

SUSTAINABILITY

Sustainability is a critical component to this project. It addresses both the operational concerns important to the University and the environmental concerns important to the user groups, SIB and SESE. The University's goal is for this project to achieve LEED gold certification under the LEED - NC v.2009 standard. The project will be designed to achieve as many LEED points as possible while maintaining the project budget. Since the building has undergone some recent maintenance work (re-roofing, window replacement, etc), we will need to seek clarification from the USGBC on how much, if any, of this work may be included in the LEED calculations. Inclusion of this work may have mixed effects, i.e, inclusion of the window replacement work will benefit the project under the Energy and Atmosphere credits, however, it may negatively affect some of the Material and Resource credits.

One obstacle that we are fighting to overcome is related to the Energy and Atmosphere credit. At this time we are projecting that the project can only achieve two of the nineteen possible points for Credit EA1. Please refer to the information on credit EA 1-Optimize Energy Performance for a detailed explanation of the issue. This issue presents a significant challenge to the project achieving LEED certification.

The LEED checklist is included at the end of this section. The checklist reflects the design team's best estimate of the points that can be achieved within the proposed project budget. We currently believe that 56 points are readily achievable and an additional 15 points may be achievable. We will continually monitor the LEED credits during Schematic Design and Design Development in order to evaluate the impact that further development of the project will have on them.

There are direct costs for LEED Certification, including project registration, certification fees, credit interpretation request (CIR) fees, and credit appeal fees. The registration and certification fees are fixed, however, the CIR and credit appeal fees are a per occurrence cost and are currently unknown. We recommend budgeting \$16,000 to cover these costs and registering the project as soon as possible.

Sustainable Sites:

Pre-requisite 1: Construction Activity Pollution Prevention.

Project will comply with UIUC standards and Storm Water Pollution Prevention requirements. Terra to provide an Erosion and Sedimentation Control plan to coordinate with the Contractor's Site Logistics Plan for protection in accordance with all local and federal requirements. This would include silt fence at the limits of disturbance, and filter baskets at all open- lid drainage structures to protect the existing storm sewer system.

Credit 1: Site selection

The project design will comply with the requirements for this credit and thus achieve one point.

Credit 2: Development Density and Community Connectivity

We believe the project will meet the requirements for development density due to its location in the heart of campus and thus earn five points.

Credit 3: Brownfield Redevelopment

Remediate the asbestos and other hazardous substances within the structure and conduct a Phase I & Phase II assessment of the site.

Credit 4: Alternative transportation (4.1, 4.2, & 4.4)

Credit 4.1: The project is near multiple municipal bus lines and will comply with the requirements for public transportation access. This credit will achieve six points.

Credit 4.2: As the project is currently designed, a shower area for 5% of the fte occupants has not been included. Room for the changing room can be provided, however one of the program elements will need to be reduced or eliminated in order to provide space.

Credit 4.4: No net increase in parking spaces is planned for. Two new spaces are planned for in the north lot to compensate for two spaces lost to the dumpster relocated on the west side of the building. This credit achieves two points.



Credit 6: Stormwater Design (6.1 & 6.2)

Credit 6.1: The existing site condition is currently developed and greater than 50% impervious. Thus, in order to achieve this credit, stormwater runoff rate and quantity for the site's 2-YR, 24-HR storm event must be decreased by 25%. A variety of stormwater BMP's mentioned in the civil/site design section of this report would achieve this credit. In particular, recommended solutions #2, #3, #4, #6, #7, and #9 would achieve SS6.1.

Credit 6.2: In order to achieve this credit, 90% of the LEED Boundary's stormwater runoff must be treated through a stormwater BMP or mechanical structure to achieve an 80% TSS Removal Rate. In order to achieve this credit, Terra recommends installing either options #8 or #9 discussed in the next section, and redirecting all existing stormwater downspouts through the proposed water quality treatment method.

