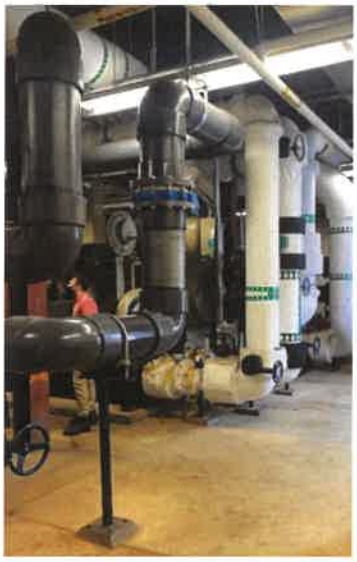


CENTRALIZED EXPRESSION OF INTEREST

CAMPUS CHILLED WATER LOOP/PLANT EVALUATION AND ENHANCEMENTS

PREPARED FOR

WEST VIRGINIA DEPARTMENT OF ADMINISTRATION, PURCHASING DIVISION

CEOI GSD2300000007

H.F. LENZ ENGINEERING

1407 Scalp Avenue
Johnstown, PA 15904
Phone: 814.269.9300
FAX: 814.269.9301

HFL File No. 2023-8000.67

February 10, 2023

H.F. LENZ
ENGINEERING
H.F. Lenz Co. | 1407 Scalp Avenue | Johnstown, PA | 15904 | 814-269-9300

February 10, 2023

WV Department of Administration
Purchasing Division
2019 Washington Street East
Charleston, WV 25305-0130

Subject: Expression of Interest
Campus Chilled Water Loop/Plant Evaluation & Enhancements
SOL NO. CEOI GSD2300000007

Purchasing Division:
H.F. Lenz Company (HFL) is enthusiastic about the opportunity to provide the Engineering Services required for the West Virginia State Capitol Campus Chilled Water Loop/Plant Evaluation & Enhancement project. The analytical skills, design capability, creativity, and overall knowledge possessed by our Team will enable us to successfully complete all aspects of the work within the allotted budget and timeframe. Our Team is fully prepared to bring the following strengths and benefits to this project:

- Detailed knowledge of the Capitol's Central Plant gained from being the Engineer of Record for the central chiller plant and main chilled water distribution loop (1999 project). Steven Gridley, P.E. who was the Principal-in-Charge and Lead Designer for that project, will be the Principal-in-Charge for this endeavor.
- Extensive experience with central chilled water plants and chilled water distribution systems for large, multi-building campuses.
- Experience in chiller plant efficiency enhancements including direct digital control energy management systems, variable speed pumping, system redundancy, and chiller controls.
- Recent and extensive experience in project phasing to allow for normal operations with minimal impact to facility occupants.
- Senior-Level Personnel. Our Team consists of senior-level professionals who will remain involved with the project throughout its duration.
- Depth of qualified personnel to quickly add staff to the project to meet increased project demands or accelerated schedules.
- Firm Stability. This is our 77th year in business. We have one of the lowest rates of employee turnover in our industry.
- Proven ability to work in collaboration with Owners and other consultants throughout the project while placing the Owner's interests first.

Thank you for the opportunity to submit this Expression of Interest. We look forward to the next steps in the selection process, including a possible oral presentation. In the meantime, we will be happy to answer any questions you may have regarding our submission.

Sincerely,

H.F. LENZ COMPANY

Steven J. Gridley

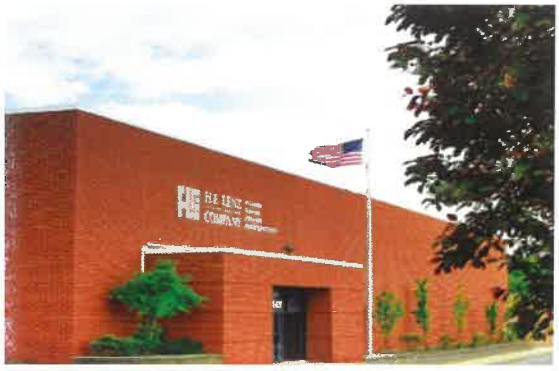
Steven J. Gridley, P.E.,
Vice President

Table Of Contents

SECTION 1: FIRM PROFILE & RELEVANT EXPERIENCE

H.F. LENZ ENGINEERING

Firm Profile



Johnstown Headquarters
1407 Scalp Avenue
Johnstown, PA 15904
Phone: 814-269-9300
Fax: 814-269-9301

Pittsburgh Office
1051 Brinton Road
Pittsburgh, PA 15221
Phone: 412-371-9073

Lancaster Office
120 North Pointe Boulevard
Suite 203
Lancaster, PA 17601
Phone: 717-461-3916

Ohio Office
322 State Street
Conneaut, OH 44030
Phone: 440-599-7800
Fax: 440-599-7801

Connecticut Office
101 Centerpoint Drive
Suite 237
Middletown, CT 06457
Phone: 860-316-2124

U.S. GREEN BUILDING COUNCIL MEMBER

H.F. Lenz Company

H.F. Lenz Company was established 1946 in its present form, under the name H.F. Lenz Company, R.E., and in 1953 the company was incorporated, as a Private Corporation, in Pennsylvania as H.F. Lenz Company. Our projects span the nation, with the heaviest concentration in the Northeast, and exceed $600 million in MEP, Civil and Structural construction annually. Each market sector—corporate, government, health care, education, and industry—is served by a team of specialists who understand the unique needs of the clients they serve. Our staff consists of 160+ individuals, including 40 Licensed Professional Engineers and 17 LEED Accredited Professionals. Our headquarters is in Johnstown, Pennsylvania with branch offices in Pittsburgh, Pennsylvania; Lancaster, Pennsylvania; Conneaut, Ohio; and Middletown, Connecticut.

Disciplines/services offered in-house include:

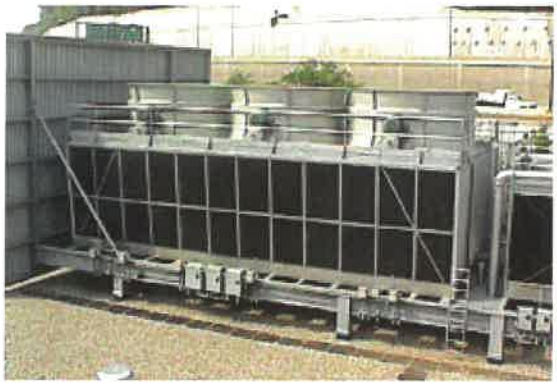
- Mechanical Engineering
- Electrical Engineering
- Data/Communications Engineering
- Fire Protection / Life Safety Engineering
- Structural Engineering
- Civil Engineering
- Surveying
- GIS
- Construction Phase Services
- Commissioning and Training
- 3D CADD with Full Visualization
- Energy Modeling
- Sustainable design/LEED Services
- Building Information Modeling (BIM)

Chilled Water System Experience

The H.F. Lenz Company's experience in chilled water systems ranges from small reciprocating chillers to centrifugal chillers as large as 2,500 tons/hour each. We have designed chilled water plants with total capacities as high as 28,000-tons. We have experience in the design of all types of chiller systems including hermetic and semi-hermetic chiller systems as well as air cooled chiller systems. H.F. Lenz Company's engineers are experts at implementing energy-conserving technologies in all types of mechanical systems. For chillers, these include direct digital control energy management systems, variable speed pumping, and capacitor and chiller controls.

Our *chilled water distribution experience* includes campus-wide distribution networks serving numerous buildings as well as single building systems. Most of these distribution systems have been underground systems including direct burial, shallow utility trench, pre-cast utility trenches, and walk-through tunnel systems.

Our evaluation of chilled water piping systems has included the exposure and physical evaluation, including ultrasonic testing, of campus-wide chilled water distribution systems.



