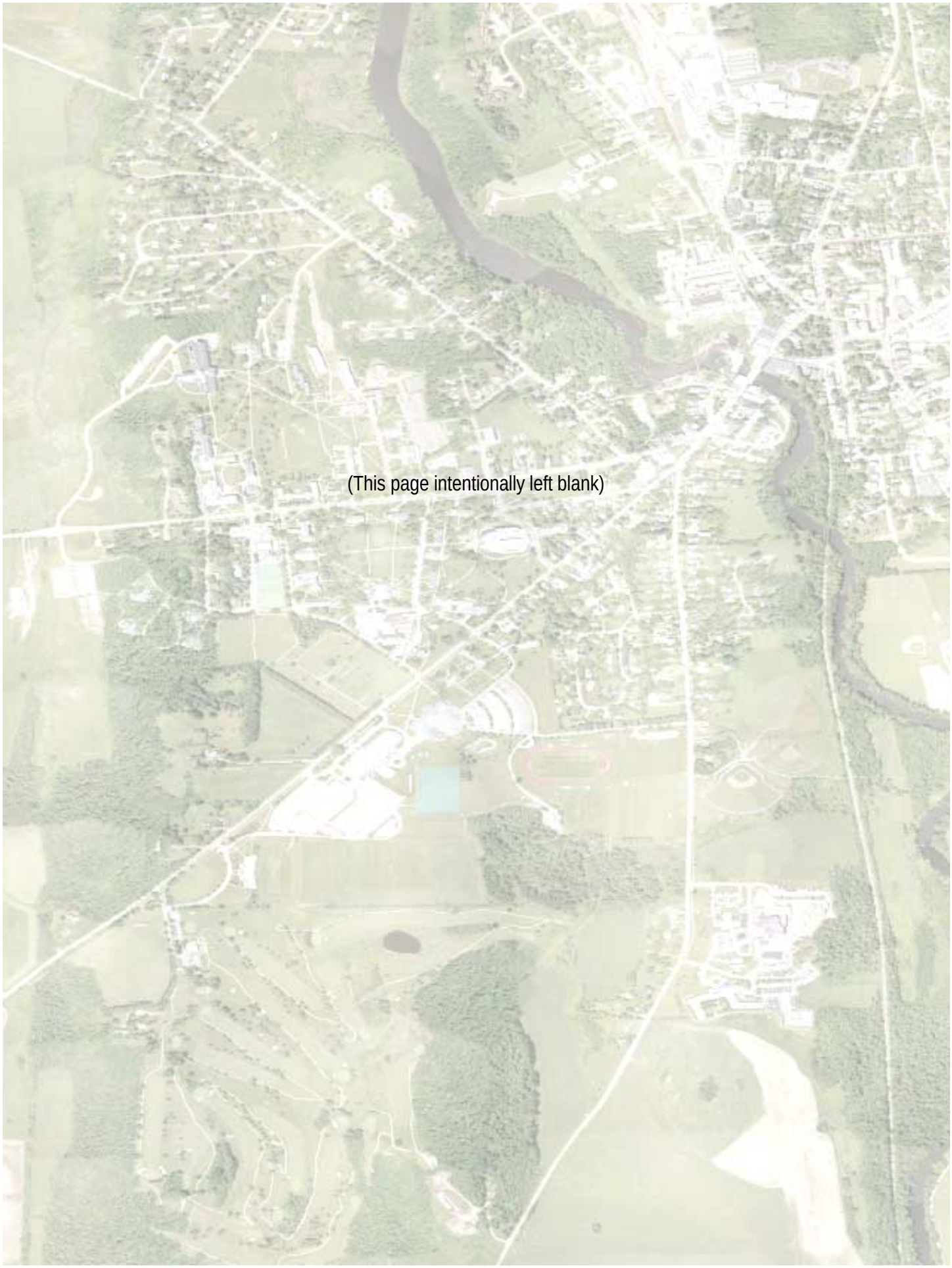
Middlebury College

SUSTAINABLE DESIGN GUIDELINES

November 2008
FINAL



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EXECUTIVE SUMMARY

Introduction

The Middlebury College Environmental Policy stresses the College's commitment to environmental education to *"build vibrant communities of students who are environmentally responsible citizens . . . challenging every College member to share the environmental values that develop through teaching, learning, working, research and living at Middlebury."* (http://www.middlebury.edu/administration/enviro/policies/enviro_policy.htm)

As articulated in its environmental policy, Middlebury College is committed to a holistic approach to sustainability, and through its campus facilities and grounds, to an integrated environmental approach. Specifically, Middlebury College recognizes that energy demands of campus facilities represent a significant component of the College's environmental footprint.

The Sustainable Design Guidelines emerge from the guiding principles in the Campus Master Plan 2008 (see Chapter 5 Sustainability). Under the Master Plan, the Guidelines address sustainable approaches to new construction and renovations. Guiding these sustainable approaches are four focus areas:

- *Carbon Neutrality* Supporting the College's Carbon Neutrality Resolution of May 2007 by reducing energy demand and resultant carbon footprint of campus buildings and facilities
- *Education* Fostering an understanding of environmental stewardship in the learning environment for all campus users
- *Community* Acknowledging the College's leadership position within its community and within its academic peer group, and embracing the community's role as a key stakeholder in the campus planning and outreach process
- *Process* Institutionalizing a process-based approach to maintain Middlebury College's leadership role in environmental and sustainable campus planning, design and development

The planning team has reviewed and analyzed the applicability of existing design guidelines and evaluation systems (see Appendix), and concluded that there are advantages to the College to reference existing industry standards, such as the US Green Building Council's LEED® protocol, while enhancing the guidelines with design criteria that reflect unique circumstances at Middlebury. While these Sustainable Design Guidelines have been developed with the express intent of going philosophically *beyond LEED®,* it is equally important to acknowledge the significance of LEED® as an internationally accepted and recognizable sustainable facilities development standard. The use of such a recognized building performance standard is important to the College community, as well as its alumni community, as it provides a recognizable benchmark for the College's commitment to maintaining a leadership role in sustainable campus planning and design.

Accordingly, the Middlebury College Sustainable Design Guidelines have been developed using the U.S. Green Building Council's (USGBC) Leadership in Energy and Environmental Design for New Construction (LEED® - NC), Version 2.2, as the core standard. For each LEED® - NC credit point, the Guidelines specify required and recommended performance levels, and where applicable, amend the LEED® credit point requirements with further Middlebury-specific performance criteria. In addition, a series of Middlebury College Supplemental Guidelines augment the basic LEED® - NC system to address carbon neutrality, life-cycle environmental impacts, and project delivery procedures not fully covered by LEED®. As recommended and documented the Master Plan, projects fulfilling the intent and requirements of these Sustainable Design Guidelines are intended to meet or exceed a LEED® - NC *Silver* rating.

Middlebury's system of augmented LEED® requirements -- ***LEED® - MC Plus*** -- forms a unique set of design guidelines offering the following benefits:

- An integrated, comprehensive approach to campus facilities development that is specific to the College and its Vermont location
- A proven framework for assessing sustainable design solutions in a cost-effective manner
- A focused approach to using LEED®, an internationally recognizable standard, as the basis of design, resulting in:
    - A higher baseline of minimum required compliance, on the level of LEED® Silver
    - Recommended additional compliance levels up to LEED® Platinum
- Integration of Vermont codes and guidelines into the standard, instead of relying on more generic national codes
- Additional criteria to reflect key Master Plan principles and project delivery procedures, recognizing the process of planning, designing, and building at Middlebury College.

Sustainable Design Guidelines Categories

The seven sections that form the Sustainable Design Guidelines for Middlebury College include a Middlebury-specific Process section and the six core LEED® -NC categories with supplemental requirements for the College. These may be characterized as follows:

1. PROCESS: ***Middlebury Supplemental Guidelines***
Goal: Support the achievement of environmental, human and economic improvements
Achieving the established sustainable design goals and objectives requires implementing procedures to supplement Middlebury College's standard construction project delivery practices. A process summary is included as Appendix 3. The MC-Plus PROCESS section outlines a series of supplemental guidelines for ensuring the success of the environmental goals in the other sections.

The sustainable design process starts in the earliest project planning phase, critically evaluating programmatic needs to determine the most environmentally preferable solution (e.g. renovation, addition, or new construction). Middlebury College's project managers need to assemble an integrated design consultant team that has the experience and capability to achieve the goals of the Master Plan, including established sustainable design goals.

During the design phase, procedures should be in place to analyze and evaluate existing environmental data, as well as proposed materials and systems to make design decisions with reduced environmental impacts. Performance will be documented during design, construction and occupancy to assure continued compliance with sustainability goals and to provide feedback for future College projects.

Through measurement, documentation and public advocacy of the positive impacts of Middlebury's sustainable design approach, the College can set an example, and be a leader among colleges and universities nationwide in establishing sustainable campus design practices.

2. SITES: *LEED®- NC Sustainable Sites + Middlebury Supplemental Guidelines*

Goal: Protect the surrounding environment

Building construction and site development affects the surrounding land, habitats, and ecosystems. Sensitive site design and construction practices can minimize the negative environmental impacts associated with construction.

For new construction or building additions, sites should be selected to avoid disturbing critical natural features such as endangered wildlife habitats, prime farmland, or areas adjacent to lakes, streams or wetlands. Siting of projects such as housing developments or campus stores could offer the opportunity for the College to strengthen and enhance connections to the Town of Middlebury's existing amenities (retail, schools, houses of worship, etc.). Building orientation and layout should work with the natural site features, and the landscape design should be environmentally appropriate. Site planning should minimize the development footprint around the building, and provide exterior lighting that reduces light trespass that could impact nocturnal environments. Roof and pavement surfaces should be selected to minimize heat island impacts to the microclimate. During construction, any existing soil contamination should be remediated, soils management practices implemented, and temporary construction established at the perimeter to minimize soil erosion and sedimentation caused by construction activities. Stormwater should not be treated as a waste product to be quickly captured and conveyed offsite; Middlebury can play a key role in protecting the health of Otter Creek and the Champlain Basin.

3. WATER: *LEED®- NC Water Efficiency + Middlebury Supplemental Guidelines*

Goal: Control water consumption and discharge

Though water may not appear to be a scarce resource in Vermont, the distribution and treatment of the campus water supply, and the quality and quantity of stormwater runoff and sewage discharge have a great impact on the health of the region's ecosystems.

The first steps in controlling water consumption include specifying low-flow or no-flow plumbing fixtures, and providing exterior plantings without irrigation systems. Beyond this, water issues must be considered in an integrated manner, considering domestic water consumption, sewage discharge, and stormwater discharge together. For example, rainwater can be harvested, decreasing demand on the potable water supply as well as reducing peak stormwater discharge rates. Unique sustainable design solutions can be achieved when building and site water issues are integrated.

4. ENERGY: *LEED®-NC Energy & Atmosphere + Middlebury Supplemental Guidelines*

Goal: Reduce energy demand and carbon footprint

As cited in the MIDD-Shift Proposal for Carbon Neutrality at Middlebury College, building heating, cooling and domestic hot water systems generate 80% of the College's carbon footprint. Incorporating energy efficiency measures to improve building envelope and mechanical systems will yield significant reductions in energy consumption and the overall carbon footprint at the College. The guidelines have been developed in recognition of the Trustees' and College's commitment to be carbon-neutral by 2016.

Vermont energy codes provide a good baseline for minimum energy performance, but buildings at Middlebury College should at a minimum exceed the performance of Vermont codes by 20%. Mechanical equipment and appliances should be selected based on energy efficiency, meeting Energy Star guidelines. Where HVAC systems are necessary, refrigerants for air-conditioning systems should be selected based on minimizing ozone depletion and global warming potential. The guidelines have been developed to incorporate the Middlebury College *Thermal Comfort Policy* to permit supplemental HVAC cooling systems only where determined absolutely necessary. Accordingly, designers should incorporate passive solar and natural ventilation elements into the building configuration and evaluate the feasibility of providing on-site renewal energy systems (solar, wind, hydro) to reduce the energy demand of the building. The possibility of investing in a local renewable energy production project -- as outlined in the Carbon Neutrality Initiative -- could engage local businesses at the same time as providing the College with a clean source of energy.

