The Leadership in Energy and Environmental Design-Existing Buildings Certification of the Art and Architecture Building

Nicholas Alanen
Lauren Berent
Jason Norinsky
Emily Thomas

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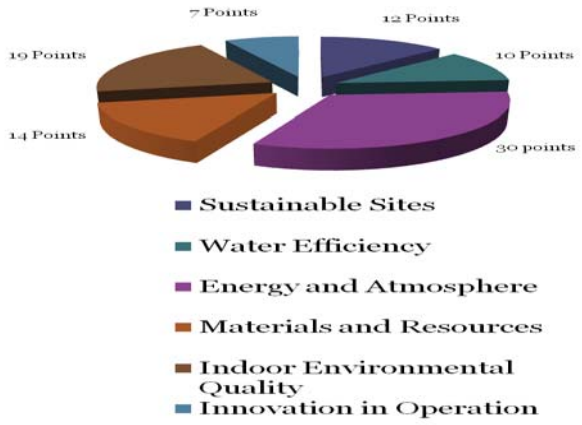
Executive Summary

Our task was to assess the Art & Architecture building for Leadership in Energy and Environmental Design-Existing Building (LEED-EB) certification with the assistance of Planet Blue. LEED certification is often an efficient construction alternative, comparable in cost to traditional construction practices when creating new buildings. LEED existing building certification requires reviewing (and often changing) current building practices and updating the systems, materials and equipment used in the building.

Our team was lead by the Planet Blue Energy Conservation Liaison, Jack Edelstein, and consisted of the previously mentioned undergraduate students as well as a group of professionals familiar with various aspects of the project. This group included LEED certified professional Robert Morikawa and Brian Morgan from Plant Engineering; Kevin Perkins from Planet Blue, graduate student intern Luojia Shi, and Facility Manager Kevin McKay. Planet Blue is currently working on assessing and improving the efficiency of 90 University of Michigan buildings over the next three years, including the Art and Architecture building.

The base level of LEED-EB certification requires thirty-four of a possible ninety-two points. These points can be earned in six different categories: Sustainable sites, Water efficiency, Energy and Atmosphere, Materials and Resources, Indoor Environmental Quality, and Innovation in Design. Each category has its own prerequisites that need to be met before certification will even be considered. We decided the most efficient method of analysis was to divide the six sections amongst the members of the student team to determine where the Art & Architecture Building would receive points given the current conditions and practices.

The sections were split up between the members of the team and each member was responsible for determining the number of points the Art & Architecture Building would receive for each of their sections. Points in each section were determined by a number of methods including asking Planet Blue questions, asking building personnel for pertinent information, performing calculations, and visiting the building. The analysis for each specific point is detailed in the results section of this paper.



Once the evaluations of each of the sections were complete, the point total was tallied at twenty-seven points. It was determined that the Art & Architecture Building would be a good candidate for LEED-EB certification because it was only seven points away from the base level of certification. The detailed breakdown is as follows: Sustainable Sites: 4 points, Water Efficiency: 2 points, Energy and Atmosphere: 11 points, Materials and Resources: 4 points, Indoor Environmental Quality: 5 points, Innovation in Operations: 1 point. We then devised a plan for attaining the remainder of the points needed for

certification. Our recommendations, which include improvements in Energy and Atmosphere, Water Efficiency, Materials and Resources, and Indoor Environmental Quality, are as follows: One to three points can be earned for credit 1 in Energy and Atmosphere, one to two points can be earned for credit 2 in Water Efficiency, one to three points can be earned for credit 1 in Materials and Resources, one point can be earned for credit 2.2 in Materials and Resources, one point can be earned for credit 9 in Materials and Resources, one point each for Materials and Resources credit 3 and credit 4 if the Materials and Resources Prerequisite 1 is met, and one to three points can be earned for Environmental Quality credits 3.4-3.6. This plan is laid out in detail in the recommendations section.

The following analysis of the Art and Architecture building will break down how each point was earned, give our conclusions on the current state of the building and give our recommendations on how to achieve the thirty-four point minimum to reach certification.

Assessment Process and Results

The following analysis of the Art and Architecture building will break down how each point was earned, give our conclusions on the current state of the building and give our recommendations on how to achieve the thirty-four point minimum to reach certification.

The Art and Architecture Building was assessed for LEED-EB Certification by thoroughly researching each credit within the six categories. Many of the following results used the assumption that if we had little or no information for a certain credit, no points would be granted for the credit. In addition, because many of the points are granted based upon proving a completed task, many points the Art and Architecture Building is said to have are reasoned to the best of our ability.

Assumptions

Planet Blue will meet all prerequisites if LEED certification is to be pursued.

Currently the following Prerequisites are either not known or no completed:

- Energy and Atmosphere Prerequisite 3
- Materials and Resources Prerequisite 1
- Materials and Resources Prerequisite 2
- Indoor Environmental Quality Prerequisite 1

The Art and Architecture Building occupancy levels were estimated as follows:

Types of Occupancy	Number of People
Total	1400
Fall/Winter weekday average	330
Spring/Summer weekday average	180
Daily Maximum	550

- If LEED –EB Certification is going to be reached, a cost/benefit analysis should follow our recommendations, especially when looking at procurement and waste management.

Sustainable Sites 12 Points

Sustainable Sites (SS) Credit Summary
Art and Architecture LEED-EB Feasibility Summary

A. Introduction
This report discusses and summarizes the key requirements in order to obtain credits for the Sustainable Sites (SS) portion of the LEED Existing Building Accreditation process. The Sustainable Sites portion contains 12 possible points that can be earned by analyzing seven main credits and two sub-credits. Sustainable Sites deals with the operations and maintenance of the external surroundings of the Art and Architecture building as well as specific internal factors such as lighting.

SS Credit 1: LEED Certified Design and Construction
(1 point)
Objective: To reward environmentally sensitive building design and construction

Requirements	Current deliverables	Accomplished
Choose one of the following options: Option A: Show that the building has previously been certified under LEED for new construction. Option B: Show that the building has been previously certified under LEED for Core & Shell, and at least 75% of the floor area has also been certified under LEED for commercial interiors.	The Art and Architecture Building has never been previously LEED certified in any way. The current certification we are looking to achieve is for Existing Buildings: Operations and Maintenance.	**No** **(0 Points)**

The Art and Architecture Building is undergoing analysis to see if it can become LEED certified for Existing Buildings: Operations and Maintenance. The building has never undergone any certification in the past and thus will not receive a point.

SS Credit 2: Building Exterior and Hardscape Management Plan
(1 point)
Objective: To encourage environmentally sensitive building exterior and hardscape management practices that provide a clean, well-maintained and safe building exterior.

Requirements	Current deliverables	Accomplished
A. Employ an environmentally sensitive, low-impact building exterior and hardscape management plan that helps preserve surrounding ecological integrity. B. The plan must employ best management practices that significantly reduce harmful chemical use, energy waste, water waste, air pollution, solid waste, and/or chemical runoff (e.g., gasoline, oil, antifreeze, salts) compared with standard practices. C. The following must be addressed, if applicable: o Maintenance equipment o Snow and ice removal o Cleaning of building exterior o Paints and sealants used on building	Currently, the Art and Architecture building as well as most buildings around the University of Michigan have building exterior and hardscape management plans that are run by the University's Building and Ground Services.	**No** **(0 Points)**

exterior o Cleaning of sidewalks, pavement and other hardscape		

No point was received for Credit 2 because the University uses very cost effective manners of making sure that the exterior and grounds of buildings are maintained. The grounds services at the University of Michigan use standardized products for all buildings and grounds around campus unless the school itself deals with the grounds, which is not the case at the Art and Architecture building. These cost effective manners are by no means environmentally sensitive and in many cases chemicals that are harmful for the environment are used. What the grounds services does for the site is make sure that snow and ice is removed, the grass and plants are fertilized, make sure the soil is good for growing, and other things of that nature.

SS Credit 3: Integrated Pest Management, Erosion Control, and Landscape Management Plan

(1 point)

Objective: To preserve ecological integrity, enhance natural diversity, and to protect wildlife while supporting high-performance building operations and integration into the surrounding landscape.

Requirements	Current deliverables	Accomplished
Have in place an environmentally sensitive management plan for the sites natural components. The plan must employ best management practice that significantly reduce harmful chemical use, energy waste, water waste, air pollution, etc, compared with standard practices. The plan must address all of the following operational elements: • Outdoor Integrated Pest Management calls for using least-toxic chemical pesticides, minimum use of chemicals, use only in targeted locations, and use only for targeted species. IPM requires routine inspection and monitoring. The outdoor IPM plan must address all of the specific IMP requirements listed in EQ Credit 3.9, Green Cleaning: Indoor Integrated Pest Management, including preferred use of nonchemical methods, definition of emergency conditions, and universal notification. The outdoor IPM must also be integrated with any indoor IPM plan for the building, as appropriate. • Erosion and sedimentation control for ongoing landscape operations and future construction activity. The plan must address both the site soil and potential construction materials. The plan must also include measures that prevent erosion and sedimentation, prevent air pollution from dust or particulate matter and restore eroded areas. Further, the plan must address the following operational elements, if applicable: • Diversion of landscape waste from the waste stream via mulching, composting or other low – impact means	A. There is currently an indoor and outdoor Integrated Pest Management plan set up by the University Building and Grounds Service. This, much like Credit 2 is done with cost being the most important factor. B. Ann Arbor and most of Michigan is not based on very erosive soils and little sediment builds up due to weathering materials, so the threat is minimal at worst. The University does not have a program that is currently in place to ensure erosion does not occur.	**No** **(0 Points)**

• Chemical fertilizer use • For projects in urban sites with little or no building setback, SS Credit 3 may be earned using vegetated roof surfaces if the plants meet the definition of native or adapted and if the vegetated roof covers at least 5% of the LEED project site area.		

The outdoor and indoor IPM plan and system that is set up at the Art and Architecture building is run by the University. These practices are supposed to be the most cost effective and do not take into consideration the fact that some chemicals may be harmful to the environment. Most of the time, when pest problems arise, toxic chemicals are used, which is against IEQ Credit 3.9. Erosion and sedimentation is not a problem at the Art and Architecture building.

SS Credit 4: Alternative Commuting Transportation
(1-4 points)

Objective: Reduce pollution from commuting trips and automobile manufacturing.

Requirements	Current Deliverables	Accomplished
Either: 1. 10% reduction (1 point) 2. 25% reduction (2 points) 3. 50% reduction (3 points) 4. 75% or greater reduction (4 points) In commuting trips from a baseline assumption of every regular occupant commuting to the building in a standard automobile.	A. UM bus system, bike racks, carpool and vanpool programs for employees. Art and Architecture building has one designated vanpool parking space. B. On average 330 daily occupants during school year, with maximum number of occupants around 800. C. 158 blue lot spaces available in parking lot. 144 visitor parking spaces available. Count of parking lot at 12:53PM on a Wednesday resulted in: 73 filled blue lot spaces 113 filled visitor spaces 1 filled vanpool space	**Yes** **(3 points)**

The maximum amount of blue permit parking spaces available (which we assume will be used by regular occupants of the building) is 158. Random counts found not all these spaces were being used, and there is no way for us to determine if all the cars parked in this lot belong to A&A building users. However, even if they were all filled, and all were used by regular occupants, there would still be a 52.1% reduction in commuting transportation from the baseline of all 330 daily occupants commuting in standard automobiles. This number is reduced primarily from the proximity to the University of Michigan bus stop, which a large portion of the student population in the building likely uses. Vanpools, biking, walking and mopeds were other observed alternate commuting methods. Assuming the parking lot count at 12:53PM is accurate (more sampling will need to be conducted prior to certification); commuting reduction is calculated at 77.9%, which would allow us to achieve the maximum number of points in this category. However, another aspect to be considered is the visitor parking lot. If these cars are also included as daily users in the A&A building, and all spaces were filled, there would only be an 8.5% reduction in commuting transportation. Using the data collected at 12:53PM, in which 186 total spaces

were filled between both lots, this would result in a 43.6% reduction. For now, we will not include visitor parking in our count of daily parking use.

