Building Design Standards
For Renovation Projects

December 14, 2009

Executive Summary

Bowdoin College has had a long standing commitment to sustainability and environmental stewardship; concentrating on issues such as waste reduction, recycling, environmentally preferable purchasing, and energy conservation. One of the fastest growing sectors in the sustainability movement has been within the architecture and building trades. Emphasis has been placed on sustainable site location, water efficiency, energy conservation, indoor air quality and using materials that are either harvested sustainably or made from recyclable materials. As can been seen in Appendix A, Bowdoin had been incorporating sustainable

TECHNICAL GUIDELINES

1. Site Design and Planning

Sustainable site planning identifies ecological, infrastructural, and cultural characteristics of the site to assist designers in their efforts to integrate the building and the site. The intent is to encourage optimum use of natural/existing features in architectural and site design of campus buildings, such that the building energy use is diminished and the environment is enhanced.

GOALS:

- Contribute to the cohesiveness of the existing campus.
- Maintain and enhance the biodiversity of natural systems and/or existing character of the site.
- Respond to Bowdoin College's microclimates and natural site conditions.
- Reduce energy use for transportation and site related activities
- Promote sensitive infill development that relates well to both natural systems and existing infrastructure.

STRATEGIES:

Guide Development to Environmentally Appropriate Infill Areas

As much as possible, select a site that:

- Meets the conditions of the approved General Use Permit for Bowdoin College.
- Is characterized as previously developed land.
- Avoids habitat for any sensitive species and species on the Federal or State threatened or endangered list.
- Avoids the loss of mature trees.

Maintain and Enhance the Biodiversity and Ecology of the Site

Integrate the building with the site in a manner that minimizes the impact on natural resources, while maximizing human comfort and social connections. The development footprint should enhance the existing biodiversity and ecology of the site by strengthening the existing natural site patterns and making connections to the surrounding site context. Consider and apply the appropriate strategies below:

- Minimize the impacts of the development process to reduce alteration and ecological disturbance.
- Design this site to reconnect fragmented landscapes and establish contiguous networks with other natural systems both within the site and adjacent systems beyond its boundaries.
- Avoid major alterations to sensitive topography, vegetation, and wildlife habitat.
- Minimize the area of the site dedicated to the building, parking, and access roads.
- Site the building to create traffic patterns that promote non-motorized access.
- Maintain setbacks that effectively utilize the site while respecting surrounding environmental conditions.

Optimizing Building Placement and Configuration for Energy Performance

Place, orient, and configure the building on the site to minimize energy use by means of daylighting, solar heating, natural ventilation, and shading from vegetation or other buildings.

Use Microclimate and Environmentally Responsive Site Design Strategies

Design the site and building to respond to microclimate and environmental conditions. Consider and apply the appropriate strategies below:

- Locate trees and shrubs to support passive heating and to complement cooling in outdoor spaces and buildings and to create seasonally appropriate heatsinks and natural ventilation corridors.
- Locate site features (plazas, patios, etc.) to take advantage of seasonal sun angles, solar access, and solar orientation.
- Locate site elements to maximize heating and cooling benefits, to ensure proper drainage, and to make pedestrian/vehicular movements safe and coherent.
- Design the overall site to reduce "heat island" effects. Exploit shading opportunities, and explore the possible use of high-albedo materials. Consider pervious surfaces for parking, walkways, plazas, etc. Use permeable paving for roads with infrequent use (e.g., fire roads).
- Design site lighting to eliminate light trespass from the building and site.

Use Native or Drought-Tolerant Trees, Shrubs, Plants, and Grasses

Use vegetation on the site that conserves water, reduces pesticide use, reduces plant mortality, and lowers operational maintenance.

2. Energy Use

A building project utilizes energy both during construction and ongoing operation and maintenance. By making its building more energy efficient, Bowdoin College can reduce its energy consumption and the financial and environmental costs associated with the burning of fossil fuels.