5. MATERIALS: *LEED®-NC Materials & Resources + Middlebury Supplemental Guidelines*

Goal: Minimize resource depletion

Building construction has typically been both a large consumer of materials and a large generator of waste. A 1995 study for the Worldwatch Institute found that 40% of the world's materials are used in the building industry (http://www.worldwatch.org/node/866). Reducing both the use of new materials and the generation of waste is key to any sustainable building program, conserving natural resources as well as the energy associated with the extraction, processing, transportation and disposal of materials.

Minimizing resource depletion starts with the earliest phases of project planning: when considering the programmatic needs for a facility, is it possible to renovate and re-use an existing structure? In formulating the building program, adequate space must be included for managing, sorting and recycling of users' waste. In design development, architects must choose materials and develop details considering the advantages of salvaged, recycled and rapidly renewable materials, and the lifecycle environmental impacts of these material choices. During construction, contractors must plan for and manage effective sorting, re-use and recycling of construction and demolition debris to minimize the waste of valuable resources.

A key commitment of the Middlebury College Environmental Policy is "supporting the local economy and community through environmental education, purchasing, and other College operations." (http://www.middlebury.edu/administration/enviro/policies/enviro_policy.htm) The State of Vermont has valuable natural materials used in the building industry (hardwoods, slate, granite and marble), an extensive local network of certified sustainable forest woodlots, and a wealth of local building craftspeople including woodworkers and masons. Using locally extracted, harvested or processed materials saves energy in transportation while providing valuable connections to local resources.

6. INTERIORS: *LEED®-NC Indoor Environmental Quality + Middlebury Supplemental Guidelines*
Goal: Promote the health of building occupants

The quality of the indoor environment is a critical design consideration, particularly as a significant proportion of campus life takes place indoors – classrooms, lecture halls, student centers, libraries, laboratories, dining facilities, and housing. The indoor environmental factors of air quality, temperature, sound, light and connections to the "outside world" all affect the physical and psychological health, well-being and productivity of building occupants.

An integrated approach to this issue involves mechanical design (ventilation rates), architectural specifications (low-emitting materials), construction phase pollution controls, and operational policies that eliminate indoor pollution (smoking, cleaning products). Design coordination of room and furniture layouts with mechanical elements, lighting and windows can increase thermal, visual and acoustic comfort for building occupants. For some larger buildings, the layout of the public spaces and vertical circulation elements can help foster healthy physical activity among building occupants by making it pleasant and convenient to use interior stairs on a regular basis.

It is important to note that providing a high quality indoor environment can come at the cost of sacrificing some degree of energy efficiency. A building that provides plentiful fresh air and exterior windows with outdoor views for all occupants will require integrated design efforts to achieve acceptable overall energy performance. Sustainable design balances the energy consumption with the positive benefits for the building occupants.

7. INNOVATION: *LEED®-NC Innovation & Design Process + Middlebury Supplemental Guidelines*
Goal: Provide opportunities for environmental learning

The LEED® Innovation & Design category allows projects to promote unique sustainable features not addressed in other credit points. As a leader in education and campus sustainability, Middlebury College can provide innovative opportunities for environmental learning through building construction projects.

Every effort of sustainable design can become an opportunity for environmental learning. Sustainable features may be visible (solar panels, window overhang shading) or may be concealed (mechanical systems, substrate materials). With effective explanatory signage and "view-windows", knowledge of a building's sustainable features can increase environmental awareness among building occupants and visitors. Installation of Measurement & Verification systems to track actual energy performance can provide valuable feedback to inform future facilities decisions at the same time as providing data for a variety of student/faculty environmental research projects.

For buildings with sustainable design features that require active participation of building users (operable windows, shades and lighting controls), user/occupant behavior will influence building energy consumption. User training and orientation can provide the educational component to ensure the viability of the environmental feature; and education and training can support and reinforce energy saving measures.

Sustainable Design Guidelines Organization

A table summarizing the Sustainable Design Guidelines is provided as a checklist and is organized in two major parts:

--Section A includes all of the prerequisites and credit points of the LEED®-NC framework;
--Section B includes the Middlebury College Supplemental Guidelines.

This organization provides transparency to the widely recognized LEED® system, and facilitates project LEED® certification if desired or required.

Section A presents the LEED® prerequisites and credits in their usual organization, and indicates for each whether compliance is "REQUIRED", "recommended" or "optional"; whether there are any amendments with Middlebury-specific performance requirements; and what the anticipated LEED® credit points would be if required and recommended credits were achieved.

Section B presents the Middlebury College Supplemental Guidelines: ten (10) of these supplementary guidelines form a new "Process" category, and the other nine (9) augment LEED® requirements for Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, and Interior Environmental Quality.

A project incorporating required and recommended actions/elements from Section A and Section B would exceed the requirements for LEED® *Silver* certification; however these Sustainable Design Guidelines are in no way intended to limit sustainable elements to a LEED® *Silver* level.

Following Table 1 are the specific Sustainable Design Guidelines forming the ***LEED®- MC Plus*** system, including additional resources, performance criteria and Supplemental Guidelines. Each of the Supplemental Guidelines includes specific actions/elements to be incorporated on a project-by-project basis, and is elaborated individually to include:

--Intent
--Required Performance
--Recommended Additional Performance
--Basis of Guideline
--Resources

Finally, it is important to note that these Guidelines have been developed expressly to be a flexible, evolving set of design criteria that should be integrated into the College's feedback and facilities review process. This set of Sustainable Design Guidelines is intended to be a "living document;" subject to updates, revision, and expansion as external standards, project experience, and priorities evolve.

Sustainable Design Guidelines Applicability

The Sustainable Design Guidelines are intended to apply to all new construction and major renovation projects at the College in accordance with the "Process Outline" included as Appendix 3. The Guidelines have been prepared for consultants, designers, contractors, and Facilities project managers, and should be used in conjunction with the "Design Standards" currently under development by the College.

Middlebury

Middlebury College Sustainable Design Guidelines
MC Plus

November 2008

SECTION A: LEED®- NC v. 2.2 PREREQUISITES & CREDITS

Sustainable Sites (SS)		MC Plus Requirements	LEED Avail Points	MC Plus Req'd Points	MC Plus Recom. Points	Comments
SS Prereq 1	**Construction Activity Pollution Prevention**	REQUIRED	--			
SS Credit 1	**Site Selection**	REQUIRED	1	1		see amendments
SS Credit 2	**Development Density & Community Connectivity**	recommended	1		1	see amendments
SS Credit 3	**Brownfield Redevelopment**	optional	1			
SS Credit 4.1	**Alternative Transportation**, Public Transportation Access	recommended	1		1	see amendments
SS Credit 4.2	**Alternative Transportation**, Bicycle Storage & Changing Rooms	recommended	1		1	coordinate w/ campus-wide transportation planning
SS Credit 4.3	**Alternative Transportation**, Low-Emitting and Fuel-Efficient Vehicles	recommended	1		1	coordinate w/ campus-wide transportation planning
SS Credit 4.4	**Alternative Transportation**, Parking Capacity	optional	1			coordinate w/ campus-wide transportation planning
SS Credit 5.1	**Site Development,** Protect or Restore Habitat	REQUIRED	1	1		see amendments
SS Credit 5.2	**Site Development,** Maximize Open Space	recommended	1		1	
SS Credit 6.1	**Stormwater Design,** Quantity Control	REQUIRED	1	1		see amendments
SS Credit 6.2	**Stormwater Design,** Quality Control	recommended	1		1	see amendments
SS Credit 7.1	**Heat Island Effect,** Non-Roof	recommended	1		1	
SS Credit 7.2	**Heat Island Effect,** Roof	recommended	1		1	
SS Credit 8	**Light Pollution Reduction**	REQUIRED	1	1		
		MC Plus Required Points =		4		
		MC Plus Recommended Points =			8	
		TOTAL Required + Recommended =			**12**	

Water Efficiency (WE)		MC Plus Requirements	LEED Avail Points	MC Plus Req'd Points	MC Plus Recom. Points	Comments
WE Credit 1.1	**Water Efficient Landscaping**, Reduce by 50%	REQUIRED	1	1		
WE Credit 1.2	**Water Efficient Landscaping**, No Potable Use or No Irrigation	REQUIRED	1	1		see amendments
WE Credit 2	**Innovative Wastewater Technologies**	recommended	1		1	
WE Credit 3.1	**Water Use Reduction**, 20% Reduction	REQUIRED	1	1		see amendments
WE Credit 3.2	**Water Use Reduction**, 30% Reduction	recommended	1		1	see amendments
		MC Plus Required Points =		3		
		MC Plus Recommended Points =			2	
		TOTAL Required + Recommended =			**5**	

Energy & Atmosphere (EA)		MC Plus Requirements	LEED Avail Points	MC Plus Req'd Points	MC Plus Recom. Points	Comments
EA Prereq 1	**Fundamental Commissioning of the Building Energy Systems**	REQUIRED	--			see amendments; part of "Process" Category
EA Prereq 2	**Minimum Energy Performance**	REQUIRED	--			
EA Prereq 3	**Fundamental Refrigerant Management**	REQUIRED	--			
EA Credit 1	**Optimize Energy Performance**	REQUIRED	10	5		see amendments
EA Credit 2	**On-Site Renewable Energy**	optional	3			see amendments
EA Credit 3	**Enhanced Commissioning**	REQUIRED	1	1		see amendments; part of "Process" Category
EA Credit 4	**Enhanced Refrigerant Management**	REQUIRED	1	1		see amendments
EA Credit 5	**Measurement & Verification**	REQUIRED	1	1		see amendments
EA Credit 6	**Green Power**	optional	1			see amendments
		MC Plus Required Points =		8		
		MC Plus Recommended Points =			0	
		TOTAL Required + Recommended =			**8**	

Materials & Resources (MR)		MC Plus Requirements	LEED Avail Points	MC Plus Req'd Points	MC Plus Recom. Points	Comments
MR Prereq 1	**Storage & Collection of Recyclables**	REQUIRED	--			see amendments
MR Credit 1.1	**Building Reuse**, Maintain 75% of Existing Walls, Floors & Roof	recommended	1		1	Required for renovation projects only
MR Credit 1.2	**Building Reuse**, Maintain 95% of Existing Walls, Floors & Roof	optional	1			
MR Credit 1.3	**Building Reuse**, Maintain 50% of Interior Non-Structural Elements	recommended	1		1	
MR Credit 2.1	**Construction Waste Management**, Divert 50% from Disposal	REQUIRED	1	1		see amendments
MR Credit 2.2	**Construction Waste Management**, Divert 75% from Disposal	recommended	1		1	see amendments
MR Credit 3.1	**Materials Reuse**, 5%	recommended	1	2	2	see amendments -- at least two credit points from 3.1, 3.2, 4.1, 4.2 and 6
MR Credit 3.2	**Materials Reuse**,10%	recommended	1			see amendments -- at least two credit points from 3.1, 3.2, 4.1, 4.2 and 6
MR Credit 4.1	**Recycled Content**, 10% (post-consumer + ½ pre-consumer)	recommended	1			see amendments -- at least two credit points from 3.1, 3.2, 4.1, 4.2 and 6
MR Credit 4.2	**Recycled Content**, 20% (post-consumer + ½ pre-consumer)	recommended	1			see amendments -- at least two credit points from 3.1, 3.2, 4.1, 4.2 and 6
MR Credit 5.1	**Regional Materials**, 10% Extracted, Processed & Manufactured Regionally	recommended	1		1	see amendments
MR Credit 5.2	**Regional Materials**, 20% Extracted, Processed & Manufactured Regionally	optional	1			see amendments
MR Credit 6	**Rapidly Renewable Materials**	recommended	1		1	see amendments -- at least two credit points from 3.1, 3.2, 4.1, 4.2 and 6
MR Credit 7	**Certified Wood**	REQUIRED	1	1		see amendments
		MC Plus Required Points =		4		
		MC Plus Recommended Points =			7	
		TOTAL Required + Recommended =			**11**	

