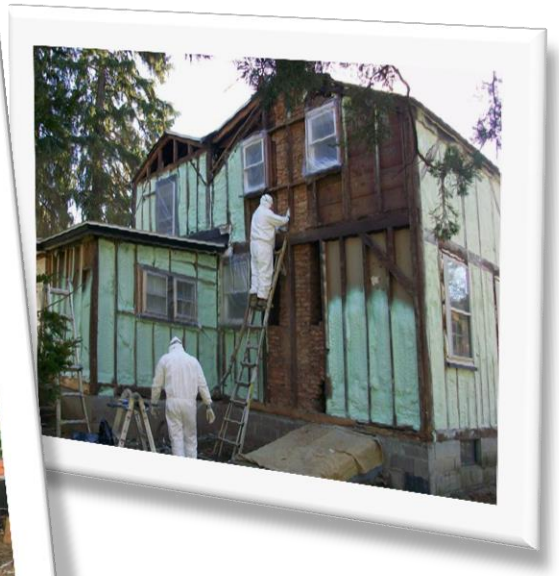

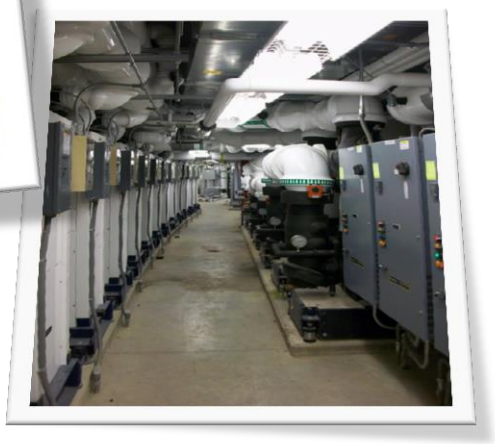

New Construction & Renovation Policy

July, 2013 (updated Feb. 2017)

Bard College

Bard College || New Construction & Renovation Policy

Introduction

The campus at Bard College is a diverse composition of academic buildings and support facilities, constructed over many decades to meet a variety of growing needs: residence halls, classrooms, offices, dining halls, student centers, art and performance spaces, laboratories, and operations facilities. The state of Bard facilities— and the systems that provide necessary ventilation, space heating and cooling, and utilities— not only impact annual operation and maintenance costs, but also the ability to satisfy the comfort, safety, and aesthetic needs of occupants. The degree to which these needs are met directly impact occupants' health and productivity[1], and shape how students, faculty, staff, and visitors perceive the College's natural and built environments.

It is Bard's goal to ensure that all new and existing buildings meet the needs of occupants and programs, and that internal systems operate efficiently to ensure longevity and to reduce annual operation and maintenance (O&M) costs. These systems include the building envelope (i.e. the outermost walls, ceilings, and fenestration) and the building's network of heating, cooling, and ventilation equipment and distribution systems, controls and automation systems, life safety systems, domestic water and sewage systems, and lighting systems.

[1] Miller, Pogue, Gough, & Davis (2009), "Green buildings and productivity"

Performance & Design Requirements for Projects

New Construction and renovation projects are a golden opportunity to create a *high performance building*[2], when expectations for design and commissioning efforts can be incorporated from the earliest design phases and onward.

Bard's principle requirements for New Construction projects, to be included in all Basis of Design documentation, are:

- Project is registered with the New York State Energy Research Authority (NYSERDA) New Construction Program, which provides cost-share and bonus funding for:
  - Technical Assistance to help evaluate, design, and install energy-efficiency measures
  - Offsetting added costs of purchasing energy-efficient equipment
  - Commissioning and LEED design services
- Project must meet all LEED V4 Prerequisites, with potential to qualify for LEED rating of *Certified* or better.
- Project must qualify for EPA ENERGY STAR Certification (i.e. score of 75 or greater) [3]
- Project is consistent with the Bard Preservation Master Plan, unless otherwise shown to economically or logistically infeasible.
- Design firms must provide documentation showing the building's expected annual and projected long-term O&M costs, including energy and water consumption and maintenance outlook (i.e. equipment replacement schedules and costs). This should include a whole-building energy model and water budget, plus support documentation.
- Project must address specific design considerations (**see next page**):