WEST VIRGINIA STATE CAPITOL COMPLEX

Study and Design for New Central Chilled Water Plant

Charleston, WV

Services
Mechanical, Electrical, Plumbing/Fire Protection, Structural

Square Feet
4,500

Completed
2002

The H.F. Lenz Company was hired to determine the most cost effective and energy efficient method for supplying chilled water to seven buildings (1.3 million SF) making up the West Virginia State Capitol Complex. Each of the seven buildings had its own chiller plant with many of the 15 chillers approaching the end of their useful life.

A detailed engineering analysis of three options was developed that included project scopes, conceptual drawings, calculations, and detailed cost estimates and calculations of energy and maintenance cost savings.

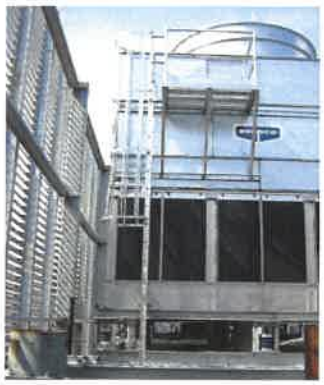
The H.F. Lenz Company showed that constructing a new central chiller plant with a main chilled water distribution loop would result in the lowest energy costs and maintenance costs with a payback period of four years.

The new chiller plant consists of three 1,200-ton and two 600-ton industrial grade centrifugal chillers along with their associated cooling towers, free cooling heat exchangers, chilled water and condenser water pumps, and automatic temperature controls. Variable speed drive pumping is incorporated for energy savings.

The new chilled water distribution system consists of approximately 5,000 feet of direct burial chilled water piping of various sizes. The seven Capitol Complex buildings are connected to this central loop by chilled water bridges.

The H.F. Lenz Company also provided the architectural and structural design work for the 4,500 SF chiller plant. A new facade was provided on two sides of the building, and a new internal structural framework was provided for support of the piping mains and cooling towers.

Relevant Experience



WEST VIRGINIA UNIVERSITY

Downtown Chiller Plant

Morgantown, WV

Services
Mechanical, Electrical, Plumbing/Fire Protection, Structural

Completed
2011

Cost
$1.5 million

References
Mr. William Jolliff, MCP
Facilities Engineer
West Virginia University
304-293-9592
William.joliff@mail.wvu.edu

H.F. Lenz Company provided the mechanical and electrical engineering services to increase the chilled water capacity of WVU's Downtown chilled water plant. The capacity increase was needed to supply chilled water to additional campus buildings.

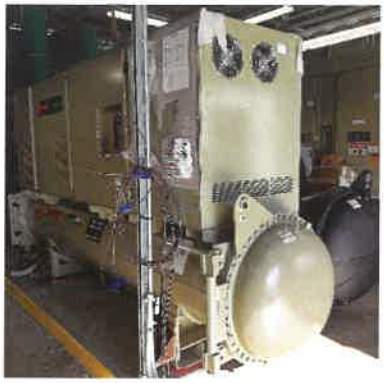
The scope of services included the design for the installation of a third and fourth 1,400-ton chiller with VFD, a free cooling heat exchanger system, fourth cooling tower, and associated electrical.

The project included the following:

- Addition of a third chiller and a new free cooling heat exchanger to the system
- Addition of a fourth chiller system including the chiller, cooling tower, pumps, and all other auxiliaries
- Control system modifications
- Relocation of existing equipment as necessary to provide space for the free cooling heat exchanger

H.F. LENZ ENGINEERING

Relevant Experience



WEST VIRGINIA UNIVERSITY

Evansdale Campus Chiller Replacements

Morgantown, WV

Services
Mechanical, Electrical, Plumbing & Structural Engineering

Completed
2018-2023

Reference
Mr. William Jolliff, MCP
Facilities Engineer
West Virginia University
304-293-9592
William.joliff@mail.wvu.edu

H.F. Lenz Company provided the Mechanical, Electrical, and Structural engineering services for multiple chiller replacements on the Evansdale Campus of West Virginia University. The capacity increase was needed to serve additional campus buildings.

The scope of services included the design for the replacement of existing chillers one, two and three with similar size centrifugal chillers.

Chiller #1 - Completion Date: 2021
- Demolition of existing Chiller #1
- Installation of replacement chiller
- Investigate maximum chiller tonnage that can be supported by existing electrical feeder, switchgear, pumps, piping, cooling tower capacity, and physical space

Chiller #2 - Completion Date: 2018
- Demolition of existing Chiller #2
- Replacement of previous chiller with new centrifugal chiller with similar size of 420 tons

Chiller #3 - Completion Date: February 2023
- Demolition of existing Chiller #3 and associated isolation valves
- Installation of replacement chiller
- Replacement chiller will match the 450 ton Trane Agility machine that was used for the replacement of Chillers 1 and 2

Strategies Implemented that Improved Outcome or Unique Characteristics that made the Project Interesting or Challenging
- Design incorporated VFDs for improved capacity control and efficiency
- Upgraded refrigerant monitoring system
- Increased plant capacity by using chillers that did not require infrastructure upgrades such as power feeds or pumping

H.F. LENZ
ENGINEERING

Relevant Experience

UNIVERSITY OF PITTSBURGH

Lower Campus Chilled Water Plant

Pittsburgh, PA

Services
Mechanical, Electrical, Plumbing/Fire Protection

Completed
2003 Phase I
2010 Phase II
2011 Phase III

Cost
$4,200,000 Phase I
$1,600,000 Phase II
$2,000,000 Phase III

References
Mr. Raj Singh
Mechanical Engineer
University of Pittsburgh
3400 Forbes Avenue
Pittsburgh, PA 15260
412-624-9526

The H.F. Lenz Company was selected for the study and design of a major chilled water system retrofit project at the University of Pittsburgh main campus in Pittsburgh, Pennsylvania. The objectives of this project were to: 1) provide additional chilled water capacity to the Lower Campus chilled water system that serves approximately 30 buildings; 2) upgrade or replace aging equipment; and 3) implement energy saving strategies into the chilled water system.

Phase I of the project included:

- Addition of a new 2,250-ton electric centrifugal chiller
- Replacement of an existing 2,000-ton chiller with a new 2,250-ton chiller
- Conversion of the system to a primary/secondary pumping system
- Interconnection of the Lower Campus chilled water system with the Upper Campus system to serve as back-up to each other
- A 2,500-ton plate-and-frame heat exchanger for free cooling
- Variable Frequency Drives on secondary and in-line chilled water distribution pumps, and building chilled water recirculation pumps
- Modified chilled water piping at each building to meet new flow requirements
- Extended chilled water distribution piping to additional campus buildings
- Provisions for future installation of an additional chiller

Phase II of the project included replacement of a 2,000-ton chiller with a 2,500-ton chiller.

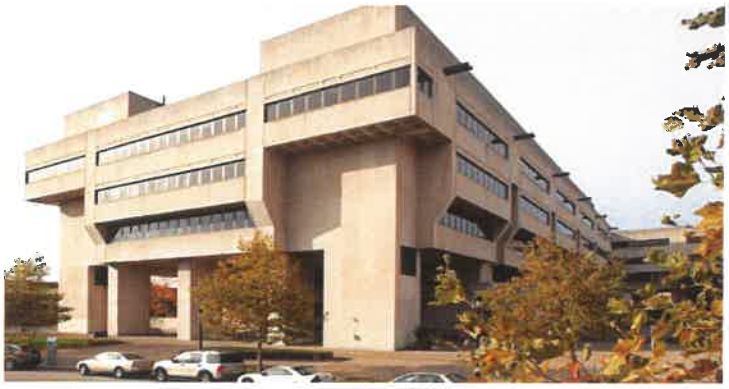
Phase III included the replacement of a 2,000-ton chiller, electrical upgrades and new control plant controls.

