

# BALANCE

NEWS FROM BALA CONSULTING ENGINEERS, INC.

*Practicing the Art of Engineering*

WINTER, 2001 • VOL. 5

## *Projects* OF SPECIAL NOTE



(From left to right, top row Richard Wizeman, Gregory DeMarco Bala Consulting Engineers, and Clark Pidcock, IDA. Bottom Row James Goshow, General Hayden, NSA, and William Westhafer, Cathers& Associates

## INSTITUTE FOR DEFENSE ANALYSES CENTER FOR COMMUNICATIONS RESEARCH

December 7, 2000 marked the ground breaking for the Institute for Defense Analyses new Center for Communications Research. Bala provided structural, HVAC, electrical, plumbing and fire protection design for this new 60,000 square foot, two-story office building. The systems were designed to conform to the strict requirements of National Security Agency (NSA) standards, with special attention given to the level of noise from the mechanical systems inside the research areas. The Architect for the project is Cathers & Associates, Inc. of Malvern, PA.

The IDA is a non-profit organization, whose purpose is to promote national security and public interest. Their mission is to assist the Office of Secretary of Defense, the Joint Staff, the unified commands and defense agencies in addressing important national security issues, particularly those requiring scientific and technical expertise.

## COMMISSIONING/CERTIFICATION OF EDUCATION FACILITIES

The well publicized, fast-paced growth of construction at higher education institutions has put added pressure on schools' facilities staff to get buildings constructed quickly and operating properly. Complicating the issue is education in the 21st century demands campuses have a broad range of sophisticated building types, from Advanced Classrooms to Research Laboratories (see **Case Study** insert). These buildings have sophisticated Heating, Ventilation and Air Conditioning (HVAC) systems, Uninterruptible Power Systems (UPS) and complex digital control systems. Therefore, many schools are wisely seeking technical assistance to bring these buildings on line.

### WHAT IS COMMISSIONING?

Different levels of commissioning services are being offered today. The Association of Higher Education Facilities Officers (APPA) publishes a 303 page Building Commissioning Handbook that provides specifications, clear performance requirements and extensive testing of building's systems and components in order to reduce the risks of system malfunctions. The American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE) defines commissioning as the "process of ensuring that the systems are designed, installed, functionally tested, and capable of being operated and maintained to perform in conformity with the design intent." In more relevant terms, facility systems are expected to function reliably and as expected. One college's VP for Administration summarized commissioning services as "Added insurance that our new facility will work."

### WHO TO HIRE?

Schools must decide whether to hire an independent "Third Party" firm or, assuming they offer commissioning services, add these services to a member of the project's existing design team. Arguments can be made on both sides. Some schools choose engineering firms that have separate, independent Commissioning Departments that closely monitor in-house projects objectively. The lines of communication within the firm can enable commissioning to be accomplished

continued on page two



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COMMISSIONING EDUCATION FACILITIES  
continued from page one

with greater ease and precision. Other schools believe that "another set of eyes" from a separate firm will provide impartial objectivity and greater representation of the owner's interests. Bala performs commissioning services for in-house projects and also as a Third Party firm. For either approach, a Commissioning Agent, must be involved early in the design process so that critical building systems can be identified and proper testing procedures written into the design documentation and specifications.

**BALA CONSULTING ENGINEERS' APPROACH-  
INTERSYSTEM RELIABILITY**

Bala's commissioning services is an out-growth of the more stringent, FDA regulated, pharmaceutical Validation program. Headed by Daniel J. Tisak, Bala's Validation/Certification Department is independently structured to provide a diverse range of consulting services in the higher education, pharmaceutical, biotech and commercial markets.

Bala takes commissioning one step further by providing "Certification" services. Our Certification services not only provide a comprehensive approach for sustainable design, construction administration and system maintainability but also focuses on the *intersystem reliability* of a building's critical systems. Certification test procedures are written to provide a planned approach founded on engineering criteria for the facility.

Certification testing is a "final exam" that demonstrates intersystem reliability. Bala strongly contends that intersystem reliability through certification is the key to successful turnover of 21st century education facilities.

