KEENE STATE COLLEGE
SUSTAINABLE BUILDING GUIDELINES

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EXECUTIVE SUMMARY

Creating A World Of Possibilities

The Keene State College campus mission and values statement says that: “As a campus community we value environmental stewardship and sustainability” and further these values by providing “an attractive and functional campus that is also efficient and sustainable”.

These Guidelines are intended to demonstrate Keene State College’s commitment to plan and develop long-term, high-value, quality, cost effective facilities and landscapes that enhance the academic mission of the College, lower ongoing operations and maintenance costs, provide healthier buildings for our students, faculty, staff and visitors, embrace our partnership with the community and reinforce our stewardship of Keene State College lands. In addition, we recognize that the building industry has a tremendous impact on the natural environment on a national and global scale, including the use of non-renewable resources and unsustainable resource management practices.

We expect that The Guidelines will serve as a stepping off point for continued improvement of the built environment at Keene State College.

The Guidelines are designed to serve as both a communication and working tool to aid in the planning, design and construction of new buildings and renovations with an appropriate level of attention to academic, economic, ecological and social concerns. It complements Master Planning and provides guidance to project managers, architects and other members of new construction or major renovations project teams. Considering the long-term impact on overall operating costs and curriculum development at Keene State College, sustainability is to be valued at the same level as traditional competing priorities such as cost, quality of work, materials and schedule. Competing priorities must be equally considered, and in balance, to support the program within the building as suggested by the illustration in Section I.

In the last twenty years, Keene State College has developed into a true college campus, following a well-developed Master Plan, from a core of buildings built in 1909 and a series of random buildings and city streets. One of ten major themes of general interest, as identified by the campus community in 1996, is for a “Green Campus/Enhanced Physical Plant” that would “encourage better use of resources - in all senses of the phrase”. Ultimately, as a way to advise the President on how to meet this goal, the President’s Council for a Sustainable Future was appointed. The Sustainable Environment theme states that we will “Plan, design and build with sustainability in mind.” This manual, The Guidelines for Sustainable Buildings (The Guidelines), is designed to provide practical tools for achieving this vision.

It is our intention that these Guidelines will be flexible and grow over time, with changes in technologies, changes in the environment, and changes in public expectations on sustainability. As these Guidelines are used and adapted to fit the ever changing building needs of the College, those adaptations will be reflected in this document. Periodic reviews of this document will help create a more dynamic and useful set of Guidelines that accurately reflects the Colleges commitment to sustainability.

Our current Master Plan, developed in 2005, notes that 'Sustainable practices on college campuses provides the opportunity to save resources" and that "sustainability integrated in contracted services is as important, as the planning decisions are often those lived with the longest." While we continuously strive to improve the campus, and as we periodically update our Master Planning, we can provide up to date educational facilities that exemplify Sustainable Principles as examples for student to learn from and carry with them as they graduate.

Section I of The Guidelines provides an overview and introduction. It explains how the word "sustainability" is used in the context of this document and why it is important at Keene State College. **Section II**, is the Technical Guidelines for sustainability. They provide technical information in the form of goals and strategies to which Keene State College's consultants should refer during the design process. The Technical Guidelines are organized by the several areas in which sustainability features can be integrated into the design of any building type: site design and planning, energy use, water management, materials/resources/wastes and indoor environmental quality. **Section III** contains a discussion of Funding, Decision Tools and Metrics that support and document a sustainable building process.

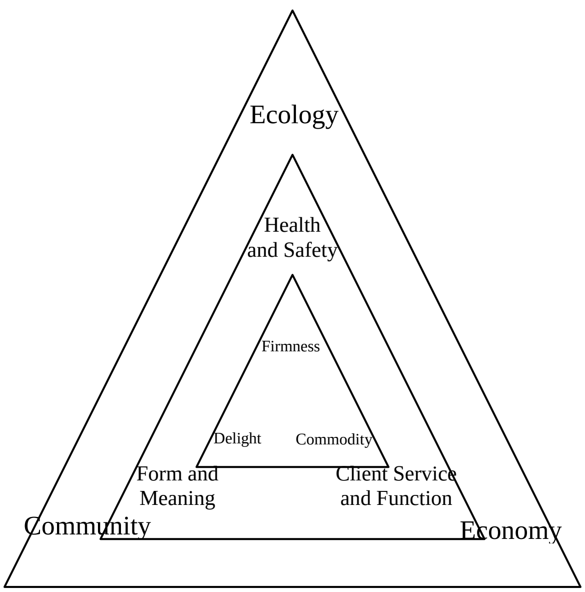
> "More than any other institution in modern society, colleges and universities have a moral stake in the health, beauty, and integrity of the world their students will inherit. We have an obligation to provide our students with tangible models that calibrate our highest values with our best capabilities; models that they can see, touch, and experience. We have an obligation to create grounds for hope in our students some of whom see themselves as the "X or millennial generation." But hope is different than wishful thinking so we have a corollary obligation to equip our students with the analytical skills and practical competence necessary to do the hard work ahead of reweaving the human presence in the world. When the pedagogical abstractions, words, and whole courses do not fit the way the academic campus in fact works, they learn that hope is just wishful thinking or worse, rank hypocrisy.
>
> We have, therefore, a moral interest in making certain that campus purchasing, investments, and operations of the physical plant do not undermine the integrity, beauty, and stability of the world students will inherit. With that obligation in mind, could farsighted colleges take the lead to declare, say, a ten-year goal to power themselves by a combination of greater efficiency, emerging solar technologies, and hydrogen? Why not? The limits are no longer technological or even economic, but those of imagination and commitment. Could some declare a similar goal to become zero-discharge campuses and eliminate waste in all of its forms? Again, why not? Through the imaginative use of our buying and investment power could they help leverage the emergence of a genuinely sustainable economy in their surrounding communities? And could they incorporate such things into the curriculum in ways that cross disciplinary boundaries while having a practical effect on the world? Why not? The important planning questions have to do with how institutions of higher education might imaginatively calibrate their moral interest in the long-term future with their actual institutional behavior and do so as part of a larger effort to teach the next generation that the world is indeed rich in good possibilities."
>
> Orr, David W. Academic Planning in College and University Programs: Proceedings of the 1998 Sanibel Symposium, 1998.

WHAT MAKES A BUILDING "SUSTAINABLE"

Background

Sustainability as applied to buildings is an evolving concept. At Keene State, with respect to facilities planning, new construction and renovations, our goal is that sustainability will be given equal consideration to other criteria, such as cost, quality, schedule and operations. The definition of the word "sustainability" must incorporate a balanced concern for the preservation of three interdependent areas: community, economy and ecology.