Additional project elements included cooling tower modifications; replacing refrigerant ventilation and detection systems; upgrading electrical equipment including 4160 volt switchgear, 480 volt motor control center, and capacitor banks; structural modifications to buildings and making sure entire system operates within safe pressure limits.

Relevant Experience

Key issues:

- Integrating large plants/cooling towers into existing facilities
- Conversion of existing systems into primary/secondary pumping systems
- Using 3D Modeling as an engineering tool
- Hydraulic analysis
- Energy conservation



UNIVERSITY OF PITTSBURGH

Wesley W. Posvar Hall Chiller Projects

Pittsburgh, PA

Services
Mechanical, Electrical, Plumbing & Structural Engineering

Completed
2018

Reference
Mr. Raj Singh
Mechanical Engineer
University of Pittsburgh
412-624-9526
Brs46@pitt.edu

Posvar Hall, constructed in 1975, is a landmark building on the campus of the University of Pittsburgh in Pittsburgh, Pennsylvania and is the largest academic-use building on campus. H.F. Lenz Company has provided multi-discipline engineering services for several projects associated with the building's HVAC systems and exterior plaza.

Replacement of Posvar Hall Chiller Plant Chiller #4

Chiller #4 in Posvar Hall was at the end of its useful life, and was replaced with a new 2,250-ton chiller. Options that were reviewed in the planning stage included VFD drives for energy efficient operation, environmentally safe refrigerants, the existing chilled water and condenser water pump capacities, the existing pipe sizes, existing cooling tower capacities, and the future cooling load requirements. HFL also provided construction cost estimates for each option during the Schematic Design Phase. The design included all equipment, piping, ductwork, controls, electrical power and control wiring along with all appurtenances necessary for a complete and functional chilled water system.

Specific project elements included:

- Provided drawings for the installation of the new chiller, transformer, VFD drive/starter and associated equipment
- New electrical wiring and electrical equipment as necessary to meet the latest NEC codes
- DDC controls to operate with the existing Building Automation System
- Provided a short circuit, co-ordination and arc flash study for the new electrical system
- New concrete pads and all general work associated with the installation of the new chiller and associated equipment

Replacement of Posvar Hall Chiller Plant Chiller #1

- H.F. Lenz Company provided the mechanical and electrical engineering evaluation and design services for the replacement of Chiller Plant #1 at Posvar Hall. Project features included:

- Investigated existing conditions of the existing chiller plant with all associated components and determine if any can be reused as part of the new installation
- Provide all necessary engineering for the existing chiller demolition and design, and for the installation and operation of a new chiller
- The design included all e equipment, components, piping, insulation, VFD/starter, transformer, duct and exhaust modifications, refrigerant leak detection, refrigerant vent, modifications of chiller and condenser water pumps, cooling tower, DDC controls, electrical wiring and equipment, short circuit coordination/arc flash studies, new concrete pads, and all general work, along with all appurtenances necessary for a complete and functional chiller system
- The design provides provisions for ease of maintenance and replacement of new equipment
- Construction cost estimates were provided at each phase of design

Posvar Hall Cooling Tower Investigation

HFL conducted a site visit to review the problems associated with Cooling Tower #5, which is part of the Chilled Water Plant for the University of Pittsburgh Complex located at Wesley Posvar Hall. It was determined that suction strainers on Pump Nos. 4 and 5 had collapsed and were filled with PVC debris. This debris was traced to damaged PVC fill and PVC eliminator material from Cooling Tower #5. HFL's recommendations included removing damaged materials, repairing pipe nozzles, installing pipe supports to prevent shifting of the header pipe, and cleaning all strainers and piping where PVC debris was found.

UNIVERSITY OF PITTSBURGH

Evaluation of Underground Chilled Water Lines

Pittsburgh, PA

Services
Mechanical, Electrical, Plumbing/Fire Protection

Completed
2012

References
Mr. Raj Singh
Mechanical Engineer
University of Pittsburgh
3400 Forbes Avenue
Pittsburgh, PA 15260
412-624-9526

This project included the identification, pipe exposure, and physical evaluation of the underground chilled water lines serving 30 buildings on the Pitt Campus. Specifically, the project included ultrasonic testing for pipe wall thickness of chilled water distribution piping ranging from 6" to 24". The project was performed as the initial phase of a campus-wide chilled water system maintenance and improvement program.

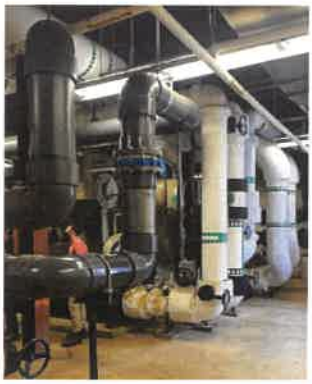
As a result of the study, the Lower Campus Chilled Water Plant was upgraded and new chilled water lines were designed and installed to serve the following facilities:

- Frick Fine Arts
- Alumni Hall
- Heinz Chapel
- Clapp Hall
- Chevron Science Center
- Benedum Hall
- Charles L. Cost Field
- Sennott Square

A total of 6,000 LF of new chilled water piping was installed for these projects using a combination of direct burial, shallow trench, and tunnel-installed methods.

H.F. LENZ
ENGINEERING

Relevant Experience



INDIANA UNIVERSITY OF PENNSYLVANIA

Chilled Water Plant Expansion

Indiana, PA

Services
Mechanical, Electrical, Plumbing/Fire Protection

Square Feet
1,192 Addition
516 Platform

Completed
2024 Construction

References
Mitch Peffer, CCM
Director
Facilities Planning and Construction
724-357-2289
724-422-9594
mpeffer@iup.com

The existing campus chilled water plant has a capacity of 4,000 tons of cooling, supplying twenty-four academic, administrative and student living buildings The University determined that the existing campus chilled water plant will no longer have redundancy or enough capacity to meet the increased peak campus cooling load (in the event of a failure of the largest chiller) once the New Science Building is connected to the central chilled water system in 2023.

H.F. Lenz Company was selected by the Pennsylvania Department of General Services to expand the plant by another 2,000 tons, which will provide the additional capacity to meet future cooling needs, but more importantly, to provide a redundant system in case of chiller failures.

Our scope involves the following:

- Design of a new building to house the new equipment; the building will be attached to the existing chiller building
- The new building will house the 2,000-ton chiller, cooling towers, condenser pumps, Siemens Controls, and electrical MCC control center
- The system piping, for chilled water supply and cooling tower feeds, will be interconnected between the two buildings to allow for maximum flexibility of system operations
- The existing 2,500 kVA, 4,160-volt transformer that feeds the plant needs will be increased to a 7,500 kVA transformer and new 12,470-volt cable feeds to meet the increased power demand
- The new building will also house the main 4,160-volt MDP for the chiller and associated 480-volt transformer power and new electrical panels
- All site work including stormwater management, retaining walls, access roads and parking, security fencing and lighting as needed in the vicinity of the new and existing chiller plant buildings
- The existing chiller plant will be required to remain in operation during construction

H.F. LENZ
ENGINEERING

Relevant Experience

GOVERNMENT SPONSORED ENTERPRISE (FINANCIAL SERVICES CLIENT)

Existing Data Center Mechanical Infrastructure Upgrade

D.C. Metro Area

Services
Mechanical, Electrical

Completed
2014

Cost
$12.8 million (entire project)

Reference
Stephen Hay – VP of Critical Environments
Mark G. Anderson Consultants
202-942-3928
shay@mgac.com

To support the IT migration of critical applications from one Enterprise Data Center to the Project Data Center and to meet future business needs, this large financial Client identified that the critical infrastructure at the Project Data Center must be increased in capacity from its current density to a density of 125 W/SF in two of its three existing 20,000 SF Data Center Bays.