Indoor Environmental Quality (EQ)		MC Plus Requirements	LEED Avail Points	MC Plus Req'd Points	MC Plus Recom. Points	Comments
EQ Prereq 1	**Minimum IAQ Performance**	REQUIRED	--			
EQ Prereq 2	**Environmental Tobacco Smoke** (ETS) **Control**	REQUIRED	--			see amendments
EQ Credit 1	**Outdoor Air Delivery Monitoring**	REQUIRED	1	1		
EQ Credit 2	**Increased Ventilation**	recommended	1		1	
EQ Credit 3.1	**Construction IAQ Management Plan**, During Construction	REQUIRED	1	1		
EQ Credit 3.2	**Construction IAQ Management Plan**, Before Occupancy	REQUIRED	1	1		
EQ Credit 4.1	**Low-Emitting Materials**, Adhesives & Sealants	REQUIRED	1	1		
EQ Credit 4.2	**Low-Emitting Materials**, Paints & Coatings	REQUIRED	1	1		
EQ Credit 4.3	**Low-Emitting Materials**, Carpet Systems	REQUIRED	1	1		
EQ Credit 4.4	**Low-Emitting Materials**, Composite Wood & Agrifiber Products	REQUIRED	1	1		see amendments
EQ Credit 5	**Indoor Chemical & Pollutant Source Control**	REQUIRED	1	1		
EQ Credit 6.1	**Controllability of Systems**, Lighting	recommended	1		1	see amendments
EQ Credit 6.2	**Controllability of Systems**, Thermal Comfort	recommended	1		1	
EQ Credit 7.1	**Thermal Comfort**, Design	REQUIRED	1	1		
EQ Credit 7.2	**Thermal Comfort**, Verification	recommended	1		1	
EQ Credit 8.1	**Daylight & Views**, Daylight 75% of Spaces	recommended	1		1	see amendments
EQ Credit 8.2	**Daylight & Views**, Views for 90% of Spaces	optional	1			

MC Plus Required Points =	9	
MC Plus Recommended Points =		5
TOTAL Required + Recommended =		**14**

Innovation & Design Process (ID)		MC Plus Requirements	LEED Avail Points	MC Plus Req'd Points	MC Plus Recom. Points	Comments
ID Credit 1.1	**Innovation in Design:** Analysis of M&V data for student/faculty research	recommended	1		1	see amendments
ID Credit 1.2	**Innovation in Design:** Explanatory signage of environmental features	recommended	1		1	see amendments
ID Credit 1.3	**Innovation in Design:** User orientation, training and commitments	recommended	1		1	see amendments
ID Credit 1.4	**Innovation in Design:** To be determined by Project Team	recommended	1		1	
ID Credit 2	**LEED® Accredited Professional**	REQUIRED	1	1		see amendments; part of "Process" Category

MC Plus Required Points =	1	
MC Plus Recommended Points =		4
TOTAL Required + Recommended =		**5**

TOTAL REQUIRED =	**29 of minimum 33 needed for LEED Silver**
TOTAL REQUIRED + RECOMMENDED =	**55 credit points**

SECTION B: MIDDLEBURY SUPPLEMENTAL GUIDELINES

PROCESS : Support the achievement of environmental, human & economic improve		MC Plus	Comments
MC Plus 1	Integrate Master Plan goals in project approach	REQUIRED	
MC Plus 2	Plan for conservation through critical analysis of facilities needs	REQUIRED	
MC Plus 3	Create an integrated design team	REQUIRED	
MC Plus 4	Include a sustainability program certified professional in the design team	REQUIRED	
MC Plus 5	Evaluate existing environmental conditions prior to design	REQUIRED	
MC Plus 6	Provide design and construction phase commissioning	REQUIRED	
MC Plus 7	Perform life-cycle cost analysis for major building systems or assemblies	REQUIRED	
MC Plus 8	Track compliance with sustainability guidelines (design - occupancy)	REQUIRED	
MC Plus 9	Complete post-occupancy project review to inform future projects	REQUIRED	
MC Plus 10	Practice environmentally sound landscape maintenance	REQUIRED	

SITES : Protect the surrounding environment		MC Plus	Comments
MC Plus 11	Orient building and site features to enhance the microclimate	recommended	
MC Plus 12	Design an environmentally and ecologically appropriate landscape	REQUIRED	
MC Plus 13	Implement soils management practices	REQUIRED	

ENERGY : Reduce energy demand and carbon footprint		**MC Plus**	**Comments**
MC Plus 14	Specify equipment and appliances that meet Energy Star guidelines	REQUIRED	
MC Plus 15	Incorporate passive solar design strategies	REQUIRED	

MATERIALS : Minimize resource depletion		**MC Plus**	**Comments**
MC Plus 16	Evaluate materials for lowest lifecycle environmental impact	REQUIRED	

INTERIORS : Promote the health of building occupants		**MC Plus**	**Comments**
MC Plus 17	Design for effective control of moisture	REQUIRED	
MC Plus 18	Provide acoustic comfort for building occupants	REQUIRED	
MC Plus 19	Promote healthy physical activity through layout of spaces and stairs	recommended	

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PROCESS: Middlebury Supplemental Guidelines

Introduction: Support the achievement of environmental, human, and economic improvements
Achieving the established sustainable design goals and objectives requires implementing procedures to supplement Middlebury College's standard construction project delivery practices. This section outlines a process for ensuring the success of the environmental goals in the other sections.

The sustainable design process starts in the earliest project planning phase, critically evaluating programmatic needs to determine the most environmentally preferable solution (e.g. renovation, addition, or new construction). Middlebury College's project managers need to assemble an integrated design consultant team that has the experience and capability to achieve the goals of the Master Plan, including established sustainable design goals. During the design phase, procedures should be in place to analyze and evaluate existing environmental data, as well as proposed materials and systems to make design decisions with reduced environmental impacts. Performance will be documented during design, construction and occupancy to assure continued compliance with sustainability goals and to provide feedback for future College projects.

Through measurement, documentation and public advocacy of the positive impacts of Middlebury's sustainable design approach, the College can set an example, and be a leader among colleges and universities nationwide in establishing sustainable campus design practices.

Summary of PROCESS Guidelines

Note: The Middlebury Sustainable Design Guidelines for PROCESS are additional supplemental guidelines specific to the College and are intended to complement LEED®-NC Credits as outlined in subsequent sections.

Middlebury Supplemental PROCESS Guidelines

Credits developed specifically for Middlebury. See Supplemental Guidelines below.

Credit	Description	MC-Plus
MC Plus 1	Integrate Master Plan goals in project approach	REQUIRED
MC Plus 2	Plan for conservation through critical analysis of facilities needs	REQUIRED
MC Plus 3	Create an integrated design team	REQUIRED
MC Plus 4	Include *LEED*® accredited professionals on the project team	REQUIRED
MC Plus 5	Evaluate existing environmental conditions prior to design	REQUIRED
MC Plus 6	Provide design and construction phase commissioning	REQUIRED
MC Plus 7	Perform life-cycle cost analysis for major building systems or assemblies	REQUIRED
MC Plus 8	Track compliance with sustainability guidelines (design - occupancy)	REQUIRED
MC Plus 9	Complete post-occupancy project review to inform future projects	REQUIRED
MC Plus 10	Practice environmentally sound landscape maintenance	REQUIRED

Middlebury Supplemental PROCESS Guidelines

MC Plus 1	Integrate Master Plan goals in project approach	REQUIRED

Intent
Include and integrate the goals of the Middlebury College Master Plan into design criteria for all building and site construction projects on the College campus. The core Master Plan principles influence various design considerations and sustainability decisions.

Required Performance
1. Develop a project screening matrix to review project purpose and need.
2. Review matrix at the pre-design phase of all projects to ensure consistency with the established Master Plan principles.

Resources
Middlebury College, Campus Master Plan
http://www.middlebury.edu/administration/fs/planning/masterplan.htm

Middlebury College Sustainability Report: *Integrating Sustainability at Middlebury College*
Ove Arup & Partners Consulting Engineers PC
August 2007

MC Plus 2	Plan for conservation through critical analysis of facilities needs	REQUIRED

Intent

Optimize facilities and operations by maximizing the utilization of existing and available buildings to the greatest extent feasible. Minimizing new construction, through renovation and reprogramming of existing facilities, will minimize overall facilities capital and operating costs as well as minimize environmental and site impacts to the campus.

Required Performance

1. Review and evaluate the following:

Can current facilities be:

- Shared, or better utilized to mitigate the need for dedicated additional space?
- Operated on a modified schedule to accommodate other programs and users, thereby reducing the need for dedicated additional space?
- Reconfigured within the existing shell and superstructure to meet projected facilities demands?

If not, then can:

- Another existing use or program be reconfigured within its shell and superstructure to meet the projected space needs?
- An addition to the current facility or another existing building meet the projected space needs?
- A proposed new space/building be optimized in its design to anticipate future sharing or reconfiguration of space, thus resulting in an overall future reduction in new building footprint?

Basis of Guideline

Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: P.2 – Planning for Conservation

MC Plus 3	Create an integrated design team	REQUIRED

Intent

Provide an effective and integrated design/construction/management team and establish communications and decision-making protocols in order to create a structure for successful outcomes of campus projects. This integrated approach established at the outset of a project and carried through completion will also enhance the likelihood of a more time- and cost-effective design process.

Required Performance

1. Assemble a core Project Team, including, but not limited to, key representatives from the following:
    - Facilities
    - Master Plan Committee
    - Design consultant team (all disciplines)
    - Users and occupants
    - Maintenance, engineering, and operations
    - Building commissioning consultant appointed by the College
    - Community and Agency representatives (e.g., Building Commissioner, Town Engineer), when appropriate

2. Establish sustainability goals and priorities as part of the project initiation; sustainability goals to be reviewed/re-assessed by Project Team at key points in the design and construction process:
    - Project Kick-off meeting
    - Programming / Pre-design meetings
    - Facility performance criteria meetings
    - Regular design team coordination meetings
    - Stakeholder coordination briefings
    - Pre-construction review meetings
    - Regular construction team coordination meetings
    - Post-occupancy review meetings

Basis of Guideline

Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: P.3 – Integrated Design Process

MC Plus 4	Include *LEED®* accredited professionals on the project team	REQUIRED

Intent

In addition to having one member of the Design Consultant Team who is a LEED® accredited professional under LEED®-NC v2.2: ID Credit 2 - *LEED® Accredited Professional*, seek to involve LEED® accredited professionals across disciplines early in the design process in order to minimize the learning curve associated with sustainable design, and to facilitate a more streamlined and efficient design process.

Required Performance

1. Ensure that at least architectural and MEP Design Team professionals are accredited by U.S. Green Building Council (USGBC) LEED® . Refer to LEED®-NC v2.2: ID Credit 2 – *LEED® Accredited Professional*.

Recommended Additional Performance

1. Ensure that the Design Team also includes at least one LEED® accredited professional in each of the following key disciplines:
   - Landscape Architecture
   - Site/Civil Engineering
   - Interiors

MC Plus 5	Evaluate existing environmental conditions prior to design	REQUIRED

Intent

Evaluate a wide array of existing conditions and reference information to establish environmental design objectives and performance standards, and to implement sustainable and ecologically appropriate site design. Several key dimensions should be researched and analyzed before site and building design begin. Once this data has been compiled for one project, much of the information may apply to other Middlebury campus projects, and could also be useful for the Town of Middlebury.

Required Performance

Gather and analyze the following environmental conditions prior to the start of design:
1. Hydrology Data: Map of predevelopment site runoff rate and quantity.
2. Climate Data: Average drought period and season; average temperature range and heating degree days for the area; stormwater volume accrued on the site in a 1-, 2-, 5-, 10-, 50-, and 100-year event (correlate with State stormwater regulations).
3. Soils Data: Basic soil analysis parameters: particle range, CEC capacity, pH, percolation/infiltration rates, USDA erosion class; depth to groundwater (on site).
4. Biological Data: Identify key plants or zones to be protected/salvaged/transplanted.