Sustainable design can encompass many elements that will vary depending on the specific project. However, it is important that a definition of *what is a sustainable building* be provided as a benchmark. At Keene State, a sustainable building is one that considers in its design and operation: principles of energy conservation, indoor air quality, and efficient use of resources, including land use, siting/landscaping, materials use, and transportation. Ultimately, the 'green' design parameters in any one building are decided collaboratively by campus stakeholders on a project by project basis. In all cases, a sustainable building must provide a safe, attractive, and productive indoor environment. Achieving these goals requires an integrated development process.



C 2001 by the National Council of Architectural Registration Boards.

The diagram above illustrates the linkage between sustainability concerns and classic architectural design principles.

WHY IS SUSTAINABILITY IMPORTANT?

Environmental concerns such as population growth, depletion of natural resources, global climate change, ecosystem degradation and pollution are real and pressing issues facing humanity today. Colleges and universities have the opportunity to be at the forefront of sustainability education not only in theory, but also practice. Construction of new buildings is resource intensive and can have a negative impact on the environment. Benefits of sustainable building design include finding ways to minimize environmental impact as compared to traditional construction methods.

We believe Keene State College should take a leadership role in sustainable building design by incorporating five categories of sustainable building design:

1. **Site design and planning**. This involves the optimal use of natural or existing features in siting new buildings to maximize energy efficiency and use of natural resources. The intent is to encourage optimum use of natural/existing features in architectural and site design of campus buildings, such that building energy use is diminished and the environment is enhanced.
2. **Energy Use**. Sustainable design means investigating and implementing ways to minimize energy use and emissions from energy processes that support building operations. For example, one way may involve maximizing the use of natural lighting or natural ventilation as a way to minimize light fixtures or HVAC loads.
3. **Water management**. Fresh water from clean sources is becoming increasingly scarce throughout the world. Sustainable building design looks for ways to minimize water use and find ways to recycle and reuse water, including ways to beneficially manage storm water.
4. **Materials resources and waste**. This involves looking at a life cycle assessment of materials, preferring the use of local and long lasting materials that are easiest and safest to maintain and reuse. Other options include reusing existing building materials for other applications or recycling existing materials. Waste is generated throughout the life of a building and transported to landfills during building demolition, renovation and construction. According to the U.S. Environmental Protection Agency, construction and demolition waste represents a quarter to a third of all waste land filled in the United States. Keene State College already diverts 38% of its waste from landfills, but 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 landfills and natural resources as well as reduce waste disposal costs.
5. **Indoor Environmental Quality**. Typical paints, carpets, and other building materials can be sources of indoor chemical emissions, contributing to poor air quality. Sustainability here means using non-toxic materials inside buildings to minimize off-gassing of chemicals and contribute to a safe and healthy indoor environment. These benefits of a good indoor environmental quality may likely also extend to the performance, retention and productivity of Keene State College's students, faculty and staff.

IMPLEMENTING SUSTAINABILITY

Implementing sustainable building practices is an ongoing process. Key elements of implementation will include appointment of a Project Team. The Team will include the Vice-President for Finance and Planning, The Sustainability Coordinator, Architects and Engineers as support and sources of ideas for improvement.

Sustainability Coordinator

Each Capital Planning and Management building Project Manager will work with a Sustainability Coordinator appointed by Vice President for Finance and Planning. The role of this coordinator will be to educate the team on the various aspects of sustainable design addressed in The Guidelines, facilitate decision making to include sustainability criteria, and track and report on the progress made toward implementing sustainability.

Project Architect Selection

The Purchasing Department will include sustainable building design qualifications as one of the criteria for selecting the design architect for each project. Requests of Qualifications/Proposals for design architects will include experience/qualification in the area of sustainable building design and these qualifications will be considered during the selection process. Requests for proposals given to potential design architects will include The Guidelines as an attachment.

Project Team Education

The entire Project Team will review the principles of sustainable building design in general and will reference The Guidelines throughout the project. This education is most important during the initial project phases. All members of the Project Team will receive a printed copy of The Guidelines which includes a reference to the web site (http:www.keene.edu/sustain/guidelines) where The Guidelines will be regularly updated and revised to reflect new technologies and learning. During the course of the project delivery process, a work session on the topic of sustainability shall be facilitated by the Sustainability Coordinator at the request of the Project Manager. The Project Team should attend this work session and focus on educating attendees on current sustainable opportunities and next steps in the process.

II. Technical Guidelines

SUSTAINABILITY GOALS AND STRATEGIES

In view of the environmental concerns associated with buildings, sustainable design embodies certain goals within each category. The discussion of each sustainability category begins with a set of goals, followed by a list of suggested strategies to be used in achieving those goals.

The sustainability strategies included here are not comprehensive; the Technical Guidelines are intended to provide a framework of ideas and not exclude any potential solutions from consideration.[1] The strategies are not ranked, but multiple strategies in each category are preferred. Where appropriate, designs are expected to exceed National or International Standards. The Project Team is encouraged to develop additional strategies.

The Technical Guidelines are divided into two sections the first section is organized into five different categories:

- Site Design and Planning
- Energy Use
- Materials, Resources and Waste
- Water Management
- Indoor Environmental Quality

The second section of the Technical Guidelines outlines the nine building use types found on the Keene State College campus:

- Performance Areas
- Residential
- Offices and Classrooms
- Libraries and Display Areas
- Wet Labs
- Dry Labs
- Computer Facilities
- Athletic Facilities
- Dining Facilities

"Whole-Systems" Design Approach

Whole-Systems Design is crucial for sustainability. The sustainability categories and strategies are interdependent; none stand in isolation. Decisions made in one area may affect the performance in another. A single design improvement might simultaneously improve several building systems' performance; for example, careful decisions on building shape and window placement that take into account both prevailing wind and sun angles may not only enhance a building's thermal performance but can also result in improved day lighting. On the other hand, considering one building system alone without regard to others may result in poorer performance in the other systems; for example, improving indoor environmental quality by increasing outside ventilation may compromise the energy performance of the building. Any conflicts among categories should be resolved by using an integrated design approach; and careful decisions should be made to select those designs that can trigger multiple savings or other benefits. It is essential that all members of the Project Team work together and consider all sustainability categories in order to be aware of the influence of their decisions on the overall sustainability performance of the building in each category.

Provide Views and Connection to the Natural Environment

Provide windows, skylights and other outside view access where possible. Provide opportunities for contact with the environment via atriums, plazas, gardens, courtyards, use of plants and other indoor design treatments. Create connected interior and exterior view spaces that provide combinations of spaciousness, privacy, personal security, visual relief, and visual access to routes and settings within and outside the building.

Provide Appropriate Building Acoustical and Vibrational Conditions

Control sources of externally and internally produced vibrations from wind loads, passing traffic, interior foot traffic, building HVAC systems and interior machinery. Similarly, use design features and strategies to control sources of noise by using techniques such as wall assemblies with appropriate Sound Transmission Class ratings, acoustic zoning, proper equipment selection, and appropriately designed ducts, piping and electrical systems.