Intersystem reliability tests individual systems and components AND coordinates the interaction between critical systems. For example, in simulating a fire event, Bala tests and documents that the Fire Protection System, HVAC system and Building Management System all work together as designed and correctly respond to the fire event.

School officials want assurance that their facilities will operate as intended.

**VERTICALNET**  
Designing at the speed of e-business.

One of Bala's recent challenges was designing space for the internet's leading creator and operator of vertical trade communities, VerticalNet. Bala had 40 working days from date of award to client move-in to convert a 45,000 sq. ft. warehouse space into a fun yet professional office environment. In May, Bala began working with Drew Christy and Gene Godick of VerticalNet, Stevie Crum of Collaborative Design and Bob Shields from Shields Construction on this fast-track design/build project. The move-in date was July 12th and the clock was ticking.

Bala's role in the project was both the Owner's Representative and engineer. With no time for design development the project went straight from Site Survey to Schematic Design to Construction Documents. Bala issued performance specifications for all disciplines (mechanical, electrical, plumbing and fire protection) and reviewed all design build documents. Bala's affiliate firm, Bala Technologies, provided the design and installation of the voice/data systems. The building was also re-skinned, adding more windows, to give every employee the benefit of natural light.

The warehouse space was challenging to design within the budget and schedule parameters, but was clearly the space that best suited VerticalNet. The organizational structure of the company is mostly horizontal and thrives on teamwork. The warehouse offered the best environment for teams to work together and still have room to grow. The facility includes numerous team working rooms, coffee bars, an exercise room and even a game room. These areas are all essential parts of VerticalNet's fun professional environment and encourages their employees to communicate frequently.

In order to keep the illusion of a higher space, ceilings were only installed along the perimeter of the building. The areas without ceilings used painted steel and round ductwork to maintain the fun atmosphere. Concerns about acoustics were resolved with the help of Felicia Doggett of Metropolitan Acoustics.

All move-in dates were met. Everyone involved on this job was very pleased with the new facility and the team has continued together on six subsequent expansions.

Surprisingly, many colleges and universities never conduct final comprehensive tests of their most critical facilities. When problems surface, the design team and trade contractors are long gone. Corrective action after building turnover can be costly. Failure of critical systems can expose the schools to a range of problems from annoying inconveniences and interruptions, to great risk to the facility and personnel.

**THE BENEFITS OF COMMISSIONING**

The objective of any school's Commissioning/Certification program must be to establish documented evidence that a building's critical systems are reliable, installed correctly and will be properly maintained. A well conceived program will provide the following:

- u Specified design and construction obligations are met.

- u Deliverables are handed over in an organized and timely manner.
- u Facility systems work independently and together as intended.
- u Facility systems "debugging" and "burn in" phase is reduced.

Ultimately, the increasing complexity of 21st century education facilities will demonstrate with greater clarity that the commissioning and certification processes make sense and are wise investments. Certification especially challenges those involved to "think outside the box". This higher level of thinking encourages successful building turnover and achieves the necessary intersystem reliability.

For specific information on Commissioning Education Facilities see the enclosed Case Study or email [djt@bala.com](mailto:djt@bala.com).

## RESIDENCE HALL FIRE SAFETY



**B**ala Consulting Engineers has expanded its Fire Protection design services to meet the growing concerns on the academic campuses. Both New Jersey and Pennsylvania have instituted legislation requiring the state managed colleges and universities to develop five year plans to install automatic sprinklers or other automatic fire suppression systems in certain types of residence halls.

Because of the enormous capital costs, well conceived, prioritized plans are paramount. The Pennsylvania State System of Higher Education estimates its 147 residence halls will cost between \$50 and \$88 million dollars--and more if underground water supply upgrades are included.

