

BALANCE

NEWS FROM BALA CONSULTING ENGINEERS, INC.

Practicing the Art of Engineering

WINTER, 2006 • VOL. 6

Projects OF SPECIAL NOTE



BALA CONSULTING ENGINEERS

On August 1, 2005 Bala Consulting Engineers left our Wynnewood, PA building of 19 years and moved into our new office at 443 South Gulph Road in King of Prussia, PA. The facility is a 21,000 square foot single story building visible from the Schuylkill Expressway and centrally located near most major highways in the Philadelphia metropolitan area. Our new facility accommodates all of our current operations and also leaves room for future expansion.

To showcase our commitment to responsible design, Bala chose to pursue certification of our new office space under the LEED for Commercial Interiors (LEED-CI) Rating System administered by the United States Green Building Council (USGBC). Bala has taken an active role in a number of building projects pursuing LEED certification and wanted to extend our expertise to our own project.

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GREEN IN THE MARKETPLACE

"Green" building design has rapidly emerged from a novel practice to a driving force in the design and construction industry. Evidence of the market strength of green building design is everywhere. Architectural, engineering and construction industry publications are giving great attention to the topic. Energy efficiency and operating costs continue to be major considerations in building design. Building product manufacturers are including recycled content and other environmental data in their product literature. Whereas environmental and progressive buildings were previously viewed in the mainstream as risky and unproven, design and construction professionals are now employing more developed and established technologies to improve energy efficiency and reduce environmental impacts. Building green is not just for environmentalists anymore; sustainable design has become mainstream and is a highly desirable goal for current construction projects.

When discussing green building in the marketplace, the United States Green Building Council (USGBC) and its Leadership in Energy and Environmental Design (LEED) Rating System inevitably step to the forefront. The LEED Rating System are the most widely accepted manner to provide certification for a green building. Achieving certification in the LEED Rating System is based on satisfying design prerequisites and achieving credits in five essential categories: Sustainable Sites, Water Efficiency, Energy and Atmosphere, Materials Resources, and Indoor Environmental Quality. Each category is instrumental to constructing a green building.

The USGBC has implemented several distinct LEED Rating Systems, all based on the same five essential categories, to accommodate the unique requirements of a variety of different commercial building projects. The article, *Elements of LEED Commissioning*, on page 2 of the newsletter details the various LEED Rating Systems and their application. Bala chose to showcase our commitment to responsible engineering and building practices by designing our new office space to achieve certification under the LEED for Commercial Interiors (LEED-CI) Rating System. More detail concerning the construction efforts of our new

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Green in the Marketplace
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office is highlighted in the Case Study in this newsletter. The LEED-CI Rating System was developed to reward and encourage environmental responsibility in the design of tenant improvement spaces.

Knowing the Green Building Landscape

From an engineering perspective, the prospect of incorporating green building principles and pursuing LEED certification can be imposing to building owners. A comprehensive knowledge of building systems, current energy standards, indoor air quality standards and good engineering design practice are all required to provide a responsible overall green building design. When pursuing LEED certification, engineering related credits and prerequisites require a thorough knowledge and understanding of referenced standards and guidelines. In addition, understanding the scope in applying these referenced standards can often be tricky.

Most recently, Bala provided LEED Commissioning for the first building in Philadelphia to receive LEED Certification, Liberty Property Trust's Crescent One building at the Philadelphia Navy Yard. The Facility has received pre-certification for the Gold level from the USGBC. Bala is currently involved in a variety of other projects pursuing LEED certification. These projects include renovation of commercial interiors, construction of core and shell office buildings, and the certification of an existing building.

In order to be successful, green buildings must not only be environmentally responsible but also must meet the demands and requirements of the building owner. Bala is committed to providing green building services that implement proven and reliable technologies to increase building efficiency in an environmentally responsible and cost efficient manner. Bala has LEED Accredited professionals on staff. Both MEP design professionals and commissioning agents are currently active in the green building environment.