SS Credit 5: Reduced Site Disturbance
(1 point)

Objective: To conserve existing natural site areas and restore damaged site areas to provide habitat and promote biodiversity.

Requirements	Current deliverables	Accomplished
A. Over the performance period, have in place native or adapted vegetation covering a minimum of 25% of the site area, excluding the building footprint. B. Improving and/or maintaining off-site areas with native or adapted plants can contribute toward earning SS Credit 5, provided improvement and maintenance are documented in a contract with the owner of the off-site area. Every 2 square feet on site can be counted as 1 square foot on-site. C. Other ecologically appropriate features that contribute to this credit are natural site elements beyond vegetation that maintain or restore the ecological integrity of the site, including water bodies, exposed rock, unvegetated ground, or other features that are part of the historic natural landscape within the region and provide habitat value D. For projects in urban sites with little or no building setback, SS Credit 5 may be earned using vegetated roof surfaces that cover at least 5% of the LEED project area.	A. The grounds surrounding the Art and Architecture building are covered by vegetation in greater than 25% of areas. B. No off-site areas have been maintained or improved near the Art and Architecture building. C. The building contains an outside portion to it where grass and vegetation are growing.	**Yes** **(1 point)**

The Art and Architecture building has maintained reduced site disturbance by having numerous shrubs, trees and vegetation located around the site area. The building includes a center courtyard that students have access to, which maintains the internal and external beauty and ecosystem. Whether or not the plants are native or "refurbished" is not known, but the University office of landscape design works closely with the Michigan Forestry and Horticulture department to make sure that what is planted is the best for the conditions that ground will experience. The University Office of Landscape Design is also committed to sustainable landscapes and so it can be concluded that the plants that are around the building are environmentally cohesive and sustainable. They currently do not have any off-site renovations or improvements being made to ecosystems, but their on-site conservation of natural site areas is effective in providing habitats and promoting biodiversity.

Sustainable Sites 12 Points

SS Credit 6: Storm Water Management
(1 point)

Objective: provide information to support the ongoing optimization of building energy performance; identify opportunities for additional energy saving investments.

Requirements	Current deliverables	Accomplished
During the performance period, implement a storm water management plan that infiltrates, collects and reuses or evapotranspirates runoff from at least 15% of the precipitation falling on the whole project site both for an average weather year and for the two-year, 24 hour design storm. Implement an annual inspection program of all storm water management facilities to confirm continued performance. Maintain documentation of inspection, including identification of areas of erosion, maintenance needs, and repairs. Perform all routine required maintenance, necessary repairs or stabilization within 60 days of inspection	This is currently unavailable and is not being planned.	**No** **(0 Points)**

After speaking with Robert Morikawa and Brian Morgan, it is very apparent that there is no storm water catchment system or plans to install one. Therefore no points are awarded for SS Credit 6. The Art and Architecture building currently has runoff for storm water, but none of the water is caught and reused in an environmentally sensitive manor. There are retention ponds located throughout North Campus for storm water runoff, but the water collected in these ponds is not reused in campus buildings.

SS Credit 7.1: Heat Island Reduction (Non-Roof)
(1 point)

Objective: To reduce heat islands (thermal gradient differences between developed and undeveloped areas) to minimize impacts on microclimates and human and wildlife habitat.

Requirements	Current deliverables	Accomplished
Choose one of the following options: Option A: Use any combination of the following strategies for 50% of the site hardscape: • Provide shade from existing tree canopy or within five years of landscape installation; landscaping must be in place at the time of certification • Provide shade from structures fully covered by Solar PV panels • Provide shade from architectural devices or structures that have a solar reflectance index (SRI) or at least 29. Implement a maintenance program that ensures these surfaces are cleaned at least every two years to maintain good reflectance • Have paving materials with an SRI[1] of at least 29 and implement a maintenance program that ensures these surfaces are	A. 50% of the hardscape around the Art and Architecture building is not shaded in any way, shape or form. There is some indication of a small amount of PV panels on the roof, but it is not clear if they are functioning and they definitely do not provide shade. B. The parking lot in the back of the building is not shaded at all. The building is on the south side of the building so it will not be shaded.	**No** **(0 points)**

[1] Appendix 1

cleaned at least every two years to maintain good reflectance • Have an open – grid pavement system (at least 50% pervious) Option B: Place a minimum of 50% of parking spaces under cover. Any roof used to shade or cover parking must have an SRI of at least 29. Implement a maintenance program to ensure roof surface is cleaned at least every 2 years.		

Heat island reduction is not something that can be easily achieved at the Art and Architecture building. The parking lot, which consists of approximately 50% of the hardscape surrounding the building, is not covered and the sidewalks are not covered because it would ruin the open campus environment. No points will be awarded for Credit 7.1, and none should be expected.

SS Credit 7.2: Heat Island Reduction (Roof)

(1 point)

Objective: To reduce heat islands to minimize impacts on microclimates and human and wildlife habitat.

Requirements	Current deliverables	Accomplished
Choose one of the following options: Option A: Use roofing materials having a SRI equal to or greater than 78 or a low sloped roof (slope <= 2.12) or 29 for a steep sloped roof (slope > 2.12) for a minimum of 75% of the roof area. If more than 75% of the roof area is covered with the SRI material, the SRI value may be lower than the required value if the resulting area-weighted equivalent SRI performance is at least as high as having the required value on 75% of the area. Implement a maintenance program that ensures all SRI surfaces are cleaned at least every two years to maintain good reflectance. Option B: Install and maintain a vegetated roof covering at least 50% of the roof area. Option C: Install high albedo and vegetated roof surfaces that, in combination, meet the following criteria: • *Area of SRI roof/.75 + Area of vegetated roof/.5 >= Total area of roof*	A. Currently no SRI materials are used on the roof. It is mainly made of tar and gravel. B. There are no plans and no current vegetation on the roof C. Once again, no plans for this and this is currently not an option for the rooftop of the Art and Architecture building	**No** **(0 points)**

Heat island reduction on the roof is something that has never been put into place. The roof is has a very shallow slope and thus would need material with a very high SRI in order to accomplish this credit or put in a vegetated roof. While currently there is nothing preventing heat island effects on the roof, after looking at the Ross School of Business, operations and maintenance may want to consider installing a vegetated roof on the Art and Architecture building because it is relatively flat and would improve heat island reduction, insulation, and water runoff.

SS Credit 8: Light Pollution Reduction
(1 point)

Objective: To eliminate light trespass from the building and site, improve night sky access and reduce development impact on nocturnal environments.

Requirements	Current deliverables	Accomplished
Interior Lighting: All nonemergency built in lighting with a direct line of sight to any openings in the envelope must be automatically controlled to turn off during all after-hours periods during the performance period. The total duration of all programmed after-hours period annually must equal or exceed 2,190 hours per year (50% of nighttime hours). Manual override capability may be provided for occasional after-hours use. Exterior and Site Lighting: Choose one of the following options: Option A: N/A Option B: Partially or fully shield all fixtures 50 watts and over so that they do not directly emit light to the night sky. Option C: Measure the night illumination levels[2] at regularly spaces points around the perimeter of the property, taking the measurements with the building's exterior and site lights both on and off. At least 8 measurements are required at a maximum spacing of 100 feet apart, so as to be representative of the illumination levels at the perimeter of the property. The illumination level measures with the lights on must not be more than 20% above the level with the lights off. This requirement must be met for each point.	• Some of the Art and Architecture building's interior lights do turn off automatically like the bathroom lights, some hallways and classrooms as well as some offices. Not all do • Exterior lighting is not abundant but it is more than 20% more luminous with the lights on than with the lights off. Exact measurements have not been taken. As well as the team's inability to measure illumination levels make this a point that we cannot give right now.	**No** **(0 points)**

Light pollution is something that the Art and Architecture will have a hard time dealing with in the future. This is because for internal lighting, not all the lights are automatic and most of the time lights will stay on to assist students as they work throughout the night on projects. External lighting is not abundant around the exterior of the building but we have no way of measuring illumination. The building would definitely not give off nearly as much light if all the outside lights were turned off, but there is no way we could know for sure at this point in time. No points will be given for SS Credit 8, and none should be expected in the future.

[2] Appendix 2

Water Efficiency 10 Credits

Water Efficiency (WE) Credit Summary
Art and Architecture LEED-EB Feasibility Project

A. Introduction
This section discusses and summaries key requirements in order to obtain credits for the Water Efficiency portion of the LEED Existing Building Accreditation process. The WE accreditation section requires one prerequisite as well as four other major credits and each of them has a few separate components. There are a total of ten available points that can be obtained in the WE section. Planet Blue regularly updates building for water efficiency and should be able to obtain many points from this section.

WE Prerequisite 1: Minimum Indoor Plumbing Fixture & Fitting Efficiency

Objective: To reduce indoor fixture and fitting water use within buildings to reduce burdens on potable water supply and wastewater systems.

Requirements	Current deliverables	Accomplished
A. Reduce potable water usage of indoor plumbing fixtures and fittings to a level equal to or below the LEED for Existing Buildings: O&M baseline, which is calculated using the assumption that 100% of the building's indoor plumbing fixtures and fittings meet the Uniform Plumbing Codes (UPC) 2006[3] or International Plumbing Codes (IPC) 2006 fixture and fitting performance requirements. Fixtures and fittings included in the calculations for this credit are water closets, urinals, showerheads, faucets, faucet replacement aerators, and metering faucets.	A. The potable water usage is or will be calculated	**No** **Will be completed at time of certification**

Our sponsor, Planet Blue, said that we need all prerequisites in order to LEED certify the building. With this being true, Planet Blue decided that they would take it upon themselves to ensure that this will be completed.

WE Credit 1.1: Water Performance Measurement, Whole Building Metering (1 point)

Objective: To measure building and subsystem water performance over time to understand consumption patterns and identify opportunities for additional water savings.

Requirements	Current deliverables	Accomplished
A. To have in place permanently installed water meters that measure the total potable water use for the entire building and associated grounds. Meter data must be recorded on a regular basis and compiled into monthly and annual summaries. Applicants are also encouraged to meter graywater or reclaimed water supplied to the building.	Meters to measure total water to the building are in place and are monitored monthly and annually by Plant Engineering/Utilities. All water used in the building is potable	**Yes** **(1 point)**

After speaking with engineers from Planet Blue, it was determined that total water usage for the building is monitored throughout. The water used at the Art and Architecture building is completely potable so therefore it is safe to say that potable water meters are set up in the building and one point can be awarded for this credit.

[3] Appendix 3

Water Efficiency 10 Credits

WE Credit 1.2: Water Performance Measurement, Sub-metering
(1 point)

Requirements	Current deliverables	Accomplished
A. Must meet the requirements for WE Credit 1.1 and have installed for one or more of the following water subsystems: 1) Irrigation: Meter water systems serving at least 80% of the irrigated landscape area on the grounds. The percentage of irrigated landscape area served must be calculated as the total metered irrigated landscape area divided by the total irrigated landscape area. All landscaping areas fully covered with native vegetation that requires no routine irrigation must be excluded from the calculation entirely. 2) Indoor plumbing fixture and fittings. Meter water systems serving at least 80% of the indoor plumbing fixtures and fittings described in WE Prerequisite1, either directly or by deducting all other measured water use from the measured total water consumption of the building and grounds. 3) Cooling towers. Meter replacement water use of all cooling towers serving the facility. 4) Domestic hot water. Meter water use of at least 80% of the installed domestic hot water heating capacity (including both tanks and on-demand heaters). 5) Other process water. Meter at least 80% of expected daily water consumption for process-type end uses, such as humidification systems, dishwashers, clothes washers, pools, and other systems using process water.	Option A: assuming the meters referenced in WE Credit 1.1 are able to measure potable water, need to find out if there if a meter on any of the described systems	**No** **(0 points)**

Although potable water meters are in place, sub-metering does not take place in the Art and Architecture building. However, it would be relatively easy to obtain this point by placing a meter on the building's existing cooling tower. At this point and time it is not believed that Planet Blue plans on doing this, so the probability of getting this point is fairly low.

WE Credit 2: Additional Indoor Plumbing Fixture and Fitting Efficiency
(1-3 points)

Objective: To maximize indoor plumbing fixture and fitting efficiency within buildings to reduce the use of potable water and consequent burden on municipal water supply and wastewater systems.