After performance of a detailed Study/System Validation Phase that included CFD Modeling, the following mechanical improvements were made to reduce risk, improve efficiency, and support the expanded critical load.

Specific project elements included:

- Conversion of a partial 2N chiller plant to an N+2 plant with new PLC controls
- Chiller plant efficiency improvements including variable frequency drives on all chillers and flow equalization control
- Repiping of the secondary system to provide N+2 pumping and proper bridging, expansion, and redundant make-up water feeds
- Removal of an improperly sized and piped thermal storage tank
- Separation of the office loads from the critical cooling plant utilizing two (2) 400-ton air cooled chillers
- Rebalancing of all primary and secondary chilled water systems and equipment
- Replacement of 16 strings of failing existing wet cell batteries with battery monitoring as an option
- Redundant Selective Catalytic Reduction Compressor for the Generator Exhaust Systems
- Redundant Building Automation System Compressor

Section 2: Approach to Project Goals & Objectives

Project Approach

In addition to having extensive experience in working on infrastructure projects on other large campuses/urban environments, the H.F. Lenz Company is very familiar with the West Virginia State Capitol chilled water plant and distribution system. After a visit to the complex, we are confident that our services match those required for this contract. These services are identical to many of the jobs recently completed by our Utility Team, which is comprised of chilled water, steam line, electrical, water, storm and sanitary distribution specialists. In addition, we have in-house specialists in GIS and telecommunications. Our chilled water specialists have over 150 years of combined experience in the design of chilled water plants, tunnels, and underground distribution systems.

Key issues that are important to complete the initial project in an efficient, cost effective manner include:

- Study and Evaluation of Chilled Water Delivery
- Computer Generated Load Modeling and Energy Analysis
- Hydraulic Analysis
- Review of Normal Plant Operating Parameters
- Evaluating Condition of Underground Piping
- Using 3D Modeling as an Engineering Tool
- Utilizing GIS as a Communications Tool
- Determining and Identifying Central Plant Efficiency Enhancements

Project Initiation

At the start of any project, we find it important to conduct a kick-off meeting where the project goals and expectations of the West Virginia Department of Administration, General Services Division (Client) are reviewed along with a project schedule. Our Principal-in-Charge / Project Engineer will be present to discuss the topics with your project manager and your key personnel.

Data Gathering

After the kick-off meeting, we will begin gathering data relative to the project. The first information we will require is updated Central Plant drawings, any updated site plans, and site survey information, which might be available. We already have the original piping layout drawings and the original Central Plant drawings. However, we will need documents showing the more recent Central Plant improvements. Any information would be available through the Client from site development drawings. However, any information which cannot be obtained from the drawings or which needs to be verified can be obtained by our surveyors. We will perform a site survey of each building to determine what opportunities exist for piping improvements. We will also meet with various facilities personnel. We know that they hold a wealth of information with regard to utilities, which may not have been shown or are routed differently. They are also very familiar with problems or issues associated with the existing systems and utilities.

Studies and Reports

As part of our chilled water optimization efforts, we will complete a computer generated load profile for all of the buildings to be connected to the chilled water system. The H.F. Lenz Company, based on input from the Client, will propose options developed by utilizing these load profiles for the building. The options will be based initially on the present load. However, if there are advantages to accommodate additional long-term loads, which will not greatly affect the performance and efficiency of the chiller plant or pumping or piping options, we will bring them to your attention. For each alternative, we will prepare schematic design sketches, determine evaluation criteria and how they should be weighed, and perform a cost benefit/life cycle cost analysis.

We will then lead efforts to evaluate the condition of the (buried) distribution piping main loop system utilizing suitable test methods including, but not limited to, field inspection (random uncovering of pipe), NDI (non-destructive inspections by dye or electrical resistance testing), or other methods by a third party. A report will be provided to the owner detailing conditions and suggested remediation of negative conditions found

Once the condition of existing piping and preliminary location of any new piping is established, we will complete a hydraulic analysis of the chilled water system. This analysis will enable us to outline for discussion any pumping options available to the facility.

As part of our efforts during the study, we will be reviewing various plant improvement options with regard to energy efficiency, system reliability, maintenance efficiency, and other issues as identified by the Team.

This review will then be translated into a draft report. The draft report will be prepared in sufficient detail for the Client's review. A review meeting will be held to discuss the report's findings and to obtain the Client's comments. Written minutes of this meeting will be issued.

A final report will then be generated. This report will include at a minimum:

- An executive summary
- Evaluation of alternatives
- Recommendation of any new system concepts
- A construction cost estimate
- A preliminary scope of work
- A life cycle cost analysis for each option

Preliminary Design Phase (if authorized)

During the Preliminary Design Phase, we will confirm the final design requirements with the Client. This project is somewhat unique since there may be the need to coordinate issues with several different parties. Your Facilities group will be the main guiding force, but Administration may need to be consulted with regards to future plans. Other architects and engineers working on site may need to be consulted. Our Design Team is experienced and well equipped to handle this coordination. We will discuss all matters of the coordination with your Project Manager and maintain the desired channels of communication with each of the parties. We will keep concise, accurate documentation of meetings and conversations. After confirmation of the requirements, we will complete preliminary design drawings and outline specifications for the recommended and selected improvements.

During the completion of the preliminary drawings and specifications, we will prepare a detailed preliminary construction cost estimate.

Prefinal Design Phase (if authorized)

After acceptance of the Preliminary Design Phase documents, we will prepare complete construction drawings and specifications for implementation of the project. These drawings and specifications will be essentially complete with the exception of comments from the Client's review. We normally go beyond the construction document requirements of the Client and complete the project in 3-D. We have successfully done this on our most recent projects and have found the three-dimensional modeling extremely helpful in eliminating construction conflicts and in generating accurate sections. We can also plot multiple 3-D viewports and give the contractor a clearer understanding of exactly what the final product or installation is supposed to look like. Another service that we normally provide is to plot the various system performance curves and pump curves on the drawings. We have found this very useful in conveying to the contractor, balancing contractor, and the controls subcontractor exactly how the system is intended to operate. Along with the prefinal design documents, we will include a prefinal construction cost estimate.

Final Design Phase (if authorized)
During the Final Design Phase we will incorporate the final comments of the Client into the documents, provide a final construction cost estimate, and an anticipated construction schedule.

Bidding and Construction Phase Services (if authorized)
H.F. Lenz Company is thoroughly familiar with the State's requirements relative to Bidding and Construction Phase Services, and we have completed a number of projects for the West Virginia Department of Administration, General Services Division. We will attend pre-bid conferences and evaluate the reasonableness of the bids and their compliance with the requirements of the bidding documents. We will submit a bid evaluation and report within 15 calendar days after the bid opening.

During construction, we will provide administration of the construction documents and generally administer and review the performance of the work in accordance with the requirements of the contract.

We will provide visits to the site, approval of payment to the contractors, review of contractors' shop drawings and materials, furnish progress reports as to status of construction, provide review and approval of contractors' breakdown sheets, and prepare and review change order requests. We will also provide the final inspection for the project and provide record drawings in Revit as well as a complete set(s) of reproducible record drawings.

Systems Commissioning (if authorized)
Another service that we recommend and can offer for this project is system commissioning.

Commissioning is a detailed and intense process that verifies the systems are operating properly, efficiently, safely, and that they meet the design objectives. Proper commissioning also significantly reduces the amount of downtime required to correct problems or equipment malfunctions that are often associated with "non-commissioned" buildings.