For more information contact David Soyka at dss@bala.com or Tom Reusche at tmr@bala.com

ELEMENTS OF LEED COMMISSIONING

The overall goal of commissioning for any project, LEED or non-LEED, is to verify that the active building systems reliably perform as intended by the engineering design and owner expectations. The character of the LEED commissioning process is distinguished by several key elements. These include the rating system, scorecard, project size, complexity of the active building systems and project team. Testing is successfully accomplished when these key elements are integrated throughout the commissioning process.

The Rating System

The sustainable building rating system currently in place has been developed for four (4) distinct types of construction: new construction (LEED-NC), existing buildings (LEED-EB), commercial interiors (LEED-CI) and core and shell buildings (LEED-CS). There are also additional rating systems, such as Healthcare (LEED-HC), under development.

Scorecard

Commissioning is just one component of the overall LEED Certification process. A LEED scorecard is established during project start-up to define the project's certification level. For all ratings, these levels are Certified, Silver, Gold and Platinum, and are grouped in five categories: Sustainable Sites (SS), Water Efficiency (WE), Energy and Atmosphere (EA), Materials Resources (MR), Indoor Environmental Quality (EQ) and Innovation & Design (ID). Another level specific to LEED-EB, is Innovation in Operation, Upgrades and Maintenance (IU). Possible points vary for each rating. Table 1 summarizes the points for each rating.

Table 1: LEED Rating Certification Points

| Level | LEED-NC | LEED-CS | LEED-CI | LEED-EB |
|------------------|---------|---------|---------|---------|
| Certified | 26-32 | 24-29 | 21-26 | 32-39 |
| Silver | 33-38 | 30-35 | 27-31 | 40-47 |
| Gold | 39-51 | 36-47 | 32-41 | 48-63 |
| Platinum | 52-69 | 48-64 | 42-57 | 64-85 |

Certification

The level of certification and associated credits typically affect the commissioning process

since achievement of different points or higher levels of certification may vary with the quantity and type of the building systems. For example, if a goal of project certification is to achieve the indoor environmental quality (EQ) credit 1, carbon dioxide monitoring, (LEED-NC, LEED-CS, LEED-CI) or EQ credit 1, outdoor air delivery monitoring (LEED-EB), then the commissioning process will verify that the carbon dioxide monitoring system performs as intended. Other projects that do not incorporate carbon dioxide monitoring as part of the design strategy for ventilation effectiveness will not require this type of testing. Higher levels of certification may incorporate additional active building systems that require testing.

For every rating, commissioning is a prerequisite requiring the development of a commissioning plan and the performance of testing for energy and environmentally related systems and equipment. Commissioning is adapted for each rating so that the focus and depth of the process remains practical and realistic to the type of project. Critical systems to be reviewed vary in number, complexity and usage depending on the rating. However, all the different ratings involve a commissioning process that includes: planning commissioning activities, developing selected documents, reviewing the design, observing installation, testing systems, and reporting findings.

According to the LEED-EB Sustainable Sites Age of Building prerequisite, a building that is more than two years old can be registered to participate. The LEED-EB EA category requires existing building commissioning to verify that the fundamental building systems and assemblies are performing as intended to meet current needs and sustainability requirements. LEED-EB does not assign the role of a commissioning authority for leadership of the commissioning process. Also specific to LEED-EB is the development of a building operations plan that meets the requirements of current building usage.

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ELEMENTS OF LEED COMMISSIONING CONTINUED

It is important to note LEED-NC, LEED-CS, and LEED-CI projects are certified once and do not need to be recertified. LEED-EB certified projects require recertification at least once every five years and, depending on the level of certification, as frequently as annually in order to recognize continuous improvements to the building.

EA Credit 3: Enhanced Commissioning

EA Credit 3 provides one point for additional or enhanced commissioning of LEED-NC, LEED-CS, and LEED-CI projects. For enhanced commissioning, the commissioning authority is an independent firm that is not part of the design team. During the design and construction phases, enhanced commissioning efforts are more focused in comparison to the fundamental commissioning prerequisite and also extend into the post-occupancy period. Training of operating personnel is also reviewed and seasonably deferred testing is performed within eight to ten months after occupancy.