[2] A high performance building means "a building that integrates and optimizes all major high-performance building attributes, including energy efficiency, durability, life-cycle performance, and occupant productivity" (Energy Policy Act of 2005, Sec. 914. BUILDING STANDARDS (a))

[3] Setting a target goal for the proposed building's energy consumption (design loads) can be done using the ENERGY STAR Commercial Building Target Finder tool, a "a no-cost online tool that enables architects and building owners to set energy targets and receive an EPA energy performance score for projects during the design process". See Energy Star website: http://www.energystar.gov/index.cfm?c=new_bldg_design.bus_target_finder

Design considerations and areas of focus include, but not limited to:

- **"Building as a whole-system" approach and systems integration**
  - Envelope— high performance insulation, air-sealing, and fenestration
  - Passive and active solar design:
    - Orientation – predominant southern exposure of roof line & glazing (longer axis of building is east/west)
    - Solar electric PV
    - Solar thermal hot air or water
    - Daylight harvesting
  - Heat-recovery systems (e.g. air-handlers, flu-stacks, condenser units, etc.)

- **Mechanical / Electrical / Plumbing (MEP) Systems:**
  - Simple/eloquent, durable/redundant
  - Highly accessible & easily maintained
  - Standardized equipment & replacement parts
  - Default HVAC system = Geothermal (ground-source heat exchange), unless shown to be economically or physically infeasible:
    - Primary-secondary loop design with buffer tank
    - Heat pumps designed for direct sensing/control by BAS (i.e. no internal 'black box' controls) and properly sequenced for simple automation
    - Well sizing and load capacity makes consideration for current and future projects (i.e. new additions or adjacent buildings)
  - Lighting package:
    - Standardized and matching to existing fixtures found on campus, to reduce variety of replacement lamps and parts to order/stock
    - Located/designed for easy access and maintenance, for example:
      - Not located directly above stairs or in hard-to-reach spaces
      - Quick-access lenses or removable panels
      - Screw-in base for re-lamp from ground with an extension pole to avoid ladders/lifts, etc.
    - Preference for screw-in fixtures (i.e. non-integrated), for easy transition to next-gen lamps.

- **Storm water management;**
  - "Green" roofs and/or native and adaptive plantings and landscaping
  - Permeable parking and pathways
  - Rainwater reclamation for greywater use (toilets, irrigation, etc.)

Selecting a Design Team

The quality of the design team will largely determine the success of a high performance building project. Bard will conduct due diligence in the selection of architecture, engineering, and construction professionals who have experience with LEED and incorporating high energy performance features into their building designs. A 3rd-party Commissioning Agent will be selected to oversee commissioning activities alongside design firms and contractors and throughout the design, construction, and start-up phases, starting with the Schematic Design (this may be all or partially fulfilled through participation in the NYSERDA New Construction Program). Once the team is selected, a design charrette will be conducted to define goals and how they will be met, and a cost analysis method will be selected to guide the decision-making process. A commissioning plan will help to verify that design and performance goals are met.

Involving Bard Program and Operations Stakeholders in design phase discussions

Bard Program and Operations directors, supervisors and other campus personnel— who must ultimately take responsibility of operating and maintaining the building for the remainder of its life— are important stakeholders with valuable insights into how to improve building design and operation. Such insights include understanding of programmatic needs to better serve occupants, and technical and field experience to guide design and selection of components for an improved maintenance outlook (i.e. reliability, ease of use, low upkeep costs, etc.). Operations stakeholders should be included in design discussions as needed and based on their area of expertise.

"Net-Zero" Energy Construction

Bard also has a considerable interest in the creation of "net-zero energy" buildings: high performance buildings that offset their energy and carbon footprint with passive features and on-site renewable energy generation. New construction projects should be approached with net-zero energy design as an option and reviewed for feasibility. However, as net-zero construction practices and renewable energy systems become more mainstream and cost-effective, and as the college gains success and comfort with high performance buildings, it is Bard's expectation to eventually require that all new construction projects be net-zero-energy.

