PHILLIPS EXETER ACADEMY

Construction Standards and Guidelines

Division of Work: Division 0/1

Specification Section: 00000/00 00 00 - GENERAL INFORMATION

Description of Material or System: Sustainability Design Guidelines

Last Updated: 6/17/2013

Updated by: Mark Leighton

Included in this section:

- [ ] Product Specifications
- [x] Design Guidelines
- [ ] Design Details/Drawings
- [ ] Supplemental Information
- [ ] Other _____
- [ ] Other _____

Guideline applies:

- [ ] Academic Buildings
- [ ] Administrative
- [ ] Athletic Facilities
- [x] Campus Wide
- [ ] Other _____
- [ ] Other _____
- [ ] Dormitories
- [ ] Faculty Residences
- [ ] Support
- [ ] Utility

Overview of system/product/guideline:

Following is the PEA Guiding Principles for Sustainable Construction.

Links to additional product information:

Additional information can be obtained by contacting Jill Robinson @ PEA.

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GUIDING PRINCIPLES FOR SUSTAINABLE CONSTRUCTION
Phillips Exeter Academy
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Introduction

A sustainable building is one that uses energy, water and other natural resources efficiently and provides a safe and productive indoor environment. By designing and constructing buildings that incorporate principles for sustainable construction, the Academy can reduce energy use and costs, improve occupant satisfaction, productivity, comfort, safety and health; reduce operating and maintenance costs, reduce emissions of carbon dioxide, and provide a sustainable environment for learning, living, and working.

This document is not a checklist of specifications. The purpose of the document is to identify goals and offer strategies to achieve those goals. Each building project is unique. The design process may bring about new strategies to meet these goals or require alternative approaches to construction. Although some building projects may be appropriate for LEED, Energy Star, or other third-party certification, this document is not a certification template.

This document is intended to be revised and updated over time to ensure it is consistent with current best practices. As Federal, State, and local governments adopt sustainable practices, policies, and regulations, this document will be revised to reflect the evolving regulatory environment, new technology, and industry best practices. When planning for capital projects, periodic building commissioning should be incorporated into project budgets to ensure that new and renovated buildings continue to meet environmental performance goals.

This document is organized in six sections:
1) Site Design and Planning;
2) Energy Use;
3) Materials, Resources and Waste;
4) Water Management;
5) Indoor Environmental Quality; and
6) Life cycle analysis in the selection of site, materials and equipment

Building project consultants and the design review team should review this document during the design phase and the design team should respond to each section by indicating which strategies will be utilized to meet selected goals in each section, or propose alternative strategies.

SECTION 1: SITE DESIGN AND PLANNING

Sustainable site planning identifies the environmental characteristics of the site to ensure that designers situate the building to maximize site characteristics for energy efficiency such as sunlight, topography, tree cover, and soils, and to minimize negative impacts on natural resources during and after construction. Sustainable site planning also considers the project's proximity to the supporting infrastructure of adjacent buildings and systems, transportation, and other services and amenities. An integrated design process involving collaborative planning between project team members helps to ensure sustainability is incorporated into the project.

OBJECTIVE: Consider re-use of existing facilities and minimize impact to the natural environment

GOALS:

- **Promote infill development that considers natural systems and existing buildings**
- **Maintain and enhance natural systems and/or the existing character of the site**
- **Reduce building energy use by careful siting and orientation of the building**
- **Reduce energy use for transportation and site or department-related activities**
- **Protect trees, soil, water bodies and other resources during construction**
- **Use Integrated Design to ensure continuity in planning from the design phase and throughout project construction, operations and maintenance**

Goal 1: Promote infill development that considers existing natural systems and existing buildings, infrastructure and systems.

STRATEGIES:

1) Select a site in proximity to existing infill development and energy systems.
2) Select a site in proximity to existing transportation systems that allows building occupants to utilize alternative methods of transportation such as pedestrian access, bicycle use, and mass transit. Provide building amenities such as shower facilities, bike racks, and drop-off access to encourage alternative commuting and carpooling.
3) Select a site that allows for renovation or reuse of an existing structure. In the case of new construction, consider how systems for the new building could be utilized by adjacent buildings.