Credit 7.1: Heat Island Effect – Non-roof

At least 50% of proposed pavement within the LEED boundary will be proposed concrete pavement or permeable pavers, specified with an SRI rating above 29, making the credit achievable for all recommendations discussed in this report. An additional exemplary point would be available if all site pavements were specified to have an SRI rating above 29.

Credit 8: Light Pollution Reduction

A possible credit related to lighting requirements within the building and throughout the site.

Water Efficiency:

Pre-requisite 1: Water use reduction 20%

The project will comply with these requirements for water use reduction.

Credit 1: Water Efficient Landscaping

The project will comply with Option 1 and Option 2, Path 2 to meet the requirements of this credit.

Credit 3: Water use reduction

The project will attempt to achieve a 35% reduction in water use from the baseline.

Energy and Atmosphere:

Pre-requisite 1: Fundamental Commissioning

Commissioning will be provided by UIUC personnel in compliance with the requirements of EA Credit 3. This effort will exceed the requirements of the prerequisite.

Pre-requisite 2: Minimum Energy performance

Performance credit will be pursued under EA c1, thereby exceeding the requirements of this prerequisite.

Pre-requisite 3: Fundamental Refrigerant Management

This project will be pursuing EA Credit 4. The requirements of this credit exceed the prerequisite requirements.

Credit 1: Optimize Energy Performance

A number of energy performance enhancements are planned as part of this project including:

- Variable volume fume hood exhaust
- Total Energy Heat Recovery from the non-hood building exhaust
- Sensible-Only Heat Recovery from hood exhaust
- High efficiency lighting, including extensive use of LED lamps
- Sealing and insulation of the exterior walls
- Increased insulation level of the roof
- Completion of the window replacement project which is currently in progress
- Reduced domestic hot water consumption due to reduced flow plumbing fixtures

On this basis, points will be pursued under this credit. An initial review of the modeling requirements necessary for documenting the performance of the design relative to a prescribed "Baseline" has been



conducted. A series of schematic level energy models have been developed to develop an initial indication of the number of points which can be reasonably expected under EAc1.

Since the building is served by the campus chilled water and steam utility system, special requirements apply as described in the USGBC document: Treatment of District or Campus Thermal Energy in LEED V2 and LEED 2009 – Design & Construction, dated 10/13/2010. This document outlines two options under the Performance Path (this path is followed when a project is attempting to earn points under EAc1). The first option is to simply model the chilled water and steam as “purchased” utilities. This method applies to both the Proposed Design model and to the Baseline model. Under this option all energy related to the generation of steam and chilled water essentially become “performance neutral.”

The second option describes a method whereby the performance of the campus generating plant and distribution system are taken into account in the Proposed Design model. The Baseline is created in the standard procedure indicated under Appendix G of ASHRAE Standard 90.1 whereby onsite chiller and boiler plants are created which are minimally compliant with the standard.

The second option described above would likely result in a performance benefit to the Proposed Design, potentially resulting in added points under EAc1. However, the document describes a very detailed process whereby the performance of the campus heating and cooling system must be characterized. It is our understanding that this would require a detailed engineering study of the plant, distribution system and historic operating data. If the university can provide this information within the schedule of this certification effort, the information will be used to enhance the energy model. If this information is not provided Option one will be pursued.

Since this is an existing building, the building envelope (roof, windows, and exterior walls) in the Baseline model is created to reflect the existing conditions prior to any renovation effort.

One last item of note relates to clarifications we have identified regarding the ventilation requirements of a lab building. Essentially these interpretations disallow the use of total energy recover for fume hood exhaust and also disallow for the code exhaust systems to be turned down when the building is unoccupied.

Based on preliminary energy modeling reflecting the constraints identified above, while every attempt is being made to reduce the energy use of this building, we do not expect that our Proposed Design energy model will outperform the Baseline model by more than 10-12%. For existing buildings, 10% earns 2 points and 12% earns 3 points under EAc1.