Requirements	Current deliverables	Accomplished
(1 point): 10% reduction in indoor plumbing fixture and fitting potable water use from the LEED for Existing Buildings: O&M baseline.	The LEED for Existing Buildings: O&M baseline still needs to be calculated; however, as soon as a baseline for the building the actual	**Yes** **(1 Point)**

(2 points): 20% reduction in indoor plumbing fixture and fitting potable water use from the LEED for Existing Buildings: O&M baseline. (3 points): 30% reduction in indoor plumbing fixture and fitting potable water use from the LEED for Existing Buildings: O&M baseline.	percentage reduction can be calculated and Planet Blue regularly reduces potable water percentages by a noticeable amount.	

The Operations &Maintenance baseline for Existing Buildings needs to be calculated. This will consist of counting and classifying all fixtures within the building. The fixtures include combination fixture, lavatories, showers, sillcocks, sinks, urinals, drinking fountains, wall hydrants, and water closets. This is a calculation that we could be done by our team; however, the result that we would come up with for the O&M baseline would be a very rough estimate because of a lack of knowledge in the subject. A professional could very readily complete the necessary calculation for the O&M baseline in the A&A building. This is a point that is worth pursuing because Planet Blue aims to reduce the water consumption in every building that they update. At this point in time duel flush valves are being placed in some women's bathrooms and low flow aerators are being placed in many bathrooms as well. The low flow aerators are 80% more efficient than current aerators and fixtures being used. With the placement of both of these fixtures, we predict at least a 10% reduction on potable water usage and therefore think the building will earn at least 1 point. Again, baseline data must be found in order to compare before and after data. We believe that up to three points may be earned, but at this point in time, we can only give one.

WE Credit 3: Water Efficient Landscaping
(1-3 points)

Objective: To limit or eliminate the use of potable water or other natural surface or subsurface resources available on or near the project site for landscape irrigation.

Requirements	Current deliverables	Accomplished
A. Reduce potable water or other natural surface or subsurface resource consumption for irrigation compared with conventional means of irrigation. If the building does not have separate water metering for irrigation systems, the water-use reduction achievements can be demonstrated through calculations. Points are earned according to the following schedule: (1 point): 50% reduction in potable water or other natural surface or subsurface resource use for irrigation over conventional means of irrigation. (2 points): 75% reduction in potable water or other natural surface or subsurface resource use for irrigation over conventional means of irrigation. (3 points): 100% reduction in potable water or other natural surface or subsurface resource use for irrigation over conventional means of irrigation. Three Options: 1. Calculate the baseline irrigation water use by	A. Current irrigation system is unknown and amount of potable water used for irrigation is also unknown. Water could be crudely calculated and a plan could be devised to reduce this amount.	**No** **(0 Points)** **Initial amount of potable water for irrigation has not been calculated and, therefore, cannot be reduced**

determining the water use that would result from using an irrigation system typical for the region and compare this with the building's actual potable water use for irrigation, which can be determined through sub-metering. Use the baseline and actual water use values to calculate the percentage reduction in potable water or other natural surface or subsurface resource use. 2. Calculate the estimated irrigation water use by determining the landscape area for the project and sorting this area into the major vegetation types. Determine the reference Evapotranspiration Rate for the region and determine the Species Factor, Density Factor, and Microclimate Factor for each vegetation type. Use this information to calculate the Landscape Coefficient and irrigation water use for the installed case. Calculate the baseline case irrigation water use by setting the above factors to average values representative of conventional equipment and design practices. Use the estimated and baseline case to determine the percentage reduction in potable water or other natural surface or subsurface resource use. 3. Use independent irrigation performance and ranking tools available from local, regional, state, or national sources to demonstrate reductions in potable water or other natural surface or subsurface resource use for irrigation purposes. Provide information about the independent tool to demonstrate that it is technically sound.		

The irrigation system of the Art & Architecture Building is unknown to or team. The baseline irrigation could be calculated by us; however, this is another case of inexperienced people completing engineering calculations and could be more effectively answered by a more knowledgeable Planet Blue member.

WE Credit 4.1: Cooling Tower Water Management, Chemical Management (1 point)

Objective: To reduce potable water consumption for cooling tower equipment through effective water management and/or use of nonpotable makeup water.

Requirements	Current deliverables	Accomplished
A. Develop and implement a water management plan for the cooling tower that addresses chemical treatment, bleed-off, biological control and staff training as it relates to cooling tower maintenance. Improve water efficiency by installing and/or maintaining a conductivity meter and automatic controls to adjust the bleed rate and maintain proper concentration at all times.	A. It is possible that a program such as this has been implemented already	**No** **(0 Points)**

At this time there is no program to reduce potable water consumption in the cooling tower. A sub-monitoring system for potable water would also have to be implemented for the cooling tower if there is no existing system. This sub-monitoring system would also gain the building a point for credit 1.2.

WE Credit 4.2: Cooling Tower Water Management, Non-Potable Water Source Use (1 point)

Requirements	Current deliverables	Accomplished
A. Use makeup water that consists of at least 50% nonpotable water, such as harvested rainwater, harvested storm water, air-conditioner condensate, swimming pool filter backwash water, cooling tower blowdown, pass-through (once-through) cooling water, recycled treated wastewater for toilet and urinal flushing, foundation drain water, municipally reclaimed water or any other appropriate on-site water source that is not naturally occurring groundwater or surface water. Have a measurement program in place that verifies makeup quantities used from nonpotable sources. Meters must be calibrated within the manufacturer's recommended interval if the building owner, management organization or tenant owns the meter. Meters owned by third parties (e.g., utilities or governments) are exempt.	A. Building does have a cooling tower, but only potable water is used.	**No** **(0 Points)**

There is no nonpotable water used throughout the building. If there was nonpotable water used, there are certainly no systems in place to use air conditioner condensate, swimming pool filter backwash water or recycled cooling tower water. No point can be earned for this credit.

Energy and Atmosphere 30 Points

Energy and Atmosphere (EA) Credit Summary
Art and Architecture LEED-EB Feasibility Project

A. Introduction
This report discusses and summarizes the key requirements in order to obtain credits for the Energy and Atmosphere (EA) portion of the LEED Existing Building Accreditation process. The Energy and Atmosphere portion contains 30 possible points that can be earned by looking at various credits about energy efficiency and other maintenance and operations plans.

EA Prerequisite 1: Energy Efficiency Best Management Practices

Objective: promote information ensures that energy-efficient operating strategies are maintained

Requirements	Current deliverables	Accomplished
A. Operating plan includes: 1) Occupancy schedule 2) Equipment run-time schedule 3) Design set points for all HVAC equipment 4) Design lighting levels throughout the building 5) Validation of operating plan B. Systems narratives includes: 1) Briefly describes mech. & elec. Systems 2) Include all systems in operating plan 3) Including HVAC, lighting, building controls C. Preventative maintenance plan for equipment Document the schedule during performance period D. Energy audit that meets ASHRAE Level I[4], walk-through analysis	A. Currently have a brief estimate of the year round occupancy • Equipment run-time can be found using the BAS system. • HVAC setpoints and lighting control are controlled by BAS, can be found in PPCL panel, point summary, and TEC reports B. Mechanical equipment list and schedule available • Enhanced alarm mode report C. A maintenance plan in placed • Previous maintenance record D. The audit has not been completed but will be by the time certification is wanted	Yes

This prerequisite is pretty much complete. We would need to complete an energy audit that meets ASHRAE Level 1 requirements. This would need to be completed before any other LEED improvements are implemented. If seeking LEED-EB certification, this energy audit will be completed and will meet required levels.

[4] Appendix 4

EA Prerequisite 2: Minimum Energy Efficiency Performance

Objective: establish the minimum level of operating energy efficiency performance

Requirements	Current deliverables	Accomplished
Earn at least 2 points under E&A Credit 1	• We believe that at least 2 points can be earned from Credit 1.	**Yes**

Because the A&A building was registered for LEED certification after June 26th, 2007 we must commit to earning at least 2 points under Credit 1- Optimized Energy Efficiency Performance in order to meet this prerequisite. After speaking with LEED Accreditation Expert Robert Morikawa, we believe that the building can earn anywhere from 2 – 5 points for energy optimization.

EA Prerequisite 3: Refrigerant Management: Ozone Protection

Objective: reduce stratospheric ozone depletion

Requirements	Current deliverables	Accomplished
A. Do not use CFC-based refrigerants in HVAC&R base building systems B. Required economic analysis: Replacement of chiller not feasible if simple payback period is greater than 10 years C. If CFC-based refrigerants are maintained in the building, reduce annual leakage to 5% or less D. Small HVAC&R units contains less than 0.5 lbs of refrigerant are exempt	A. Failed, electric chiller uses R123 or R124, a CFC refrigerant (ODP: 0.022, GWP: 0.02) B. Absorption Chillers (no CFC) upgraded to electric centrifugal chillers, new cooling towers, replaced to summertime boilers. All replaced with economic feasibility. C. Need calculation to demonstrate less than 5% annual leakage from chiller specs D. No known data available	**No**

All aspects of this prerequisite are unknown. After talking with building managers, we believe that CFC-based refrigerants are most likely still used in the A&A building. Currently, there is a possible plan to

connect the A&A building to the chiller plant on North Campus. If this plan gets approved the A&A building might meet this prerequisite. If not, we will need to establish a plan that will phase out CFC-based refrigerants in the HVAC&R systems in order to comply with this prerequisite. Talking to someone that works in plant engineering who specializes in Refrigerant Systems can help us find if the building meets this prerequisite.

EA Credit 1: Optimize Energy Efficiency Performance
(2-15 points, 2 points mandatory)

Objective: achieve an increased level of operating energy efficiency performance relative to typical buildings of similar types

Requirements	Current deliverables	Accomplished
A. Choose one of the following Option A. Receive an EPA rating of at least 69, eligible for a rating using Portfolio Manager must used A Option B. If not eligible for Portfolio Manager, demonstrate energy efficiency in at least the 19th percentile for typical buildings of similar type. Option C. If not meeting A & B, use alternative method describes in LEED-EB O&M Ref. Guide B. Have an energy meter(s) that measures all energy use throughout the certifying period. A full 12 months of continuous measured energy data	A. EPA rating not available, use Option B. Compared to CBECS national average energy usage for university(campus) type buildings: • 280 avg. Source EUI (kbtu/sqft) • 63% avg. Electric • 120 avg. Site EUI (kbtu/sqft) A&AB: • Electric: 9,974,949kbtu (F2008) • Total sqft of A&AB = 225,128 • Avg. electric kbtu/sqft = 44.31	**Yes** **(2 Points)**

After considering the options, we have decided to look into option B in order to receive the required 2 points. In order to be 19% above the national average the building will most likely have to be retrofitted with energy saving techniques. Given the vast diversity of the A&A building, further cost/benefit analysis will be needed to determine the best places to install energy saving equipment. Right now we believe that this credit can earn the building at least two points. Anywhere from one to three more points lay be able to be earned after looking at further analysis of the buildings energy efficiency.

Energy and Atmosphere 30 Points

EA Credit 2.1: Existing Building Commissioning: Investigation and Analysis (2 points)

Objective: develop an understanding of the operation of building's major energy-using systems

Requirements	Current deliverables	Accomplished
A. Choose one of the following Option A. Commissioning Process 1) Develop a commissioning plan for building's major energy using systems 2) Conduct the investigation and analysis phase 3) Document breakdown of building energy use 4) List the operating problems and operational changes that will solve them 5) List the identified capital improvements that will provide cost-effective energy savings, include analysis Option B. ASHRAE Level II, Energy Audit, energy survey and analysis methodology	Option A in place: methodology that is used to determine the cost benefits of energy efficiency implementation have been carried out.	**Yes** **(2 points)**

Option A is already in place at the A&A building. We receive 2 points for this credit.