GOALS:

- Reduce total building energy consumption and peak electrical demand.
- Reduce air pollution, contributions to global warming, and ozone depletion caused by energy production.
- Slow depletion of fossil fuel reserves.
- Achieve energy cost and related savings due to upgrades to infrastructure.

STRATEGIES:

Reduce Loads

Optimize Building Envelope Thermal Performance

Design building envelope to optimize thermal performance. Consider and apply the appropriate strategies below:

- Size openings, select glazing, and utilize shading devices (interior or exterior) to optimize daylighting and glare control while minimizing unwanted heat loss and heat gain.
- Optimize insulation to reduce heating and cooling energy consumption by heat losses and gains through the building envelope.
- Moderate interior temperature extremes by using thermal mass where appropriate.
- Ensure the integrity of the building envelope to provide thermal comfort and prevent condensation. Use best air/vapor barrier practices and avoid thermal bridging.
- Reference to Bowdoin College's Standard Products and Procedures List

Providing Daylighting Integrated with Electric Lighting Controls

Ensure that daylighting is designed in coordination with the electric lighting system to reduce energy consumption while maintaining desired lighting characteristics. Consider and apply the appropriate strategies below:

- Shape the architectural plan and section and use appropriat

- Group similar building functions into the same HVAC control zone so those areas can be scheduled separately (e.g., separate around-the-clock areas from classrooms and offices)
- Apply direct/indirect evaporation cooling and/or pre-cooling for conditioned spaces
- When not using central steam, design boilers using high efficiency equipment
- Modulate outside air according to occupancy, activities, and operations. Use occupancy sensors and variable air volume distribution systems to minimize unnecessary heating or cooling
- Use heat recovery systems to reduce heating energy use
- Use of whole-building energy management systems
- Use zero CFC-based refrigerants in HVAC and refrigeration equipment. Phase out CFC-based refrigerants for renovation projects
- Reference to Bowdoin College's Standard Products and Procedures List

Use Efficient Equipment and Appliances

Design and/or select any building equipment to optimize energy efficiency. Consider and apply the appropriate strategies below:

- Use equipment with premium efficiency motors and variable speed drives.
- Select new equipment (including transformers) and appliances that meet EPA ENERGY STAR® criteria.
- Use efficient equipment to heat and supply service water to the building. When feasible, consider use of tankless water heaters.
- Reference to Bowdoin College's Standard Products and Procedures List

Use Energy Sources with Low Environmental Impact

Use Renewable or Other Alternative Energy Sources

Consider the use of alternative energy sources and supply systems to reduce the building's total energy load and minimize environmental impacts of burning fossil fuels such as air pollution and global warming.

- Evaluate possibilities for the use of renewable energy (such as solar water heaters, geothermal heating and cooling systems, and solar walls).
- Evaluate feasibility of geothermal systems.

3. Water Management

Sustainable design dictates that water and its relationship to building design, development and operation are managed carefully. The principle of sustainable building seeks to increase the value we derive from our water resources by designing and operating our structures more efficiently.

GOALS:

- Preserve site watersheds and groundwater aquifers
- Conserve and reuse stormwater
- Maintain appropriate level of water quality on the site and in the building(s)
- Reduce potable water consumption
- Reduce off-site treatment of wastewater

STRATEGIES:

Manage Site Water

Stormwater

Implement an effective stormwater management plan. Consider and apply the strategies below:

- Select a site and develop design strategies that will require minimum alterations and ecological impacts to the watershed.
- Use biologically based stormwater management features such as swales, sediment control ponds, pools, wetlands along drainage courses, and infiltration basins to retain and treat stormwater on site and/or in adjacent areas.
- Retain and/or maximize pervious and vegetated areas of the site.
- Capture rainwater from impervious areas of the building for groundwater recharge or reuse.

Erosion Control

Consider and apply the appropriate strategies below:

- Prevent soil erosion before, during, and after construction by controlling stormwater runoff and wind erosion. Consider silt fencing, sediment traps, construction phasing, stabilization of slopes, and maintaining and enhancing vegetation and groundcover.
- Protect hillsides using adequate erosion control measures such as hydro seeding, erosion control blankets, and/or sedimentation ponds to collect runoff.