Recommended Additional Performance

Gather and analyze the following environmental conditions prior to the start of design:
1. Hydrology Data: Performance data on the most impacted natural drainage way (stream, tributary, creek, river, or wetland) such as: temperature range and dissolved oxygen; Middlebury and State of Vermont list of mandatory stormwater BMPs and structural controls; velocity and volume range; suspended load and dissolved load ranges; rare, threatened or endangered species within the water body.
2. Climate Data: Predominant seasonal wind directions and velocities; microclimate characterization/modeling.
3. Soils Data: Depth to refusal/bedrock (on site); location of groundwater recharge zones; soil biota analysis/inventory; threats to those communities (invasive species, parasites, disease, population imbalances).
4. Biological Data: Base line biodiversity index rating; dispersal mechanisms for those communities (pollinators, seed dispersers); adjacent habitat corridors and patches; threats to those communities (invasive species, parasites, disease, population imbalances).

MC Plus 6	Provide design and construction phase commissioning	REQUIRED

Intent

Confirm and verify, through the building design and construction commissioning process, that the College's sustainability goals are realized in the design, and that the building's basic thermal enclosure and mechanical, electrical, and plumbing (MEP) systems are installed, calibrated, and performing in accordance with the project requirements and specifications.

Required Performance

Meet the requirements of LEED®-NC v2.2: EA Prerequisite 1 – *Fundamental Commissioning of the Building Energy Systems* and EA Credit 3 – *Enhanced Commissioning*, for the following expanded scope:

1. Select a consultant to serve as the project Commissioning Authority (*CxA*). Scope of commissioned building systems shall include, at a minimum:
    - Building envelope
    - Mechanical HVAC systems, passive systems and controls
    - Plumbing fixtures and fittings
    - Artificial lighting, daylighting and controls
    - Domestic hot water systems
    - Renewable energy systems (if used)
    - Water harvesting systems (if used)
2. Conduct commissioning tasks during design and preparation of construction documents:
    - Establish, review and update the College's specific sustainability goals and Basis of Design (BOD) for the project.
    - Review a progress and final set of construction documents to ensure that the sustainability goals are realized in the construction drawings and specifications.
    - Develop and implement a commissioning plan, and incorporate commissioning requirements into the construction specifications.
3. Conduct commissioning tasks during construction and project closeout:
    - Review contractor submittals for sustainability features in key systems to be commissioned.
    - Verify the installation and performance of the systems to be commissioned.
    - Complete a commissioning report and systems manual, and review the results and recommendations with the College.
    - Verify that training and orientation has been provided for building users/occupants and maintenance staff.

4. Also refer to Guideline MC Plus 9 *Complete post-occupancy project review to inform future projects*.

MC Plus 7	Perform life-cycle cost analysis for major building systems or assemblies	REQUIRED

Intent
Consider life-cycle cost when assessing design options and integrate life-cycle costs in the benefit-cost analysis of these options.

Required Performance
1. Evaluate at least three different options for building energy-use systems, based on analysis of life-cycle costs.

Recommended Additional Performance
1. Use life-cycle cost analysis to evaluate choices for other major building systems, such as exterior cladding and interior finish materials.

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: P.6 – Lowest Life Cycle Cost

Resources
State of Minnesota Sustainable Building Guidelines
http://www.msbg.umn.edu/download2.html

US DOE, Energy Efficiency and Renewable Energy – Building Life-Cycle Cost Programs
http://www1.eere.energy.gov/femp/information/download_blcc.html

Whole Building Design Guide, Life-Cycle Cost Analysis (LCCA)
http://www.wbdg.org/design/lcca.php

MC Plus 8	Track compliance with sustainability guidelines (design - occupancy)	REQUIRED

Intent

Track compliance with Sustainable Design Guidelines during design and construction phases. Collect performance data to evaluate the effectiveness of Middlebury's guidelines and determine areas of improvement for future College projects.

Required Performance

1. Using these Sustainable Design Guidelines, prepare a matrix of specific sustainability actions, timeline for incorporation, and party responsible for achieving action. Update matrix at the conclusion of each phase of design and construction.
2. Provide feedback to Middlebury College Project Managers for possible amendments to Sustainable Design Guidelines, based on actual project experiences.

Recommended Additional Performance

1. Complete documentation for LEED® certification of project.
2. Maintain a project archive to track the history of the project.

Basis of Guideline

Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: P.1 – Guideline Management

MC Plus 9	Complete post-occupancy project review to inform future projects	REQUIRED

Intent
Verify that the completed design project is being operated and maintained to meet sustainable design intent; gather knowledge of "lessons learned" to inform future College projects.

Required Performance
1. Core design, construction and commissioning team members to attend a post-occupancy de-briefing with College facilities project managers to review "lessons learned" for future College projects, as well as recommendations for possible updates to Sustainable Design Guidelines.
2. Commissioning Authority (*CxA*) to provide a post-occupancy re-review approximately one year after substantial completion, and prepare a report reviewing performance data from Measurement and Verification (M&V) systems, comparing post-occupancy building performance to expected results for the following criteria:

- Water device and system performance
- Domestic hot water system performance
- Energy device and whole building system performance
- Indoor environmental quality (IEQ) performance, including work request logs associated with user comfort and satisfaction
- Waste management

Refer to Middlebury Supplemental Guideline MC Plus 6 *Provide design and construction phase commissionin*g for details of Commissioning Authority (*CxA*).

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: P.5 – Operations Commissioning

MC Plus 10	Practice environmentally sound landscape maintenance	REQUIRED

Intent

In the landscape there are a variety of inputs, outputs and by-products that can be linked together to reduce waste and increase efficiencies.

Required Performance

1. Compost landscape waste such as grass clippings and leaf litter.
2. Use mulching mowers for turf grass areas.

Recommended Additional Performance

1. Process compost for soil augmentation or manufactured soils.
2. Inoculate compost for use as mulch.
3. Document the need for fertilizers before applying (e.g. with a soil test or plant symptom diagnosis), and determine how the effectiveness of the fertilizers will be evaluated. Use the least harmful material (such as compost and compost teas) for addressing nutrient deficiencies.
4. Encourage Integrated Pest Management training for all landscape managers.

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SITES: LEED®-NC Sustainable Sites + Middlebury Supplemental Guidelines

Introduction: Protect the surrounding environment

Building construction and site development affects the surrounding land, habitats, and ecosystems. Sensitive site design and construction practices can minimize the negative environmental impacts associated with construction.

For new construction or building additions, sites should be selected to avoid disturbing critical natural features such as endangered wildlife habitats, prime farmland, or areas adjacent to lakes, streams or wetlands. Siting of projects such as housing developments or campus stores could offer the opportunity for the College to strengthen and enhance connections to the Town of Middlebury's existing amenities (retail, schools, houses of worship, etc.). Building orientation and layout should work with the natural site features, and the landscape design should be environmentally appropriate. Site planning should minimize the development footprint around the building, and provide exterior lighting that reduces light trespass that could impact nocturnal environments. Roof and pavement surfaces should be selected to minimize heat island impacts to the microclimate. During construction, any existing soil contamination should be remediated, soils management practices implemented, and temporary construction (hay-bales) established at the perimeter to minimize soil erosion and sedimentation caused by construction activities. Stormwater should not be treated as a waste product to be quickly captured and conveyed offsite; Middlebury can play a key role in protecting the health of Otter Creek and the Champlain Basin.

Summary of SITES Guidelines

Note: The Middlebury Sustainable Design Guidelines for SITES are a combination of LEED®-NC Sustainable Sites Credits (which may include modifications specific to Middlebury where indicated by **+** *symbol) and additional supplemental guidelines specific to the College.*

LEED®-NC Sustainable Sites Credits

+ *= Additional requirements under MC-Plus beyond LEED-NC requirements. See Amendments below.*

	Credit	Description	MC-Plus
	SS Prereq. 1	Construction Activity Pollution Prevention	REQUIRED
+	SS Credit 1	Site Selection	REQUIRED
+	SS Credit 2	Development Density & Community Connectivity	recommended
	SS Credit 3	Brownfield Redevelopment	optional
+	SS Credit 4.1	Alternative Transportation, Public Transportation Access	recommended
	SS Credit 4.2	Alternative Transportation, Bicycle Storage & Changing Rooms	recommended
	SS Credit 4.3	Alternative Transportation, Low-Emitting and Fuel-Efficient Vehicles	recommended
	SS Credit 4.4	Alternative Transportation, Parking Capacity	optional
+	SS Credit 5.1	Site Development, Protect or Restore Habitat	REQUIRED
	SS Credit 5.2	Site Development, Maximize Open Space	recommended
+	SS Credit 6.1	Stormwater Design, Quantity Control	REQUIRED
+	SS Credit 6.2	Stormwater Design, Quality Control	recommended
	SS Credit 7.1	Heat Island Effect, Non-Roof	recommended
	SS Credit 7.2	Heat Island Effect, Roof	recommended
	SS Credit 8	Light Pollution Reduction	REQUIRED

Supplemental Middlebury SITES Guidelines

Credits developed specifically for Middlebury. See Supplemental Guidelines below.

Credit	Description	MC-Plus
MC Plus 11	Orient building and site features to enhance the microclimate	recommended
MC Plus 12	Design an environmentally and ecologically appropriate landscape	REQUIRED
MC Plus 13	Implement soils management practices	REQUIRED

Middlebury Amendments to LEED®-NC Sustainable Sites Credits

SS Credit 1	Site Selection	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance

1. Do not develop buildings, roads, paving or parking in any of the following site conditions:
   - Land of biological, ecological or natural resource significance as identified in a national, state, regional or local natural resources inventory/assessment, and land within a 150 foot buffer zone of these areas.
   - Land which is under a conservation easement.

SS Credit 2	Development Density & Community Connectivity	recommended
SS Credit 4.1	Alternative Transportation, Public Transportation Access	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance

1. Follow recommendations of Middlebury College Master Plan for building siting and improvements to pedestrian network and public open space.

SS Credit 5.1	Site Development, Protect or Restore Habitat	REQUIRED

In addition to complying with the requirements of this LEED® credit point where applicable, also comply with the following:

Required Performance

1. Provide tree protection fencing for existing trees to remain prior to the commencement of construction activities.
2. For restoration of native vegetation, see Middlebury Supplemental Guideline MC Plus 12: *Design an environmentally and ecologically appropriate landscape*.

SS Credit 6.1	Stormwater Design, Quantity Control	REQUIRED
SS Credit 6.2	Stormwater Design, Quality Control	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance

1. Implement a water quality monitoring program to ensure the effectiveness of onsite water quality treatment features.
2. Select vegetation and landscape design components that are adapted to the site's geologic and climatic conditions, and reduce lawn areas.
3. Install bioswales at parking areas and rain gardens within the campus after coordination with College landscape maintenance.
4. Restore wetlands and wet meadows on campus.

Recommended Additional Performance

1. Capture and reuse stormwater wherever possible and link directly to irrigation systems. See LEED® Credits WE1.1 and 1.2.
2. Design infiltration basins with habitat benefits; wetland restoration and wet meadow restoration are examples.
3. Advanced water treatment processes that can be used onsite include phytoremediation systems such as constructed wetlands for greywater treatment.
4. Set building performance standards that at least 50% of precipitation is used in landscape or building processes before draining to Otter Creek.
5. Investigate alternatives to impervious paving systems.
6. Disconnect site development from the existing stormwater drainage network and redirect flows to wetlands, retention basins or bioswales.
7. Identify rare, threatened, or endangered species in receiving waters. Tailor site water management design to protect those species.

Middlebury Supplemental SITES Guidelines

MC Plus 11	Orient building and site features to enhance the microclimate	recommended

Intent
Ensure that the building's relationship to natural factors such as topography, solar exposure, wind, and vegetation is considered as important as its relationship with its built context. Choosing the right orientation of a building can have a tremendous impact on a building's long-term energy consumption and general user approval, and can either positively or negatively impact adjacent outdoor spaces.

Required Performance
1. Buildings should maximize their exposure to winter (low-angle) sunlight.
2. Buildings should reduce their overall exposure to north by limiting entrances and operable windows on the northern façade.
3. Use coniferous plants in dense groups to block winds and/or provide heavy shading where desired.
4. The landscape should protect a building's northern façade from high winds and drifting snow. Locate coniferous trees in dense groups on northern edges or open spaces to block storm-driven northerly winds.
5. Southerly facades should allow for threshold spaces at building entrances such as patios, drop-off areas, terraces, and colonnades. All threshold spaces should be accessible.
6. Locate deciduous trees close to the south façade of buildings to provide summer envelope cooling/shading.