In addition, not all strategies suggested here are relevant for every project and certainly not all strategies will be implemented in every project. Strategies and decisions will have to be balanced by the Project Team and integrated in a way that makes sense for each project.

Notes:

1. These guidelines draw heavily from the *University of Minnesota Sustainable Design Guide*, the *City of New York High Performance Building Guidelines*, the *Stanford University Guidelines for Sustainable Buildings* and the *LEED Green Building Guidelines and Rating System*

Site Design and Planning

Goals:

- Promote sensitive infill development that relates well to both natural systems and existing infrastructure.
- Maintain and enhance the biodiversity of natural systems and/or the existing character of the site.
- Respond to Keene State College's microclimates and natural site conditions.
- Reduce energy use for transportation and site related activities.
- Contribute to the cohesiveness and intelligibility of the existing campus.
- 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.
- Orient and configure the building on the site to minimize energy use by means of day lighting, solar heating, natural ventilation and shading from vegetation or other buildings.

Strategies:

Guide Development to Environmentally Appropriate Infill Areas

Select a site that:

- ❑ Meets the conditions of the approved Master Plan
- ❑ Is characterized as previously developed land
- ❑ Avoids habitat for any sensitive species and species on the Federal or State threatened or endangered list or is a wildlife or riparian corridor
- ❑ Avoids the loss of mature tree and plantings
- ❑ Does not impinge on flood plain and flood area requirements
- ❑ Promote sensitive infill development that relates well to both natural systems and existing infrastructure
- ❑ Maintain and enhance the biodiversity of natural systems and/or the existing character of the site
- ❑ Respond to Keene State College's microclimates and natural site conditions
- ❑ Reduce energy use for transportation and site related activities
- ❑ Contribute to the cohesiveness of the existing campus

Maintain and Enhance the Biodiversity and Ecology of the Site

- ❑ Minimize the impacts of development process to reduce alterations and ecological disturbance
- ❑ For greenfield (previously undeveloped) sites, limit site disturbance including earthwork and clearing of vegetation
- ❑ Design the 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 buildings, parking and access roads
- ❑ Site the buildings to create traffic patterns that promote non-motorized access
- ❑ Maintain setbacks that effectively utilize the site while respecting surrounding environmental conditions

Use Microclimate and Environmentally Responsive Site Design Strategies

Design the site and building to respond to microclimate and environmental conditions

- ❑ Locate trees and shrubs to support passive heating and to complement cooling in outdoor spaces and buildings and to create seasonally appropriate heat sinks 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 ensure proper drainage
- ❑ Locate site elements 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
- ❑ Design site lighting for safety and to minimize light trespass from the building and site and to minimize impact on nocturnal environments
- ❑ Use of storm water management techniques as identified in these guidelines

Use appropriate trees, shrubs, plants and grasses

- ❑ Reference Landscape Master Plan
- ❑ Use vegetation on the site that conserves water
- ❑ Use vegetation that reduces pesticide use
- ❑ Design landscaping that promotes Keene State College’s “*sense of place*”
- ❑ Select vegetation that reduces plant mortality
- ❑ Select vegetation that lowers operational maintenance

ENERGY USE

Goals:

- Reduce total building energy consumption and peak electrical demand.
- Reduce air pollution, contributions to global climate change and ozone depletion caused by energy production.
- Slow depletion of fossil fuel reserves.
- Achieve energy cost and related savings due to upgrades to infrastructure.
- Achieve carbon neutrality[1].
- Identify alternate benchmarks for Energy efficiency rating similar to Energy Star
- Evaluate and select systems, equipment, and materials on the basis of life cycle cost. Where less efficient selections are made for capital budget reasons, identify those choices and, where possible, buy back efficiencies using internal funds, grants, and third party funding.
- Total building design will achieve a minimum Energy Star Energy Performance Rating (EPR[3]), or its equivalent, of 75 or greater whenever possible.
- Consider the use of alternative energy sources and supply systems to reduce the buildings' total energy load and minimize environmental impacts of burning fossil fuels, such as air pollution and global warming.

Strategies:

<u>Load Reduction:</u>

Optimize Building Envelope Thermal Performance

Design building envelope to optimize thermal performance:

- ❑ Size openings, select glazing and utilize shading devices, interior or exterior, to optimize daylight and glare control while minimizing unwanted heat loss or heat gain
- ❑ Optimize insulation to reduce heating and cooling energy consumption by heat loss and gain through the building envelope
- ❑ Moderate interior temperature extremes by using thermal mass whenever 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

Provide Day light Integration with Electric Lighting Controls

Ensure that daylight is designed in coordination with the electric lighting system to reduce energy consumption while maintaining desired lighting characteristics:

- Shape the architectural plan to use appropriate strategies to maximize the amount of useful, controlled daylight that penetrates into occupied spaces (e.g. roof monitors, clerestory window, atriums and courtyards)
- Use shading devices such as overhangs on south elevations, vertical fins on east and west elevations and/or vegetation to let in natural light but reduce glare and overheating
- Use light shelves combined with higher, more reflective ceilings to bring natural light deeper into perimeter spaces and control glare and excessive contrast.
- Select clear films or spectrally-selective low-e glazing to increase daylight while minimizing heat gain.
- Use photocell-dimming sensors that adjust electric lighting in response to available daylight.

<u>Efficient Systems Design:</u>

Provide Efficient Electric Lighting Systems and Controls

Design the electric lighting systems and components to minimize energy use while still meeting project requirements and high visual quality:

- Use high efficiency lamps, luminaries and ballasts
- Use controls to reduce energy use (e.g. dimmers, occupancy sensors, photocells and time clocks)
- Use low levels of ambient light with walkway lighting where appropriate
- Use full or partial cutoff lighting
- Use direct/indirect lighting fixtures to illuminate ceilings and walls, producing low-level ambient light that minimizes glare in computer rooms
- Reference Facilities Design Guidelines and the outdoor lights standards[3]

Maximize Mechanical System Performance

Design the building heating, ventilating and air conditioning (HVAC) system to minimize energy use while maintaining standards for indoor air quality and occupant comfort:

- When possible, minimize or eliminate air conditioning. Where AC is considered, use central systems
- When providing cooling systems for computer equipment consider using cabinet systems that focus on cooling just the equipment not the entire room
- Use central campus steam when building in the core campus
- 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 evaporative cooling and/or pre-cooling for conditioned spaces
- When not using central steam or chilled water, design boilers and chillers using high efficiency equipment, use multiple modular boilers to allow more efficient part-load operations, high efficiency condensing boilers, or gas heater/chillers