Once the mechanical/electrical systems are installed and operational, the following commissioning tasks are normally performed:

- Verify the operation of each system component, i.e., chillers, towers, pumps, control valves, sensors, etc.
- Review specified sequences of operation.
- Simulate operating conditions and verify control sequences and proper system operation.
- Verify automatic temperature control system functions and test system safety features.
- Provide any necessary system testing to verify balancing and operation.
- Coordinate the correction of system deficiencies with the Contractor and verify their implementation

Training is another essential element in ensuring the design intent of the system is carried forth in the continuing operation of the facility. The training should include the preparation of color-coded, single-line diagrams; operations and maintenance manuals; and training sessions, which are videotaped for the training of future operations personnel. Training personnel in the proper operation and maintenance of the systems—as well as the design intent—helps in the development of a team who feels a sense of ownership. Even the visual appearance of equipment areas can enhance personnel performance by establishing a baseline of expectations.

Proper commissioning and thorough training of facility personnel will ensure the client a well-functioning facility that meets the project's goals.

SECTION 3: STAFFING PLAN

Project Staffing & Management Plan

Our firm has developed the management techniques, accountability protocols, and reporting methods to successfully and efficiently manage projects while meeting schedules and budgets. Contributing to this is the direct involvement of our senior-level Principals and Project Managers who possess the technical expertise, fully understand the Client's business or mission, and have the ability to create and maintain a collaborative environment among all Team members.

Senior Level Leadership

H.F. Lenz Company is well known for maintaining senior level leadership involvement throughout a project and this effort is no different. **Steven J. Gridley, P.E.,** will serve as the **Principal-in-Charge,** and **John M. Weiland., P.E., CEM, LEED AP** will be the Project Manager. These individuals will remain involved throughout the duration of the contract to maintain a level of consistency and oversight of the project team.

Single Point of Contact for This Contract

The designated Project Manager and Single-Point-of-Contact for this project will be **John M. Weiland., P.E., CEM, LEED AP.** John is a Registered Mechanical Engineer with 21 years engineering experience. He will function as the day-to-day Project Team leader and will be responsible for the project schedule and budget, coordinating and participating in meetings, and the checking of construction documents. Scott will also assist in bidding support and oversee the construction administration services.

Additional Senior-Level Staff

The other team members for this project are also senior-level staff with extensive chilled water system experience. They are: **Joel Shumaker, P.E.** - electrical engineer, 37 years' experience **Dave Blackner, P.E.** - structural engineer, 34 years' experience **Keith Gindlesperger, P.E.** - civil engineer, 25 years' experience **Christopher Formica** - plumbing designer, 34 years' experience

Project Management Techniques

The Project Manager's objective is to achieve ideal balance among cost, schedule, design quality, and life cycle cost, and will direct all Team Members towards this end. To accomplish this, our Project Manager will adhere to the following approach, which has proven to be successful on past projects.

Establish a Dedicated Project Team that does not change

Consistency of the team is very important in keeping all personnel aligned with the objectives and goals of the project—including budget and schedules adherence. H.F. Lenz Company has one of the lowest employee turnover rates in our industry.

Clear and efficient communication

Clear and timely communication among the Project Team is critical to developing high quality, well- coordinated construction documents that meet the project schedule and budget. During the pre-design phase of a project ideas and knowledge are shared, processes are collectively developed, and common goals are defined.

Communication is maintained throughout the entire Project through team meetings, participating in benchmarking processes, telephone and teleconferencing calls, and online collaborative applications.

Assigning Responsibilities

Staffing Plan

Maintaining the quality of work while meeting schedules and budgets, is achieved through an ongoing planning process involving dialogue among the various team members in the relationship. The key is the development of a mutual understanding of individual responsibilities, well-defined group goals, and the establishment of real communication. Early on in the process, it is extremely important to identify and assign both group and individual responsibilities. The responsibilities of each Team Member are identified for each phase of the project, from programming and design through construction and commissioning.

Promoting a collaborative environment

We place a high value on creating and supporting a dynamic collaborative environment among the Project Team where ideas and knowledge are shared, processes are collectively developed, and common goals are defined. The objective is to draw upon the collective intelligence of the entire Team, while supporting the Client's values and mission.

Principal-in-Charge
Steven J Gridley, P.E.

H.F. LENZ COMPANY

Project Management and Engineering Services

Project Manager & Mechanical Engineer
John M. Weiland, P.E., CEM, LEED AP

Electrical Engineer
Joel C. Shumaker, P.E., LEED AP

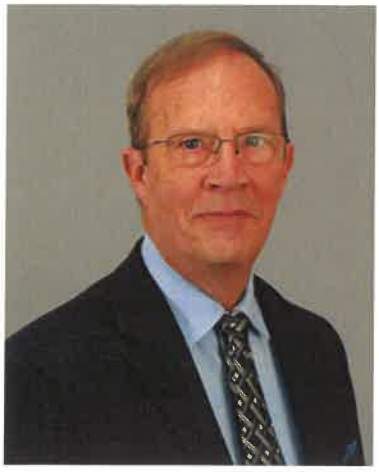
Plumbing/Fire Protection
Christopher A. Formica

Structural Engineer
David A. Blackner, P.E.

Civil Engineer
Keith A. Gindlesperger, P.E.

Construction Administration & Commissioning
Brian J. Rager

SECTION 4: RESUMES



Steven J. Gridley, P.E.

Principal-in-Charge

Mr. Gridley is responsible for the master planning and design of colleges and universities, health care facilities, industrial facilities, data operations centers, commercial office buildings, utility systems, and renovation/retrofit of historic buildings for private, public, and governmental agencies. He is experienced in the design of chilled water, steam, hot water, refrigeration, air distribution, heat recovery and control systems, underground power distribution systems, uninterruptible power supplies, and interior building distribution systems of all types including building lighting, building security and surveillance, fire protection, normal and emergency power distribution, communication systems, and computer power systems.

Education
Bachelor of Science, Architectural Engineering, 1979, Pennsylvania State University

Experience
H.F. Lenz Company 1979-Present

Professional Registration / Certification
Licensed Professional Engineer in all 50 States and the District of Columbia

Professional Affiliations
First Place, 1987 ASHRAE International Energy Award

National Society of Professional Engineers

Pennsylvania Society of Professional Engineers
American Society of Heating

Refrigerating and Air-Conditioning Engineers

Building Officials Code Administrators International

Professional Engineers in Private Practice

National Fire Protection Association

Project Experience

West Virginia State Capitol Complex, Charleston, WV
- New 4,500 SF chiller plant consisting of three (3) 1,200-ton and two (2) 600-ton industrial grade centrifugal chillers
- New chilled water loop consisting of 5,000 feet of direct burial chilled water piping of various sizes

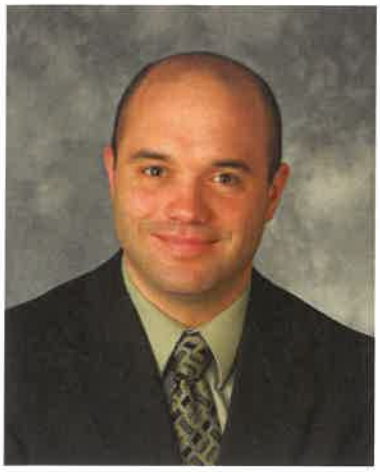
University of Pittsburgh, Pittsburgh, PA
- Phased retrofit of existing chilled water plant to provide added chilled water capacity to serve approx. 30 buildings; PH I added two new 2,250-ton chillers, PH II replaced existing with a 2,250-ton chiller, PH III replaced a 2,000-ton chiller
- Design of approximately 6,000 LF of new chilled water piping using a combination of direct burial, shallow trench, and tunnel-installed methods

West Virginia University Hospitals, Morgantown, WV
- New 4,200-ton central chiller plant to serve one million SF of clinical and administrative space

West Virginia University, Morgantown, PA
- Chilled Water Plant expansion including design for a third and fourth 1,400-ton chiller with VFD, a free cooling heat exchanger system, and fourth cooling tower

Conemaugh Memorial Medical Center, Johnstown, PA
- Design of a new chiller plant and chilled water distribution system to serve an 850,000 SF medical center campus; utility distribution is through a 600-ft. walk-through utility tunnel containing two 20-in chilled water lines

The Ohio State University, Columbus, Ohio
- Installation of 8,000 tons of additional cooling capacity to the University's existing power plant which serves most of the Ohio State University main campus



John M. Weiland, P.E., CEM, LEED AP

Project Manager & Mechanical Engineer

Mr. Weiland specializes in the design of HVAC systems for colleges and universities and healthcare facilities. His responsibilities include client contact, project scheduling, preparation of reports and cost estimates, coordination and supervision of project design teams and other projects management functions. His duties include design calculations, equipment selection, schematic and construction document design, specification writing, and life cycle cost analyses.