Recommended Additional Performance
1. Locate outdoor terraces adjacent to major pathways and set them higher than adjacent grounds.
2. Provide a variety of seating options that help define the threshold space.

MC Plus 12	Design an environmentally and ecologically appropriate landscape	REQUIRED

Intent
Vegetation plays a critical role in the provision of many ecosystem services, such as wildlife habitat, air and water filtration, greenhouse gas regulation, and natural heating and cooling benefits. Current landscape practices often ignore or underutilize the benefits vegetation can provide; however, improved vegetation design, selection and maintenance can enhance these natural services.

Required Performance
1. Choose only species native to the Ecoregion and more specifically to the Champlain Basin At least 50% of the site area must be restored using a native plant palette.
2. Assemble plants into communities that are appropriate to the microclimate in which they are placed or are tasked to create.
3. Assemble plants into maintenance groups that clearly delineate areas with differing maintenance needs.
4. Select plants that will not require significant fertilizers or pesticides.
5. Select plants that support the life cycle of key pollinators and seed dispersers such as birds and insects.
6. Use herbaceous and durable ground covers on erosion-prone or high-traffic slopes (grass lawn is not considered a durable ground cover).
7. Submit planting designs for College Landscape Services review.

Recommended Additional Performance
1. Choose only individual plants with local provenance.
2. Cater plant selections to support habitat of rare/threatened/endangered species
3. Cater plant selection to improve the local biodiversity index
4. Plant to reinforce or expand existing habitat corridors and to increase forest interior areas

MC Plus 13	Implement soils management practices	REQUIRED

Intent
Maintaining healthy soils is key to planting success and the long-term durability of campus open spaces. Healthy soils perform valuable functions such as: effectively cycling nutrients; minimizing runoff and maximizing water holding capacity; absorbing excess nutrients, sediments and pollutants; providing a healthy rooting environment and habitat to a wide range of organisms; and maintaining structure and aggregation.

Soil degradation types that typically occur with land development include compaction, grading, chemical and pollutant contamination, changes in drainage, and erosion.

Required Performance
1. Restrict equipment traffic to designated paths/zones and keep away from tree root zone.
2. Limit construction activities and staging to designated areas.
3. De-compact soils with deep tilling or deep-tyne aeration after construction.
4. Rehabilitate post-construction soils both chemically and physically.
5. Avoid unnecessary grading. Balance grading cut and fill -- avoid importing or exporting soils.
6. Select plants specific to soil type.

Recommended Additional Performance
1. Augment soils with local materials such as compost, sand, limestone, and manure.
2. Manufacture soils from compost and other waste streams.
3. Plan soil disturbance for maximum carbon sequestration.
4. Inoculate soils with local microbial/fungal communities in restoration zones if necessary.
5. Maintain or improve pre-development infiltration rates.
6. Design soil mixes or augmentation plans in accordance with stormwater management plans.
7. Compare the biology and chemistry of on-site soils to a regional reference soil to determine what components the on-site soils may require in order to maintain normal nutrient cycling.

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: S.3 – Soil Management

Middlebury Supplemental SITES Resources

State of Minnesota Sustainable Building Guidelines
http://www.msbg.umn.edu/download2.html

U.S. Environmental Protection Agency, National Pollutant Discharge Elimination System (NPDES)
http://cfpub.epa.gov/npdes/

Vermont Department of Environmental Conservation "Clean & Clear" Program
http://www.anr.state.vt.us/cleanandclear/erosion.htm

Vermont Agency of Natural Resources – Agency Maps and Mapping
http://www.anr.state.vt.us/site/html/maps.htm

Vermont Natural Resources Board, Farmland Classification Systems for Vermont Soils
http://www.nrb.state.vt.us/lup/publications/importantfarmlands.pdf

FEMA Flood Insurance maps (also available at Middlebury Town Clerk's and Zoning Offices)
http://www.fema.gov/business/nfip/mscjumppage.shtm#1

Vermont Department of Environmental Conservation – Wetlands Section
http://www.anr.state.vt.us/dec/waterq/wetlands.htm

Vermont Department of Environmental Conservation – Stormwater Section
http://www.anr.state.vt.us/dec/waterq/stormwater.htm

Middlebury College Geographical Resources
http://www.middlebury.edu/academics/lis/lib/guides_and_tutorials/subject_guides/collection_guide-vermont/geographical_resources/

U.S. Department of Transportation, Federal Highway Administration – State Plant Listings: Vermont
http://www.fhwa.dot.gov/environment/rdsduse/vt.htm

Vermont Department of Environmental Conservation Brownfields Program
http://www.anr.state.vt.us/dec/wastediv/SMS/brownfields-home.htm

Middlebury College, Campus Master Plan
http://www.middlebury.edu/administration/fs/planning/masterplan.htm

Middlebury Business Association
http://www.middbiz.org/

Addison County Transit Resources (ACTR)
http://www.actr-vt.org/

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WATER: LEED®-NC Water Efficiency + Middlebury Supplemental Guidelines

Introduction: Control water consumption and discharge

Though water may not appear to be a scarce resource in Vermont, the distribution and treatment of the campus water supply, and the quality and quantity of stormwater runoff and sewage discharge have a great impact on the health of the region's ecosystems.

The first steps in controlling water consumption include specifying low-flow or no-flow plumbing fixtures, and providing exterior plantings without irrigation systems. Beyond this, water issues must be considered in an integrated manner, considering domestic water consumption, sewage discharge, and stormwater discharge together. For example, rainwater can be harvested, decreasing demand on the potable water supply as well as reducing peak stormwater discharge rates. Sustainable design solutions should be sought to reduce demands on potable water and where building and site water issues can be integrated.

Summary of WATER Guidelines

*Note: The Middlebury Sustainable Design Guidelines for WATER are LEED®-NC Sustainable Water Efficiency Credits (which may include modifications specific to Middlebury where indicated by **+** symbol). There are no additional supplemental WATER guidelines specific to the College.*

LEED®-NC Water Efficiency Credits

+ *= Additional requirements under MC-Plus beyond LEED-NC requirements. See Amendments below.*

	WE Credit 1.1	Water Efficient Landscaping, Reduce by 50%	REQUIRED
+	WE Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	REQUIRED
	WE Credit 2	Innovative Wastewater Technologies	recommended
+	WE Credit 3.1	Water Use Reduction, 20% Reduction	REQUIRED
+	WE Credit 3.2	Water Use Reduction, 30% Reduction	recommended

Middlebury Amendments to LEED®-NC Water Efficiency Credits

Credit 1.2	Water Efficient Landscaping, No Potable Use or No Irrigation	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance

1. Use drought tolerant native plant species appropriate to the Vermont climate to lessen need for water use in the landscape. See Middlebury Supplemental Guideline MC Plus 12: *Design an environmentally and ecologically appropriate landscape*.

Recommended Additional Performance

1. After a 2-year planting establishment period, eliminate all water use in the landscape.

Credit 3.1	Water Use Reduction, 20% Reduction	REQUIRED
Credit 3.2	Water Use Reduction, 30% Reduction	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Vermont Plumbing Rules, based on the International Plumbing Code (IPC) differ slightly from the Energy Policy Act of 1992, cited in these LEED® credit points. Projects are required to comply with the minimum requirements of the Vermont Plumbing Code as well as meet the minimum 20% water reduction target based on cited LEED® baseline.

Middlebury Supplemental WATER Resources

2004 State of Vermont Plumbing Rules
www.dps.state.vt.us/fire/licensing/plumbingrule.pdf

2003 International Plumbing Code (IPC)
http://www.iccsafe.org/e/category.html

U.S. Environmental Protection Agency -- WaterSense Efficiency Made Easy Program
http://www.epa.gov/owm/water-efficiency/

American Water Works Association -- Water Wiser: The water efficiency clearinghouse
http://www.awwa.org/Resources/content.cfm?ItemNumber=29269&navItemNumber=1561

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ENERGY: LEED®-NC Energy & Atmosphere + Middlebury Supplemental Guidelines

Introduction: Reduce energy demand and carbon footprint

As cited in the MIDD-Shift Proposal for Carbon Neutrality at Middlebury College, building heating, cooling and domestic hot water systems generate 80% of the College's carbon footprint. Incorporating energy efficiency measures to improve building envelope and mechanical systems will yield significant reductions in energy consumption and the overall carbon footprint at the College. The guidelines have been developed in recognition of the Trustees' and College's commitment to be carbon-neutral by 2016.

Vermont energy codes provide a good baseline for minimum energy performance, but buildings at Middlebury College should at a minimum exceed the performance of Vermont codes by 20%. Mechanical equipment and appliances should be selected based on energy efficiency, meeting Energy Star guidelines. Where HVAC systems are necessary, refrigerants for air-conditioning systems should be selected based on minimizing ozone depletion and global warming potential. The guidelines have been developed to incorporate the Middlebury College *Thermal Comfort Policy.* The inclusion of supplemental HVAC cooling systems will require direction from the Master Plan Committee before being incorporated into specific projects. Accordingly, designers should incorporate passive solar and natural ventilation elements into the building configuration and evaluate the feasibility of providing on-site renewal energy systems (solar, wind, hydro) to reduce the energy demand of the building. The possibility of investing in a local renewable energy production project -- as outlined in the Carbon Neutrality Initiative -- could engage local businesses at the same time as providing the College with a clean source of energy.

Summary of ENERGY Guidelines

Note: The Middlebury Sustainable Design Guidelines for ENERGY are a combination of LEED®-NC Energy & Atmosphere Credits (which may include modifications specific to Middlebury where indicated by **+** *symbol) and additional supplemental guidelines specific to the College.*

LEED®-NC Energy & Atmosphere Credits

+ *= Additional requirements under MC-Plus beyond LEED-NC requirements. See Amendments below.*

	Credit	Description	MC-Plus
+	EA Prereq 1	Fundamental Commissioning of the Building Energy Systems	REQUIRED
	EA Prereq 2	Minimum Energy Performance	REQUIRED
	EA Prereq 3	Fundamental Refrigerant Management	REQUIRED
+	EA Credit 1	Optimize Energy Performance	REQUIRED
+	EA Credit 2	On-Site Renewable Energy	optional
+	EA Credit 3	Enhanced Commissioning	REQUIRED
+	EA Credit 4	Enhanced Refrigerant Management	REQUIRED
+	EA Credit 5	Measurement & Verification	REQUIRED
+	EA Credit 6	Green Power	optional

Supplemental Middlebury ENERGY Guidelines

Credits developed specifically for Middlebury. See Supplemental Guidelines below.

Credit	Description	MC-Plus
MC Plus 14	Specify equipment and appliances that meet Energy Star guidelines	REQUIRED
MC Plus 15	Incorporate passive solar design strategies	REQUIRED

Middlebury Amendments to LEED®-NC Energy & Atmosphere Credits

EA Prereq 1	Fundamental Commissioning of the Building Energy Systems	REQUIRED

In addition to complying with the requirements of this LEED® prerequisite, also comply with the following:

Required Performance

1. Also refer to related requirements in Middlebury Supplemental Guidelines MC Plus 6: *Provide design and construction phase commissioning*, and MC Plus 9: *Complete post-occupancy project review to inform future projects*.

EA Credit 1	Optimize Energy Performance	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance

1. Meet all the minimum baseline performance criteria as established by the 2005 Vermont Guidelines for Energy Efficient Commercial Construction (based on International Energy Conservation Code – 2004). Energy efficiency design strategies should address:
   - building enclosure/envelope
   - heating/cooling
   - domestic hot water
   - electrical power and lighting
   - other equipment
2. Develop enclosure and ventilation approach to thermal comfort to reduce dependency on air-conditioning, particularly during the summer semester.
3. Exceed the ASHRAE Standard 90.1-2004 cited for baseline performance in LEED®-NC by 25% for new construction and 18% for building renovations (level of achieving 5 LEED® credit points).

Recommended Additional Performance

1. Exceed the ASHRAE Standard 90.1-2004 cited for baseline performance in LEED®-NC by 32% for new construction and 25% for building renovations (level of achieving 7 LEED® credit points).