Bala Consulting Engineers, Inc. has added Donald K. Sutton, PE to our Fire Protection Department to help address these fire protection issues. Don Sutton and Bala bring a professional engineering perspective to evaluation and compliance to the complex issues of safety and fiscal responsibility. We evaluate the new State Codes, the individual school's assortment of buildings and supporting utility infrastructure, future campus plans plus the college's or university's existing Protection program to develop safe and practical solution. Issues that are addressed include:

- u BUILDING COMPLIANCE CRITERIA
- u COST EFFECTIVE DESIGN SOLUTIONS
- u PHASED IMPLEMENTATION PLANS (BY FLOOR AND BY BUILDING BASIS)
- u CAMPUS WATER SUPPLY (POTABLE/NON POTABLE)
- u ARCHITECTURAL AESTHETICS

Bala Consulting Engineers' and Don Sutton's management philosophy is to assess each school's unique needs and existing conditions, then develop a prioritized, cost effective plan to make the campus buildings safe for their students. For information contact [info@bala.com](mailto:info@bala.com).

## WIMBLEDON@BALA



The third annual Wimbledon@Bala is not far away. Be sure to keep some dates in the last week of June reserved. Last year's Wimbledon@Bala tennis event was a huge success. Despite some light showers a great time was had by all

attendees, clients, and colleagues. The 1st and 2nd place winners (pictured here) received engraved crystal awards from Tiffany's. Bala plans on making this an annual event. Please contact **Suzanne Cammarota**, [smt@bala.com](mailto:smt@bala.com), if you're interested in participating.

Projects  
OF SPECIAL NOTE

continued from page one

**BRISTOL-MYERS SQUIBB COMPANY**

Data Center expansion including new services and infrastructure to increase reliability and capacity for new computing equipment.

**MILLENNIUM CORPORATE CENTER**

Structural engineering services for this new 570,000 square foot corporate campus.

**SAP AMERICA**

Electrical and Fire Suppression upgrades to the 42,000 square foot data center to accommodate 360 additional servers.

**MAIN LINE EXECUTIVE CAMPUS**

Structural design and documentation for two 90,000 s.f. three-story office buildings in the Frazer, PA executive campus.

**GLOBESPAN**

Tenant fit-out for 100,000 s.f. of office and electronic laboratory space. Electronic labs design includes separate HVAC & power distribution, static free flooring and isolated grounds.

**EMCORE**

Numerous renovations and expansions for this manufacturer of compound semiconductor solutions.

**MERCK & COMPANY**

Multiple projects including a new training center and the conversion of a warehouse facility in Lansdale, PA to a new order management center.

**INTERNATIONAL FLAVORS & FRAGRANCES (IFF)**

Tenant fit-out for their new corporate headquarters in New York City and engineering services for their Creative Center in Hazelton, NJ.

**SCHERING PLOUGH**

Numerous office and laboratory renovations, plus validation of the HVAC systems at their Kenilworth, NJ facility.

**EPI GENESIS**

Renovation to existing laboratory space for a vivarium and research and development lab.

**QUAKER CHEMICAL**

Structural design for two building additions totaling 100,000 s.f. plus conversion of a warehouse facility retrofit to office space.

**ROWAN UNIVERSITY**

Numerous renovation projects for classroom buildings, residence halls, and academic offices on the campus, including boiler and chiller replacements.

**LAFAYETTE COLLEGE**

Engineering services for the \$8.0 million renovation to Alumni Hall of Engineering/Dana Hall and Dana Laboratory.

**URSINUS COLLEGE**

Central Plant Chiller feasibility study.

## COMMISSIONING/CERTIFICATION OF HUGEL SCIENCE CENTER



Lafayette College recently underwent a major addition and renovation to its existing Olin Hall, which has transformed the structure to a 21st century science complex. The first phase of the two phase project included a 40,000 s.f. addition, recently dedicated as Hugel Science Center, and houses state of the art Chemistry laboratories, high tech classrooms, two lecture halls and a new mechanical plant. The second phase has been a total retrofit of the existing building to accommodate additional Chemistry teaching labs, the Physics Department and classrooms for the Math Department.

Lafayette selected Ellenzweig Associates as architect for the project. Lafayette also sought the services of a "Commissioning Agent" to assist in certifying the operations of the facility's critical engineering systems. Lafayette chose Bala's Validation/Certification Department to conduct both a Phase 1 (Building Addition) and Phase 2 (Total Project) Certification Program.