For LEED-EB, EA Credit 3 provides one point for building operation and maintenance staff education. The credit requires 24 hours of high-quality training each year for building operations and maintenance staff. The training objectives include information for building operation and maintenance and achieving sustainable building performance.

Project Size, Complexity

The total square footage of the building spaces to be commissioned as well as the length of the project duration may also affect commissioning. Larger buildings may deploy a greater number of building systems and so the commissioning strategy requires commissioning a greater quantity of systems. Projects with greater construction duration may require an incremental consolidation of testing as equipment is installed and there may be additional site visits for visual observations and testing.

The project's design intent may prescribe complex building systems such as continuous metering equipment for building energy usage, thermal, ventilation and lighting system control, alternative energy systems such as geothermal and/or other proven or innovative technologies. These complex building systems require a higher level of testing.

Team Effort = Success

Finally, the abilities, experience, and motivation of a high-performance team project approach contribute to the commissioning process. These positive human qualities will transform any project, LEED or non-LEED, from ordinary to great. A fundamental principle of quality systems management is that individuals working together as a team are more effective than individuals working separately. For great commissioning, when tensions are at their highest, the team members are at their best, applying strategies of preparedness, cooperation and accommodation during the commissioning process. This element enables the team to adapt to the dynamics of the project schedule, provide reasonable testing, apply corrective actions, and turn over a truly reliable and sustainable building.

For more information on LEED Commissioning contact Dan Tisak, djt@bala.com.

Projects OF SPECIAL NOTE



AAA Mid-Atlantic

Engineering for a new 157,000 square foot headquarters facility on the Christina River in Wilmington, DE

ACE INA

Due Diligence and tenant fit-out engineering services for their 130,000 s.f. offices in Philadelphia.

Episcopal Academy

Providing MEP/FP and voice/data engineering design for their new 123-acre campus in Newtown Square, PA. The new site will house over 350,000 square feet of new facilities, including lower, middle and upper school buildings, a science center, student center, athletic facility and chapel, as well as numerous athletic fields..

FMC

Renovation of 80,000 s.f. in the Mellon Bank Center for the consolidation of their Corporate Headquarters.

ING Direct

Renovation of over 200,000 s.f. on multiple floors of their 802 Delaware Avenue facility in Wilmington, DE. The facility includes, office, data center, cafeteria, conference, and fitness spaces. Bala was also involved in the renovation of their executive offices in the Pakhuis Building

Independence Blue Cross Data Center

MEP/FP design for a second, co-location Data Center totaling 8,000 s.f. Reliability level is Tier II, N+1. A Phase II expansion is currently being studied.

Information Services International (Mars, Inc.) Data Center

Design-build services for a 7,000+ s.f. data center. Reliability level is Tier II, N+1, and the facility is used as a second active global Data Center.

Lafayette College

Renovation of McKeen Residence hall. The residence hall was originally constructed in 1955 and is 37,000 s.f. with over 90 rooms. Bala provided MEP/FP, structural engineering services and overall project management.

Liberty Property Trust

Engineering and Commissioning services for multiple "Green" Building projects. Projects include new buildings, renovations to existing facilities, and design-build services.

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Projects of Special Note - continued from page three

Piazza Complex

Structural engineering for the design of this five building complex in the Northern Liberties section of Philadelphia. The complex consists of residential, office, and retail space.

School District of Philadelphia

Renovation of 440 N. Broad Street for their new 800,000 s.f. Administration Facility. The facility includes office spaces, conference/ training rooms, a data center and warehouse space.

Sunoco, Inc.

MEP/FP and Voice/Data engineering design for the renovation of 1735 and 1818 Market Street for their new 270,000 s.f. corporate headquarters. Also providing Voice/Data engineering services across the country for various Sunoco offices, facilities and/or refineries.