EA Credit 2	On-Site Renewable Energy	optional

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance

1. Review recommendations for Renewable Energy systems in the report *Integrating Sustainability at Middlebury College*.
2. During the project schematic design phase, design team members should evaluate the feasibility of providing minimum 5% of the building's energy needs through renewable systems, including, but not limited to:
   - Photovoltaic (PV)
   - Solar thermal (active systems with collection panels and heat transfer)

- Wind
- Hydro
- Biomass
- Geothermal

Recommended Additional Performance
1. Provide a minimum of 7.5% of the building's energy needs through renewable systems (level of achieving 2 LEED® credit points). Note role of central plant use of biomass in meeting building's energy needs.

EA Credit 3	Enhanced Commissioning	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance
1. Also refer to related requirements in Middlebury Supplemental Guidelines MC Plus 6: *Provide design and construction phase commissioning* and MC Plus 9: *Complete post-occupancy project review to inform future projects*.

EA Credit 4	Enhanced Refrigerant Management	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance
1. Design, specify, maintain and operate mechanical equipment to reduce refrigerant leakage over the life of the equipment.
2. Refrigerants used to be in conformance with Middlebury Design Standards.

EA Credit 5	Measurement & Verification	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance
1. Also refer to related requirements at ID Credit 1.1: *Analysis of M&V data for student/faculty research*.

EA Credit 6	Green Power	optional

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Recommended Additional Performance
1. Follow recommendations for community-based Renewable Energy systems in the report *Campus Master Plan 2008.*
2. Commit to an operating agreement of at least 4 years' duration with a renewable energy provider within 100 miles of Middlebury, Vermont, including but not limited to CVPS "Cow Power" program, solar, wind, hydroelectric and geothermal sources.

Middlebury Supplemental ENERGY Guidelines

MC Plus 14	Specify equipment and appliances that meet Energy Star guidelines	REQUIRED

Intent
Reduce energy use associated with building plug loads and process loads by specifying Energy Star certified efficient equipment.

Required Performance
1. All equipment and appliances specified and furnished as part of the project must meet the requirements of the U.S. Environmental Protection Agency (EPA) Energy Star program.

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: E.3 – Efficient Equipment and Appliances

Resources
US Environmental Protection Agency/US Department of Energy: Energy Star Program
http://www.energystar.gov/index.cfm?fuseaction=find_a_product.

MC Plus 15	Incorporate passive solar design strategies	REQUIRED

Intent
Locate and design buildings to harness passive solar energy to reduce the building's overall lighting and heating/cooling requirements, thereby reducing the College's overall carbon footprint.

Required Performance
1. Refer to Action M3 – Climate analysis and site orientation, from *Integrating Sustainability in Middlebury College,* August. Consider the following planning criteria:
   a. Consider winter heating loads (instead of summer cooling loads) as the primary criteria for building design and orientation
   b. Evaluate building orientation and site planning based on review of microclimates and solar orientation (refer to Middlebury Supplemental Guideline MC Plus 11: *Orient the building and site features to enhance the microclimate*)
   c. Consider building footprint proportions: thin footprints enhance natural ventilation; for large footprints, consider using the stack effect to encourage natural ventilation (including atria whenever feasible to improve airflow) but recognize importance of minimizing envelope enclosing interior space.

Basis of Guideline
Components of this guideline are adapted from:
Integrating Sustainability in Middlebury College, August 2007

Middlebury Supplemental ENERGY Resources

State of Minnesota Sustainable Building Guidelines
http://www.msbg.umn.edu/download2.html

Integrating Sustainability in Middlebury College, August 2007

Vermont Commercial Building Energy Standards (CBES)
http://www.energycodes.gov/implement/state_codes/state_status.php?state_AB=VT
http://www.leg.state.vt.us/statutes/fullsection.cfm?Title=21&Chapter=003&Section=00268

Energy Benchmark for High Performance Buildings (E-Benchmark)
http://www.poweryourdesign.com

Efficiency Vermont Business Resource Center
http://www.efficiencyvermont.com/pages/Business/

Middlebury College Thermal Comfort Policy
http://www.middlebury.edu/about/handbook/general/misc/thermal.htm

U.S. Environmental Protection Agency – Ozone Depletion
http://www.epa.gov/Ozone/intpol/index.html

U.S. Department of Energy, Green Power Network – Vermont
http://www.eere.energy.gov/greenpower/buying/buying_power.shtml?state=VT

Renewable Energy Vermont
http://www.revermont.org/

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MATERIALS: LEED®-NC Materials & Resources + Middlebury Supplemental Guidelines

Introduction: Minimize resource depletion

Building construction has typically been both a large consumer of materials and a large generator of waste. A 1995 study for the Worldwatch Institute found that 40% of the world's materials are used in the building industry (http://www.worldwatch.org/node/866). Reducing both the use of new materials and the generation of waste is key to any sustainable building program, conserving natural resources as well as the energy associated with the extraction, processing, transportation and disposal of materials.

Minimizing resource depletion starts with the earliest phases of project planning: when considering the programmatic needs for a facility, is it possible to renovate and re-use an existing structure? In formulating the building program, adequate space must be included for managing, sorting and recycling of users' waste. In design development, architects must choose materials and develop details considering the advantages of salvaged, recycled and rapidly renewable materials, and the lifecycle environmental impacts of these material choices. During construction, contractors must plan for and manage effective sorting, re-use and recycling of construction and demolition debris to minimize the waste of valuable resources.

A key commitment of the Middlebury College Environmental Policy is "supporting the local economy and community through environmental education, purchasing, and other College operations." (http://www.middlebury.edu/administration/enviro/policies/enviro_policy.htm) The State of Vermont has valuable natural materials used in the building industry (hardwoods, slate, granite and marble), an extensive local network of certified sustainable forest woodlots, and a wealth of local building craftspeople including woodworkers and masons. Using locally extracted, harvested or processed materials saves energy in transportation while providing valuable connections to local resources.

Summary of MATERIALS Guidelines

Note: The Middlebury Sustainable Design Guidelines for MATERIALS are a combination of LEED®-NC Materials & Resources Credits (which may include modifications specific to Middlebury where indicated by **+** symbol) and additional supplemental guidelines specific to the College.

LEED®-NC Materials & Resources Credits

+ *= Additional requirements under MC-Plus beyond LEED-NC requirements. See Amendments below.*

	Credit	Description	MC-Plus
+	MR Prereq. 1	Storage & Collection of Recyclables	REQUIRED
	MR Credit 1.1	Building Reuse – Maintain 75% of Existing Walls, Floors & Roof	recommended
	MR Credit 1.2	Building Reuse – Maintain 95% of Existing Walls, Floors & Roof	optional
	MR Credit 1.3	Building Reuse – Maintain 50% of Interior Non-Structural Elements	recommended
+	MR Credit 2.1	Construction Waste Management – Divert 50% from Disposal	REQUIRED
+	MR Credit 2.2	Construction Waste Management – Divert 75% from Disposal	recommended
+	MR Credit 3.1	Materials Reuse – 5%	recommended
+	MR Credit 3.2	Materials Reuse – 10%	recommended
+	MR Credit 4.1	Recycled Content – 10% (post-consumer + ½ pre-consumer)	recommended
+	MR Credit 4.2	Recycled Content – 20% (post-consumer + ½ pre-consumer)	recommended
+	MR Credit 5.1	Regional Materials – 10% Extracted, Processed & Manufact'd Regionally	recommended
+	MR Credit 5.2	Regional Materials – 20% Extracted, Processed & Manufact'd Regionally	optional
+	MR Credit 6	Rapidly Renewable Materials	recommended
+	MR Credit 7	Certified Wood	REQUIRED

Middlebury Supplemental MATERIALS Guidelines

Credits developed specifically for Middlebury. See Supplemental Guidelines below.

Credit	Description	MC-Plus
MC Plus 16	Evaluate materials for lowest life-cycle environmental impact	REQUIRED

Middlebury Amendments to LEED®-NC Materials & Resources Credits

MR Prereq. 1	Storage & Collection of Recyclables	REQUIRED

In addition to complying with the requirements of this LEED® prerequisite, also comply with the following:

Required Performance

1. When developing detailed layouts for small spaces such as workstations and dorm rooms, provide for adequate space for user recycling bins.
2. When designing food service facilities, provide for adequate space for composting activities.

Recommended Additional Performance

1. Where appropriate, provide space for "freecycling" donations to Middlebury College's Re-use trailer

MR Credit 2.1	Construction Waste Management – Divert 50% from Disposal	REQUIRED
MR Credit 2.2	Construction Waste Management – Divert 75% from Disposal	recommended

In addition to complying with the requirements of these LEED® credit points, also comply with the following:

Required Performance

1. Consider issues of material waste in project detailing, using standard component dimensions to avoid excess trimming.
2. Include in the Construction Waste Management Plan how packaging materials suitable for re-use such as pallets and protective wrappings will be returned to materials suppliers.

Recommended Additional Performance

1. Coordinate construction waste management in design process with Construction Manager and include requirements for tracking and reporting in specifications.
2. Divert from disposal at least 90% of waste generated from demolition and construction activities. This could qualify for an additional LEED® Innovation & Design credit point for "Exemplary Performance".

MR Credit 3.1	Materials Reuse – 5%	recommended
MR Credit 3.2	Materials Reuse – 10%	recommended
MR Credit 4.1	Recycled Content – 10% (post-consumer + ½ pre-consumer)	recommended
MR Credit 4.2	Recycled Content – 20% (post-consumer + ½ pre-consumer)	recommended
MR Credit 6	Rapidly Renewable Materials	recommended

Required Performance

1. During design, evaluate the feasibility of using all of the following types of environmentally preferable materials:
   - Salvaged or re-used materials, whether from on-site or off-site resources
   - Materials with a high recycled content, such as steel, gypsum board, and certain carpets and ceramic tiles
   - Products made from rapidly renewable bio-based resources such as bamboo, cotton, wheat, and cork
   - Products that, at the end of their useful building life, can be reused, recycled or composted ("cradle-to-cradle" cycle)

2. Include requirements in project specifications that product submittals include data for tracking recycled content, rapidly renewable materials sources, and biodegradability of product.
3. Meet the requirements for a minimum of two LEED®-NC credit points for salvaged, recycled and/or rapidly renewable materials.

NOTE: It would not be considered "environmentally preferable" to use, for example, a rapidly renewable material that needs to be transported half way around the globe. Energy costs associated with material transportation must also be considered – refer to LEED®-NC MR Credit 5.1 and 5.2 *Regional Materials – 10%/20% Extracted, Processed & Manufactured Regionally*, and Middlebury Supplemental Guideline MC Plus 16 *Evaluate materials for the lowest life-cycle environmental impact*.

MR Credit 5.1	Regional Materials – 10% Extracted, Processed & Manufactured Regionally	recommended
MR Credit 5.2	Regional Materials – 20% Extracted, Processed & Manufactured Regionally	optional

In addition to complying with the requirements of these LEED® credit points, also comply with the following:

Required Performance
1. If the project is to incorporate regional materials under Credit 5.1 or 5.2, then 5% of total building materials for the project shall be extracted, harvested, and processed within a 200-mile radius of Middlebury, Vermont.

Recommended Additional Performance
1. If the project is to incorporate regional materials under Credit 5.1 or 5.2, then 10% of total building materials for the project shall be extracted, harvested, and processed within a 200-mile radius of Middlebury, Vermont.

MR Credit 7	Certified Wood	REQUIRED

In addition to complying with the requirements of these LEED® credit points, also comply with the following:

Recommended Additional Performance
1. A minimum of 75% of all permanently installed wood-based products used in the building construction is to be certified in accordance with the Forest Stewardship Council's (FSC) "seal of approval".

Middlebury Supplemental MATERIALS Guidelines

MC Plus 16	Evaluate materials for lowest life-cycle environmental impact	REQUIRED

Intent
Choose materials and products with the lowest life-cycle environmental impact, taking into consideration the energy use, air and water pollution and waste generated in the production and transportation of building products.

Required Performance
1. During design development phase, evaluate alternatives for major building systems (foundations, intermediate floors, roof, exterior wall and windows. Document life-cycle environmental impacts of global warming potential, air and water pollution, energy use, resource use and waste produced over a 60-year material life-cycle.

