Lane Community College
Building 11 Remodel

SUSTAINABILITY REPORT

Introduction:

Generally, the Building 11 Remodeling project consisted of interior reworking to provide several new classroom spaces on the first floor and a new department suite and offices for the ALS program on the second floor. These new functions replaced existing offices and classrooms that did not meet current LCC space standards. The project also involved significant modifications and upgrades to mechanical systems including rebuilding of the two main air handling units. Grant funded seismic upgrades led to replacement of a little more than a quarter of the exterior walls with new shear walls. An exterior elevator capable of serving the campus circulation system in addition to this building was also included. The walls for the elevator shaft were designed to assist in seismic stabilization.

The design approach to sustainability for the Building 11 Remodel included a balanced look at LEED criteria, budget considerations, and a careful selection of sustainability measures that make sense for this building. We decided not to pursue LEED certification at any level. However, the project did require compliance with LEED criteria in numerous aspects. We also considered additional sustainability measures that are not evaluated under the LEED criteria, but that do contribute to occupant welfare and preservation of natural resources.

Because LEED criteria were considered in the design, this report is broken in to sections that reflect LEED categories. In addition to these seven categories, the report adds discussion of additional measures and summary at the conclusion of the report.

Sustainable Sites:

Many of credits associated with the LEED Sustainable Sites (SS) category were not considerations for this project. This project is a remodel of an existing building on an existing campus. Although the project would score LEED points for connections to public transportation, this is based upon the current location rather than any decisions made during design. By the same reasoning, the site does not contribute to development density on this existing suburban campus.

The LEED sustainable sites category focuses attention on vehicle parking, use of outdoor open spaces, heat island effect, storm water management, and light pollution. The project was primarily an interior remodel, so modifications to outdoor systems were limited. The design and construction team was able to develop an erosion control plan, although construction activities generally did not create any concerns.

Revisions to existing parking were outside the scope of this project. This again resulted in some points being scored under the LEED system and some points being unavailable. Lane Community College already has a comprehensive parking plan for the campus that includes fueling for alternative fuel vehicles and priority parking for low-emitting and fuel efficient vehicles. No parking was added for this project except for 20 new bicycle parking spaces under cover and convenient to the Building 11 entries.

As primarily an interior remodel, the project did not have any opportunity to maximize vegetated open space or to restore natural habitat. There is a concrete plaza to the north of the building. We discussed a potentially concurrent project that plans to turn portions of that plaza in to garden space. We concluded, however, that while this project would offer occupant benefit, it is not realistically a part of this building remodel.

We reviewed storm water management for this project, but again we found no opportunities to provide any improvement to existing systems as part of this project. Basically, storm water systems were unaltered as a result of this project.

Work involved limited roofing and exterior concrete work. Concrete walks included only minor patching, so it was not reasonable to introduce new reflective products in only the small areas patched. Therefore, exterior flatwork could not contribute to reduction of heat island effect. Roof systems involved only about 200 square feet of new work on a building that has over 22,000 square feet of roofing that was recently replaced. However,

new metal panels matched existing, and they did comply with LEED criteria for reduction of heat island effect on roofs. On sloped roofs, LEED requires a minimum Solar Reflectance Index (SRI) of 29 on 75% of the roof. Almost all of the roof area at Building 11 is sloped, and the metal panels have an SRI of 34.

The final consideration for Sustainable Sites is light pollution. The project did not include modifications to exterior lighting.

Water Efficiency:

Water use in the Building 11 remodel project had limited impact with regard to LEED standards for this category. Much of the LEED criteria in this category does not apply. Irrigation and use of process water were not impacted by this project. Wastewater systems were also unmodified. However, incremental improvement occurred as a result of the new work.

We installed one new sink on the project at the ALS workroom. This sink was installed with a faucet with 2.2 gpm flow and fitted with a water-conserving 1.5 gpm aerator. LEED does not provide baseline criteria for faucets in this application, but the project recognized the benefit of low flow fixtures regardless of use and location.

The remodel project also included replacement of existing drinking fountains with new fountains that include water bottle filling stations. These fixtures encourage reusable water bottles over purchase of bottled water. The U.S. consumes 29 billion bottles of water annually. Manufacture of the bottles alone, requires 17 million barrels of crude oil, which is enough to keep 1 million vehicles on the road for 12 months.[1] Additionally, despite the ability to recycle water bottles, approximately 80% of bottles are dumped in landfills. The bottle filling stations provide users with another option to divert material from landfills and to conserve natural resources.