Temple University Health System Administration Facility

MEP/FP, structural and voice/data engineering design services for the tenant improvements of their new 250,000 s.f. Administrative Satellite Offices located at the Budd Commerce Center in Philadelphia.

Temple University Health System Data Center

MEP/FP and voice/data services for a new 9,000 square foot data center and call center. Reliability and availability goals for the data center are in the Tier II to Tier III range.

Towers Perrin

Providing Voice/Data engineering services for multiple locations around the world. Services include system design, installation oversight, and coordinating with local exchange carriers.

Toll Brothers, Inc.

Base building upgrades and tenant fit-out engineering for the relocation of their 200,000 s.f. headquarters to 250 Gibraltar Road in Horsham, PA.

TV Guide

Renovation of 110,000 square feet of their headquarters facility in Radnor, PA.

WSFS Bank Center

Base building design of a new 21-story, 371,000 s.f. office and retail facility, with the first six (6) floors as a parking garage with 525+ covered parking spaces, in Wilmington, DE.

NEW EMPLOYEES/PROMOTIONS

Thomas M. Harrigan, PE: Bala's Mechanical Department Manager, brings over 20 years of experience in engineering and project management for commercial, pharmaceutical, higher education, and military market sectors. Tom is a graduate of the United States Naval Academy.

Bruce W. Young, PE: Joins Bala's Electrical Engineering Team as a Senior Electrical Engineer. Bruce has 20 years of electrical engineering experience, specializing in power distribution systems for mission critical facilities.

Daniel J. McGroary: Another addition to Bala's Electrical Engineering Team, Dan is also a Senior Electrical Engineer. Having worked on the electrical design, construction and equipment vendor sides, Dan brings a unique perspective and 14 years of experience.

Joseph R. Troiano: Joins Bala's Electrical Engineering Team as a Senior Electrical Designer.

Robert W. Heineman: Joins Bala's Electrical Engineering Team as a Senior Electrical Designer.

Richard A. DeHaven: Joins Bala's Electrical Engineering Team as a Senior Electrical Designer.

Jeffrey V. King: Joins Bala's Electrical Engineering Team as a Senior Electrical Designer.

David Bock: Joins as an HVAC Engineer in Bala's Mechanical Department.

Bernadette Shandlay: Joins as a Project Engineer in Bala's Plumbing and Fire Protection Department.

Steve Ziga: Joins Bala's Plumbing & Fire Protection Department as a Lead Designer.

R. Drew Carré: Joins Bala's Validation and Commissioning Team as a Validation/Commissioning Specialist.

Joseph E. Ford, RCDD: Lead Project Designer, joins Bala's Voice/Data Technology Team and is a Registered Communication Distribution Designer (RCDD), with extensive voice/data system design, documentation, and installation experience.

Tonya M. Zatko: Joins Bala's marketing department as our new Marketing Assistant.



Ever Wonder What an Engineer's Green Space Looks Like?

Over 200 people were interested in finding out and attended our Open House on Wednesday November 30th. From green Apple Martinis to taking home seeds to grow, this party was very earth friendly. A great time was had by all who attended! If you weren't able to attend and are still curious what an engineer's green space looks like, keep watch for the next invitation to an event in our office, or contact Henry Hudson (hwh@bala.com) or Tom Reusche (tmr@bala.com) to get a personal tour..

Some photos of our facility and a more detailed description of our offices can be found in the Case Study section of this newsletter.



Project
BALA CORPORATE OFFICE
 Applying Green Building Principles

Bala chose to showcase our commitment to responsible design by being one of the first engineering firms in the nation to design their offices to the LEED standards. Using our expertise and commitment to “green” building, we implemented many sustainable strategies to conserve water, optimize energy efficiency and improve indoor air quality and working conditions in our new office. Those strategies required the input from all project team members from architectural and engineering design, to construction.