Goal 2: Maintain and enhance the existing natural systems and/or the existing character of the site.

STRATEGIES:

1) Maintain setbacks and buffers to protect water quality and satisfy regulatory requirements.
2) Minimize the area of the site dedicated to the building, parking, and access roads.
3) Design the site to reconnect fragmented landscapes and/or establish contiguous networks with other natural systems, and protect existing wildlife habitat where possible.
4) Utilize culverts and crossings that meet local requirements and also permit wildlife passage.
5) Design windows to minimize issues from bird death. Consider animal nuisance issues in designing ponds or other water features in site design.

6) Use vegetation on the site that is suited for the prevailing temperature/seasonal and soil conditions to minimize maintenance costs. Protect slopes from erosion during and after construction.

Goal 3: Reduce building energy use by careful siting and orientation of the building.
STRATEGIES:

1) Locate site and orient buildings to take advantage of seasonal sun angles, and solar access.
2) Locate trees and shrubs to support passive heating and to complement cooling in outdoor spaces and buildings.
3) Design the site to reduce heat island effects by using shading, white or high albedo (reflective) materials on roofs and other surfaces. Consider the use of pervious surfaces for parking, walkways, patios, driveways, and roads with infrequent use.
4) Design site lighting to eliminate light trespass and minimize night sky light pollution by using recommended practices from the International Dark Sky Association.

Goal 4: Reduce energy use for transportation and site or department related activities.
STRATEGIES:

1) Locate buildings near existing parking areas and other public areas.
2) Provide commuter amenities such as shower facilities, bike racks, and pedestrian access.
3) Locate similar-function buildings together.
4) Where feasible, share building systems and amenities and coordinate facility use.

Goal 5: Protect trees, soil, water bodies and other resources during construction
STRATEGIES:

1) Use best practices for erosion and sediment control during construction, fencing and other best practices for tree protection during construction, and comply with local regulations for buffers and setbacks for water resources.
2) Consult with the Grounds Manager during the design phase and construction phase to ensure continuity between existing and future landscaping plans and grounds maintenance.

Goal 6: Use Integrated Design to ensure continuity from initial phases of design through later phases of construction, operations and maintenance.
STRATEGIES

1) Use a collaborative, integrated planning and design process that maintains an integrated project team in all stages of a project's planning and delivery.
2) Establish performance goals for siting, energy, water, materials, and indoor quality to ensure incorporation of these goals through the design and lifecycle of a building.
3) Consider all stages of the building's lifecycle, including deconstruction.
4) Use life cycle cost analysis to weigh design options and choose high performance system components when justified.

5) Consult with stakeholders including building occupants, project managers, and maintenance and operations staff to ensure the building is designed to meet occupant needs and can be maintained efficiently over time to continue to meet building performance goals.
6) Require periodic building commissioning and include commissioning in project funding to ensure the building meets performance goals after construction and beyond.

SECTION 2: ENERGY USE

OBJECTIVE: Optimize energy performance and pollution prevention

GOALS:

- **When feasible, reduce total building energy consumption and peak electrical demand**
- **Reduce air pollution and ozone depletion caused by energy production**
- **Achieve energy savings due to upgrades and high-performance system components**
- **Pursue all opportunities for funding, rebates, and other means of financing energy-efficient building components and measurement tools and demonstrate return on investment over the life-cycle of the building component or system through savings due to increased efficiency**

Goals 1 and 2: When possible, reduce total building energy consumption and peak electrical demand and reduce air pollution and ozone depletion caused by energy production
STRATEGIES:

1) Establish a whole building performance target that takes into account the intended use, occupancy, operations, plug loads and other energy demands and design based on the ENERGY STAR Target finder for new construction and major renovation where applicable, even if ENERGY STAR or other certification is not sought on the project.
2) Utilize technologies such as heat recovery systems, fan coil units, long-life high-efficiency mechanical equipment for HVAC systems, and high performance components.
3) Sub-meter buildings to measure KwH and peak demand and incorporate metering into software monitoring that can generate data reports broken down by time of day, peak use, day of the week, month, and year.
4) Optimize insulation to reduce heating and cooling energy consumption by heat losses and gains through the building envelope.
5) Provide daylighting integrated with electric lighting controls, and ensure that glare and excessive contrast is controlled for through shading, window glazing, and architectural design.