Education
Bachelor of Architectural Engineering, 2002, Pennsylvania State University

Experience
H.F. Lenz Company 2002-Present

Professional Registration / Certification
Licensed Professional Engineer in PA

Certified Energy Manager

LEED Accredited Professional

Professional Affiliations
ASHRAE – Johnstown, PA Chapter

Project Experience

University of Pittsburgh, Pittsburgh, PA
- *Chilled Water Master Plan for Investigating* the feasibility and options for distributing chilled water to 8 campus building

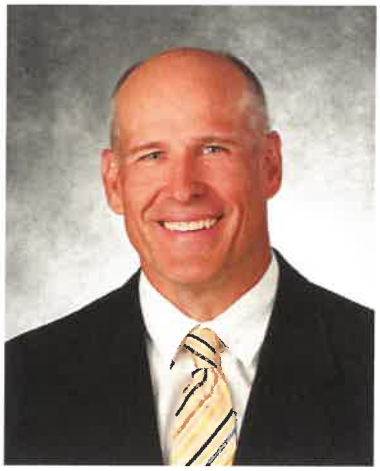
West Virginia University, Morgantown, WV
- Chilled Water Plant expansion including design for a third and fourth 1,400-ton chiller with VFD, a free cooling heat exchanger system, and fourth cooling tower
- Extension of a 6-in chilled water line from the campus central chilled water system to serve 3 buildings; the piping is direct burial; project included the structural engineering design for a new chilled water vault

West Virginia University, Evansdale Campus, WV
- Multiple chiller replacements required to serve additional campus buildings, the design incorporated VFDs for improved capacity control and efficiency

Indiana University of Pennsylvania, Indiana, PA
- Chilled Water Plant expansion including addition of 2,000-ton chiller, cooling towers, condenser pumps, Siemens Controls, and electrical MCC control center
- Planning and design for extending chilled water, natural gas, and electric service to 9 new student housing buildings comprising a total of 1.3 million SF
- Fisher auditorium renovation and addition including a new chiller plant

University of New Hampshire, Durham, NH
- Feasibility Study for New Chilled Water Thermal Energy Storage Tank

Lock Haven University, Lock Haven, PA
- Replacement of chillers at four campus buildings; also included was a new cooling tower for two buildings on the campus



Joel C. Shumaker, P.E., LEED AP

Electrical Engineer

Mr. Shumaker is responsible for client contact, project scheduling, preparation of reports and cost estimates, coordination and supervision of project design teams, and other project management functions. Mr. Shumaker is experienced in the design of electrical systems for both new buildings and building retrofits for educational, health care, commercial, government, industrial, residential, and utility-related facilities. He is experienced in the design of power distribution systems; emergency power systems and monitoring; uninterruptible power supplies; lighting and emergency lighting systems; fire alarm systems; nurse call; security; sound; and telephone systems.

Education
Bachelor of Science, Electrical Engineering Technology 1993, University of Pittsburgh at Johnstown

Experience
H.F. Lenz Company 1985-Present

Professional Registration / Certification
Licensed Professional Engineer in PA, CT, DE, MD, NY, VT, VA, and WV

Professional Affiliations
Pennsylvania Society of Professional Engineers,

Johnstown Chapter Secretary National Society of Professional Engineers

Keystone Chapter of Association of Physical Plant Administrators

International Society of Pharmaceutical Engineers (ISPE)

Project Experience

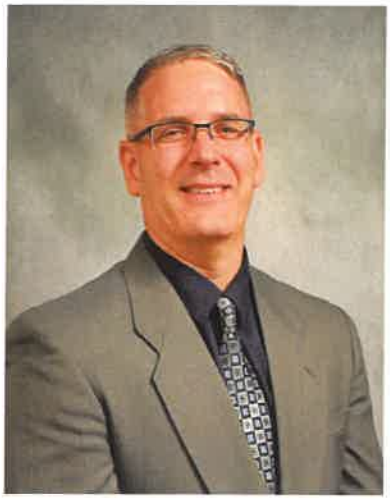
Indiana University of Pennsylvania, Indiana, PA
- Chilled Water Plant expansion including addition of 2,000-ton chiller, cooling towers, condenser pumps, Siemens Controls, and electrical MCC control center

University of Pittsburgh, Pittsburgh, PA
- Phased retrofit of existing chilled water plant to provide added chilled water capacity to serve approx. 30 buildings; PH I added two new 2,250-ton chillers, PH II replaced existing with a 2,250-ton chiller, PH III replaced a 2,000-ton chiller and new plant controls
- Design of approximately 6,000 LF of new chilled water piping using a combination of direct burial, shallow trench, and tunnel-installed methods

West Virginia University, Morgantown, WV
- Analysis and extensions of the campus underground utility systems to support the redevelopment of the Evansdale Campus; included relocation of the campus chilled water distribution system

West Virginia University Hospitals, Ruby Memorial Hospital, Morgantown, WV
- Central plant to serve one million SF of the hospital campus including a new 4,200-ton chiller plant, with the associated cooling towers, interconnected with two existing 750-tons chillers and two 400-ton chillers

Lock Haven University, Lock Haven, PA
- Replacement of chillers at four campus buildings; also included was a new cooling tower for two buildings on the campus



Christopher A. Formica

Plumbing/Fire Protection System Designer

Mr. Formica is responsible for the complete plumbing design for hospitals, colleges, schools, office buildings, prisons, and laboratories. He is responsible for system design, layout, specifications and calculations, selection and sizing of equipment, cost estimates, and site survey work. Mr. Formica coordinates the plumbing design with utility companies, with other trades, and with the Project Engineer and Project Architect; and is responsible for assembling complete and accurate plumbing bid documents which meet H.F. Lenz Company standards.

Education
Associate in Architectural Design, 1989, Pennsylvania Technical Institute

Experience
H.F. Lenz Company 1997 - Present
Dynamic Design Company 1996
Miller-Picking Corp. 1993 - 1995
Dupont-Belcan. 1991-1993
Simions Eastern. 1989-1991

Project Experience

Indiana University of Pennsylvania, Indiana, PA
- Chilled Water Plant expansion including addition of 2,000-ton chiller, cooling towers, and condenser pumps
- Renovation and addition to the historic Fisher Auditorium and new chiller plant

West Virginia University, Morgantown, WV
- Downtown Chiller Installation of a third and fourth 1,400-ton chiller with VFD, a free cooling heat exchanger system, fourth cooling tower, and associated electrical
- Arnold Hall Boiler - three new natural gas-fired low pressure steam boilers with a steam capacity of 2,760 pounds per hour each