- Modulate outside air according to occupancy, activities and operations. Use occupancy sensors and variable air volume distribution systems to minimize unnecessary heating or cooling and dual duct systems, or other systems that provide equal or better results
- Use energy – heating or cooling - recovery systems to reduce energy use.
- Use zero CFC-based refrigerants in HVAC and refrigeration equipment. Phase out CFC-bases refrigerants for renovation projects
- Design extensive operator overrides and controls into the BAS (Building Automation Standards) to allow temporary response to abnormal situations and conditions and for troubleshooting problems

Use Efficient Equipment and Appliances

Design and/or select any building equipment and appliances to optimize energy efficiency:

- Use equipment with premium efficiency motors and variable speed drives
- Select new equipment, including transformers and appliances that meet EPA ENERGY STAR[2] criteria
- Use efficient equipment to heat and supply service water to the building. When feasible, use tankless water heaters
- Ensure luminance levels are appropriate for user's activities and tasks, minimize and avoid glare from lighting, and use design features that consider color temperature and color rendering appropriate for user's activities and tasks
- Use partial or full cut off lighting in outdoor situations were applicable

Low Environmental Impact Energy Sources

Use Renewable or Other Alternative Energy Sources

These systems can be either building integrated or directly connected

- For buildings and activities not served by PSNH, evaluate possibilities for the use of renewable energy (such as photovoltaic panels, solar water heaters, wind turbines, and ground source heat pumps)
- Evaluate possibilities for other alternative energy supply systems (such as fuel cells and micro turbines)
- When possible, include renewable energy percentage as a weighted criteria in the selection of KSC's electrical energy provider

Notes:

1. The point at which the amount of CO_2 produced by a manufacturing process, distribution system and / or product use is equal to the amount being removed.
2. http://www.energystar.gov
3. Facilities design guidelines and the outdoor lights standards

MATERIALS, RESOURCES AND WASTE

Goals:

- Reduce consumption and depletion of material resources, especially nonrenewable resources.
- Minimize the life-cycle impact of materials on the environment.
- Enhance indoor environmental quality.
- Minimize waste generated from construction, renovation and demolition of buildings
- Minimize waste generated during building occupancy.
- Encourage better management of waste.
- Choose those materials with the lowest environmental impact[1].
- Use locally manufactured materials.
- Use products and materials that are durable (with a life cycle of at least 50 years), weather well and last more than one building lifetime (i.e. through a remodel or re-use in other buildings).
- Use of materials with post-consumer recycled content are preferred to those with pre-consumer content.

Strategies:

Production

Conserve embodied energy of materials and reduce the consumption of natural resources

- ❑ Use salvaged materials
- ❑ Use remanufactured materials, such a engineered wood products[3]
- ❑ Use recycled-content (post-consumer and/or pre-consumer) products and materials specified with a content of 5% or more
- ❑ Use reusable, recyclable and biodegradable materials
- ❑ Use materials from rapidly renewable sources[4] (e.g., wheat, cotton, cork, bamboo, etc)
- ❑ Use wood certified by the Forest Stewardship Council[5]
- ❑ Create a work site that encourages the collection and storage of recyclables and waste

Distribution

- Obtain materials and products from local resources and manufacturers (within New England)
- Minimizing energy use and pollution associated with transporting materials from great distances[6]

Design for less Material Use

- Reuse existing buildings
- Employ design strategies to use fewer materials
- Reduce the size of the building and spaces
- Eliminate unnecessary architectural and finish materials
- Use modular and standard dimensioning
- Include strategies that decrease waste during construction

Design Building for Adaptability

Incorporate interior or exterior design options into the project to facilitate building adaptability

- Consider site planning and building configuration to accommodate future additions and alterations
- Plan for maximum standardization or repetition of building elements and details to increase the ease of adapting the structure for future alterations or upgrades
- Design cladding systems that are fixed by snap release connectors, friction, or other joints that do not require sealants. Use joints and connections that facilitate adaptability, including bolts, screws and clips
- Consider spatial configurations, floor deck, structure, mechanical and ceiling options to facilitate adaptability
- Use a sandwich space between the ceiling to floor level for structure, sprinklers, supply and return ductwork, lighting fixtures and ceiling system, floor level ventilation supply, etc (Allowing the space to be more easily altered)
- 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

Design Building for Disassembly

Incorporate interior or exterior design options into the project to facilitate building disassembly, particularly in short term renovations or swing space

- Use structural systems, cladding systems and no-load bearing wall systems that facilitate disassembly
- Use structure/shell systems that maintain integrity when demounted or disassembled (e.g. steel, glass, or concrete and panel claddings)
- Use materials, systems and components that can be recycled or reused
- Use materials, systems and components that can be assembled or fastened in a manner that facilitates reassembly into new construction or remodeling
- Use snap release connectors, friction or other joints which do not require sealants. Use joints and connections that facilitate disassembly, including bolts, screws and clips

- ☐ Use homogeneous materials rather than composite materials (such as reinforced plastics and carpet fibers and backing), that are easier to separate and recycle.[7]

Notes:

1. With respect to *Raw Material Extraction* - Use Materials with Low Life-Cycle Cost[1a] and a life-cycle methodology (such as ATHENA or BEES assessment tools[2]) to evaluate materials, focusing on those used in large quantities or with significant negative environmental impact (e.g. steel).
   1A. "life-cycle cost" means the amortized annual cost of a product, including capital costs, installation costs, operation costs, maintenance costs, and disposal costs discounted over the lifetime of the product.
2. ATHENA and BEES (Building for Environmental and Economic Sustainability) assessment tools - www.eere.energy.gov
3. Engineered wood products are manufactured from sawdust and chips, traditional waste products from lumber and plywood manufacturing processes. The main drawback is the use of formaldehyde-based glues, though a few engineered wood products that don't use formaldehyde glues are available.
4. Renewable resources are those materials that substantially replenish themselves faster than traditional extraction demand.
5. www.fscus.org
6. A tradeoff exists between the resource conservation benefits of using these products versus the extra energy input to transport these products from distant sources.
7. An exception is the use of engineered wood products, which are composites and are environmentally preferable to using virgin lumber.

Water Management

Goals:

- Minimize negative impact to the local watershed.
- Conserve and reuse storm water where possible.
- Conserve potable water and reduce water consumption.
- Reduce non-point source pollution from campus activities and construction.
- Ensure contractor storm water management plans are included in construction bids for new buildings. Examples of potential actions include erosion control measures and silt control options.
- Reduce water consumption in new buildings.