EA Credit 2.2: Existing Building Commissioning: Implementation (2 points)

Objective: implement minor improvements and identify planned capital projects to optimize energy performance of the systems

Requirements	Current deliverables	Accomplished
A. Implement no or low-cost operational improvements	A. Implemented HVAC system tune up, complete review of building mechanical systems, tune up stage	A. **Yes**

B. Provide training for management staff that buildings awareness and skills in a broad range of sustainable building operations topics C. Demonstrate the observed anticipated financial cost and benefits of measures that have been implemented D. Update the building operating plan to reflect any changes in the occupancy schedule, equipment run-time schedule, design set points, and lighting levels	log. Reduce by 2-3% of energy usage rate. B. Plant Engineering dept are well known of this area. Normal operational staff training. C. All completed and implementing projects have gone through economic analysis of less than 10 years of payback period D. All updated according to the newest changes	B. **Yes** C. **Yes** D. **Yes** **(2 points)**

The minor improvements needed to optimize the energy performance have already been implemented. We earn 2 points for this credit.

EA Credit 2.3: Existing Building Commissioning: Ongoing Commissioning (2 points)

Objective: Address changes in facility occupancy, usage, maintenance, and repair. Review building operation systems.

Requirements	Current deliverables	Accomplished
A. Ongoing commissioning program 1) planning, system testing, measurement… to address operating problems 2) create a written plan that summarizes the overall	A. Same methods and procedures used as in the implementing projects	**Yes** **(2 points)**

The A&A building does not have any plans to change occupancy, usage, or maintenance; except for the normal fluctuations through-out the year due to semester changes. We earn 2 points for this credit.

EA Credit 3.1: Performance Measurement: Building Automation System (1 points)

Objective: provide information to support the ongoing optimization of building energy performance; identify opportunities for additional energy saving investments.

Requirements	Current deliverables	Accomplished
A. Have in place a BAS that monitors and controls key building systems	A. BAS in placed, operational	**A. Yes**
B. Have a maintenance program in place that ensures BAS components are tests and repaired	B. BAS reports available, need an official maintenance program (expensive to calibrate after each maintenance)	B. **No**
C. Demonstrate that BAS is being used to inform decisions regarding changes in building operations and energy-saving investments.	C. BAS currently used to identify areas of energy improvement	**C. Yes** **(0 Points)**

Even though we are very close to meeting this credit, we will most likely not try to achieve the point for this credit. While a maintenance program exists for repairs to the BAS, there is no program for regular recalibrations. These calibrations are costly and would not greatly improvement the quality of the A&A building. Therefore, we do not recommend spending money to earn this credit.

EA Credit 3.2 and 3.3: Performance Measurement: System-Level Metering (1-2 points)

Objective: provide accurate energy use information to support energy management and identify opportunities for energy-saving improvements

Requirements	Current deliverables	Accomplished
A. System-level metering is in place covering at least 40% of the total expect annual energy consumption of the building	A. At least 40% for sure	**Yes** **(1 Point)**
B. At least 2 of the three largest energy use categories from the breakdown report must be covered to the extent of 80% or more	B. Electricity and Gas annual energy usage (the 2 largest) are reported, cover more than 80%	
A. Demonstrate system-leveling metering is in place covering at least 80% of the total expect annual energy consumption of the building.	A. Unsure about 80% energy metering of energy consumption, assume it is above that range.	**Yes** **(1 Point)**

B. Two of the largest 3 energy use categories from the breakdown report must be covered to the extent of 80% or more	B. Electricity and Gas are monitored	

All of the A&A building's electricity and gas consumption is monitored. We believe we earn 2 points for this credit.

EA Credit 4.1: On-Site and Off-Site Renewable Energy

(1-4 points)

Objective: To encourage and recognize increasing levels of on-site and off-site renewable energy to reduce energy use and environmental impact. Points will be awarded by the % of meeting building's energy load by using on-site and off-site renewable energy. Points can be combined.

Requirements	Current deliverables	Accomplished
A. On-site renewable B. Off-site renewable: RECs purchase	A. No operational RE on-site currently. Previous PV panel is on top of the roof, not functioning. Need to look into geothermal, wind, or other types of energy generation using solar. B. No current RECs purchased at this date, need to look into RECs available in the state of Michigan	**No** **(0 Points)**

Due to the lack of an on-site renewable energy source, the A&A building will not earn this credit. Renewable energy can be expensive to retrofit to this building and the RECs would still have to be purchased in order to earn this credit. At this time we do not feel like we should pursue these points.

EA Credit 5: Refrigerant Management

(1 points)

Objective: reduce ozone depletion and support early compliance with Montreal Protocol while minimizing direct contributions to global warming

Requirements	Current deliverables	Accomplished
Option A. Do not use CFC-based refrigerants in HVAC&R base building systems	Option A: failed using R123 based Electric chiller	**No** **(0 Points)**

Option B. Comply to the maximum threshold for the combined contributions to ODP and GWP LOGWP + LOODP*105 </= 100 LOGWP = [GWP*(Leakage*Life+Mr)*Rc]/Life LOGWP = [ODP*(Leakage*Life+Mr)*Rc]/Life	**Option B**: Electric chiller GWP = 0.02, ODP = 0.022 Need to calculate the option B using chiller specs	

As previously mentioned for prerequisite 3, the A&A building uses CFC- based refrigerants. This leaves us with only option B. This credit is also dependent on the decision to connect the building to the chiller plant. Once that decision is reached, we will be able to assess this credit

EA Credit 6: Emissions Reduction Report
(1 points)

Objective: document the emission reduction benefits of building efficiency measures

Requirements	Current deliverables	Accomplished
Identify building performance parameters that reduce energy use and emissions: 1) energy efficiency measures 2) operational improvements 3) Renewable energy or RECs purchased	ECM identified feasible energy efficiency implementations and carried out projects to reduce energy use.	**Yes** **(1 Point)**

For this credit we just need to document what emission reduction measures we are practicing and the benefits associated with these measures. This document is not complete. After final decisions are made on the other credits in this section, this document should be fairly simple to record. This would earn the building 1 point.

Materials and Resources 14 Points

Materials and Resources (MR) Credit Summary
Art and Architecture LEED-EB Feasibility Project

A. Introduction
This report discusses and summarizes requirements in order to obtain credits for the Materials and Resources portion of the LEED Existing Building Accreditation process. The MR accreditation section requires two prerequisites as well as nine other large credits; some have separate components to them. There are fourteen possible points that can be earned in Materials and Resources for any particular building. This section makes up what the building contains and purchases for running on a daily basis.

MR Prerequisite 1 Sustainable Purchasing Policy

Objective: To reduce the environmental impacts of materials acquired for the use in the operations, maintenance, and upgrades of buildings.

Requirements	Current deliverables	Accomplished
Have in place a sustainable purchasing policy that includes, at a minimum, product purchasing policies for the buildings site addressing the requirements of MR Credit 1, Sustainable Purchasing: Ongoing Consumables. This policy must adhere to the LEED for Existing building O&M policy model. At a minimum, the policy must cover those product purchases that are within the building and site management's control. Additionally, extend the sustainable purchasing policy to include purchasing for the building and site addressing the requirements of at least one of the credit listed below. This extended policy must also adhere to the LEED fro Exiting Buildings: O&M policy model and specifically address the goal, scope and performance metric for the respective credit: ▪ MR Credit 2: Sustainable Purchasing- Durable Goods ▪ MR Credit 3:Sustainable Purchasing- Facility Alterations and Additions ▪ MR Credit 4: Toxic Material Source Reduction- Reduced Mercury in Lamps This prerequisite requires only policies, not going actual sustainable performance.	• Currently, all requirements in this prerequisite have not been completed. In fact, moist of the requirements have not been completed at this point in time.	**No**

To our knowledge, the A&A building does not have this type of policy. Since this is a prerequisite, this would have to be addressed before any other LEED improvements are made. A sustainable purchasing policy can be achieved by following the U.S. EPA's environmental Preferable Purchasing Program guidelines, which can be found at http://wwwepa.gov/epp/. Currently, there are no policies set up for buying sustainable durable furniture, but there is a policy set up to makes sure that all durable electric goods are run by battery or power chord rather than natural gas. Also, some of the equipment in the

building is energy star rated. Credit 3 does not have a sustainable purchasing plan for when alterations and additions are done to the Art and Architecture building and there is no policy in place to buy the types of lights that would get points for credit 4. This prerequisite must be met in order to get an LEED-EB certification.

MR Prerequisite 2 Solid Waste Management Policy

Objective: To reduce the amount of waste and toxins that are hauled to and disposed of in landfills or incineration facilities.

Requirements	Current deliverables	Accomplished
Have in place a solid waste management policy for the building and site addressing the requirements for the waste management credits listed below as well as recycling of all mercury-containing lamps. This policy must adhere to the LEED for Existing Buildings: O&M policy model. At a minimum, the policy must cover the waste streams that are within the building and site's management's control. ▪ MR Credit 7: Solid Waste Management-Ongoing Consumables ▪ MR Credit8: Solid Waste Management-Durable Goods ▪ MR Credit 9: Solid Waste Management-Facility Alterations and Additions This prerequisite requires only policies, not ongoing actual sustainable performance.	• Currently there is no policy set up for Credit 9. But we believe that in order to get LEED-EB certified policies for all these credits will be drafted.	**No**

We know that the A&A building has a recycling policy covering Credit 7- Ongoing Consumables. There are similar policies set up for Credit 8 – Durable Goods as well. Credit 9 is more or less left in the hands of the construction company that does the renovations. If this policy can be changed to at least try and incorporate sustainable alterations and additions up to the levels required for LEED-EB certification, this prerequisite will be met.

MR Credit 1.1-1.3: Sustainable Purchasing: Ongoing Consumables (1-3 points)

Objective: To reduce the environmental and air quality impacts of the materials acquired for use in the operations and maintenance of buildings.

Requirements	Current deliverables	Accomplished
Maintain a sustainable purchasing program covering materials with a low cost per unit that are regularly used and replaced through the course of business. These materials includes, but are not limited to, paper	N/A	**No** **(0 points)**

(printing or cope paper, notebooks, notepads, envelopes), toner cartridges, binders, batteries, and desk accessories but exclude food and beverages (see MR credit 5). For materials that may be considered either ongoing consumables or durable goods (see MR Credit 2), the project team is free to decide which category to put them in as long as consistency is maintained with MR credit 2, with no contradictions, exclusion or double-counting. Consistency must also be maintained with MR Credit 7. A template calculator for MR Credit 1.1-1.3 is available in the LEED for Existing Buildings: O&M Reference Guide. One, two, or three points are awarded to projects that achieve sustainable purchases of at least 40%, 60%, or 80%, respectively, of total purchases (by cost) over the performance period. Sustainable purchases are those that meet one or more of the following criteria: ▪ Purchases contain at least 10% post-consumer or 20% post-industrial material. ▪ Purchases contain at least 50% material rapidly renewable materials. ▪ Purchases contain at least 50% materials harvested and processed or extracted and processed within 500 miles of project. ▪ The purchases consist of at least 50% Forest Stewardship Council (FSC) - certified paper products. ▪ Batteries are rechargeable. Each purchase can receive credit for each sustainable criterion met (i.e. a $100 purchase that contains both 10% postconsumer recycled content and 50% of content harvested within 500 miles of the project counts twice in the calculation, for a total of $200 of sustainable purchasing.). Ongoing consumables must be purchased during the performance period to earn points in this credit.		

Given the academic nature of the A&A building and the types of materials needed for the classes, we do not believe that the building could earn any points for this credit. Currently, no policy is set up to even attempt to gain points for Credit 1. While the Art and Architecture building does encourage using double sided printing on paper and the use of rechargeable batteries, there is no hard evidence that an increase in sustainable purchasing for ongoing consumables is taking place.

MR Credit 2.1and 2.2: Sustainable Purchasing: Durable Goods

Materials and Resources 14 Points

(1 point)

Objective: To reduce the environmental and air quality impacts of the materials acquired for use in the operations and maintenance of the buildings.