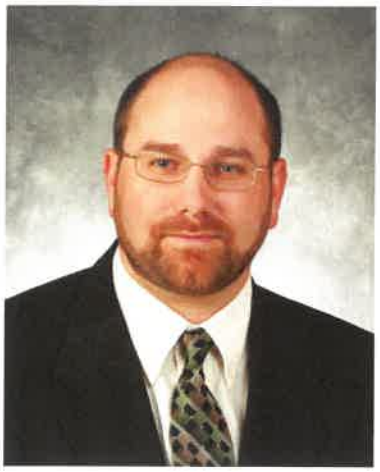
Lock Haven University, Lock Haven, PA
- Installation of two chillers and a new cooling tower for Bentley Hall and Stevenson Library

Mansfield University, Tioga County, PA
- Installation of new 3,000 MBH boilers in Decker Gym, Butler Center Music Building, and the Fieldhouse

CDC/NIOSH – Pittsburgh, Pennsylvania & Morgantown, WV
- Bruceton Research Center - comprehensive study for the decentralization of a boiler plant serving 51 buildings
- Open-end Contract

University of Pittsburgh, Pittsburgh, PA
- Replacement of the existing plumbing and fire protection systems on all 15 floors of Benedum Hall over three project phases
- Replace 2,250-ton chiller at Posvar Hall Chiller Plant

University of Pittsburgh at Johnstown, Johnstown, PA
- New 7,400 SF John P. Murtha Center for Public Service
- New 26,000 SF, two-story Nursing/Health Science Facility



Keith A. Gindlesperger, P.E.

Civil Engineer

Mr. Gindlesperger holds a bachelor's degree in Civil Engineering Technology with experience in site planning and design for numerous types of educational, commercial, and government facilities. His responsibilities in these areas include site design, site utilities, parking and traffic circulation, roadway design, stormwater management, and erosion and sedimentation control. He also has experience working with local municipalities enforcing local planning and zoning codes. He has completed continuing education in stormwater management.

Education

Bachelor of Science, Civil Engineering Technology, 1998, University of Pittsburgh at Johnstown

Experience

H.F. Lenz Company 1998 – Present

Professional Registration / Certification

Licensed Professional Engineer in PA, MD, VA, and WV

Project Experience

West Virginia University, Morgantown, WV

- Site design for the phased design of the new Ag Sciences Building II. The design included site utilities, grading and drainage plan, stormwater management plan, erosion and sedimentation control plan, WV DEP Permitting, Morgantown Utility Board Approvals

Indiana University of Pennsylvania, Indiana, PA

- New chiller plant in connection with Fisher Auditorium addition
- Topographic and utility survey of an approximately 15 acre portion of the campus.

National Energy Technology Laboratory (NETL), Various Locations

- Civil/site design for building renovations and utilities projects at NETL sites West Virginia and Pennsylvania

Robert Morris University, Moon Township, PA

- Complete civil/site design for new 170,000 SF Events Center, included traffic circulation and parking facilities

Mansfield University, Tioga County, PA

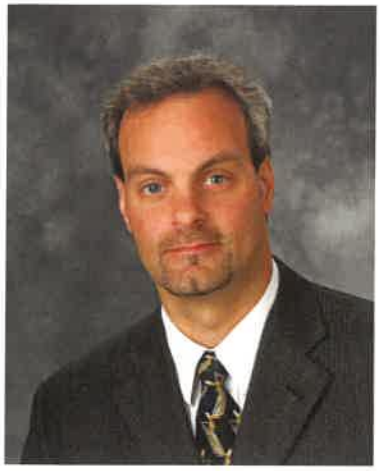
- Installation of new boilers in Decker Gym, Butler Center Music Building, and the Fieldhouse

Carnegie Mellon University, Pittsburgh, PA

- Utility design, drainage design, stormwater management, erosion and sedimentation control plan for new dormitory

Slippery Rock University, Slippery Rock, PA

- Civil engineering for a new student housing development
- Replace portion of direct burial Lower Campus steam line
- New steam tunnel (550 LF) with service laterals to five buildings



David A. Blackner, P.E.

Structural Engineer

Mr. Blackner is responsible for the complete layout, design and detailing of building structural systems. He has diverse experience in the structural analysis and design of projects involving steel, engineered masonry, reinforced cast-in-place concrete, pre-cast/pre-stressed concrete and wood frame structures. He is proficient in multiple analysis platforms (STAAD, RAM Structural Systems, 3-D Analysis and Finite Elements). He also oversees structural coordination with other trades, as well as conducting periodic site visits related to the structural work.

Education
Associate, Mechanical Engineering Technology, 1988, Pennsylvania State University

Associate, Architectural Engineering Technology, 1988, Pennsylvania State University

Experience
H.F. Lenz Company 1998-Present

L. Robert Kimball & Associates 1995-1998

George D. Zamias Developer 1989-1995

Professional Registration / Certification
Licensed Professional Engineer in PA, AZ, CO, CT, DE, GA, ME, MD, MA, NY, and NC

Project Experience

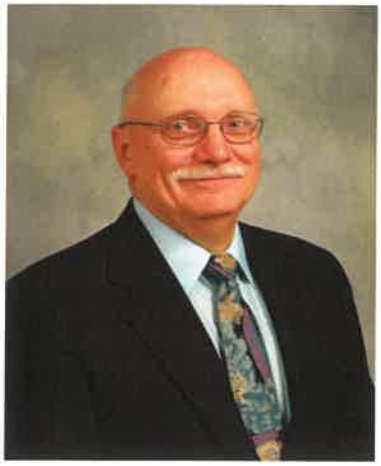
Veterans Affairs Medical Center, Pittsburgh, PA
- New 1,250 ton chiller and replace three existing 750-ton cooling towers with three new 1,250 ton cooling towers

Indiana University of Pennsylvania, Indiana, PA
- Fisher Auditorium renovation and addition including the addition to the existing boiler/chiller plant of approximately 3,700 gross SF

Carnegie Mellon University, Pittsburgh, PA
- Addition of a 900-ton chiller and cooling tower to the Physical Plant building
- Phase 2 upgrade to the Mellon Institute chiller plant, which included two new 600-ton chillers and a 700-ton cooling tower Replacement of the roof-mounted cooling towers at Physical Plant building with new four cell cooling tower totaling 3000 tons and replacement of a 500-ton chiller with a 800-ton chiller
- Replacement of the cooling towers at the Wean Hall chilled water plant, overall capacity is 3000 tons

Cleveland Clinic, Cleveland, OH
- Cooling tower replacement project which involved demolishing three built up towers and replacing the entire cooling tower system with two new towers and a third relocated tower that matched the two new towers

Bank of New York Mellon, Pittsburgh, PA
- One Mellon Center - Cooling Tower Replacement project - The removal and replacement of the cooling towers and chilled water plant replacement



Brian J. Rager

Construction Administration & Commissioning

Mr. Rager serves as a Construction-Administration Representative and Commissioning Technician for all types of heating, ventilating, air conditioning, plumbing, fire protection, electrical, building management, automatic temperature control, and site utility projects. His CA responsibilities include on-site troubleshooting; monitoring and observing construction workmanship; enforcing applicable codes during construction; attending construction and coordination meetings; providing cost estimates for contract revisions; and reviewing vendor/contractor submittals. He also has a thorough knowledge of system design concepts and is responsible for carrying out the company standard of quality during construction. His commissioning responsibilities include performance testing; review of design documents; site visits; review of O&M manuals; preparation of systems manual; and analysis of energy using systems

Education
Associate Degree, Electronics Engineering Technology, 1977, Ohio Institute of Technology

Experience
H.F. Lenz Company 1980-Present

Project Experience

Carnegie Mellon University, Pittsburgh, PA
- Construction Administration for Phase 1 upgrade to the Mellon Institute chiller plant, which included a new 400-ton chiller and a 600-ton cooling tower

Social Security Administration, Woodland, MD
- Construction Administration for addition of a 1,250-ton chiller capable of operating simultaneously with three existing chillers for a total plant capacity of 5,000-tons

UPMC Magee Womens' Hospital Chiller Plants, Pittsburgh, PA
- Commissioning services for the renovations to the 0203 chilled water plant.
- Commissioning services for the 0695 chilled water plant

OSU McCracken Power Plant Chiller Expansion, Columbus, OH
- Construction Administration for the installation of 8,000-tons of additional cooling capacity to the plant at Ohio State University; included addition of electrical switchgear

Veterans Affairs Medical Center, Pittsburgh, PA
- New 1,250-ton chiller and replace three existing 750-ton cooling towers with three new 1,250 ton cooling towers

Veterans Affairs Medical Center, Philadelphia, PA
- Replacement of two 300-ton chillers and cooling tower in the Research Building

SECTION 5: CONTROL OF QUALITY, DESIGN, BUDGET, & SCHEDULE

Design Quality

The quality of our Team's construction documents are among the best in the industry. In fact, it is not uncommon for contractors to request copies of our CADD files for their use in preparing shop drawings. Our 3D CADD and/or Revit drawings of critical mechanical and electrical systems have historically resulted in better coordination between trades, aided contractors in visualizing how installation is to occur, and produced more competitive bidding.