Strategies:

Storm Water

- ❑ Use erosion control methods such as; silt fencing, sediment traps, construction phasing, stabilization of slopes, erosion control blankets on hillsides, and maintaining or enhancing natural vegetation and groundcover
- ❑ Encourage use of natural storm water protection by use of swales, basins, wetlands, and vegetation cover to provide filtration
- ❑ Minimize hardscapes where possible
- ❑ Consider capture of storm water from impervious areas for groundwater recharge
- ❑ Use public outreach to educate the campus community on non point source pollution

Water Conservation

- ❑ Select drought tolerant, native species for landscaping
- ❑ Use efficient irrigation technologies like drip irrigation
- ❑ Use lake or pond water for irrigation
- ❑ Encourage use of gray water systems in new buildings
- ❑ Use infrared faucet sensors or automatic mechanical shutoff valves
- ❑ Use low flow toilets (EPAct 1.6 gallons per flush), low flow urinals such as 0.5 gallons per flush (EPAct 1 gallon per flush) or dual flush systems
- ❑ Use lavatory faucet flow restrictors for a maximum rate of 0.5 gpm (EPAct 2.5 gpm), low flow kitchen faucets and showerheads (EPAct 2.5 gpm) and aerators
- ❑ Consider use of EPA Energy Star appliances

INDOOR AIR QUALITY

Keene State College is committed to maintaining a safe and healthful work environment for its employees, students, and visitors. Good indoor air quality promotes a favorable learning environment for both students and faculty and a productive work environment for employees.

Ideal indoor air quality is a balancing act between trying to contain rising energy costs by designing and installing energy efficient buildings, and providing sufficient ventilation for comfort and a healthy environment. A variety of airborne contaminants such as paints, tobacco smoke, dust, mold and other materials, can negatively impact indoor air quality. A properly designed HVAC system should control temperature and humidity to provide thermal comfort, distribute adequate outdoor ventilation air, and removes odors and other contaminants as needed. There are currently no formal regulations for indoor air quality. Typically, buildings are designed with ASRAE 62.1 - 2004 in mind, defining acceptable indoor air as “air in which there are no known contaminants at harmful concentrations as determined by cognizant authorities and with which a substantial majority (80% or more) of the people do not express dissatisfaction”.

Goals:

- Provide and maintain acceptable indoor air quality as defined by current standards and best practices.
- Monitor and avoid indoor air quality problems during renovation, demolition, and construction activities.
- Provide occupants with operational control of lighting and HVAC (heating ventilation and air conditioning) systems, where possible.
- Produce environments that enhance human comfort and performance.

Strategies:

- ❑ Comply with current design standards that pertain to the design, operation, inspection, and maintenance of HVAC systems
- ❑ Protect return side of the ventilation systems to prevent contamination
- ❑ Where moisture precautions are needed, materials should be specified that prevent microbial growth. Moisture control should be addressed on site, within the building envelope and inside the building
- ❑ Consider environmental and seasonal thermal variability for dry bulb temperature and radiant temperature profiles, relative humidity and occupants’ activities and modes of dress
- ❑ Adhere to the latest consensus standards that pertain to ventilation pollutant control, and thermal comfort, including but not limited to:
  - ASHRAE Standard 62.1-2004, *Ventilation for Acceptable Indoor Air Quality*
  - ANSI/AHIA Z9.5–1992, *American National Standard for Laboratory Ventilation*

- ASHRAE Standard 55-2004, *Thermal Environmental Conditions for Human Occupancy*

<u>Use low –VOC (Volatile Organic Compounds) emitting materials</u>

- ❑ Design and construction should use low or no emitting materials such as paints, coatings, adhesives, carpet, ceiling tiles, and furniture systems to help ensure good indoor air quality
- ❑ Ensure that all construction materials, interior finishes, and major furnishings installed at Keene State College comply with the most recent industry or regulatory standards for low VOC emission standards, including carpet and paint selections.
- ❑ Follow material conditioning procedures and project sequencing procedures (i.e., allow wet products to dry before installing porous products)
- ❑ Reduce dust emissions in occupied buildings through the use of wet methods
- ❑ Submit Material Safety Data Sheets to EHS Office for review and approval prior to construction projects that require large-scale use of materials such as paint, epoxy's or others that can produce strong odors

BUILDING USE TYPES DESCRIPTIONS

Although the Technical Guidelines should be considered in the design of all buildings, not all strategies apply to all buildings. Depending on what a building is used for, different constraints exist and some categories of sustainability can be more easily applied to some building types than others. Keene State College buildings can generally be divided into 9 types: Performance/Assembly Areas, Residential, Offices and Classrooms, Libraries and Display areas, Wet Labs, Dry Labs, Computer Facilities, Athletic Facilities and Dining Facilities. It is important to note, however, that many buildings have mixed uses. For example, the Science center building houses offices, classrooms and labs.

Performance/Assembly areas

Performance/Assembly areas represent a significant amount of space, and have energy use profiles that are different from other areas: they have intermittent use and widely varying loads, depending on whether they are vacant, being used for rehearsal or setup, or being used for performance. We currently schedule those spaces as occupied or unoccupied, and there is no provision for reduced ventilation rates for rehearsals or setup, for example.

Residential Use Buildings

Residential buildings are occupied by students, faculty and staff and are in use 24 hours a day. But not 52 weeks/yr. Residences include dorm complexes, suites, apartments with their own kitchens, family apartments and converted single family houses. Residences typically have relatively low electric load density, although electric plug load is growing rapidly as students bring more computer equipment and appliances.

Given that much of Keene State College's planned construction is housing for undergraduate students, there are great opportunities for sustainability in this use type. In general, residences are not air-conditioned and heating is provided by central steam or natural gas. Water usage is one of the largest concerns, though greater sustainability should be a goal in all categories.

Offices and Classrooms

Offices and classrooms are typically scheduled for the normal workday; they are mostly used between 8 a.m. and 5 p.m. on weekdays. These buildings include faculty, departmental and administrative offices as well as classrooms and auditoriums used for teaching purposes. Out of all the building types on the Keene State College campus, offices and classrooms have the greatest seasonality in use; although still used in the summers, their use decreases significantly. They use return air systems and have non-critical cooling and heating loads. They also have normal user electric loads and minimal domestic water use. Buildings with retail space (e.g. Young Student Center) are also grouped into this building type since they follow similar use patterns and requirements.

Many of the offices and classrooms on campus are located off Appian Way. These older building also have historical preservation issues to take into account. Since they are used less in the summer, they may not need as much cooling during these lower use times.

Libraries, Galleries, Archives

Like offices and classrooms, library use is scheduled and a return air system is used. They generally have low use per square foot for chilled water, steam and electricity, except when strict temperature and humidity control is specified.

Libraries are subject to specific temperature and moisture controls in order to protect against drastic temperature fluctuations and provide the appropriate conditions to preserve books and art. However, their typical large mass can help with their thermal performance and should be taken into account in design.