Recommended Additional Performance
1. Perform similar life-cycle environmental impact analyses for interior finish materials (flooring, wall surfacing, casework, etc.).

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: M.1 – Life Cycle Assessment of Building Assemblies

Resources
Athena Institute Impact Estimator for Buildings
http://www.athenasmi.ca/tools/impactEstimator/

Building Fire and Research Laboratory, National Institute of Science and Technology, BEES (Building for Environmental and Economic Sustainability) Program:
http://www.bfrl.nist.gov/oae/software/bees/bees.html

Middlebury Supplemental MATERIALS Resources

State of Minnesota Sustainable Building Guidelines
http://www.msbg.umn.edu/download2.html

Middlebury College Recycling and Waste Management
http://www.middlebury.edu/administration/recycle

Middlebury College Food Composting Program
http://www.middlebury.edu/administration/recycle/topics/compost.htm

Middlebury College Re-Use Program
http://www.middlebury.edu/administration/recycle/Reuse.htm

Vermont Department of Environmental Conservation Waste Management Division
http://www.anr.state.vt.us/dec/wastediv/recycling/CandD.htm

Middlebury College Construction and Demolition Policy
http://www.middlebury.edu/administration/enviro/policies/c_and_d_recycling_guidelines.htm

State of Vermont, Agriculture and Environment, "Made in Vermont"
http://www.vermont.gov/portal/agriculture/index.php?id=157

Vermont Department of Economic Development: Natural Resources
http://www.thinkvermont.com/natural/index.cfm

Vermont Wood Manufacturers' Association (VWMA)
http://www.vermontwood.com/index.html

Vermont Wood Products Marketing Council
http://www.vermontwood.org/

Guild of Vermont Furniture Makers
http://www.vermontfurnituremakers.com/

Barre Granite Association
http://www.barregranite.org/

Vermont Marble Museum
http://www.vermont-marble.com/

Vermont Family Forests
http://www.familyforests.org/

Vermont WoodNet
http://www.vtwoodnet.org/certified_wood_sources.html

Middlebury College – Local Green Wood
http://www.middlebury.edu/administration/enviro/initiatives/design/green_wood/

INTERIORS: LEED®-NC Indoor Environmental Quality + Middlebury Supplemental Guidelines

Introduction: Promote the health of building occupants

The quality of the indoor environment is a critical design consideration, particularly as a significant proportion of campus life takes place indoors – classrooms, lecture halls, student centers, libraries, laboratories, dining facilities, and housing (Commons). The indoor environmental factors of air quality, temperature, sound, light and connections to the "outside world" all affect the physical and psychological health, well-being and productivity of building occupants.

An integrated approach to this issue involves mechanical design (ventilation rates), architectural specifications (low-emitting materials), construction phase pollution controls, and operational policies that eliminate indoor pollution (smoking, cleaning products). Design coordination of room and furniture layouts with mechanical elements, lighting and windows can increase thermal, visual and acoustic comfort for building occupants. For some larger buildings, the layout of the public spaces and vertical circulation elements can help foster healthy physical activity among building occupants by making it pleasant and convenient to use interior stairs on a regular basis.

It is important to note that providing a high quality indoor environment can come at the cost of sacrificing some degree of energy efficiency. A building that provides plentiful fresh air and exterior windows with outdoor views for all occupants will require integrated design efforts to achieve acceptable overall energy performance. Sustainable design balances the energy consumption with the positive benefits for the building occupants.

Summary of INTERIORS Guidelines

*Note: The Middlebury Sustainable Design Guidelines for INTERIORS are a combination of LEED®-NC Indoor Environmental Quality Credits (which may include amendments specific to Middlebury where indicated by **+** symbol) and additional supplemental guidelines specific to the College.*

LEED®-NC Indoor Environmental Quality Credits

+ *= Additional requirements under MC-Plus beyond LEED-NC requirements. See Amendments below.*

	Credit	Description	MC-Plus
	EQ Prereq 1	Minimum IAQ Performance	REQUIRED
+	EQ Prereq 2	Environmental Tobacco Smoke (ETS) Control	REQUIRED
	EQ Credit 1	Outdoor Air Delivery Monitoring	REQUIRED
	EQ Credit 2	Increased Ventilation	recommended
	EQ Credit 3.1	Construction IAQ Management Plan, During Construction	REQUIRED
	EQ Credit 3.2	Construction IAQ Management Plan, Before Occupancy	REQUIRED
	EQ Credit 4.1	Low-Emitting Materials, Adhesives & Sealants	REQUIRED
	EQ Credit 4.2	Low-Emitting Materials, Paints & Coatings	REQUIRED
	EQ Credit 4.3	Low-Emitting Materials, Carpet Systems	REQUIRED
+	EQ Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	REQUIRED
	EQ Credit 5	Indoor Chemical & Pollutant Source Control	REQUIRED
+	EQ Credit 6.1	Controllability of Systems, Lighting	recommended
	EQ Credit 6.2	Controllability of Systems, Thermal Comfort	recommended
	EQ Credit 7.1	Thermal Comfort, Design	REQUIRED
	EQ Credit 7.2	Thermal Comfort, Verification	recommended
+	EQ Credit 8.1	Daylight & Views, Daylight 75% of Spaces	recommended
	EQ Credit 8.2	Daylight & Views, Views for 90% of Spaces	optional

Middlebury Supplemental INTERIORS Guidelines

Credits developed specifically for Middlebury. See Supplemental Guidelines below.

Credit	Description	MC-Plus
MC Plus 17	Design for effective control of moisture	REQUIRED
MC Plus 18	Provide acoustic comfort for building occupants	REQUIRED
MC Plus 19	Promote healthy physical activity through layout of spaces and stairs	recommended

Middlebury Amendments to LEED®-NC Indoor Environmental Quality Credits

EQ Prereq 2	Environmental Tobacco Smoke (ETS) Control	REQUIRED

In addition to complying with the requirements of this LEED® prerequisite, also comply with the following:

Required Performance
1. Ensure that building and site design enhances compliance with Middlebury College's Smoking Policy.

Resources
Middlebury College Smoking Policy
http://www.middlebury.edu/about/handbook/general/misc/smoking.htm

EQ Credit 4.4	Low-Emitting Materials, Composite Wood & Agrifiber Products	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance
N/A

Recommended Additional Performance
1. Additional materials permanently installed in the building interior shall meet the indoor air quality requirements of California Section 01350. This is to include, but not be limited to: resilient flooring and base, pre-finished wood flooring, thermal and acoustical insulation, acoustical wall and ceiling panels, gypsum board and cabinetry.

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: I.2 – Specify Low-emitting Materials

Resources
California Integrated Waste Management Board – Section 01350
http://www.ciwmb.ca.gov/GreenBuilding/Specs/Section01350/

EQ Credit 6.1	Controllability of Systems, Lighting	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance
1. Design artificial lighting system to be responsive to variations in available daylight and variations in user activities.

EQ Credit 8.1	Daylight & Views, Daylight 75% of Spaces	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Required Performance

1. Provide light and glare control for all exterior windows. Strategies may include window blinds/shades and interior light shelves, as well as exterior solar shading devices or trees.

Middlebury Supplemental INTERIORS Guidelines

MC Plus 17	Design for effective control of moisture	REQUIRED

Intent
Prevent intrusion and accumulation of moisture in buildings and provide adequate ventilation to prevent mold contamination.

Required Performance
1. Provide proper site drainage and stormwater management to divert rain water and moisture away from building perimeter.
2. Design building envelope and enclosure systems to resist moisture penetration to the interior.
3. Design mechanical systems to control indoor humidity levels and prevent water accumulation through condensation.
4. Specify maximum moisture content of materials and substrates to avoid moisture intrusion during construction.

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: I.3 – Moisture Control

Resources
Whole Building Design Guide – Moisture Control
http://www.wbdg.org/sustainableEO/mou_mc.php?print=1

MC Plus 18	Provide acoustic comfort for building occupants	REQUIRED

Intent
Through the control of noise and vibration, provide a comfortable acoustic environment to enhance the health and well-being of building occupants.

Required Performance
1. Design structural systems to control transmission of noise and vibration, including floor deflections.
2. Locate mechanical equipment to minimize noise and vibration impacts on occupied spaces.
3. Utilize vibration isolators, duct silencers, and minimize air velocities to minimize transmission of mechanical noise through ductwork.
4. Design building envelope to mitigate external sources of noise and vibration.

Recommended Additional Performance
1. For acoustically critical spaces such as lecture halls and performing spaces, conduct acoustic analysis to insure speech intelligibility, acceptable reverberation time, and similar criteria.

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: I.7 – Effective Acoustics and Positive Soundscapes
State of Minnesota Sustainable Building Guidelines: I.8 – Reduce Vibration in Buildings
State of Vermont Department of Buildings and General Services (BGS) – Design Guidelines

MC Plus 19	Promote healthy physical activity through layout of spaces and stairs	recommended

Intent
Through the location of stairs and the arrangement of spaces within the building, provide an environment which promotes incidental physical activity, to enhance the health and well-being of building occupants.

Recommended Additional Performance
1. Where permitted by building code, provide an open stair connecting the building entry floor level with adjacent occupied floor levels. Stair design should be visible, inviting, safe and convenient for building occupants to use instead of elevators.
2. Provide circulation paths that encourage building occupants to walk between frequently used spaces. Features to include:

- separation of service areas such as restrooms, kitchenettes and copy rooms from work areas
- continuous circulation loops that allow for multiple paths to common destinations
- daylight and views along circulation path
- niches and open gathering spaces along the circulation paths to encourage spontaneous interactions

Basis of Guideline
Components of this guideline are adapted from:
State of Minnesota Sustainable Building Guidelines: I.12 – Encourage Healthful Physical Activity

Middlebury Supplemental INTERIORS Resources

State of Minnesota Sustainable Building Guidelines
http://www.msbg.umn.edu/download2.html

State of Vermont Department of Buildings and General Services (BGS) – Design Guidelines
www.bgs.state.vt.us/facilities/engineering/pdf/Engineering_guidelines.pdf

U.S. Environmental Protection Agency -- IAQ Design Tools for Schools
http://www.epa.gov/iaq/schooldesign/construction.html

Middlebury College Thermal Comfort Policy
http://www.middlebury.edu/administration/enviro/policies/thermal_comfort.htm

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INNOVATION: LEED®-NC Innovation & Design + Middlebury Supplemental Guidelines

Introduction: Provide opportunities for environmental learning

The LEED® Innovation & Design category allows projects to promote unique sustainable features not addressed in other credit points. As a leader in education and campus sustainability, Middlebury College can provide innovative opportunities for environmental learning through building construction projects.

Every effort of sustainable design can become an opportunity for environmental learning. Sustainable features may be visible (solar panels, window overhang shading) or may be concealed (mechanical systems, substrate materials). With effective explanatory signage and "view-windows", knowledge of a building's sustainable features can increase environmental awareness among building occupants and visitors. Installation of Measurement & Verification systems to track actual energy performance can provide valuable feedback to inform future facilities decisions at the same time as providing data for a variety of student/faculty environmental research projects.

For buildings with sustainable design features that require active participation of building users (operable windows, shades and lighting controls), user training and orientation will provide the educational component to ensure the viability of the environmental feature. User/occupant behavior influences building energy consumption; education and training can support and reinforce energy saving measures. Students, faculty and staff could be asked to sign a voluntary environmental pledge, demonstrating their active commitment to the College's environmental goals.