Requirements	Current deliverables	Accomplished
Maintain a sustainable purchasing program covering items available at a higher cost per unit and durable goods that are replaced infrequently and/or may require capital program outlays to purchase. Materials that may be considered either ongoing consumables (see MR Credit 1) or durable goods can be counted under either category provided consistency is maintained with MR Credit 1, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credit8. ▪ MR Credit 2.1: Electric-Powered Equipment. One point is awarded to projects that achieve sustainable purchases of at least 40% of total purchases of electric-powered equipment (by cost) over the performance period. Examples of electric powered equipment include, but not limited to, office equipment (computer monitors, copiers, printers, scanners, and fax machines), appliances (refrigerators, dishwashers, and water coolers), external power adapters, and televisions and other audiovisual equipment. Sustainable purchases are those that meet one of the following criteria: o The equipment is ENERGY STAR labeled (for product categories with developed specifications). o The equipment (either battery or corded) replaces conventional gas-powered equipment. Examples include, but are not limited to, maintenance equipment and vehicles, landscaping equipment and cleaning equipment. ▪ MR Credit 2.2: Furniture: One point is awarded to projects that achieve sustainable purchases of at least 40% of total purchases of furniture (by cost) over the performance period. Sustainable purchases are those that meet one or more of the following criteria: o Purchases contain at least 10% post-	**Credit 2.1:** Some durable electric goods are energy star rated and all equipment uses battery power or power chords for energy instead of natural gas. **Credit 2.2:** The furniture in the Art and Architecture building is found and placed because of its artistic qualities and designs, not because of how sustainable the material it was made from is.	**Credit 2.1: Yes** **(1 Point)** **Credit 2.2: No** **(0 Points)**

consumer or 20% post-industrial material. o Purchases contain at least 70% material salvaged from off-site or outside the organization. o Purchases contain at least 70% material salvaged from on-site, through an internal organization materials and equipment reuse program. o Purchases contain at least 50% rapidly renewable material. o Purchases contain at least 50% Forest Stewardship Council (FSC)-certified wood. o Purchases contain at least 50% material harvested and processed or extracted and processed within 500 miles of the project. Each furniture purchase can receive credit for each sustainable criterion met (i.e. a $100 purchase that contains both 10% postconsumer recycled content and 50% of content harvested within 500 miles of the project counts twice in the calculation, for a total of $200 of sustainable purchasing). Durable goods must be purchased during the performance period to earn points in this credit.		

After talking with Planet Blue members, Plant Engineering and doing some analysis of our own, we have found that many of the durable electric goods and equipment used in the Art and Architecture building are energy star rated and no electric equipment is powered by natural gas. We believe that these criterion are enough to earn the building one point for Credit 2.1. Credit 2.2 however is going to be harder to earn when trying for a LEED-EB certification. The reason for this is the nature of the school itself. The furniture that is brought into the building must be creative, interesting and artistic, at this point in time; the use of sustainable materials is not something that is looked at when purchasing furniture for the building. However, if sustainable materials became something that furniture was judged on when selecting, then this point could be earned somewhere in the future.

MR Credit 3: Sustainable Purchasing: Facility Alterations and Additions (1 point)

Objective: To reduce the environmental and air quality impacts of the materials acquired for use in the upgrade of buildings.

Requirements	Current deliverables	Accomplished
Maintain a sustainable purchasing program covering materials for facility renovation, demolitions, refits,	• There are no plans for alteration or additions to the Art and Architecture	**No**

and new construction additions. This applies only to base buildings elements permanently or semi-permanently attached to the building itself. Examples include, but are not limited to, building components and structures (wall studs, insulation, doors, windows) panels, attached furnishings (drywall, trim, ceiling panels), carpet, and other flooring material, adhesives, sealants, paints, and coating. Materials considered furniture, fixtures, and equipment (FF&E) are not considered base-building elements and are excluded from this credit. Mechanical, electrical, and plumbing components and specialty items such as elevators are also excluded from this credit. A template calculator for MR Credit # is available in the LEED for Existing Buildings: O&M Reference Guide. One point is awarded to projects that achieve sustainable purchases of 50% of total purchases (by cost) over the performance period. Sustainable purchases are those that meet one or more of the following criteria: ▪ Purchases contain at least 10% postconsumer or 20% post-industrial material ▪ Purchases contain at least 70% material salvaged from off-site or outside the organization. ▪ Purchases contain at least 70% material salvaged from on-site, through an internal organization material and equipment reuse program. ▪ Purchases contain at least 50% rapidly renewable material. ▪ Purchases contain at least 50% Forest Stewardship Council (FSC) - certified wood. ▪ Purchases contain at least 50% material harvested and processed within 500 miles of the project. ▪ Adhesives and sealants have a VOC content less than the current VOC content limits of South Coast Air Quality District (SCAQMD) Rule #1168, or sealants used as fillers meet or excess the requirements of the Bay Area Air Quality Management District Regulation *, Rule 51. ▪ Paints and coating have VOC emissions not exceeding the VOC and chemical component limits of Green Seal's Standard GS-11 requirements.	building. There is no policy set up for purchasing sustainable and environmentally friendly products at this time.	**(0 Points)**

▪ Noncarpet finished flooring is FloorScore-certified and constitutes a minimum of 25% of the finished floor. ▪ Carpet meets the requirements of the CRI Green Label Testing Program. ▪ Carpet cushion meets the requirements of the CRI Green Label Testing Program. ▪ Composite panels and agrifiber products contain no added urea-formaldehyde resins. *Composite wood and agrifiber products* are defined as particleboard, medium-density fiberboard (MDF), plywood, oriented-strand board (OSB), wheatboard, strawboard, panel substrates and doors cores. Each purchase can receive credit for each sustainable criterion met (i.e. a $100 purchase that contains both 10% postconsumer recycled content and 50% of content harvested within 500 miles of the project counts twice in the calculation, for a total of $200 of sustainable purchasing). Material for alterations or additions must be purchased during the performance period to earn points in this credit.		

Currently, there are no major plans for alterations or additions to the A&A building. If any plans were to be approved and/or started during the performance period, these guidelines could be followed to earn a point. Implementation of a policy is needed in order to gain LEED-EB certification because this Credit is included in Prerequisite 1 of Materials and Resources. If this policy was to be in place for buying sustainable things when making alterations or additions to the building, then the prerequisite would be closer to completion and a point would be earned for Credit 3.

MR Credit 4: Sustainable Purchasing: Reduced Mercury in Lamps (1-2 points)

Objective: To establish and maintain a toxic material source reduction program to reduce the amount of mercury brought onto the buildings site through purchases of lamps.

Requirements	Current deliverables	Accomplished
Develop a lighting purchasing plan that specifies maximum levels of mercury permitted in mercury-containing lamps purchased for the building and associated grounds. The purchasing plan must specify a target for the overall average of mercury content in lamps of 90 picograms per lumen-hour or less. The plan must include lamps for both indoor and outdoor fixtures, as well as both hard-wired and portable	Linear fluorescent tubes (T8 size) and compact fluorescent lights (CFLS) are used throughout building	**No** **(0 points)**

fixtures. The plan must require that at least 90% of purchased lamps comply (as measures by the number of lamps). Lamps containing no mercury may be counted toward plan compliance only if they have energy efficiency at least as good as their mercury-containing counterparts. Implement the lighting purchasing plan during the performance period. One or two points are awarded to projects for which at least 90% of all mercury-containing lamps purchased during the performance period (as measured by the number of lamps) comply with the purchasing plan and meet the following overall targets for mercury content: ▪ MR Credit 4.1 (1 point): 90 picograms Hg per lumen-hour ▪ MR Credit 4.2 (2 points): 70 picograms Hg per lumen-hour A template calculator to aid in documenting performance for MR Credits 4.1 and 4.2 is available in the LEED for Existing Building: O&M Reference Guide. Exception: Screw-based, integral compact fluorescent lamps (CFLs) may be excluded from both the plan and the performance calculation if they comply with the voluntary industry guidelines for maximum mercury content published by the national Electrical Manufactures Association (NEMA), as described in the LEED for Existing Buildings: O&M Reference Guide. Screw-based, integral CFLs that do not comply with the NEMA guidelines must be included in the Purchasing plan and the performance calculation. Performance metrics for lamps- including mercury content (mg/lamp), mean light output (lumens) and rated life (hours)- must be derived according to industry standards, as described in the LEED for Existing Building: O&M Reference Guide. Mercury values generated by toxicity characteristic leaching procedure (TCLP) test do not provide the required mercury information for LEED for Existing Buildings: O&M and cannot be used in the calculation. LEED for Existing Buildings: O&M addressed only the lamps purchased during the performance period, not the lamps previously installed in the building. Similarly, LEED for Existing Buildings: O&M does not require that each purchased lamp comply with the specific		

mercury limit; only the overall average of purchased lamps must comply. Mercury-containing lamps (or their high-efficiency counterparts) must be purchased during the performance period to earn points in this credit.		

The A&A building is currently using high-efficiency light bulbs that contain some mercury. More research is needed to determine the exact lumens for the light bulbs, but initial estimates indicate that picograms of mercury per lumen hours to be in the millions. However, there may be a provision that allows these light bulbs to be used as long as they are properly recycled at the end of their life-cycle. A policy must be in place for purchasing light bulbs that adhere to the requirements in Credit 4 or else Prerequisite 1 cannot be completed. With the adoption of this plan, the building would need to show that it is actually implementing this plan by putting in low mercury bulbs. This would be enough to get the Art and Architecture building one point towards LEED-EB certification.

MR Credit 5: Sustainable Purchasing: Food
(1 point)

Objective: To reduce the environmental and transportation impacts associated with food production and distribution.

Requirements	Current deliverables	Accomplished
Achieve sustainable purchases of at least 25% of totally combined food and beverage purchases (by cost) during the performance period. Sustainable purchases are those that meet one of both of the following criteria: ▪ Purchases are labeled USDA Certified Organic, Food Alliance Certified, Rainforest Alliance Certified, Protected Harvest Certified, Fair Trade, or Maine Stewardship Council's Blue Eco-Label. ▪ Purchases are produced with-in 100-mile radius of the site. Each purchase can receive credit for each sustainable criterion met (i.e. a $100 purchase that is both USDA Certified Organic and is produced on a farm that is within 100 miles of the project counts twice in the calculation, for a total of $200 of sustainable purchasing). Food or beverages must be purchased during the performance period to earn points in this credit.	There is no food court in the building. The only available food is beverages and snacks from machines.	**Yes** **(1 point)**

There is no food court in the Art and Architecture building, however, there is a small place where students can go to get fresh fruit, snacks and drinks while doing work or going in between classes. We believe that the food in the Art and Architecture building will earn one point towards LEED-EB certification. The reason for this is that all fruits and food of that manner are USDA Certified Organic. Even though some of this fruit does not come from within a 100 mile radius of the site, the fact that it is organic helps this credit towards earning a point. The food that is not organic, such as the drinks, snacks and occasional food that is brought it is all produced within a 100 mile radius. Although getting this point may be a little tricky, we believe that one point can be earned for Credit 5.

MR Credit 6: Solid Waste Management: Waste Stream Audit
(1 point)

Objective: To facilitate the reduction of ongoing waste an toxins generated by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

Requirements	Current deliverables	Accomplished
Conduct an audit of the waste stream for ongoing consumables (not durable goods or construction waste for facilities alterations and additions). Use the audit's results to establish a baseline that identifies the types of waste making up the waste stream and the amounts of each type by weight or volume. Identify opportunities for increased recycling and waste diversion. The audit must be conducted during the performance period.	This audit has been performed	**Yes** **(1 point)**

This audit has been completed and the facility managers and other people involved with the building know exactly where most of their waste is going from the building. Other audits will be performed prior to applying for certification.

MR Credit 7.1 and 7.2: Solid Waste Management: Ongoing Consumables
(1-2 points)

Objective: To facilitate the reduction of waste and toxins from the use of ongoing consumable products by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

Requirements	Current deliverables	Accomplished
Maintain a waste stream reduction and recycling program that addresses materials with a low cost per unit that are regularly used and replaced through the course of business. These materials included, but are not limited to, paper, toner cartridges, glass, plastics, cardboard and old corrugated cardboard, food waste, and metals. Materials that may be considered either ongoing consumables or durable goods (see MR Credit 8) can be counted under either category provided	Waste management services reports that about 25% of the consumables are recycled	**No** **(0 Points)**

consistency is maintained with MR Credit*, with no contradictions, exclusions or double-counting. Consistency must also be maintained with MR Credit 1 and 5. ▪ Credit 7.1 (1 point): Reuse, recycle or compost 50% of the ongoing consumables waste stream (by weight or volume). ▪ Credit 7.2 (2 points): Reuse, recycle, or compost 70% of the ongoing consumables (by weight or volume). Have a battery recycling program in place that implements the battery recycling policy adopted in MR Prereq 2. The program must have a target of diverting at least 8-% of discarded batteries from the trash; the actual diversion performance must be verified at least annually. The program must cover all portable dry-cell types of batteries, including single-use and/or rechargeable used in radios, phones, cameras, computers, and other devices or equipment.		