Wet Labs

Wet labs are science and engineering labs such as those found in the Science Center. They have a high density of fume hoods and dense user electric loads and they require large amounts of chilled water and steam. The experiments that take place in these labs often use toxic chemicals, hazardous and other materials. Thus, air is allowed to travel only once through the labs to protect the researchers and ensure the health of the building's occupants; the system is characterized as "once-through". Wet labs, especially those with intense washing and sterilization of lab glassware, can have high water consumptions as well. Wet labs have atypical scheduling and specific needs.

Wet labs are by necessity extremely energy- and resource- intensive, which presents a particular sustainability challenge. Once-through cooling with high levels of air changes does not lend itself well to alternative ventilation options. Both the water and air in the building cannot be reused once they have become contaminated. There are also several health and safety issues associated with loss of power or supply air.

Dry Labs

Dry labs are also science and engineering labs. They have dense user electric loads and may also have some fume hoods. These buildings may use mixed once-through cooling and return air. The primary difference between wet and dry labs, however, is their steam requirements; large internal loads may reduce steam loads and dry labs typically require large amounts of chilled water. On the other hand, dry labs do not have much domestic water use.

Computer Facilities

Computer facilities are characterized by high internal loads; high electricity use is required to run the computers and cooling is required to offset the heat load generated by the equipment. Thus, they have large chilled water loads and have reduced steam requirements. A return air system is used. Computer facilities have minimal water consumption. Some of these buildings house the network servers for the campus and thus are required to run continuously.

Similar to libraries and museums, computer facilities need temperature control against wide temperature swings to protect the equipment. However, the expectation of the degree of cooling required may at times exceed the actual need, and it may be possible to use economizers to take advantage of cool outside air at night to help cool the building.

Athletic Facilities

Athletic facilities on campus encompass a wide range of facilities, from the Owl's Stadium to Joyce Fields to the Spaulding Gym and Recreation Center. Most are not continually in use throughout the day. They are, however, used year-round: for the varsity teams and other students and members of the community during the school year and for sports camps in the summers. In general, these building have high domestic water and heating needs, such as the pools and shower facilities.

The maintenance of many of these facilities extends beyond the building itself and site needs are often increased. Site irrigation (e.g. watering the athletic fields) and nighttime lighting needs may be greater than other parts of campus. User education may be an important part of sustainability (e.g. covering the pool at night to prevent heat and water loss).

Dining Areas

Dining areas are by their nature energy and water intensive. There is a heavy steam load for both temperature and cooking.
Energy reuse options exist – like taking heat from refrigeration units to pre-heat incoming air, using grey water for irrigation of inside and outside plantings.

III. Funding, Decision Tools, and Metrics

"GREEN" FUNDING

The Funding, Decision Tools, and Metrics section provides tools and examples for how to make educated decisions about trade-offs among conflicting priorities. At Keene State College, sustainability is to be considered at the same level as traditional competing priorities such as cost, quality, and schedule. It does not control any other priorities, and often, sustainability benefits the others. For example, day lighting may contribute to building aesthetics and reduce operations cost. The competing priorities must be equally considered and in balance to support the program within the building.

For sustainable building features that have significant environmental or social benefits but have no clear economic benefits, the project should investigate alternative funding sources. Other benefits, such a public relations and educational value, may also be considered.

A dedicated "green" funding source at Keene State College has been identified through rebates received from energy efficient lighting conversions. The purpose of these savings is to fund certain sustainable building features when cost consideration otherwise makes it prohibitive or difficult to justify.

DECISION TOOLS

Tools for Decision Making include economic, social, and environmental decision tools. When considering the benefits and costs associated with a particular course of action, it is common to focus only on those which are easily quantified and monetized. However, the principles of sustainability require that the full range of costs and benefits be taken into consideration to avoid limiting the choices in the future. The table below provides examples of economic, environmental/ecological, and social/community benefits, both direct and indirect, that might follow from typical building design choices.

Benefit	Examples
Economy	Reduced operating energy expenditures Reduced operations and maintenance costs Improvements in employee performance/productivity Reduces first cost (e.g., optimized wood framing)
Environmental/Ecology	Pollution prevention Preservation of forests Less resource usage Reduces waste in landfill Reduced greenhouse gas emissions
Social/Community	Aesthetics Development of environmentally preferable product markets Behavior modification (cultural change) “Good neighbor” Institutional leadership

Cost-Benefit Analysis

A cost-benefit analysis attempts to articulate and weigh all of the costs associated with a particular action against all of the benefits that will accrue from that action. If the benefits are greater than the costs, then the correct decision is in favor of the action.
It is important to incorporate sustainability in the basic design elements, such as building form and orientation. It shows that incorporating sustainable design features early in the design process require less incremental capital outlay while still yielding a significant environmental benefit.

During the project delivery process, the Project Team should identify sustainable features as low-cost, no-cost, or cost-saving alternatives. Often there is no clear-cut choice for a selection of sustainable features in a building project. Cost-Benefit Analyses are tools that facilitate informed decision-making.

Economic Analysis Decision Tools

Although Keene State College does not have a formal standard for performing economic or financial analyses, there are effective tools to assist in making informed decisions. Life-cycle Cost (LCC) Analysis can be applied to all kinds of investment decision about equipment, materials, and products. The LCC Analysis sums, for each investment alternative, the costs of acquisition, maintenance, repair, replacement, energy and any other monetary costs that are affected by the investment decision. The time-value of money must be taken into account for all amounts, and the amounts must be considered over the relevant period. All amounts are usually measured in present value. The preferred investment should have the lowest life-cycle cost but not necessarily the lowest first cost. Two methods to perform LCC Analysis are described:

INTERNAL RATE OF RETURN (IRR) METHOD

The internal rate of return method solves for the interest rate for which dollar savings are just equal to dollar costs over the relevant period. This interest rate is the rate of return on the investment. It is compared to the investor's minimum acceptable rate of return to determine if the investment is desirable.

DISCOUNTED PAYBACK METHOD

This method measures the elapsed time between the point of an initial investment and the point at which accumulated savings, net of other accumulated costs, are sufficient to offset the initial investment, taking into account the cost of capital. It is used to indicate the amount of time at which the investment breaks even. The discounted payback method is not always the best tool for performing financial analysis. It should be considered a rough guide, or supplementary measure to the other financial analysis tools. It is important to point out that a discount rate should be used to account for the time-value of money rather than simply using X-year costs and benefits.