## Project METHODOLOGY

The objective of Bala's Certification Program was to establish documented evidence that the facility's critical systems were reasonably designed, installed correctly and operated reliably. Also of great importance was the *intersystem* testing program to demonstrate that the critical systems worked together as intended.

Bala's responsibilities included the following tasks:

**Peer Review** Reviewed critical engineering systems design documentation, specifications, construction sequencing schedules plus installation and testing procedures.

**Certification Test Procedures** Developed a comprehensive program specification to be implemented by trade subcontractors to ensure that testing is completed in an organized, logical manner and in accordance with the design intent.

**Site Observation** Conducted monthly field visits and witnessed all major testing of equipment and systems.

**Problem Solving** Assisted with correction of deficiencies found during the design review, site visits, and testing.

## CRITICAL SYSTEMS

The Hugel Science Center contains over 70 laboratory fume hoods, redundant chilled water plant and tie-in to the campus steam loop. An Automatic Temperature Control (ATC) System using Direct Digital Controllers (DDC) manages the facility. In cooperation with Lafayette's Plant Operations engineers and the project's Program Manager, Bovis Lend Lease, the following systems were determined to be critical to the operations of the Hugel Science Center:

- u Laboratory Fume Hoods
- u Fire Protection

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## *Project* **METHODOLOGY** continued from front

- u Emergency Power Generation
- u HVAC
- u ATC/DDC
- u Reverse Osmosis/Deionized (RO/DI) Water

Bala performed a peer review of the engineering design and issued a Design Review Report focusing on the critical systems using the following criteria:

- u Design intent
- u Emergency operations
- u Intersystem testing
- u Preventative maintenance and training programs
- u Control interface
- u Recommendations

Concurrently, Bala developed a Commissioning Procedures Specification Test Checklist that compiled every specified test for each critical system. To avoid trade subcontractor confusions and disputes, the checklist cross-referenced all testing requirements with the design team's specification and identified who was the subcontractor responsible for each test. The checklist was reviewed during several construction meetings for comments and clarifications by the College, the design firm and subcontractors.

Bala's third responsibility was to develop a Critical Systems Test Procedures Manual that provided written test procedures for each of the six critical systems. These test procedures also cross-referenced all testing requirements with the design team's specification. The test procedures focused on intersystem testing as well as system tests. A sampling include:

### **FUME HOODS**

- u Performance Testing (smoke and face velocities)
- u HVAC/ATC Interaction
- u Alarm Operational Testing

### **FIRE PROTECTION SYSTEM**

- u HVAC/ATC interaction

### **EMERGENCY POWER**

- u Power failure/return to normal conditions
- u Critical equipment supply
- u Fire protection and elevator operation interaction

### **HVAC/ATC**

- u Interlock operation of air handling units (AHUs), chillers, and controls
- u Equipment start/stop and feedback

### **RO/DI**

- u Automatic Flushing and Backwash Cycles
- u Operating Indication/Alarms with ATC/DDC
- u Emergency Power Mode

## **PROJECT SUMMARY**

Lafayette occupied the laboratory intensive addition while renovation continued in the existing building. The Critical Systems Test Procedures Manual outlined the testing procedures to be conducted for the addition plus the retesting of critical systems of the entire Hugel Science Center at the conclusion of the project.

Several issues were uncovered and corrected during the course of the program that would not have been discovered if the program was not in place. For example, durations for system shut down and lag chiller start were lengthened from 100 to 500 seconds in order to give the chillers' compressors sufficient time to react to demand changes and help prevent unnecessary cycling. By avoiding this condition, the chillers will function better, have improved performance and will, potentially, extend the life expectancy of the compressors. After uncovering another issue concerning the exhaust fan installation early in the program, one of Lafayette's plant operation engineers commented, "As far as I'm concerned, the certification program has already paid for itself."

Another benefit received from Bala's services is that the Certification Program has shortened and simplified the "burn in" and "debugging" phase normally associated with technically complex buildings.