Currently, the A&A building recycles approximately 25% of their consumables. Unfortunately, this credit requires 50% waste diversion. To earn this point, the building would have to double its current recycling program. We do not believe that this credit is achievable or cost-effective.

MR Credit 8: Solid Waste Management: Durable Goods
(1 point)

Objective: To facilitate the reduction of waste and toxins generated from the use of durable goods by building occupants and building operations that are hauled to and disposed of in landfills or incineration facilities.

Requirements	Current deliverables	Accomplished
Maintain a waste reduction, reuse and recycling program that addresses durables goods that are replaced infrequently and/or may require capital program outlays to purchase. Examples include, but are not limited to, office equipment (computers, monitors, copiers, printers, scanners, and fax machines), appliance (refrigerators, dishwashers, and water coolers), external power adapters, television, and other audiovisual equipment. Materials that may be considered either ongoing consumables (see MR Credit 7) or durable goods can be counted under either category provided consistency is maintained with MR Credit 7, with nor contradictions, exclusions, or double counting. Consistency must also be maintained with	• Currently metal salvagers are used, as well as property dispositions. • Most of waste of durable goods does not find its way to a landfill.	**Yes** **(1 Point)**

MR Credit 2. Reused or recycle 75% of the durable goods waste stream (by weight, volume or replacement value) during the performance period. *Durable goods* waste stream is defined as durable goods leaving the project building, site, and organization that have fully depreciated and reached the end of their useful lives for normal business operations. Durable goods that remain useful and functional and are moved to another floor or building, etc. do not qualify. Leased durable goods returned to their owner at the owner at the end of their useful lives for normal business operations do qualify.		

Although a set plan is not in place to make sure that these practices are upheld. Most waste from durable goods is either put unto the reuse or the recycle waste stream. This means that most good do not find themselves in landfills or dumps. Metal is sent to a metal salvager who can break it down and resell the metal. Other products and goods are sent to the University Property Disposition where the goods are put up for sale (like a yard sale). Not much in the way of non reusable waste is found with durable goods and the building either reuses them, or sends them somewhere to be reused or recycled.

MR Credit 9: Solid Waste Management: Facility Alterations and Additions (1 point)

Objective: To divert construction and demolition waste from disposals to landfills and incineration facilities. Redirect recyclable recovered resources to the manufacturing process. Redirect reusable materials to appropriate sites.

Requirements	Current deliverables	Accomplished
Divert at least 70 % of waste (by volume) generated by facility alterations and additions from disposal to landfills and incineration facilities. This applies only to base building elements permanently or semipermantently attached to the building itself that enter waste stream during facility renovations, demolitions, refits, and new construction additions. Examples included, but are not limited to, building component and structures (wall studs, insulation, doors, and windows), panels, attached finishing's (dry wall, trim, ceiling panels), carpet and other flooring material, adhesives, sealants, paints, and coatings. Furniture, fixtures, equipment (FF&E) are not considered base building elements and are excluded from this credit. Mechanical, electrical, and plumbing components and specialty items such as elevators are also excluded.	No plans have been made to help divert waste created by additions and alterations to the building away from landfills.	**No** **(0 Points)**

Materials and Resources 14 Points

Currently there are no plans for alterations or additions to the A&A buildings. When alterations and additions are made to the Art and Architecture building, it is more up to the contractor that is hired to decide where the waste will go and end up. A lot of times landfills are the best options and therefore no point can be earned for this Credit.

Indoor Environmental Quality 19 Points

Indoor Environmental Quality (EQ) Credit Summary
Art and Architecture LEED-EB Feasibility Project

A. Introduction

This report discusses and summaries key requirements in order to obtain credits for the Indoor Environmental Quality (EQ) portion of the LEED Existing Building Accreditation process. It is written for the Arts & Architecture Building LEED-EB feasibility project. The EQ accreditation section requires three prerequisites energy efficiency optimization projects as well as three other major credits and each of them has many separate components. There are a total of 19 available points that can be obtained in the EQ section.

EQ Prerequisite 1: Outdoor Air Introduction and Exhaust Systems

Objective: To establish minimum Indoor air quality performance to enhance indoor air quality in buildings

Requirements	Current deliverables	Accomplished
Choose one of the following options: Option A: Modify and maintain each outside air intake, supply air fan, and/or ventilation distribution system to supply at least the outdoor air ventilation rate required by ASHRAE 62.1-2007 Ventilation Rate Procedure under all normal operating systems. Option B: If meeting ASHRAE 62.1-2007[5] ventilation rates is infeasible because of the physical constraints of the existing ventilation system, modify or maintain the system to supply at least 10 cubic feet per minute (cfm) of outdoor air per person under all normal operating conditions. Demonstrate through design documentation, measurements, or other relevant evidence that the current system cannot provide the flow rates require under any operating condition even when functioning properly	• Currently meeting or will be meeting this prerequisite.	**No**

EQ Prerequisite 2: Environmental Tobacco Smoke (ETS) Control

Objective: To prevent or minimize exposure of building occupants, indoor surfaces, and systems to environmental tobacco smoke.

Requirements	Current deliverables	Accomplished
Choose one of the following options: Option A: Prohibit smoking in the building and designate exterior smoking areas at least 25 feet from building entries, outdoor air intakes and	Smoking is not allowed inside the building and although smoking is not permitted, people do and will smoke less than 25 feet from the building.	**Yes**

[5] Appendix 5

operable windows. Option B: Prohibit smoking in the building except in designated smoking rooms and establish negative pressure in the rooms with smoking. Locate any outdoor air intakes and operable windows and designate that one must smoke 25 feet away from them and the building. Option C: N/A		

EQ Prerequisite 3: Green Cleaning Policy

Objective: To reduce the exposure of building occupants and maintenance personnel to potentially hazardous chemical, biological, and particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment.

Requirements	Current deliverables	Accomplished
Have in place a green cleaning policy for the building and site addressing the following green cleaning credits and other requirements: - Purchase of sustainable cleaning and hard floor and carpet care products meeting the sustainability criteria outlined in EQ credits 3.4-3.6. - Purchase of cleaning equipment meeting the sustainability criteria outlined in EQ Credit 3.7. - Establishment of standard operating procedures addressing how an effective cleaning and hard floor and carpet maintenance system will be consistently utilized, managed, and audited. - Development of strategies for promoting and improving hand hygiene, including both hand washing and use of alcohol based water-less hand sanitizers. -Provision for collecting occupant feedback and continuous improvement to evaluate new technologies, procedures, and processes.	Many of these are in place currently and those not in place would be set up by Planet Blue, who are handling the prerequisites for each section of the LEED-ED certification	**Yes**

EQ Credit 1.1: IAQ Best Management Practices: IAQ Management Program (1 point)

Objective: To enhance indoor air quality by optimizing practices to prevent the development of indoor air quality problems in buildings, correcting indoor air quality problems when they occur, and maintaining the well-being of the occupants.

Requirements	Current deliverables	Accomplished
Develop and implement on an ongoing basis an IAQ management program based on EPA's "Indoor Air Quality Building Education and Assessment Model (I-BEAM)," EPA Reference Number 402-C-01-001, December 2002.	Currently not program in place based on EPA program and model.	**No** **(0 Points)**

There is no program currently set up to manage air quality on an ongoing basis according to the EPA Indoor Air Quality Assessment Model. This could be a way to get points in the future because it requires merely training and some qualified personnel on the job in order for a point to be awarded.

EQ Credit 1.2: IAQ Best Management Practices: Outdoor Air Delivery Monitoring (1 point)

Objective: To provide capacity for ventilation system monitoring to help sustain occupants' comfort and well-being

Requirements	Current deliverables	Accomplished
Install permanent, continuous monitoring systems that provide feedback on ventilation system performance to ensure that ventilation systems maintain minimum outdoor rates under all operating conditions. **For all mechanical Ventilation Systems**: Provide an outdoor airflow measurement device capable of measuring the minimum outdoor airflow rate at all expected system operating conditions within 15% of the design minimum outdoor air rate. Monitoring must be performed for at least 80% of the building's total outdoor air intake flow serving occupies spaces. The outdoor airflow measurement device must take measurements at the system level. The device must be monitored by a control system that is configured to trend outdoor airflow in intervals no longer than 15 minutes for a period of no less than six months. **For mechanical ventilation system that predominantly serve occupied spaces**: Have a CO2 sensor or sampling location for each densely occupied space and compare it with ambient CO2 concentrations. Each sampling location must be 3 – 6 feet from the floor. Sensors must be accurate to 75 ppm. Measurements taken in intervals no longer than 30 minutes.	Currently, air monitoring systems are located through most of the building. In fact pretty much all of the buildings air intake and uptake are monitored with humidity, temperature and CO2 concentrations being measured.	**Yes** **(1 point)**

Currently, The Art and Architecture building is monitored very well in terms of outdoor air quality, temperature, and humidity. In certain sections where the most densely populated areas could be, like the auditorium, certain hallways, project areas, etc, air that is taken from outside goes through a smoke detector, a humidity checkpoint, a temperature monitor and then a CO_2 monitor. The outdoor air intake is designed to take more air when CO_2 concentrations in the building rise, so a negative feedback loop system has been set up inside the building. This allows one point to be earned.

EQ Credit 1.3: IAQ Bests Management Practices: Increased Ventilation (1 point)

Objective: To provide additional outdoor air ventilation to improve indoor air quality for occupants' comfort, well – being, and productivity.

Requirements	Current deliverables	Accomplished
For Mechanically Ventilated Spaces: Increase outdoor air ventilation rates for all air-handling unites serving occupied spaced by at least 30% above the minimum required by ASHRAE 62.1-2007. **For Naturally Ventilated Spaces**: Design natural ventilation systems for occupied spaces to meet the recommendations set forth in "Good Practice Guide 237: Natural Ventilation in non-domestic buildings" (1998). Determine whether natural ventilation is an effective strategy for the project by following the flow diagram process in Figure 2.8 of CIBSE Applications Manual 10: 2005, "Natural Ventilation in Non-domestic Buildings." In addition, either (1) use diagrams and calculations to show that the design of the natural ventilation systems meets the recommendations set forth in CIBSE Applications Manual 10: 2005, "Natural Ventilation in Non-domestic Buildings," or (2) use a macroscopic, multi-zone, analytic model to predict that room – by – room airflows will effectively naturally ventilate at least 90% of occupied spaces.	Air ventilation rates do not meet these standards and probably will not meet them in getting LEED certified.	**No** **(0 Points)**

Air ventilation rates are something that Planet Blue is not concerned with at this point in time. They understand that fact that they can increase air ventilation rates, but that this would increase the amount of energy being used. Planet Blue is more concerned with energy efficiency and savings because energy is very important in becoming LEED certified. No points are awarded or will be awarded for EQ Credit 1.3

EQ Credit 1.4: IAQ Best Management Practices: Reduce Particulates in Air Distribution (1 point)

Objective: To reduce exposure of building occupants and maintenance personnel to potentially hazardous particulate contaminants, which adversely affect air quality, human health, building finishes, building systems, and the environment.

Requirements	Current deliverables	Accomplished
Have in place filtration media with a minimum efficiency reporting value (MERV) greater than or equal to 13 for all outside air intakes and inside air recirculation returns over the performance period. Establish and follow a regular schedule for maintenance and replacement of these filters	Currently, it is believed that MERV 11 filters are used, as well as bag filters behind them. MERV 13 filters would require large increases in energy to pump air through.	**No** **(0 points)**

according to the manufacturer's recommended interval.		