Credit 2: On-Site Renewable Energy

This building type is not expected to have a substantial base daily use of domestic hot water. For this reason, a solar thermal system was not given serious consideration. The application of photovoltaic panels on the roof was considered, but was rejected for two reasons: 1) there is insufficient available roof area to achieve the credit threshold, and 2) the payback for this increased level of investment is beyond 20 years.

Credit 3: Enhanced Commissioning

Enhanced Commissioning will be provided by UIUC personnel.

Credit 4: Enhanced Refrigerant Management

This project will be pursuing EA Credit 4. The university must provide complete documentation on all chillers in the chilled water plant since this credit requires that all downstream (within building) and upstream (campus system) be accounted for in the calculation of the overall Ozone Depletion and Global Warming function.

Credit 5: Measurement and Verification

This project will be pursuing EA Credit 5. Since the building is served by a campus heating and cooling plant and is pursuing credits under the Performance Path of EAc1, the measurement and verification requirements extend not only to the equipment within the building (heat exchangers, steam pressure



reduction stations, pumps, valves, pipes, building electrical services, and controls) but also includes plant equipment.

Credit 6: Green Power

The University does not desire to be encumbered in their procurement of energy by this project.

Materials and Resources:

Pre-requisite 1: Storage and Collection of Recyclables

Dedicated space has been planned adjacent to the loading dock for the collection and storage of recyclables. Additional receptacles will need to be provided at multiple locations on each floor for collection before being gathered and stored.

Credit 1: Building Re-use

1.1: The project will attempt to maintain as much of the exterior wall, structure, and floor as possible. Portions of the floor structure (1908 addition) will need to be removed due to their structural inadequacy. This should not affect this credit negatively since LEED 2009 allows you to discount systems that are hazardous or structurally unsound. We believe we can achieve at least one point and potentially two others depending on USGBC's determination.

1.2: In addition to maintaining some of the existing non-structural walls, the existing doors will be salvaged and re-used. For this credit, only items reused for the same purpose as initially constructed can be included. Where we intend to salvage wood floor material for reuse as a wall finish, then that material can not be included in this credit. It can be included under Credit MR 3. The majority of non-bearing walls are being removed in order to accommodate construction of spaces that support the required program. At this time, we believe that one point may be possible, but this will need to be further reviewed when the project moves ahead.

Credit 2: Construction Waste Management

The project should meet the requirements for recycling at least 75% of the non-hazardous construction waste and therefore earn 2 points.

Credit 3: Materials Re-use.

We currently plan to salvage and re-use as much of the hardwood material, (trim, doors, and flooring) as possible totaling at least 5% of the total materials. The project may earn up to one point if this target is reached.

Credit 4: Recycled Content.

Products will be specified that contain as much recycled content as possible while meeting the University's standards. The project should achieve a recycled content of 20% and earn two points.

Credit 5: Regional Materials:

Products will be specified that meet the requirements for regional materials (extracted, harvested, or manufactured within 500 miles of the site) and the University standards. 20% of the materials by cost will meet this requirement and the project will earn two points.

Credit 7: Certified wood

At least 50% wood products (framing, flooring, sub-flooring, doors, and trim) specified for installation will be certified under the Forestry Stewardship Council's guidelines. One point will be earned.

Indoor Environmental Quality:

Pre-requisite 1: Minimum Indoor Air Quality Performance

This facility will meet and in many cases exceed the requirements of ASHRAE 62.1-2007.

Pre-requisite 2: Environmental Tobacco Smoke (ETS) Control

Smoking will be prohibited in this facility and within 25 ft of all building openings per the University's smoking policy.

Credit 1: Outdoor Air Delivery Monitoring

This project will be pursuing EA Credit 1. The mechanical equipment which provides ventilation air will be equipped with air flow measuring stations. In addition space will be provided with CO2 monitoring equipment as required.