Irrigation and Specialty-Use Water

Minimize the need for irrigation. Consider and apply the appropriate strategies below:

- Select drought tolerant plant species
- Use efficient irrigation systems that utilize technologies such as drip irrigation, moisture sensors, and weather data-based controllers.
- Match system to water use.
- Use correct nozzles on irrigation heads.
- Incorporate gray water systems.

Reduce Building Water Consumption

Design strategies and systems to reduce building water use to exceed the requirements of the Energy Policy Act (EPACT) of 1992. Consider and apply the appropriate strategies below:

- Use infrared faucet sensors and delayed action shut-off or automatic shut-off valves.
- Use low flow toilets, preferably dual-flush, that have been tested and rated to function reliably. EPACT requirement: 1.6 gallons (6 liter) per flush (GPF).
- Use waterless urinals or 0.5 gallons per flush urinals. EPACT requirement: 1.0 GFP
- Use lavatory faucets with flow restrictors for a maximum rate of 0.5 gallons per minute (GPM), or use metering faucets at 0.25 gallons per cycle. EPACT requirements: 2.5 GPM.
- Use low-flow kitchen faucets. EPACT requirement: 2.5 GPM.
- Use low-flow showerheads. EPACT requirement: 2.5 GPM.
- Use domestic dishwashers that use 10 gallons per cycle or less. Use commercial dishwashers that use 120 gallons per hour (conveyer type) or one gallon or less per rack (door type).
- Use clothes washers that meet EPA ENERGY STAR ® requirements.
- Reference to Bowdoin College's Standard Products and Procedures List.

4. Materials, Resources, and Waste

From a sustainability perspectives, the best building materials are those that are long-lived, least disruptive to harvest, ship, and install, and are also easiest and safest to maintain and reuse. Sustainable design at all stages of building development, including plans to recycle or reuse construction and demolition waste, can help to further alleviate the pressure on our natural resources and our landfills.

GOALS:

- Reduce consumption and depletion of material resources, especially nonrenewable resources.
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- Plan for maximum standardization or repetition of building elements and details to increase the ease of adapting the interior structure for future alterations or upgrades.
- Where appropriate use raised floor systems for power and telecommunications wiring to accommodate reconfiguration of spaces and information technology support.
- Use modular space planning, partitions, and furnishings.

5. Indoor Environmental Quality

In the fall of 2004 **Kanbar Hall**

- Interior storm windows with high performance insulating glass enhance the thermal performance of the existing exterior shell.
- Abundant natural light is provided into all major spaces, including the Recital Hall. Special detailing of the laminated glass installed on an angle is employed to allow natural light while preserving the acoustical isolation of the Hall.

In the summer of 2007 a major renovation and expansion of **Walker Art Building** was completed. Bowdoin's Building Design Standards for Renovation Projects were utilized to allow the project to include such features as:

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In January 2009 **Sidney J. Watson Arena** hosted its first hockey game. In July of 2009 the project became the first newly constructed ice arena in the United States to earn the coveted LEED™ certification. Sustainable features include:

- A storm water management system which includes two infiltration systems that divert clean rainwater from the roof into the aquifer, and two retention ponds to remove sedimentation and debris from storm water runoff while minimizing peak flow rates into the watershed.
- Low-flow showers, faucets, toilets and urinals result in a 38% reduction in water use over that of typical fixtures.
- 82% of generated construction waste (515 tons) was diverted from landfill to recycling
- 30% of the building products include pre and post consumer recycled material
- 40% of building materials came from within 500 miles of the site, reducing emissions from transportation while supporting the local economy.

In September 2009 **The Peter Buck Center for Health & Fitness** opened to the campus community. The new facility consists of new Athletic Department offices and associated meeting spaces, free weight, cardio training and wellness areas for use by the faculty, staff, and students. The building also contains the Bowdoin Health Services Center which is predominantly used by students. This project would be the Colleges third LEED™ certified project. Some of the many sustainablTc /p7hin 500 min50iA₮j/TT1 1omy.

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