page*

*Continued From Preceding Page*

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**





GEOEXCHANGE

# Earth Comfort Update

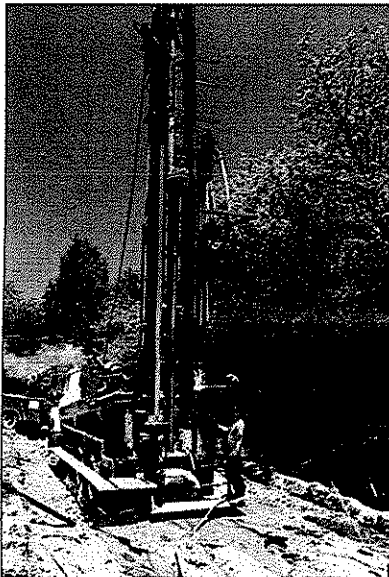
The GeoExchange National Information Resource Center Newsletter Volume 6, Issue 4

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."**

*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.*

### 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."

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.

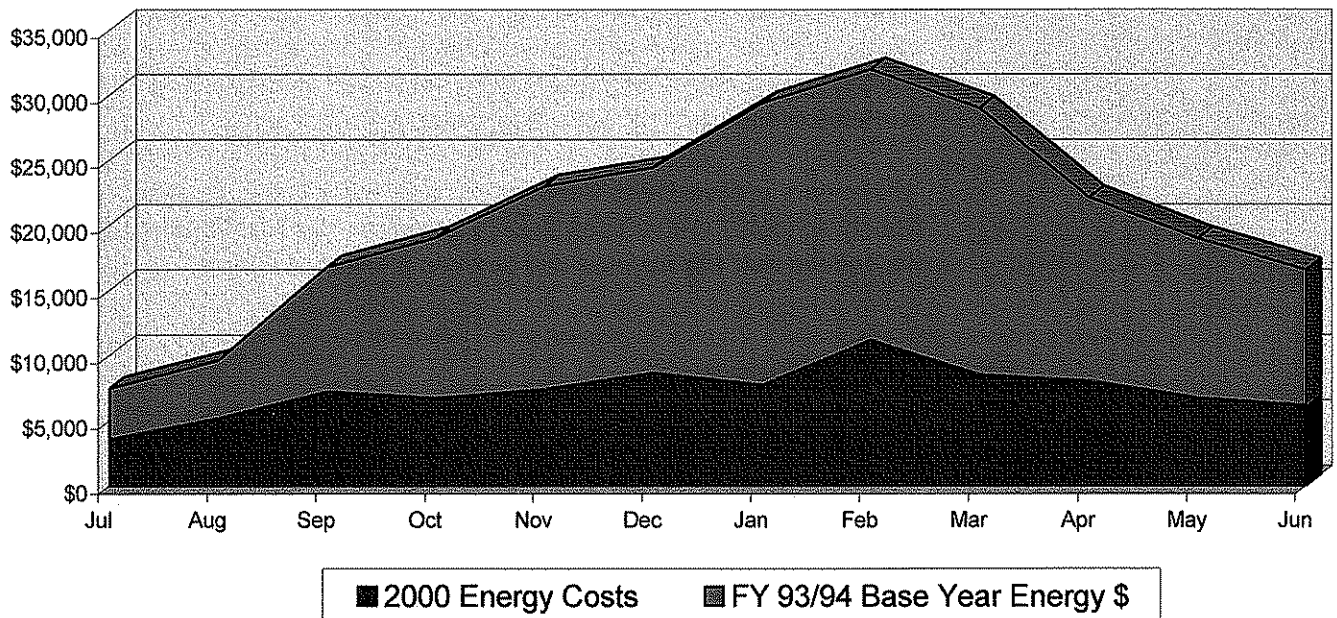
### Improved Comfort and Efficiency

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