1. National Geographic, 2011

Energy and Atmosphere:

The LEED Energy and Atmosphere category promotes construction of high performance buildings that will require less energy to operate and that will cause less damage to Earth's atmosphere. The Building 11 Remodel project included upgrades to existing inefficient mechanical systems and replacement of some exterior walls with high performance envelope components.

Typically, a LEED project will qualify for points in this category through energy modeling and comparison of the project systems against baseline systems. Energy modeling was not completed as part of this project design. The modeling may be executed in the future as a class assignment within the LCC curriculum. Sub-metering was connected to the building automation system as part of this project, so monitoring of energy use specific to this building will now be possible.

Even without energy modeling, we can track several ways that the building systems perform better than the LEED referenced baseline standard. Building envelope improvements were made at all locations where exterior walls and windows were replaced. New lighting is more efficient, and HVAC system efficiency is also improved.

Two types of new walls were used where the project replaced existing exterior walls. The project included new shear walls at some locations and simple non-load bearing walls at other locations.

New shear walls included thermal mass plus insulated framing and additional continuous insulation. Batt insulation of R-21 within the framing exceeded the strict Oregon Energy Efficiency Code minimum for framed walls by about 60%. In addition, the wall includes 1-1/2-inches of rigid insulation to provide an additional R-Value of about 9, which again exceeds code for metal framed walls. On top of this, the mass wall contributes significantly. Overall, the insulating R-Value of the new wall more than doubles code minimum.

The project also includes new exterior walls that are not shear walls. These walls are constructed with steel stud framing with R-21 batt insulation and R-9 continuous rigid insulation. At these locations, the project did not have opportunity to take advantage of the thermal mass of the shear wall concrete. Still, the batt insulation and continuous rigid insulation exceed Oregon Energy Code minimums by 60% and 20% respectively.

New windows on the project use double pane, low-E glazing. Performance is significantly improved over the single pane glazing that was existing.

The project included extensive modification of the building's original HVAC system. The mechanical engineer has estimated the building performance rating following the project

improvements to be 10 to 15% better than the LEED referenced (Code) baseline, primarily through reduced reheating energy requirements. Equally important, from both a LEED and overall project cost perspective, the approach chosen to execute the mechanical system improvements achieved the over-arching goal of improving and retaining most of the original mechanical equipment, rather than simply replacing it. Careful evaluation of the two central air handling units and distribution system allowed their conversion from constant volume multizone to VAV operation, resulting in dramatically improved energy efficiency, significant construction cost savings, reduced waste, and saved resources for the environment. If the project were pursuing LEED certification, we expect that this design approach would be eligible for an innovation in design credit.

In addition to the mechanical system modifications, the project included a complete replacement of the original, failing pneumatic HVAC controls with a new DDC Building Automation System. The BAS allows for all Code-required control features, enhanced efficiency strategies, and also provides remote monitoring and adjustment of building systems. The BAS is currently being integrated with a campus-wide scheduling system to automatically control the building systems according to actual need throughout the year. Finally, the BAS system provides sub-metering for the building so that energy uses can be monitored and analyzed.

New lighting was designed to be 25% more efficient than required by the Oregon Energy Code. New classrooms and open office spaces include pendant mounted direct/indirect fixtures that provide efficient and well balanced lighting. This lighting quality far exceeds that which is supplied by only direct fixtures.

To confirm that building users and facilities managers understand the complex building systems, the project includes fundamental commissioning. This is a LEED prerequisite to achieving any points in this category and critical to building efficiency. Commissioning includes functional testing and training for any and all building operation systems. Over the past several years, mechanical control systems have become increasingly complex. Coordination between controls is insured through complete testing to verify that sensors provide correct information and the building reacts appropriately. Training is also critical. Without proper understanding of systems, users can inadvertently defeat efficient operations and cause the building to use much more energy than the design intended.

Other components in this LEED category were not considerations for this project. Lane Community College has a campus wide approach to green power usage and on-site energy generation. The overall approach did not fit well with any incremental improvements that could be incorporated in to this project.

Finally, the Energy and Atmosphere category reviews refrigerant management. Chlorofluorocarbons (CFCs) used in cooling have been shown to cause stratospheric ozone depletion. Because building 11 receives chilled water from LCC's central plant,

opportunity to improve cooling systems was not possible on this project. Central plant improvements will be addressed under a separate project.