Goal 3: Achieve energy savings due to upgrades and high-performance system components
STRATEGIES:

1) Use equipment with premium efficiency motors and variable speed drives.
2) Select new equipment and appliances that meet EPA Energy STAR criteria.
3) Use heat recovery systems.

Goal 4: Pursue all opportunities for funding, rebates and other means of financing energy-efficient building components and energy measurement tools and demonstrate return on investment over the life-cycle of the building component or system through savings due to increased efficiency.
STRATEGIES:

1) Consult with local utility companies to participate in energy efficiency rebate programs.
2) Utilize state and federal programs for investments in energy efficient technologies.

SECTION 3: MATERIALS, RESOURCES, AND WASTE

OBJECTIVE: Select products and materials that contribute to environmental stewardship

GOALS:

- **Reduce consumption and depletion of material resources, especially non-renewable resources**
- **Minimize the life-cycle impact of materials on the environment**
- **Minimize waste generated from construction, renovation, and demolition of buildings**
- **Minimize waste generated during building occupancy**

Goal 1: Reduce consumption and depletion of material resources, especially non-renewable resources
STRATEGIES:

1) Use life-cycle methodology to evaluate materials, focusing on those used in large quantities or with significant environmental impact. Choose materials with the lowest environmental impact when feasible. New furniture should meet the criteria of GREENGUARD Children & Schools certification.

Goal 2: Minimize the life-cycle impact of materials on the environment
STRATEGIES:

1) To reduce the consumption of natural resources, consider and use the following:

    - Salvaged materials
    - Remanufactured materials
    - Materials with post-consumer recycled content
    - Reusable, recyclable and biodegradable materials
    - Durable materials which are easier to maintain on surfaces such as flooring, countertops, walls, trim, doors, and in considering furniture, fixtures, and textiles
    - Wood certified by the Forest Stewardship Council or from a Certified NH Tree Farm
    - Timber that is harvested within 500 miles of Phillips Exeter Academy
    - Low or zero VOC materials

2) Use materials systems, and components that can be recycled or reused, and avoid composite materials when possible.

Goal 3: Minimize waste generated from construction, renovation, and demolition of buildings
STRATEGIES:

1) Divert construction waste and demolition debris waste from area landfills by preparing a Construction Waste Management plan with a goal of achieving a 75% diversion rate.
2) Use salvaged and re-used materials where applicable and feasible.

Goal 4: Minimize waste generated during building occupancy
STRATEGIES:

1) Provide designated areas for recycling.
2) Provide signage for recycling areas and lists of materials that can be recycled.
3) Provide signage for appropriate disposal of other items including light bulbs, batteries, hazardous materials, computers, cell phones, and other electronics.

SECTION 4: WATER MANAGEMENT

OBJECTIVE: Conserve and protect water resources
GOALS:

- **Reduce stormwater runoff impacts on the area's water resources**
- **Reduce potable water consumption associated with landscape irrigation**
- **Reduce overall water consumption inside buildings**

Goal 1: Reduce stormwater runoff impacts on the area's water resources
STRATEGIES:

1) Retain and/or maximize pervious and vegetated areas of the site.
2) Utilize best practices for stormwater management and erosion and sediment control
3) Where possible, use biologically based stormwater management techniques such as swales, rain gardens and infiltration basins.

Goal 2: Reduce potable water consumption associated with landscape irrigation
STRATEGIES:

1) Select drought-tolerant species and species native to the region.
2) Utilize efficient irrigation systems that utilize moisture sensors, drip irrigation, and other technologies to reduce irrigation.

Goal 3: Where possible, reduce overall water consumption inside buildings
STRATEGIES:

1) Use technologies such as infrared faucet sensors, low-flow toilets, dual-flush toilets, low-flow faucets and showerheads, and clothes washers and other appliances that meet EPA ENERGY STAR requirements.
2) Use domestic dishwashers that use 10 gallons per cycle or less. Use commercial dishwashers that use 120 gallons per hour (conveyor) or one gallon or less per rack.