Construction

With the excellent direction of Shields Construction as the general contractor, and an assembled team of very qualified and experienced subcontractors, Bala implemented a comprehensive plan to minimize waste in all aspects of the project, through maximum reuse of existing materials and recycling.

By utilizing selective demolition to create the appearance of a completely new layout and reusing existing materials wherever

possible, the design team contributed to the reduction of overall construction waste in the design process. During demolition, and throughout construction, contractors were specifically directed to separate all materials. Areas were designated for each type of item to be recycled. To the amazement of the contractors involved, only 1½ dumpster loads of waste were produced from this project.

Architecture

With the expertise of Meyer Associates as architect and interi



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or designer, Bala was able to utilize the existing building layout from the previous tenant and make minor modifications to adapt the building to our needs. New construction was limited to three (3) offices, expansion of the training room, the library half walls, and the server room.

The design process also included thorough attention to selecting sustainable materials for use in the project. Paint selections with low VOC contents, carpet with high recycled content, and refurbished office workstations with sustainable fabrics were selected.

Engineering

Acting as our own engineer and LEED Project Administrator, Bala incorporated many green strategies into the design for each system.

The building mechanical system was redesigned and is comprised of 9 roof top packaged AC units with natural gas heat and has a total cooling capacity of 84 tons. Bala also added a Variable Frequency Drive (VFD) to the roof top unit serving the open office area. The HVAC system is controlled and monitored by an internet-based Automated Logic Corporation (ALC) building automation system.

Duct Sock

In lieu of installing exposed metal ductwork with duct mounted diffusers or registers, a fabric ductwork system was installed in the open office area. Heating, ventilation, and air conditioning are achieved in the engineering area and resource library via the KE Fibertec Textile Duct Sock. Air is delivered via two types of nozzles or by perforations spaced linearly along the fabric. For the fabric duct to remain taut, even when the VAV system is at minimum air volume, Bala had to coordinate the duct design and nozzle displacement.



From an environmental perspective, the fabric ductsock provides multiple advantages to metal ductwork. Acoustically, the fabric duct is quieter than equivalent rigid ductwork. Air diffusion is also more efficient. Continuous air diffusion prevents localized drafts and provides a more even distribution of air throughout the space. The utilization of a fabric duct also leads to improved indoor air quality due to its modular construction. Sections of the fabric duct can easily be removed, cleaned and replaced in order to keep the ductwork free of contaminants and debris.

Lighting Design

Throughout the office space Bala utilized a combination of up and down lights for a total of 1.0 watts/square foot for lighting. To optimize energy efficiency, all existing fluorescent light fixtures were replaced with Lutron T-8 Parabolic troffer light fixtures, Corelight T-8 Linear Pendant light fixtures or Focal Point 26 watt triple tube compact fluorescent light fixtures with electronic ballasts. All building lighting and office lighting controls are also continuously monitored and metered via the Automated Logic Control's (ALC) BAS and the Trittek lighting control panel. Perimeter office light fixtures are automatically operated by occupancy sensors. If sufficient natural light exists, the sensors will disable the automatic "on" function. The main electrical system is comprised of a 600 amp, 480Y/277 Volt, 3 phase electric service located in the main electrical room.

Fire Proofing

In the workstation area, which comprises a majority of our building, the design called for removal of the existing 2x4 ceiling tiles to create a more open space. The spray-on fire proofing applied to the underside of the metal deck roofing provides additional insulation properties to the roof structure to improve building energy efficiency while also adding sound absorption to improve indoor environmental quality.

Plumbing

The new plumbing fixtures in the Men's and Women's bathrooms were selected based on their water conservation characteristics. Automatic flush valves were installed, as well as low flow faucets with automatic sensors. One unique fixture in the Men's bathroom is a waterless urinal by Falcon. As this urinal does not require flushing, it saves 1.0 gallon of water per use compared to traditional flushing type urinals.

With these and other strategies in place, Bala has applied for LEED-CI Certification of our new office space under the Commercial Interiors (CI) rating system.