Materials and Resources:

The LEED Materials and Resources category focuses on two main issues. The first is the environmental impact of materials brought to the site and incorporated in to the project. the second is minimization of materials that are disposed of in a landfill. The Building 11 Remodel project allowed several opportunities for stewardship in both of these categories.

A simple step toward reduction of material that is disposed in a landfill is recycling of construction packing materials and waste. The contractor set up recycling bins and kept track of material disposal throughout the project. The result is that 80% of disposed material was diverted from landfills. Under the LEED rating system, this would qualify the project for two points; the highest number possible for this LEED credit.

Remodel of an existing building also offers significant opportunity for reuse of existing materials. Either existing walls and doors can be left in place, or they can be removed and then reincorporated in to the finished design. Reuse of existing material obviously reduces the use of new natural resources. It also reduces the additional resource use involved in packaging and transportation of new products to the site.

The Building 11 remodel project maintained all of the existing structural system and many of the existing exterior wall systems. By doing so, the need for new resources was reduced. We estimated the following reuse for the building structure and envelope:

Building Structure and Envelope Reuse Calculation

Structure/Envelope Element	**Existing Area (sf)**	**Reused Area (sf)**	**Percentage Reused (%)**
Foundation/Slab on Grade:	20,460	20,460	100%
2nd Floor Deck (including balcony):	25,200	25,200	100%
1st Floor Interior Structural Walls:	NA (none)	NA	NA
2nd Floor Interior Structural Walls:	NA (none)	NA	NA
Roof Deck:	24,470	24,470	100%
North Exterior Wall (excl. windows):	2,332	1,432	61.4%
South Exterior Wall (excl. windows):	3,130	1,722	55%
East Exterior Wall (excl. windows):	4,275	2,789	65.2%
West Exterior Wall (excl. windows):	3,825	2,966	77.5%
Total:	81,360	79,039	**97%**

In addition, interior non-structural elements were maintained for more than half of the building by area. This would contribute a point under the LEED rating system. However, the preservation of existing components is largely due to the nature and scope of the project rather than decisions made during design. A significant amount of the existing building components that were removed contained hazardous materials, so had to be abated and disposed of to meet specific requirements. The project did have opportunity to reuse some existing cabinetry at a new location where it fits seamlessly in the new space.

Recycling can continue during building use after project completion. Recycling stations were installed at two locations in on the first floor. This provides easy access to recycling for occupants in new classrooms. During design, recycling was reviewed with office staff at new second floor offices. Staff prefers to utilize individual recycling bins within offices and transfer to recycling stations periodically. Therefore, we did not include a large recycling station within the new office suite.

Material selection to reduce environmental impact is also important. This project used FSC Certified wood for new siding, sheathing and cabinetry. The Forest Stewardship Council recognizes forestry practices that result in the long term health and integrity of ecosystems. Use of FSC wood on more than 50% of the project would result in one point being awarded for this credit under the LEED rating system. This project would qualify for that point.

Another opportunity to reduce environmental impact is by selecting materials that are made from rapidly renewable resources. The linoleum flooring used throughout the project would qualify as this type of material. Although this is a positive step, it is not significant enough to achieve a point for this credit under the LEED rating system. Overall, the design goals on this project were not a good fit with selection of materials to meet the LEED rating system criteria for renewable resources.

Natural resource impacts can be minimized by selecting materials that have recycled content. The use of recycled materials in new products reduces the quantity of new natural resources that need to be extracted or harvested for building construction. LEED weighs the quantity of recycled content in a project as a function of cost. If 10% (by cost) of material used in construction is from recycled content, then LEED would award a point for this credit. 20% would gain 2 points. For the Building 11 Remodel project, we did not specifically track recycled content. However, the linoleum flooring used includes 46.5% pre-consumer (post industrial) recycled content. A variety of suspended acoustic ceiling panels were used. Typically, the panels include approximately 51% combined pre-consumer and post-consumer recycled content. The metal grid system itself also contains approximately 30% recycled content.

Transport of materials to a jobsite requires fuel for vehicles and then the burning of that fuel adds to air pollution. Therefore, LEED recognizes credit for materials that are extracted and manufactured within a 500 mile radius of the project site. Although we did not track materials specifically for the Building 11 project, wood products used were extracted from northwest forests and processed in regional mills. Regionally sourced materials were used where there was opportunity to do so.