SECTION 5: INDOOR ENVIRONMENTAL QUALITY

OBJECTIVE: Ensure optimal indoor environmental quality

GOALS:

- **Monitor indoor air quality during renovation, demolition, and construction activities.**
- **Provide and maintain acceptable indoor air quality, defined as: "Air in which there are no known contaminants at harmful concentrations as determined by state and federal authorities and with which a substantial majority (80%) of the people do not express dissatisfaction**
- **Produce environments that enhance comfort, well-being, performance, and productivity**

Goal 1: Monitor indoor air quality during renovation, demolition, and construction activities
STRATEGIES:

1) Develop an Indoor Air Quality Management Plan meeting or exceeding recommended Control Measures of the SMACNA IAQ Guidelines for Occupied Buildings Under Construction 2007, ANSI (/SMCNA 008-2008 or most recent version or amendment.
2) Conduct baseline air quality testing prior to occupancy consistent with US EPA Compendium of Methods for the Determination of Air Pollutants in Indoor Air.
3) Address Environmental Tobacco Smoke Control during construction and post occupancy. Maintain a smoke free work site and post construction smoke free building environment.

Goal 2: Provide and maintain acceptable indoor air quality, defined as: "Air in which there are no known contaminants at harmful concentrations as determined by state and federal authorities and with which a substantial majority (80%) of the people do not express dissatisfaction
STRATEGIES:

1) Adhere to ASHRAE standards for ventilation and thermal comfort including standards for Ventilation for Acceptable Indoor Air Quality, and Thermal Environmental Conditions for Human Occupancy.
2) Ensure laboratories are properly ventilated and meet current national standards. Consider technologies for laboratories such as variable air volume hood controls and fume hood sash restrictors.

3) Where moisture precautions are needed, specify materials to discourage microbial growth and address moisture control in design specifications and building maintenance.
4) Utilize GreenSeal or EcoLogo certified cleaning products within an established cleaning protocol to clean interiors of buildings.

Goal 3: Produce environments that enhance comfort, well-being, performance, and productivity
STRATEGIES:

1) Use low or no VOC-emitting materials (including paints, coatings, adhesives, carpet, ceiling tiles, and furniture systems) to help ensure good indoor air quality. Choose GREENGUARD certified surfaces such as flooring and GREENGUARD certified furniture.
2) Follow material conditioning procedures and project sequencing procedures.
3) Reduce dust emissions in occupied buildings during and after construction.
4) Specify design features to control sources of noise from mechanical and electrical equipment and from exterior sources.
5) Specify design strategies and features to create appropriate sound reverberation levels, background sound levels, sound rendition, and speech interference levels.
6) Where feasible, provide building occupants with control of thermal and lighting conditions within a specified range for optimal energy performance.

SECTION 6: LIFE CYCLE COST ANALYSIS

OBJECTIVE: Demonstrate improved efficiency and cost savings within a reasonable time period by providing life cycle cost analysis and return on investment calculations for proposed materials and system components when considering multiple choices of materials or system components

When choosing materials, components and systems, provide calculations for life cycle cost analysis and when warranted return on investment for system upgrades or components. The design team and Phillips Exeter Academy should weigh investments in increased efficiency versus the achievement of a reasonable return on investment by utilizing life cycle cost analysis and other tools to determine that such systems and components are justified.

REFERENCES

1. Basis of Design, Phillips Exeter Academy Phillips Hall Renovation, The Green Engineer LLP, April 14, 2011.
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3. LEED for Schools (United States Green Building Council).
4. Building Standards, Stanford University, March 2002.
5. U.S. Department of Energy. Guiding Principles for Federal Leadership in High Performance and Sustainable Buildings. http://www1.eere.energy.gov/femp/program/sustainable_buildings.html
6. Minnesota Sustainable Design Guide, 1999-2001.

7. Campus Sustainable Design Guidelines, University of Connecticut, November 2004.
8. The Collaboration for High Performance Schools, Best Practices Manual, Volume II, Design, 2006.