The Art and Architecture building is currently using MERV 11 filters in addition to bag filters that go behind the primary filtration media. This number is not known completely as we must go and look at the MERV numbers on the filters in person. This task is not too hard to do. Also, since two filters are used, the MERV may be higher than a score of 11, and might actually be near 13. MERV calculations are not known at this time and will be figured out in the time remaining. No points can be awarded at this time.

EQ Credit 1.5: IAQ Best Management Practices: Facility Alterations and Additions (1 point)

Objective: To prevent indoor air quality problems resulting from any construction or renovation projects and thus help to sustain the comfort and well being of construction workers and building occupants.

Requirements	Current deliverables	Accomplished
Develop and implement an indoor air quality management plan for the construction and occupancy phases. During construction, meet or exceed the recommended design approaches of the Sheet Metal and Air Conditioning National Contractors Association (SMACNA) "IAQ Guidelines for Occupied Buildings under Construction," 1995, Chapter 3	Current bylaws are in place, maintaining that certain materials can only be used during construction times and it is made sure that air pollution is at a minimum, but guidelines needed for credit are not met.	**No** **(0 points)**

When facility alterations and Additions are made to the Art and Architecture building there are practices that must be used in order to make sure that air quality is not harmful in any way. No points can be awarded though because the practices used do not comply with the SMACNA guidelines.

EQ Credit 2.1: Occupant Comfort: Occupant Survey

(1 point)

Objective: Assess occupant comfort

Requirements	Current Deliverables	Accomplished
Implement an occupant comfort survey and complaint response system to collect anonymous responses about thermal comfort, acoustics, indoor air quality, lighting level, building cleanliness and other occupant comfort issues. They survey must be collected from a representative sample of building occupants making up at least 30% of the total occupants, and it must include an assessment of overall satisfaction with building performance and identification of any comfort related problems,	An initial survey of the building occupants was conducted at the start of Planet Blue's involvement with the Art and Architecture Building.	**Yes** **(1 point)**

1. Document survey results and corrective actions to address comfort issues identified through the surveys. 2. Conduct at least one survey during the performance period. .		

Surveys of occupant comfort have been conducted and will continue to be in the future, as a building occupant survey is very easy and inexpensive to conduct. Suggestions for the future include an internet based survey that could be e-mailed to all associated students, faculty and staff. At least one building occupant survey would need to be conducted during the performance period.

EQ Credit 2.2: Occupant Comfort: Occupant Controlled Lighting (1 point)

Objective: Allow individuals to control level of lighting in multioccupant spaces.

Requirements	Current Deliverables	Accomplished
Use lighting controls that enable adjustments to suit the task needs for at least 50% of individual workstations AND for groups sharing a multioccupant space or working area for at least 50% of the multioccupant space in the building.	All individual workstations in the communal studios are equipped with task lights. Machine shops are not equipped with individual lighting, however this accounts for less than 50% of multi-occupant space.	**Yes** **(1 point)**

The Art and Architecture building has several large communal studios where each desk has its own task light, and facilitates adjustment of lighting on an individual basis. In addition to the high degree of task lighting present in the building, many overhead room lights are controlled by occupancy sensors and/or daylight sensing controls.

EQ Credit 2.3: Occupant Comfort: Thermal Comfort Monitoring (1 point)

Objective: Provide comfortable thermal environment to support productivity and well-being of occupants.

Requirements	Current Deliverables	Accomplished
Have in place a system for continuous tracking and optimization of the systems that regulate indoor comfort and conditions (air temperature, humidity, air speed and radiant temperature) in occupied space. Have a permanent monitoring system to ensure ongoing building performance to the desired comfort criteria as determined by ASHRAE 44-2004, Thermal Comfort Conditions for Human Occupancy.	Plant operations monitors air temperature and humidity throughout buildings.	**Yes** **(1 point)**

Thermal comfort monitors are placed throughout the entire building. Smoke detectors as well as humidity monitors are set up to make sure that occupants are comfortable. As talked about in Credit 1.2, CO_2 monitors are also located throughout the building and when levels get too high, more air is pumped into the building.

EQ Credit 2.4-2.5: Occupant Comfort: Daylight and Views (1-2 points)

Objective: Provide connection between indoor and outdoor environments through daylighting and views.

Requirements	Current Deliverables	Accomplished
Credit 2.4: Achieve a 2% daylight factor in 50% of all spaces occupied for critical visual tasks OR Achieve a direct line of sight to vision glazing for building occupants in 45% of regularly occupied spaces **Credit 2.5**: Achieve a 2% daylight factor in 75% of all spaces occupied for critical visual tasks OR Achieve a direct line of sight to vision glazing for building occupants in 90% of regularly occupied spaces. For Daylight: Achieve a minimum daylight factor of 2% (excluding all direct sunlight penetration) in space occupied for critical visual tasks. Option A: MEASUREMENT Demonstrate, through records of indoor light measurements, that a minimum daylight illumination level of 25 foot-candles has been achieved in at least 50% (credit 2.4) or 75% (credit 2.5) of all regularly occupied areas. Option B: CALCULATION (See manual for formula) Option C: SIMULATION Demonstrate, through computer simulation, that a minimum daylight illumination level of 25 foot-candles has been achieved in at least 50% (credit 2.4) or 75% (credit 2.5) of all regularly occupied areas. Modeling must demonstrate 25 horizontal foot candles under clear sky conditions at noon on the equinox at 30 in above the floor.	Daylight is a large source of light on the top level of the Art and Architecture building, but natural light is not a large source elsewhere in the building.	**No** **(0 points)**

From touring the building, we believe that day-lighting is not a large enough factor in the lighting of the building to achieve this point. However, Professor Moji in the Architecture department has developed computer models of the lighting in the Art and Architecture building, and it may be possible to fulfill this credit using his simulations.

EQ Credit 3.1: Green Cleaning: High Performance Cleaning Program
(1 point)

Objective: Reduce exposure to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, health, building systems, and the environment.

Requirements	Current Deliverables	Accomplished
Have in place over the performance period a high performance cleaning program supported by a green cleaning policy that addresses the following: 1. Appropriate staffing plan 2. Implementation of training of maintenance personal in the hazards, use, maintenance, disposal and recycling of cleaning chemicals, dispensing equipment and packaging. 3. Use of dilution to minimize chemical use when possible 4. Use of sustainable cleaning products, materials, trash bags, etc. 5. Use of hard floor and carpet care products which meet sustainability criteria as specified in IEQ 3.4 6. Use of cleaning equipment meeting criteria of IEQ 3.7	Janitorial staff is present and trained. Sustainable cleaning products are not currently in use. IEQ 3.4 and 3.7 are not satisfied.	**No** **(0 points)**

This credit relies on the fulfillment of credits 3.4 and 3.7, and will likely not be obtained due to the costs barriers associated with credit 3.7. However, the janitorial staff is adequately trained in the use, maintenance, disposal, and recycling of cleaning chemicals and dilution is used when possible.

EQ Credit 3.2-3.3: Green Cleaning: Custodial Effectiveness Assessment
(1-2 points)

Objective: Reduce exposure to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, health, building systems, and the environment.

Requirements	Current Deliverables	Accomplished
Conduct an audit with APPA Leadership in Educational Facilities (APPA) "Custodial Staffing Guidelines" 1 point- score of 3 or less 2 points- score of 2 or less	The APPA audit has not been conducted.	**No** **(0 points)**

There are currently no plans to conduct the APPA audit for custodial staffing guidelines, and this is likely to not be pursued. The audit is not seen as a worthwhile expense seeing as the university custodial staff is already capable of performing their duties effectively.

EQ Credit 3.4-3.6: Green Cleaning: Sustainable Cleaning Products and Methods (1-3 points)

Objective: Reduce the environmental impact of cleaning products, disposable paper products, and trash bags.

Requirements	Current Deliverables	Accomplished
Implement sustainable purchasing the cleaning materials and procedures, disposable janitorial paper products, and trash bags. Cleaning products and material purchases include items used by in house staff or outsourced service providers. One point is awarded for each 30% of annual purchases (by cost) that meet either an Environmental Choice CCD or Green Seal criteria.	No environmentally friendly products are currently purchased.	**No** **(0 points)**

The University has contracts with suppliers that can provide the green cleaning products required for LEED certification. Kellermeyer has a university contract for bulk and dock delivery of janitorial paper products and sanitary cleaning products, and offers Green Seal chemicals and recycled paper products. Ordering information is available at www.kellermeyer.com. The percentage of sustainable products bought is limited only by budget restraints; therefore it is possible to obtain all three points for this category. Due to the increased cost of sustainable cleaning products, it will be easier to obtain the percentage by cost specified for this point.

EQ Credit 3.7: Green Cleaning: Sustainable Cleaning Equipment (1 point)

Objective: Reduce exposure to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, health, building systems, and the environment.

Requirements	Current Deliverables	Accomplished
Implement a janitorial program that minimizes environmental impact. Requirements include: 1. "Green Label" vacuum cleaners that operate under 70dBA 2. Deep cleaning equipment for carpets certified by Carpet and Rug Institutes "Seal of Approval" program. 3. Floor maintenance equipment operates under 70dBA 4. Propane powered equipment has high efficiency, low emissions engines, must meet EPA standards and operate under 90dBA. 5. Automated scrubbing machines have onboard chemical metering. 6. Batteries used in equipment are environmentally preferable gel	No sustainable cleaning equipment is currently in use. Safety and ergonomic criteria are satisfied.	**No** **(0 points)**

batteries. 7. Power equipment ergonomically designed for user comfort. 8. Equipment has safeguards (bumpers, rollers, etc) Keep a log for all powered cleaning equipment to document the date of equipment purchase and all repair and maintenance activities and include vendor specification sheets for each type of equipment in use.		

Sustainable equipment purchases are unlikely due to budget constraints; however Kellermeyer, a university supplier, offers green cleaning equipment on their website. Cleaning equipment below the noise requirements are also available for sale or rent on the Kellermeyer website.

EQ Credit 3.8: Green Cleaning: Entryway Systems
(1 point)

Objective: Reduce exposure to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, health, building systems, and the environment.

Requirements	Current Deliverables	Accomplished
Utilize entryway systems (grilles, grates, mats) to reduce the amount of dirt, dust, pollen, and other particles entering the building at all public entryways, and develop the associated cleaning strategies to maintain these entryway systems as well as exterior walkways. At least 10 feet of mats must be in place immediately inside all public entryways. Public entryways that are not in use or serve only as emergency exits are excluded from the requirement.	Grates and mats at the 2 main front and back entrances entrance exceed 10 feet.	**Yes** **(1 point)**

Mats were measured to be approximately 18 feet. In addition, grates were present between the double doors at each entrance. The mats and grates appeared to be properly maintained and in good condition, and are therefore effective in reducing the amount of particulates entering the building.

EQ Credit 3.9: Green Cleaning: Indoor Integrated Pest Management
(1 point)

Objective: Reduce exposure to potentially hazardous chemical, biological and particulate contaminants, which adversely affect air quality, health, building systems, and the environment.

Requirements	Current Deliverables	Accomplished
Develop, implement and maintain an indoor integrated pest management plan (IPM), defined as managing indoor pests in a way	This credit cannot be met at this point in time, as the university does not use least toxic cleaning products.	**No** **(0 points)**

that protects human health and the surrounding environment and that improves economic returns through the most effective, least risk option. IPM calls for using least toxic chemical pesticides, minimum use of chemicals, for only targeted species in targeted locations. The plan must include the following elements: 1. Integrated methods, site or pest inspections, pest population monitoring, evaluating of the need for pest control and one or more pest control methods, including sanitation, structural repairs, mechanical and living biological controls, other nonchemical methods, and if nontoxic options are unreasonable and have been exhausted, a least toxic pesticide 2. Specification of the circumstances under which an emergency application of pesticides in a building or surrounding grounds can be conducted without complying with earlier provisions. 3. A communications strategy directed to building occupants that addresses universal notification, which requires notice of not less than 72 hours before a pesticide under normal conditions, and 24 hours after application of a pesticide in emergency conditions, other than a least toxic pesticide, is applied in a building or on the surrounding grounds. Any cleaning products included in the IPM policy must meet criteria of IEQ credits 3.4-3.6.		