We employ several internal processes to ensure completeness and coordination of the design between the various disciplines and to reduce the number of Change Orders. This process has been the core of our design approach and has an excellent success rate for our complex projects that include steam heating plants, chilled water plants, electrical distribution systems, and other MEP infrastructure improvements. The following processes have been developed by our firm over time and are used on every project.

- ***High Level Involvement*** – A senior Principal of the firm with extensive experience in multi-discipline projects will be directly involved with the project throughout its duration.
- ***Clear and efficient communications Among a Dedicated Design Team*** – The proper management and supervision of a dedicated design team that does not change personnel is a key element to producing contract documents that are well coordinated, within budget, meeting time schedules, and in conformance with the Owner's requirements and project objectives.
- ***Ongoing Design Reviews*** – In addition to the formal design reviews, we strive to make design review an ongoing part of the design process. We accomplish this by using progress meetings as the key component in a strategy of constantly aligning expectations between the Owner and the design team.
- ***Constructability Reviews*** – In the pre-construction phase our engineers often participate in constructability reviews that check for completeness of design documents and design coordination between engineering disciplines. An evaluation of the constructability of final construction documents can be performed at this time.
- ***Employing Experienced Field Personnel*** – Utilizing Construction Phase Representatives who understand both the construction phase and the design process greatly aids in the ability to effectively monitor construction and resolve problems. Their efforts consistently avoid unnecessary deletions, substitutions, and change orders.
- ***Adhering to our Quality Control Program*** –Quality Assurance and Quality Control are an integral part of the H.F. Lenz Company design process. The objective is the highest level of consistency and quality achievable in design and document production. It relies on verification of the design procedures resulting in solutions that match the client's design criteria. Quality Assurance and Quality Control involve an on-going process of review and documentation at every task level and within each discipline. The control documentation is intended to be a "traceable" means of "accountability" in the decision-making process

Budget Control

Value Engineering and Life Cycle Costing are key components of the H.F. Lenz Company cost control program. These tools allow evaluation of design options using engineering economic analysis. The benefit to the Client is a facility that has equal or more utility at reduced cost.

Value Engineering is the continuous review of material to be supplied under the contract for the purpose of identifying and questioning constraints to achieving the required function or objective at the lowest overall cost consistent with the desired performance/appearance requirements. Value Engineering does not always translate to initial cost reduction. Value Engineering also incorporates the review of "value" for the project. This value may involve increasing the initial project cost to save money over the life of the project. This action involves the use of Life Cycle Cost Analysis to evaluate the overall system cost and assist in decision making to select the best system option for the life of the project.

Life Cycle Costing is the continuous review of material to be supplied under the contract for the purpose of evaluating construction costs (first costs) along with costs of operating and maintaining these materials for their expected usable life and finding those materials that have the lowest overall cost consistent with the desired performance requirements.

H.F. Lenz Company has completed Life Cycle Cost Analysis to determine the most effective mechanical and electrical systems for many commercial and institutional projects. In addition to Life Cycle Cost, however, the Client often has other criteria that the mechanical/electrical systems must meet. By using a matrix, we compare the priority ranking of the client's criteria with how well the various mechanical and electrical systems meet each criterion. This matrix has proven to be a useful tool in selection systems that meet all of the Client's criteria, including Life Cycle Costing.

Contractor Input in Managing Costs. If the contractor is known and available during the design of a project, many cost-saving benefits can be realized by obtaining their input at this time. Contractors usually have good information available that relates to purchasing construction materials. These contractors have purchasing agents who know which products are the most competitively priced. They are also very much aware of important items like product availability, product quality, and realistic delivery schedules. In many cases, the contractors have many years of experience maintaining the items that are being purchased for a new project. With this information, the contractor can provide accurate maintenance track records for various types of equipment. All of this information is used in the life cycle costing and the value engineering efforts that take place in the early stages of design.

When a construction contractor is working as a partner with the design team, the contractor will become actively involved with the life cycle costing and the value engineering effort as described. Contractors also have purchasing agents who are very skilled at expediting high-quality materials at a reasonable cost. The input of these personnel is quite valuable during all stages of design. Their suggestions and comments can often be incorporation with the design documents. Within this scenario, labor-saving techniques become part of the design. Our firm welcomes the opportunity to partner with experienced cost estimators and construction supervisors during the design portion of the project.

Meeting Project Schedules

Vital to any well-organized project is an orderly procedure to coordinate efforts and meet schedules. Proper scheduling and control enables the Project Team to address project essentials during any phase of a project in order to prevent needless duplication of effort or lost time waiting for the development of information that may be critical to work flow. To facilitate meeting project schedules, we incorporate the following strategies:

Control of Quality, Design, Budget, & Schedule

- Regular communication between the Project Team and the Owner's engineering staff
- In-house progress review meetings, Principal-in-Charge evaluation
- Weekly Team scheduling meetings for coordination and allocation of resources
- Contact appropriate personnel when reviews from the Owner's staff are not returned by the scheduled date
- Construction schedules must be compiled and updated on a regular basis to permit the identification of both potential conflicts and opportunities, which when addressed early enough in the process, provide for a project completed within the desired time frame. Schedules must include milestone dates which are used to monitor construction

When authorization to proceed has been received, the Principal-in-Charge and/or Project Manager (PM) meets with the client and user group to establish the project scope and specific completion milestones. Afterwards, an initial project scheduling meeting is held where the PIC, PM, and key consultants establish a realistic timetable, estimate staff hours, identify the specifics of key project requirements, and outline the efforts of each discipline.

At the start of each project, the Project Manager enters the starting date, completion date, estimated staff hours per discipline, and total fee for the project into a database. A weekly job scheduling report tracks the project in terms of percent complete and staff hours expended.

Another method we use to monitor design schedules is through Gantt charts using Microsoft Project software. This database depicts lead and lag time relationships between tasks, project milestones, critical and non-critical tasks, and priority levels. As the project progresses, the Project Manager inputs the percentage of completion for each task and can adjust resources, tasks, or the schedule as necessary. The resulting charts and reports advise of any work slippage or over-allocated resources that require attention. This schedule control assures that project submissions and completion dates are met and provides a current and continuous status and work effort projection.

Control of Quality, Design, Budget, & Schedule

Deviating From Design, Schedule, & Budget

Today's supply chain issues often necessitate deviations from design and schedule and many times impact the budget. Material delays often result in the need to quickly evaluate alternate solutions or material selections to keep the project on schedule. These alternates must be weighed as to their impact on quality and the budget. For the past two years, especially, we have worked with owners and contractors to resolve these deviations to the satisfaction of the owner and have communicated their impacts to the team.