Credit 3: IAQ management Plan (3.1 & 3.2)

The project specifications will include requirements for the contractor to construct the project in a manner that complies with the requirements for these credits. Time will need to be included in the construction schedule for the two week building flush out at the end of construction. Two points should be achievable.

Credit 4: Low Emitting Materials (4.1 – 4.4)

The project specifications will be developed around materials that limit the amount of Volatile Organic Compounds included in adhesives, sealants, paints, coatings, flooring, and composite wood and agri fiber components. Four points should be achievable under this credit.

Credit 5: Indoor Chemical and Source Pollutant Control

One requirement of this credit is the installation of permanent entryway systems with a minimum length of 10' in all entryways. Due to the existing layout of the building, this may not be possible at all locations. This requirement will need further study to determine if the project can comply. Additionally, this credit requires the separation of exhaust for all spaces where gases or chemicals may be present such as janitorial closets, storage rooms, science labs, copy rooms, etc. The project will include separate exhaust for these spaces. One point may be possible.

Credit 6: Controllability of Systems. (6.1 & 6.2).

Suitable controls for lighting will be provided in Offices and Classrooms as necessary to meet the requirements of this credit. Additionally, thermal comfort controls and/or operable windows will be available in all of the regularly occupied spaces and classrooms for at least 50% of the building occupants. Two points should be achievable under this credit.

Credit 7: Thermal Comfort (7.1&7.2)

7.1: This project will be pursuing this credit by providing equipment that can control temperature, humidity and airflow. In addition individual temperature control will be provided as applicable and per the University's design standards.

7.2: This project will be pursuing this credit by including the required surveys as part of the University's commissioning effort.

Credit 8: Daylight and Views

Due to nature of the existing building and the need to infill the courtyards to create as much usable program space as possible, it does not appear that these credit requirements can be met. We will further evaluate during the design process, but do not anticipate achieving any points under this credit.

Innovation and Design Process:

Credit 1: Innovation in Design (1.1-1.5)

Based on our evaluation of the project, we currently plan to achieve up to 3 innovation and design credits through a combination of innovate design and exemplary performance on previously discussed credits. Innovations currently being considered include Lab Exhaust technology, education and outreach program, and show energy use. Potential exemplary performance credits include: MR 4, MR 5, &MR 7.

Credit 2: LEED Accredited Professional

Regional Priority Credits:

Credit 1: Regional Priority (1.1-1.4)

We hope to achieve up to 4 points by achieving at least four the following priority credits – SS c1, SSc2, SSc4.1, SSc4.4, SS c6.2, and /or SSc7.1.





LEED 2009 for New Construction and Major Renovations

Project Checklist

University of Illinois - Natural History Building
revised 7/7/2011

17 3 6 Sustainable Sites Possible Points: 26

Y	?	N	Prereq	Description	Points
1			Credit 1	Construction Activity Pollution Prevention	1
5			Credit 2	Site Selection	5
1			Credit 3	Development Density and Community Connectivity	1
1			Credit 4	Brownfield Redevelopment	1
1			Credit 4.1	Alternative Transportation—Public Transportation Access	6
3			Credit 4.2	Alternative Transportation—Bicycle Storage and Changing Rooms	3
2			Credit 4.3	Alternative Transportation—Low-Emitting and Fuel-Efficient Vehicles	2
1			Credit 4.4	Alternative Transportation—Parking Capacity	1
1			Credit 5.1	Site Development—Protect or Restore Habitat	1
1			Credit 5.2	Site Development—Maximize Open Space	1
1			Credit 6.1	Stormwater Design—Quantity Control	1
1			Credit 6.2	Stormwater Design—Quality Control	1
1			Credit 7.1	Heat Island Effect—Non-roof	1
1			Credit 7.2	Heat Island Effect—Roof	1
1			Credit 8	Light Pollution Reduction	1

6 1 3 Water Efficiency Possible Points: 10

Y	?	N	Prereq	Description	Points
4			Credit 1	Water Use Reduction—20% Reduction	2 to 4
2			Credit 2	Water Efficient Landscaping	2
1			Credit 3	Innovative Wastewater Technologies	2 to 4
1			Credit 3	Water Use Reduction	2 to 4