Indoor Environmental Quality:

The LEED category for Indoor Environmental Quality covers a range of concerns related to occupant comfort and health. The project applies standards related to air quality provided through mechanical system performance and elimination of materials that release harmful fumes or toxins in to the environment. Additional concerns are placed on thermal comfort and the availability of individual control. Finally, the category analyzes how the project provides daylight and exterior views to building occupants.

The LEED IEQ category begins with two simple prerequisites, both of which were achieved on this project. First, the building design must include an HVAC system that can meet Sections 4 through 7 of ASHRAE Standard 62.1 – 2007 for minimum air quality performance. The installed system does meet these criteria. Second, LEED requires signage or policy to control tobacco smoke in and around the building. Although not part of this project, the prerequisite is met through Lane Community College policy that prohibits smoking on campus.

LEED awards a point for providing CO_2 monitoring in high occupant load spaces. The design at Building 11 includes CO_2 monitoring in new classrooms and the new conference room. Carbon-dioxide concentrations can indicate a lack of ventilation to a space. This can result in a build-up of indoor air pollutants that can be harmful to users. Building systems include monitoring of CO_2 and resulting HVAC system operation to increase ventilation where needed.

This project did not pursue increased ventilation to meet LEED requirements to be awarded a point for this credit. Increased ventilation tends to increase the HVAC system size, which increases operational costs and building energy consumption. The project included reuse of existing HVAC systems, so this credit was not a good fit. However, the project did provide operable windows for all offices on an exterior wall. This allows users access to increased ventilation and greater control over their thermal comfort.

The project implemented measures to protect indoor air quality during construction and prior to occupancy. This included a complete building flush that was executed before the start of classes in the building. The building flush runs the mechanical system to provide 100% outside air to all spaces until all air within the existing building is completely replaced with fresh outside air. The intent is to remove any lingering gasses from new materials installed including paint, adhesives, or textiles. The management plans and

implementation performed on this project would result in points being awarded under the LEED criteria for two credits.

A significant opportunity in controlling indoor air pollutants exists in material selection during design. By installing materials that have lower concentrations of Volatile Organic Compounds (VOCs), the project limits occupant exposure. Many quality products are available that comply with low VOC requirements. The Building 11 Remodel incorporated only products that meet LEED requirements. The LEED requirements allow various levels of VOC concentration in products based upon current technologies and manufactured products. This sets a high, but attainable standard for product selection. Products considered by LEED include adhesives and sealants, paints and coatings, and flooring systems. Additionally, LEED includes a credit for wood and fiber products used that contain no added urea-formaldehyde resins. All cabinetry and all new wood doors for the project include wood products that contained no added urea-formaldehyde.

The ability for occupants to control artificial lighting within their spaces is critical to comfort and proper use of the spaces. Through the project construction, lighting control in classrooms was designed to exceed the quality of that required by LEED. Classroom lighting includes simple, intuitive controls that provide separate dimming for front of classroom and back of classroom lighting. By doing so, lighting can be appropriately controlled for A/V presentations, testing and concentrated tasks, or for general classroom presentation. LEED also considers the importance of lighting control in offices. The project did not provide task lighting for individuals, but it is intended that use of task lighting will be an option for users. Task lights may be incorporated as part of the building use.

The design for thermal comfort in the Building 11 remodel was carefully considered to maximize the quality of spaces using existing mechanical systems. Under the LEED rating system, the project would gain one point for the Thermal Comfort Design credit because the HVAC system and all new wall systems meet ASHRAE Standard 55 - 2004, Thermal Environmental Conditions for Human Occupancy (with errata but without addenda). LEED allows another point where projects provide a high level of individual control for occupants. Individual control did not fit well with this project because the existing mechanical system has a limited number of zones. The cost to increase zones to the level recommended was not reasonable for the project to consider.

In addition to design for thermal comfort, LEED considers verification after building occupancy. Within any complex system, there is possibility for errors in operation. Without information from occupants, the building managers might have no means of learning of problems so that they can be corrected. As problems go uncorrected, the building operates inefficiently, occupants are uncomfortable, or both. The LEED rating system can award a point to projects where the building operation includes an occupant survey to be conducted between 6 and 18 months following initial building occupancy. It is anticipated that LCC will conduct such a survey for this project.