There are several important considerations to keep in mind when using the financial analysis tools:

- New KSC buildings are depreciated over 30 years, while renovations are depreciated over 20 years (straight-line depreciation)
- Future costs must be discounted to present value to account for the time-value of money.
- It is important to establish common assumptions and parameters and document their sources. These assumptions include:
    - Utility rates
    - Change-out/replacement periods
    - Discount /inflation rate
    - Expected loads
    - Expected building "life"
    - Maintenance labor rates
    - Identity of final decision maker once analysis is performed

Social and Environmental Analysis Decision Tools

Social and environmental benefits often do not have direct economic benefits and are thus difficult to quantify in dollar terms. Environmental life-cycle assessment software tools and databases can aid with product and material selection decisions. Some examples of these tools are *Building for Economic Sustainability (BEES)* software and the *ATHENA™ Life-cycle Inventory Product* Databases. These tools can be supplemented with *The Environmental Resource Guide, GreenSpec Product Directory* and other resources.

Decision matrices can also be useful in helping to prioritize environmental and social goals and to choose among different options. One way to construct a decision matrix is by taking the following steps:

- Define options (e.g., Site A versus Site B).
- Determine criteria (e.g., Distance from stream; area previously disturbed).
- Rank or weight criteria (optional).
- Give each option a relative score for each criterion.
- Multiply score for each option by criteria weighting (optional).
- Sum scores for each option and compare.

Design Tools

Energy modeling, using software tools such as *DOE-2, eQUEST,* or *ENERGY-10*, to simulate the proposed design's response to climate and season. Designers can preview and improve the performance of interdependent features such as orientation, alternative building shell design, and various mechanical systems. Energy modeling can quickly evaluate cost-effective design options for the building envelope or mechanical systems by simulating the various alternatives in combination. This process takes guesswork out of sustainable building design and specification and enables an accurate cost-benefit forecasting.

METRICS: SUSTAINABILITY PERFORMANCE

Successful implementation of these guidelines depends on a number of factors. The establishment and use of performance benchmarks as metrics are two of these important factors. Informed decisions and incremental improvements based on data are essential to gauge the progress being made. During the first year of implementation, the database designed by Saratoga Associates during the master planning process will be used to measure performance in existing buildings. For example, an indicator of energy use is the annual BTU consumption per square foot; an indicator of waste reduction is the percent of materials (by weight) that are reused, recycled, or otherwise diverted from landfill.

Metrics are used to answer the questions, "How are we doing?" and "Are we moving in the right direction?" The College is committed to developing two tools for establishing existing building stock to provide "low," "median," and "high" performance benchmarks for each building use type. This database will be accessible to Project Team members and College staff as an aid in project-specific sustainability goal-setting. It will be updated annually by the Physical Plant Department to reflect the contributions of new projects and major renovations.

The second tool is a project sustainability performance chart. The chart is intended to visually summarize the performance indicators and provide a mechanism for establishing sustainability goals and outcomes for each project. The Project Team will establish their building's performance goals and refine them as more details become available. When a project is completed, the performance metrics will be verified and added to the benchmarking database. These charts will thereby serve as tools for implementing sustainability, documenting sustainable features, and (over time) serve as a way to assess progress toward improving the sustainability of Keene State College's building stock.

EXAMPLES OF POTENTIAL EXTERNAL FUNDING SOURCES

US FEDERAL	TYPE	ELIGIBLE	COMMENTS	CONTACTS
EPA	Free technical support for financing energy upgrades	Federal, state and city buildings		Julio Rovi; The Cadmus Group Inc. (703)-247-6134; Finance@cadmusgroup.com
Energy Star	Free info and recognition for increasing energy efficiency in buildings	All consumers: Home, Business, government, schools, congregations, etc	· Jointly managed by the US. EPA and DOE · Offers city, county and state governments a variety of actions to prevent pollution and conserve energy · Offers the only national rating system for energy performance in buildings. (efficient buildings can receive the Energy Star Label.)	www.energystar.gov 1-888-star-yes (782-7937)
	Internet Presentations: · "Money for Energy Upgrades" · "5-stage approach to building upgrades" · "One-2- Five Energy Management Diagnostic" · "Benchmarking Tool/Portfolio Manager" · "Labeling" · "Cost Savings thru Energy Star Purchasing" · "Energy Star Computer and Monitor Power Management Program."	All consumers, though each presentation is geared to a specific target audience.	· Presentations are delivered via conference call with an Energy Star Consultant and the Internet. · No cost for participation · Presentations viewed from an office computer · The Cadmus Group, Inc. offers these presentations in support of Energy Star for the U.S. Environmental Protection Agency. (EPA)	To register: www.ecadmus.com/ecadmus/forums
	Purchasing info.	All consumers	To make it easier to purchase energy-efficient products from electronics to lighting and office equipment.	www.energystar.gov

Private Funding	TYPE	ELIGIBLE	COMMENTS	CONTACTS
Kresge Foundation	A green building initiative to encourage environmentally sustainable nonprofit organizations to examine their planning and design processes so that they can assess the environmental impact of their facilities - and the Foundation is adding the incentive of planning and bonus grants that are available on a limited basis.	All 501(c) 3 organizations	The Foundation is also making available a series of **educational materials** designed for nonprofits to help them understand the green approach and consider it next time they build. In order to support in-depth learning about green building, The Kresge Foundation is sponsoring **green building workshops** designed for nonprofit organization executives interested in the subject. New Planning Grant Guidelines are now available. Proposals must be submitted using the new planning grant guidelines application policies and Fact Sheets. The Foundation will not accept proposals which use application materials from the previous Planning Grant Program.	http://www.kresge.org/ John E. Marshall, III President, The Kresge Foundation 3215 W. Big Beaver Road Troy, Michigan 48084 (248) 643-9630

Private Funding	TYPE	ELIGIBLE	COMMENTS	CONTACTS
ESCO's (Energy Service Companies)	An ESCO, or Energy Service Company, is a business that develops, installs, and finances projects designed to improve the energy efficiency and maintenance costs for facilities over a seven to 10 year time period. ESCO's generally act as project developers for a wide range of tasks and assume the technical and performance risk associated with the project. Typically, they offer the following services: · Develop, design and finance energy efficiency projects · Install and maintain the energy efficient equip involved · Measure, monitor, and verify the project's energy savings · Assume the risk that the project will save the amount of energy guaranteed. These services are bundled into the project's cost and are repaid through the dollar savings generated.	Energy retrofit projects- Public and Private	· The ESCO's compensation, and often the project's financing, are directly linked to the amount of energy that is actually saved. · ESCO projects typically employ a wide array of cost-effective measures to achieve energy savings. These measures often include the following: high efficiency lighting, high efficiency heating and air conditioning, efficient motors and variable speed drives, and centralized energy management systems. · ESCO's are typically involved in the education of customers about their own energy use patterns in order to develop an "energy efficiency partnership" between the ESCO and the customer. A primary purpose of this partnership is to help the customer understand how their energy use is related to the business that they conduct. · Most performance-based energy efficiency projects include the maintenance of all or some portion of the new high-energy equipment over the life of the contract. · Included in the ancillary services provided in a typical performance-based energy efficiency contract is the removal and disposal of hazardous materials from the customer's facility.	NAESCO – National Association of Energy Service Companies 1615 M Street, NW Suite 800 Washington, DC 20036 202-822-0959 www.naesco.org · Provides information on ESCO's · Accreditation of ESCO's · Assistance in finding a provider NORESCO, LLC. 1 Research Drive Westborough, MA 01581 508-614-1000 www.noresco.com · Local ESCO (NAESCO member) · Umass Medical Center in Worcester as a case study.