Benefits, costs, and funding opportunities

Properly implemented high performance design and construction yield both energy and non-energy benefits realized throughout the lifetime of the building. Where the Energy Star certification sets design goals for energy consumption, the commissioning and LEED processes provide guidelines and oversight to ensure that building siting and layout, design, construction methods, materials, and equipment are consistent with high performance standards. In summary:

- Commissioning of new construction projects has shown to result in: [4]
  - Median energy savings of 13% in comparison to non-commissioned cohort
  - Identification of deficiencies that would otherwise manifest in the future as higher repair and maintenance costs, increased energy consumption and reduced occupant comfort and safety
  - Median payback times of 4.2 years

- LEED-certified buildings have shown on average to use 18 – 39 % less energy than their conventional counterparts [5]

- Life Cycle Analysis of LEED-certified buildings have shown positive 20-year Net Present Value across all certification levels (Certified, Silver, Gold, and Platinum) [6]

While moving beyond conventional construction to require high performance (or "green") construction and LEED certification can add to the upfront costs of a new building project, there are mixed reports of how much these added costs, if any, might be. An earlier attempt to analyze costs associated with LEED certification reported "softs" costs (including design, commissioning, and LEED documentation and fees) adding between 1.5 – 3.1% to total project cost, with green construction "hard" costs adding a further 3 – 8%.[7]

[4] Values obtained from Mills (2011) "Building commissioning: a golden opportunity for reducing energy costs and greenhouse gas emissions in the United States", which reviewed commissioning costs for 82 new construction projects.

[5] Values obtained from Newsham et al. (2009) "Do LEED-Certified buildings save energy? Yes, but…", which conducted a re-analysis of data supplied by the New Buildings Institute and the US Green Buildings Council on measured energy use data from 100 LEED-certified commercial and institutional buildings. A major stipulation of the report is that simply "going LEED" is not a guarantee of savings or performance, with roughly 31% of LEED buildings using more energy than conventional counterparts, and the takeaway lesson being that strong oversight of projects is required to ensure energy efficiency measures are implemented correctly and target goals are met.

[6] Values obtained from Kats, Gregory et al. "The Costs and Financial Benefits of Green Buildings: A Report to California's Sustainable Building Task Force." Report developed for the California Sustainable Building Task Force, October 2003.

[7] Values obtained from Northbridge Environmental Management Consultants (2003) "Analyzing the cost of obtaining LEED certification".

However, case-studies and more recent reports[8] comparing the total costs (soft and hard) of conventional and LEED-certifiable construction have shown that high-performance goals have been achieved with no or limited additional funding (between 0 - 2% of total project cost) when projects had clear goals and guidelines set forth from inception and as a result of a streamlined design process, capital cost offsetting (e.g. investing in a more efficient building envelope results in reduced heating and cooling loads and therefore reduced HVAC equipment size and costs), and optimizing LEED credit selection based on economic feasibility.

Reduced costs have also been attributed to market adaptation as firms have evolved to respond to growing demand for LEED-certified buildings and have gained experience with green construction and the LEED process. Projects where cost inflation did occur happened largely as a result of introducing green features mid-project, requiring re-design and modeling, change orders, and associated delays and costs, or when projects opted to include specific sustainable features such as an electric photovoltaic system.

These reports indicate that the technical and financial success of green/LEED building projects is driven by having clear goals from project onset and a hands-on/interactive approach to design and construction management (namely, the kind of oversight that would come from NYSERDA Technical Assistance program, a comprehensive commissioning plan, and increased participation of Bard operations stakeholders) and by selecting firms with experience in high performance design and construction and a successful track record with LEED certification.

Incentives and funding opportunities

Additional upfront costs for high-performance building and LEED certification can be further offset by incentive opportunities under the NYSERDA New Construction Program, which provides cost-share and bonus funding for Technical Assistance, Commissioning, and LEED design and implementation services.

[8] Case-studies and reports include:

- Davis Langdon (2007). "Cost of Green Revisited: Reexamining the Feasibility and Cost Impact of Sustainable Design in the Light of Increased Market Adoption."
- Athens & Gale (2002). “Developing a Public Portfolio of LEED Projects: The City of Seattle Experience”, Proceedings of the 2002 International Green Building Conference and Expo, Austin, TX, November 2002.
- Kats & Gregory (2003). "Green Building Costs and Financial Benefits." A report for the Massachusetts Technology Collaborative.