The products used for pest management do not meet the criteria of IEQ credits 3.4-3.6, which pertain to Environmental Choice CCD or Green Seal least toxic cleaning products. A plan for emergency pest control and a communications plan to notify building occupants before an application of pesticide could easily be constructed in accordance with the LEED guidelines, and this point could be fulfilled if the appropriate green chemicals were purchased.

Innovation in Operations 7 Points

Innovation in Operations (Innovation) Credit Summary
Art and Architecture LEED-EB Feasibility Project

A. Introduction

This report discusses and summaries key requirements in order to obtain credits for the Innovation in Operations (Innovation) portion of the LEED Existing Building Accreditation process. The Innovation accreditation section has three major credits, one having separate components. There are a total of 7 available points that can be obtained in the Innovation section.

Innovation Credit 1.1 – 1.4: Innovation in Operations

Objective: To provide building operations, maintenance, and upgrade teams with the opportunity to earn points for environmental benefits achieved beyond those already addressed by the LEED for Existing Buildings: Operations and Maintenance Rating System

Requirements	Current deliverables	Accomplished
Choose one of the following options: Option A: Achieve exemplary performance in a LEED for Existing Buildings: O & M prerequisite or credit that allows exemplary performance. Option B: Achieve significant, measureable environmental performance using an operations, maintenance, or system upgrade strategy not addressed in the LEED for Existing Buildings: Operations & Maintenance Rating System. • Credit 1.1 (1 point): Specify the exemplary performance achieved (Option A). Alternatively, identify the intent of the proposed innovation credit, the additional environmental benefits delivered, the proposed requirements for compliance, the proposed performance metrics to demonstrate compliance, and the approaches that might be used to meet the requirements; meet the proposed requirements during the performance period. • Credit 1.2 – 1.4: Same as Credit 1.1	No current Innovations in Operations are being made or planned.	**No** **(0 points)**

Innovation Credit 2: LEED Accredited Professional
(1 point)

Objective: To support and encourage the operations, maintenance, upgrade, and project team integration required for LEED for Existing Buildings: O & M implementation and to streamline the application.

Requirements	Current deliverables	Accomplished
At least one principle participant of the project team must be a LEED Accredited Professional	Robert Morikawa is a LEED Accredited Professional	**Yes** **(1 point)**

Innovation in Operations 7 Points

Credit 2 can earn one point for having a certified LEED expert working with everyone from Planet Blue. Robert Morikawa is this Accredited Professional.

Innovation Credit 3: Documenting Sustainable Building Cost Impacts (2 points)

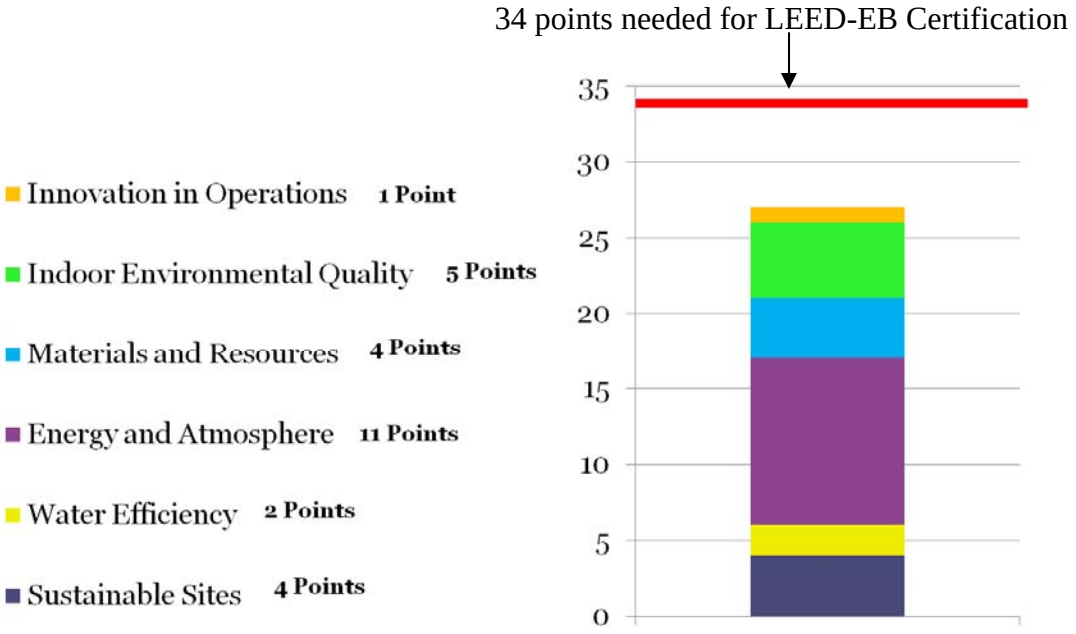
Objective: To document sustainable building cost impacts

Requirements	Current deliverables	Accomplished
Document overall building operating costs for the previous five years and track changes in overall building operating costs over the performance period. Document building operating costs and financial impacts of all aspects of LEED for Existing Buildings: O & M implementation on an ongoing basis. Follow the detailed instructions in the LEED for Existing Buildings: Operations and Maintenance Reference Guide.	It is unknown if this is actually done, but from speaking with facility managers and other members of the Art and Architecture staff, it is pretty clear that this is probably not done.	**No** **(0 points)**

This is something that is probably not done by the building or the facility managers on site. Documenting sustainable building cost impacts is something that is not needed in order to gain LEED-EB certification, but if the Art and Architecture building is serious about a sustainable future, this should be done.

Conclusions

Upon the completion of our assessment, we determined that the Art and Architecture building could obtain 27 of the 34 points required for LEED certification. These points were earned in the following areas:



This total represents existing conditions in the Art and Architecture building. Seven additional points would need to be achieved through modifications in building policy, procurement, and efficiency. These changes will require the cooperation of building occupants, staff, and facility managers, as well as additional expenses likely to be incurred when purchasing environmentally friendly products. Energy efficiency upgrades will also have a high upfront cost; however will only be implemented if their payback period is within eight years. It is our conclusion that with the help of Planet Blue, it is feasible for the Art and Architecture building to obtain these seven additional points and reach the minimum level of LEED-EB certification.

Recommendations

Our conclusion stated that we believe LEED-EB Certification is attainable because only seven additional points are needed for this certification. This section will outline the approach that we developed to most readily earn the remaining seven points needed for LEED-EB Certification.

In the category of Energy and Atmosphere, we believe one to three more points can be earned for credit 1. Credit 1 has to do with the energy efficiency performance of the building. For LEED-EB Certification, Robert Morikawa recommended that the building should follow the guidelines for option B which entails "demonstrating energy efficiency in at least the 19th percentile for typical buildings of similar type by benchmarking against national median source energy data provided in the Portfolio Manager tool or in USGBC's supplementary calculator." Planet Blue installs energy savings lights, motion sensing power strips and many other energy saving devices throughout each building it updates. Robert believed that with the energy saving installations from Planet Blue, the Art & Architecture Building would reach the 19th percentile and could conceivably reach the 25th percentile which would award five points for this credit.

The next place that would be feasible to gain points in is Water Efficiency. We believe that it is possible to gain one to two more points for Water Efficiency Credit 2. Credit 2 has to do with the reduction of potable water used within the building. After an O&M Baseline has been calculated, Planet Blue will reduce the potable water used in the building through methods of low-flow aerators, dual-flush toilets, and waterless urinals. Robert Morikawa believes that after Planet Blue has installed water saving devices throughout the building, our reduction in water from the baseline will be at least 10%. Because many of the water saving devices being installed in the building were said to reduce the water of the fixture that they are installed on by almost 80%, we believe that the reduction in potable water from the baseline could be as much as 30%, which would result in three points total for this credit.

Another place that we believe we can gain points in is Materials and Resources. We believe it would be reasonable to gain one to three points for Credit 1: Ongoing Consumables. Credit 1 has to do with the purchasing of either postconsumer, postindustrial, rapidly renewable, local, or Forest Stewardship Council materials such as paper, toner cartridges, binders, batteries, and desk accessories. One point would be awarded for 40% all of purchases being of this description, two points for 60%, and three points for 80%. While there is no current plan for this change in materials purchasing, Kevin McKay believes it is an option that could be looked into.
Within Materials and Resources, we also believe that 1 point for Credit 2.2: Durable Goods (Furniture) is achievable. Credit 2.2 has to do with purchasing furniture that is made of postconsumer, postindustrial, salvaged, rapidly renewable, forest stewardship, or locally grown materials. The building does not plan on purchasing furniture before certification, but if any furniture were to be purchased before or during the performance period, the building would consider buying furniture of this nature to obtain this point.

We believe points could be gained by completing Materials Resources Prerequisite 1: Sustainable Purchasing Policy. This prerequisite requires the building to have a sustainable purchasing policy that pertains to products for MR Credits 1-4. It should be noted that this prerequisite requires only polices, not ongoing sustainable performance. This policy does not currently exist for the Art and Architecture building; this must be completed before LEED certification can be obtained. Once complete this prerequisite is complete would earn the building one point for MR Credit 3. This credit requires that there is a sustainable purchasing policy for any additions or alterations. As previously mentioned, there are no planned additions or alterations to the building at this time. However, but having the policies in place before the certification process, the building would earn one point. Along with the complete, this prerequisite may earn the building at least one point for MR Credit 4 - which requires a phase-out plan of incandescent light bulbs for compact fluorescent bulbs.

One more point we believe it may be possible to obtain is for Credit 9: Facility Alterations and Additions (waste). Credit 9 has to do with diverting waste that is created by the alteration and additions to the building. If 70% of the waste generated in the building by alterations and additions is diverted away from landfills than one point is earned. Neither Robert Morikawa, nor Kevin McKay knew if there was a plan that was already in place to divert waste from alterations or addition, but they did agree that a plan could easily be made to accomplish this.

In the category of indoor Environmental Quality, we believe it is possible to fulfill Credits 3.4-3.6: Sustainable Cleaning Products and Materials. These credits pertain to the procurement of environmentally friendly products, defined as those products certified as either Environmental Choice CCD or Green Seal. The University of Michigan has contracts with companies through procurement services that provide appropriate green cleaning products, making them readily available for use in the Art and Architecture building. The primary obstacle in achieving these points would be the additional cost associated with green products; however the LEED points awarded are based on percentage of the purchases on a cost basis. If 30% of the money spent on cleaning products or janitorial supplies is spent on green cleaning products, one point can be obtained. Two points are awarded for 60% of total cost, and three points for 90%.

Appendix

1) SRI: Solar Reflectance Index[1]:

A measure of the roof's ability to reject solar heat as shown by a small temperature rise

2) Illumination Levels (illuminance)[2]:

The total amount of visible light illuminating (incident upon) a point on a surface from all directions above the surface. This "surface" can be a physical surface or an imaginary plane. Therefore illuminance is equivalent to *irradiance* weighted with the response curve of the human eye.

- Standard unit for illuminance is **Lux (lx)**, which is lumens per square meter (lm/m^2).
    - 1 fc= 10.764 lx

3) Uniform Plumbing Codes (2006): International plumbing practices for the year 2006. These codes are not made public unless one is a paying member.

4) ASHRAE Level 1[3]: The ASHRAE Level 1 audit focuses on low-cost/no-cost energy conservation measures, and provides a list of higher cost energy conservation measures. In addition to tasks performed in the Overview Audit, in the ASHRAE Level 1 audit, the audit will report how much in energy and energy costs can be saved from each energy conservation opportunity.

5) ASHRAE 62.1 – 2007 Ventilation Rate Procedure: Can be looked at in the book that has to be purchased in order to see information. Basically, this is a manual that sets minimum ventilation rates and other requirements for commercial and institutional buildings.

[1] http://www.flexroofingsystems.com/documents/roofing_systems/elvaloy/Solar%20Reflectance%20Index%20(SRI)%20Value.pdf
[2] http://www.facilities.ufl.edu/cp/pdf/Lighting%20Illumination%20levels.pdf
[3] http://www.abraxasenergy.com/energyconsult2.php