9 2 24 Energy and Atmosphere Possible Points: 35

Y	?	N	Prereq	Description	Points
2			Prereq 1	Fundamental Commissioning of Building Energy Systems	2
17			Prereq 2	Minimum Energy Performance	17
7			Prereq 3	Fundamental Refrigerant Management	7
2			Credit 1	Optimize Energy Performance	1 to 19
2			Credit 2	On-Site Renewable Energy	1 to 7
2			Credit 3	Enhanced Commissioning	2
2			Credit 4	Enhanced Refrigerant Management	2
3			Credit 5	Measurement and Verification	3
2			Credit 6	Green Power	2

6 7 Materials and Resources Possible Points: 14

Y	?	N	Prereq	Description	Points
1			Prereq 1	Storage and Collection of Recyclables	1
2			Credit 1.1	Building Reuse—Maintain Existing Walls, Floors, and Roof	1 to 3
1			Credit 1.2	Building Reuse—Maintain 50% of Interior Non-Structural Elements	1
2			Credit 2	Construction Waste Management	1 to 2
1			Credit 3	Materials Reuse	1 to 2

Materials and Resources, Continued

Y	?	N	Prereq	Description	Points
1			Credit 4	Recycled Content	1 to 2
1			Credit 5	Regional Materials	1 to 2
1			Credit 6	Rapidly Renewable Materials	1
1			Credit 7	Certified Wood	1

11 1 2 Indoor Environmental Quality Possible Points: 15

Y	?	N	Prereq	Description	Points
1			Prereq 1	Minimum Indoor Air Quality Performance	1
1			Prereq 2	Environmental Tobacco Smoke (ETS) Control	1
1			Credit 1	Outdoor Air Delivery Monitoring	1
1			Credit 2	Increased Ventilation	1
1			Credit 3.1	Construction IAQ Management Plan—During Construction	1
1			Credit 3.2	Construction IAQ Management Plan—Before Occupancy	1
1			Credit 4.1	Low-Emitting Materials—Adhesives and Sealants	1
1			Credit 4.2	Low-Emitting Materials—Paints and Coatings	1
1			Credit 4.3	Low-Emitting Materials—Flooring Systems	1
1			Credit 4.4	Low-Emitting Materials—Composite Wood and Agrifiber Products	1
1			Credit 5	Indoor Chemical and Pollutant Source Control	1
1			Credit 6.1	Controllability of Systems—Lighting	1
1			Credit 6.2	Controllability of Systems—Thermal Comfort	1
1			Credit 7.1	Thermal Comfort—Design	1
1			Credit 7.2	Thermal Comfort—Verification	1
1			Credit 8.1	Daylight and Views—Daylight	1
1			Credit 8.2	Daylight and Views—Views	1

3 1 2 Innovation and Design Process Possible Points: 6

Y	?	N	Prereq	Description	Points
1			Credit 1.1	Innovation in Design: Lab Exhaust	1
1			Credit 1.2	Innovation in Design: Education and Outreach program.	1
1			Credit 1.3	Innovation in Design: Exemplary Performance	1
1			Credit 1.4	Innovation in Design: Specific Title	1
1			Credit 1.5	Innovation in Design: Specific Title	1
1			Credit 2	LEED Accredited Professional	1

4 Regional Priority Credits Possible Points: 4

Y	?	N	Prereq	Description	Points
1			Credit 1.1	Regional Priority: Specific Credit	1
1			Credit 1.2	Regional Priority: Specific Credit	1
1			Credit 1.3	Regional Priority: Specific Credit	1
1			Credit 1.4	Regional Priority: Specific Credit	1

56 15 37 Total Possible Points: 110

Certified 40 to 49 points Silver 50 to 59 points Gold 60 to 79 points Platinum 80 to 110