SAMPLE IDEA FORM

Use this form to submit ideas for Sustainable Building Design Elements. Individuals may submit multiple ideas, however to assist in the collating process each idea must be submitted as a separate form.

Idea Title:	Fenestration orientation (EA)
Idea Subject Matter:	Building with west facing glazing cause significant solar loads on a building in many climates. This peak solar load due to west facing windows often coincides with the peak load on electric utility plants.
Idea Text:	Intent: Reduce the area of west facing glazing to reduce solar loads on a building Requirements: On sites with land equal to more than four times the building footprint, the sum of the glazing or fenestration area on the north and south facades shall be 30% more than on the east and west facades. The building may be rotated up to 45 degrees for purposes of calculations. Submittals: A template showing sum of glazing or fenestration area on each façade and calculating the appropriate percentages. Architectural drawings showing location of fenestration.
	Submitted by Mary Jensen, mjensen@keene.edu February 5, 2007

Total Project Score — Possible Points

Certified 26 to 32 points Silver 33 to 38 points Gold 39 to 51 points Platinum 52 or more points

Sustainable Sites — Possible Points 14

Y	?	N			
Y			Prereq 1	Erosion & Sedimentation Control	
			Credit 1	**Site Selection**	1
			Credit 2	**Urban Redevelopment**	1
			Credit 3	**Brownfield Redevelopment**	1
			Credit 4.1	**Alternative Transportation**, Public Transportation Access	1
			Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	1
			Credit 4.3	**Alternative Transportation**, Alternative Fuel Refueling Stations	1
			Credit 4.4	**Alternative Transportation**, Parking Capacity	1
			Credit 5.1	**Reduced Site Disturbance**, Protect or Restore Open Space	1
			Credit 5.2	**Reduced Site Disturbance**, Development Footprint	1
			Credit 6.1	**Stormwater Management**, Rate and Quantity	1
			Credit 6.2	**Stormwater Management**, Treatment	1
			Credit 7.1	**Landscape & Exterior Design to Reduce Heat Islands**, Non-Roof	1
			Credit 7.2	**Landscape & Exterior Design to Reduce Heat Islands**, Roof	1
			Credit 8	**Light Pollution Reduction**	1

Water Efficiency — Possible Points 5

Y	?	N			
			Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	1
			Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	1
			Credit 2	**Innovative Wastewater Technologies**	1
			Credit 3.1	**Water Use Reduction**, 20% Reduction	1
			Credit 3.2	**Water Use Reduction**, 30% Reduction	1

Energy & Atmosphere — Possible Points 17

Y	?	N			
Y			Prereq 1	Fundamental Building Systems Commissioning	
Y			Prereq 2	Minimum Energy Performance	
Y			Prereq 3	CFC Reduction in HVAC&R Equipment	
			Credit 1.1	**Optimize Energy Performance**, 20% New / 10% Existing	2
			Credit 1.2	**Optimize Energy Performance**, 30% New / 20% Existing	2
			Credit 1.3	**Optimize Energy Performance**, 40% New / 30% Existing	2
			Credit 1.4	**Optimize Energy Performance**, 50% New / 40% Existing	2
			Credit 1.5	**Optimize Energy Performance**, 60% New / 50% Existing	2
			Credit 2.1	**Renewable Energy**, 5%	1
			Credit 2.2	**Renewable Energy**, 10%	1
			Credit 2.3	**Renewable Energy**, 20%	1
			Credit 3	**Additional Commissioning**	1
			Credit 4	**Ozone Depletion**	1
			Credit 5	**Measurement & Verification**	1
			Credit 6	**Green Power**	1

Materials & Resources — Possible Points 13

Y	?	N			
Y			Prereq 1	Storage & Collection of Recyclables	
			Credit 1.1	**Building Reuse**, Maintain 75% of Existing Shell	1
			Credit 1.2	**Building Reuse**, Maintain 100% of Existing Shell	1
			Credit 1.3	**Building Reuse**, Maintain 100% Shell & 50% Non-Shell	1
			Credit 2.1	**Construction Waste Management**, Divert 50%	1
			Credit 2.2	**Construction Waste Management**, Divert 75%	1
			Credit 3.1	**Resource Reuse**, Specify 5%	1
			Credit 3.2	**Resource Reuse**, Specify 10%	1
			Credit 4.1	**Recycled Content**, Specify 25%	1
			Credit 4.2	**Recycled Content**, Specify 50%	1
			Credit 5.1	**Local/Regional Materials**, 20% Manufactured Locally	1
			Credit 5.2	**Local/Regional Materials**, of 20% Above, 50% Harvested Locally	1
			Credit 6	**Rapidly Renewable Materials**	1
			Credit 7	**Certified Wood**	1

Indoor Environmental Quality — Possible Points 15

Y	?	N			
Y			Prereq 1	Minimum IAQ Performance	
Y			Prereq 2	Environmental Tobacco Smoke (ETS) Control	
			Credit 1	**Carbon Dioxide (CO_2) Monitoring**	1
			Credit 2	**Increase Ventilation Effectiveness**	1
			Credit 3.1	**Construction IAQ Management Plan**, During Construction	1
			Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	1
			Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	1
			Credit 4.2	**Low-Emitting Materials**, Paints	1
			Credit 4.3	**Low-Emitting Materials**, Carpet	1
			Credit 4.4	**Low-Emitting Materials**, Composite Wood	1
			Credit 5	**Indoor Chemical & Pollutant Source Control**	1
			Credit 6.1	**Controllability of Systems**, Perimeter	1
			Credit 6.2	**Controllability of Systems**, Non-Perimeter	1
			Credit 7.1	**Thermal Comfort**, Comply with ASHRAE 55-2004	1
			Credit 7.2	**Thermal Comfort**, Permanent Monitoring System	1
			Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	1
			Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	1

Innovation & Design Process — Possible Points 5

Y	?	N			
			Credit 1.1	**Innovation in Design:**	1
			Credit 1.2	**Innovation in Design:**	1
			Credit 1.3	**Innovation in Design:**	1
			Credit 1.4	**Innovation in Design:**	1
			Credit 2	**LEED™ Accredited Professional**	1

KSC **Scorecard** KSC Calculator