*Although our name might not always be penned/recognized in the paper, our clients, projects, and people have made an impact locally and nationally.*

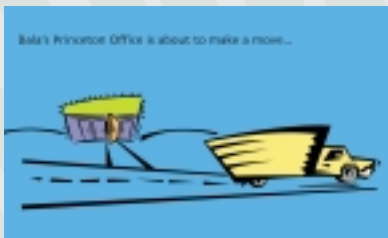
For the second year in a row, Michael Hayko, Vice President and Department Head of Structural Engineering, was a judge for the annual **Associated Builders and Contractors, Inc.'s** (ABC) Merit Construction Award of Excellence program. Henry Hudson, Exec. Vice President also participated in the judging this year.

Allen Frakes, PE, Bala's R&D Vice President, spoke at the annual **ISPE national meeting** in San Diego. Allen presented a Case Study of the McNeil Consumer Products Facility in the Republic of China as part of the session on Designing Pharmaceutical Facilities in the Global Marketplace.

In January, Ed Lynch and Chuck Kensky gave a presentation on **Green Building Design** to the Healthcare Committee of the Philadelphia AIA Chapter. They have also presented to other clients and organizations on this hot topic. If you are interested in scheduling a presentation, please email **info@bala.com**.

Pennsylvania is leading the way in Environmentally Responsible Building. In October four (4) new buildings received **LEED Certification** from the U.S. Green Building Council. Currently there are only thirteen (13) LEED Certified buildings in the world and four of them are located in Pennsylvania.

## NEW LOCATION FOR BALA'S NJ OFFICE



**Bala's Princeton, NJ office moved to Windsor Corporate Park** in Cranbury, NJ.

Bala now occupies 18,000 square feet of office space in the new 300,000 square foot office park. The new address, phone and fax numbers for the NJ office are::

**50 MILLSTONE ROAD  
BUILDING 300, SUITE 100  
CRANBURY, NJ 08512  
609 490 8950 PHONE  
609 490 8955 FAX**

## NEW EMPLOYEES/PROMOTIONS

**HENRY HUDSON** was promoted to Executive Vice President & Principal. Henry will continue to direct all sales and marketing initiatives for Bala and our affiliate voice/data firm, Bala Technologies.

**ALEXANDER MARTINEZ** hired as a Project Manager in the Commercial Division. Alex brings extensive experience in the education industry from both the owner's and the design firm's perspective. He has a technical background in mechanical engineering.

**JOSEPH NARWICH, PE**, joins Bala's Project Management Team in the New Jersey office. Joe brings over 25 years of experience in the design and construction of manufacturing facilities and pharmaceutical and specialty chemical process plants.

**DONALD SUTTON, PE**, is Bala's new Fire Protection expert in the Commercial Division. Don's background is in the design and implementation of fire protection systems for commercial, education and government clients.

**LALIT JAIN**, is Bala's new Lead Process Engineer in the Pharmaceutical/Industrial Division. Lalit has over 19 years of experience in process engineering including the development of pilot plants and chemical facilities internationally.

**ANDREW TAKACS** joins Bala's Pharmaceutical/Industrial Division as a Senior Electrical Engineer.

**MARK POWERS** joins Bala's Commercial Division Electrical Engineering Team as an Electrical Designer.

**KARL MILLER**, Electrical Designer, joins Bala's Commercial Division Electrical Engineering Team.

**GREGORY CHRISTMAS** joins Bala's Structural Engineering Team as a Structural Engineer and Designer.

**ED QUEMUEL**, is Bala's new Computer Technician, assists with Network Administration, and troubleshooting. Ed is a Microsoft Certified Systems Engineer and is also A+ certified.

**DONNA STANUIKYNAS** joins Bala's Commercial Division as an Administrative Assistant for Specifications and the Marketing Department.

**JENNIFER ALPHONSE** returns to Bala as a Senior Administrative Assistant in the Pharmaceutical/Industrial Division.

**PAMELA HAMPTON**, Administrative Assistant, also joins Bala's Pharmaceutical/Industrial Division to assist the Marketing Department.