Summary of INNOVATION Guidelines

*Note: The Middlebury Sustainable Design Guidelines for INNOVATION are LEED®-NC Innovation & Design Credits (which may include amendments specific to Middlebury where indicated by **+** symbol). There are no additional supplemental guidelines specific to the College.*

LEED®-NC Innovation & Design Credits

+ *= Additional requirements under MC-Plus beyond LEED-NC requirements. See Amendments below.*

	Credit	Description	MC-Plus
+	ID Credit 1.1	Innovation in Design: Analysis of M&V data for student/faculty research	recommended
+	ID Credit 1.2	Innovation in Design: Explanatory signage of environmental features	recommended
+	ID Credit 1.3	Innovation in Design: User orientation, training and commitments	recommended
	ID Credit 1.4	Innovation in Design: To be determined by Project Team	recommended
+	ID Credit 2	LEED® Accredited Professional	REQUIRED

Middlebury Amendments to LEED®-NC Innovation & Design Credits

ID Credit 1.1	Innovation in Design: Analysis of M&V data for student/faculty research	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Intent
Collect post-occupancy systems performance data through Measurement & Verification (M&V) to determine 1) the effectiveness of the systems design; 2) report "lessons learned" and update building design standards as necessary for future projects; and 3) provide valuable data for student/faculty research projects.

Recommended Performance
1. Establish a matrix for regular post-occupancy commissioning to make sure that building operations are consistent with systems design intent.
2. Provide Measurement & Verification (M&V) systems to monitor actual building systems performance over time. Refer to LEED®-NC EA Credit 5.
3. Establish procedures for implementing corrective action based on trends from M&V data.

Recommended Additional Performance
1. Facilities project managers to update College design standards based on analysis of M&V data.
2. College to promote publication of reports/articles documenting key trends and facilities issues to benefit campus design teams as well as the greater building community.

ID Credit 1.2	Innovation in Design: Explanatory signage of environmental features	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Intent
Highlight sustainable building features with interpretive exhibition techniques, commonly found in museums and other educational centers (including the National Park Service); use signage or cut-away view windows (also known as "truth windows") to provide visual stimuli and background knowledge to encourage building occupant and visitor interest in a sustainable campus.

Recommended Performance
1. Develop a building-specific explanatory program for sustainable design features. Elements should include:
    - Building features and design intent/outcomes
    - Key themes (e.g. materials, building systems, site strategies, water efficiency, and energy, etc.)
    - Effects of building occupant behavior on performance of building systems

Recommended Additional Performance
1. Provide exhibit technologies that provide real-time monitoring and display of key building systems in coordination with automatic building controls systems.

ID Credit 1.3	Innovation in Design: User orientation, training and commitments	recommended

In addition to complying with the requirements of this LEED® credit point, also comply with the following:

Intent
Provide a general orientation as well as specific building training for users of major facilities, including libraries, student centers, laboratories, and housing, to help encourage a stronger, campus-wide comprehension of sustainable design principles as they relate to every-day usage.

Recommended Performance
1. Provide campus orientation tours for all students, faculty and staff focusing on issues of campus-wide environmental impacts. Walk-throughs should be led by College engineering, facilities, and/or environmental staff to provide technical understanding for the users.
2. Provide building-specific walk-throughs for all new occupants of facilities where significant amounts of time will be spent. Walk-throughs should highlight sustainable design features that require active user participation to reinforce compliance with energy-saving measures.

Recommended Additional Performance
1. Encourage all campus users to pledge their commitment to efforts to create a sustainable campus. Commitments should address:

- Recycling programs
- Building water consumption
- Building energy use
- Control of indoor pollutants
- Regional and campus-wide transportation alternatives

ID Credit 2	LEED® Accredited Professional	REQUIRED

In addition to complying with the requirements of this LEED® credit point, also comply with the following:
Refer to additional requirements in Middlebury Supplemental Guideline MC Plus 4: *Include LEED® accredited professionals on the design team.*

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APPENDIX 1

Review and Assessment of Sustainable Design Guideline Models, August 7, 2007

LEED®-NC Version 2.2 http://www.usgbc.org/DisplayPage.aspx?CategoryID=19
The Leadership in Energy and Environmental Design (LEED®) Green Building Rating System™ was launched by the US Green Building Council (USGBC) in 1998. With twelve initial pilot projects certified in 2000, and nearly 900 projects certified since then, LEED® has become a nationally accepted benchmark for high performance buildings. LEED® certification involves documenting achievement of prerequisites and credit points from six categories of sustainable design and construction: Sustainable Sites, Water Efficiency, Energy & Atmosphere, Materials & Resources, Indoor Environmental Quality, and Innovation in Design (for project-specific sustainable features not addressed in the other categories). LEED® offers a range of certification levels (certified, silver, gold and platinum) depending on the number of credit points achieved.

According to the USGBC website,

> "The LEED® Rating System was created to transform the built environment to sustainability by providing the building industry with consistent, credible standards for what constitutes a green building. The rating system is developed and continuously refined via an open, consensus-based process that has made LEED® the green building standard of choice for Federal agencies and state and local governments nationwide."

The LEED® rating system has been adopted as the basis of sustainable design requirements by:

- The General Services Administration (GSA), Environmental Protection Agency (EPA), National Aeronautics and Space Administration (NASA), US Navy, Department of State, and many other Federal agencies,
- 23 States including California, Illinois, Michigan, New York, and Pennsylvania, and the New England states of Connecticut, Maine, Massachusetts, Rhode Island and Vermont,
- Atlanta, Boston, Chicago, Kansas City, Los Angeles, Minneapolis, New York City, Salt Lake City and numerous other counties, cities and towns across the US, and
- Bowdoin College, Dartmouth College, Harvard University, University of Connecticut, University of Vermont, and many other American colleges and universities, large and small, public and private.

The chief weaknesses cited in the LEED® rating system include the absence of the following:

- addressing impacts on standard project delivery processes,
- concern for social impacts and development of sustainable communities,
- requirements for incorporating green design features in all of the sustainability categories,
- analysis of life cycle costs of materials and systems, including analysis of lifetime maintenance costs,
- analysis of complete "cradle-to-grave" environmental impact of materials, including effects of resource harvesting, manufacture and transportation, and
- requirements for post-construction sustainable operations practices during the life of the building.

BREEAM http://www.breeam.org/
In the UK, BREEAM (Building Research Establishment Environmental Assessment Method) has been the standard for certification of sustainable design and construction for over 20 years. Currently, there are nearly 100,000 buildings in the UK that are BREEAM certified. According to the BRE website, their assessment method has formed the basis for sustainable design rating systems by other Green Building Councils worldwide.

The BREEAM certification process involves the hiring of an independent licensed BREEAM assessor in the earliest stages of project planning, and continuing to work with that assessor throughout the design and construction process to insure that sustainable design strategies are incorporated. BREEAM includes nine categories of environmental considerations: Management, Health & Wellbeing, Energy, Transport, Water, Materials, Land Use, Ecology, and Pollution. The assessment is specific to building type (offices, homes, courts, retail, etc.), and includes a "bespoke" (custom) option for unique building types. For each criterion in the assessment, it is possible to receive a number of points, and depending on the total number of points achieved, a project can be awarded a rating level of Pass, Good, Very Good or Excellent.

In December 2005, the Van De Kamp Bakery Building for the Los Angeles City College was the first building in the US to receive BREEAM certification, and may still be the only one. According to Program Manager DMJM, "the costs of BREEAM certification (approximately $20,000) were absorbed by the [Los Angeles Community College] District while DMJM funded the BRE assessor's time, travel, and accommodation for over five months." While it is infeasible for projects in the US to receive BREEAM certification until there is a complete network of local licensed assessors, there is much in the details of the BREEAM guidelines that could be used to supplement LEED®, specifically:

- focus on CO_2 emissions from building heating and cooling systems,
- assessment of ozone depleting potential and global warming potential of materials such as building insulation
- concern for acoustic issues as a factor in indoor environmental quality
- monitoring of CO_2 emissions, water and energy use during construction

Green Globes http://www.thegbi.org/greenglobes/
Green Globes is an online environmental audit tool, applicable both to the management of existing buildings and to the design of new construction and renovations. Originally developed from BREEAM for the Canadian market, Green Globes was introduced into the US in 2004 by GBI (The Green Building Initiative). GBI has begun the process to establish Green Globes as an official ANSI standard for the US market.

According to their website, Green Globes Design uses "confidential questionnaires for each stage of project delivery, [and] the program generates comprehensive on-line assessment and guidance reports." Specific online questionnaires are tailored to the various project team members and project delivery phases, and cover the topics of Site, Energy, Water, Resources, Emissions and Effluents, Indoor Environment, and Project Management. Depending on the number of points achieved, a project can earn a rating of one, two, three or four globes. Certification is achieved through independent third-party verification by a trained and licensed Green Globes assessor.

The advantages of the Green Globes rating system include the following:

- an interactive online tool engaging all members of the project design team and requiring consideration of sustainable strategies at the earliest phases of design,

- assigning the largest number of points to the Energy category, which aligns with Middlebury's findings that 80% of the campus' carbon emissions are from building heating and cooling systems,
- addressing in the Resource category lifecycle assessments of building materials and assemblies, including "cradle-to-grave" assessments of environmental impacts, a perceived shortcoming of the LEED® rating system, and
- using the EPA's EnergyStar Target Finder for developing building energy benchmarks, which set higher energy performance goals than LEED®, ASHRAE and most state energy codes.

CASBEE http://www.ibec.or.jp/CASBEE/english/index.htm

CASBEE (Comprehensive Assessment System for Building Environmental Efficiency) was developed by the Japan Sustainable Building Consortium (JSBC) for use in Asia. It developed from the earliest building assessments which focused solely on improving the quality of the interior environment of the building users, and later assessments that focused solely on the negative (pollution) impacts of buildings. The CASBEE assessment system analyzes both the positive impacts of building Environmental Quality and Performance, and the negative impacts of building Environmental Loadings, defining BEE (Building Environmental Efficiency) as the ratio of Environmental Quality to Environmental Loadings with the equation:

BEE = Eco-Efficiency = (beneficial output) / (input + non-beneficial output)

BEE values are represented graphically by plotting the Environmental Loading on the x axis and Environmental Quality on the y axis, and then drawing a line from the origin (0,0) to the BEE value. The higher the Quality value and the lower the Loading value, the steeper the gradient of the line, and the more sustainable the building is.

While too complicated to adopt in the US as a rating system, CASBEE is still worthwhile to consider as a conceptual structure for evaluating the relationship between positive environmental Quality and negative environmental Loadings.

State of Minnesota Sustainable Building Guidelines Version 2.0 http://www.msbg.umn.edu/

All new bond-funded state building construction in Minnesota since 2004 has been required to comply with the State of Minnesota Sustainable Building Guidelines (MSBG). These guidelines were developed in a multi-year process in collaboration with the Center for Sustainable Building Research at the University of Minnesota. LEED® and other nationally accepted rating systems form the basis of the guidelines, supplemented with additional requirements and priorities specific to the State of Minnesota.

In contrast with the LEED® system where credit points are accumulated for each sustainable feature, the MSBG sets high minimum performance requirements for achieving sustainable design in all of the typical categories. In addition, the MSBG includes Performance Management Guidelines, which help to insure that sustainable design practices are integral to the design process from pre-design to post-occupancy, and that projects provide critical feedback to guide future design and construction decisions.

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APPENDIX 2

Map Indicating Regional Materials Distances within 200 and 500 Mile Radius

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APPENDIX 3

Process Outline

Current edition

Sustainable Design Guidelines, dated November 2008 FINAL

Applicable projects

All new construction and major renovation greater than 5,000sf or $1 million

Sustainable Design Guidelines are meant to complement and to be used in conjunction with

MiddShift Report, dated November 2008
Campus Master Plan, dated May 2008
Design Standards, dated TBD

Target standard

All projects under this guideline will target LEED MC Plus Silver level of compliance as a minimum threshold.

Pre-project/project initiation

--Review all projects regardless of size for applicability of sustainable design guidelines
--Coordinate with Master Plan Committee (MPC)
--Identify MPC member to be part of Project Team
--MPC recommendation to President about LEED certification

Project design

--Sustainable design workshop organized by Project Team, led by PM/designer
--Project Team proposes sustainability goals, including LEED MC Plus level
--Establish schedule of project reviews to track progress on sustainability goals

Project construction

--Sustainable design coordination as part of pre-construction selection/meeting
--Project manager (Facilities) to monitor progress on sustainability goals through construction

Project completion

--Post-occupancy review by Project Team reporting to MPC
--Conduct monitoring and verification
--Incorporate feedback and updates into guidelines and standards

Periodic updates

--Working committee including Facilities and Environmental Affairs representatives to update and report to MPC at least annually

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