Finally, indoor environmental quality can be greatly improved by providing natural daylight and views to the exterior. The lack of daylight has been shown to have a negative effect on occupants. Windowless spaces will generate more user complaints, increase absenteeism, and can decrease student confidence.[2] The Building 11 remodel project incorporated windows to offices and maintained or increased windows to all new classrooms. Further, office design included relights so that daylight from exterior offices will be shared across hallways to interior offices. To achieve a point for this credit under the LEED rating system the project must provide at least 75% of the spaces with daylight. This could not be achieved with this building remodel because of existing forms and plan configurations that were not altered.

When providing natural daylight to spaces, the project must consider glare, energy efficiency, and heat gain. All factors can be affected by adding window area. Although windows were added on the south and west elevations where heat gain can be a particular concern, the existing building form provides protection. Covers over the exterior walkway block the high summer sun and shade window surfaces when heat gain could be a serious problem.

2. U.S. Department of Energy, National Best Practices for Building High Performance Schools, 2010.

Innovation in Design:

The LEED Innovation in Design Category offers additional opportunity to implement sustainable building practices to gain points within the LEED rating system. These points can be achieved through exemplary performance or through sustainable measures that are not accounted for by other categories. Sustainable design strategies are constantly evolving as we continue to find new means of making buildings more comfortable and

efficient. The Building 11 Remodel project and ongoing work at Lane Community College merit consideration for additional points under LEED.

Rehabilitation of the existing air handling units is an innovative design strategy that would likely receive one point in this LEED category. Multiple objectives were achieved. First, natural resources were saved by reusing portions of the existing equipment that were in good shape and capable of providing many additional years of service life. Second, there was economic benefit in not having to purchase completely new systems. Cost savings were realized in both maintaining original equipment and avoiding the additional effort of removing equipment from the basement and getting new equipment in place. The energy cost of shipping new components was also reduced because less new equipment needed to be delivered to the site. Finally, the HVAC system, with modifications, provides the thermal comfort needed for building occupants.

Several Lane Community College policies are recognized as sustainable practices by LEED. LCC's active recycling program allows users ample opportunity to divert recyclable materials away from landfills. The Building 11 Remodel included new recycling stations that were coordinated with the overall recycling program needs. Also, LCC does not allow nicotine smoking on campus. This practice has been recognized by LEED as a benefit to environmental quality for project users. Finally, LCC uses green housekeeping practices by selecting environmentally friendly cleaning products and employing Good Housekeeping. Overall, multiple Innovation in Design concepts could provide this project with additional points under the LEED rating system. LEED allows a maximum of five points in this category.

Regional Priority:

The regional priority credits in the LEED rating system offer additional points to projects that pay particular attention addressing concerns that are more important or unique to a region. The particular categories are identified by local boards within each region. Building reuse has been identified by this region, and the Building 11 project shows building reuse of greater than 95%. This would qualify for an additional point. Significant use of FSC Certified wood would qualify for additional credit also, but the use of certified wood in the project remodel fell slightly short of the threshold required by LEED. Other credits identified in this category did not apply well to this project.

Conclusion:

The approach to sustainability at the Building 11 Remodel project is balanced between sustainability goals, economic restraints, and project scope. Success of sustainable design and construction efforts were measured by comparing the project to LEED standards using the LEED rating point system. Although the project would not qualify for LEED certification, several measures were implemented to meet sustainable design goals. A significant portion of the project budget involved seismic upgrades and mechanical

system upgrades. Because of the focus on these components and limit of additional scope, the project was unable to make upgrades in all areas considered by LEED. The approach needed to take advantage of opportunities where available, but also recognize where meeting some thresholds would be impossible.

One of the foundations of LEED and of sustainable design in general is the "triple bottom line". LEED defines these as people, profit, and planet. When thinking about people, we want to create environments that improve health, quality of life, and general well being. As we consider the planet, we look to preserve natural resources, reduce in energy consumption, and eliminate waste and pollution. However, neither people not planet can be properly considered without recognition of the economic impact associated with each of our decisions. By balancing all three considerations, we can achieve a reasonable, but rigorous approach to creating a more efficient and comfortable built environment. This reflects the goals and approach to the Building 11 remodel project.

Addenda

Prepared by the Lane Community College Institute for Sustainable Practices on November 21, 2013

Lane's Bond Project Management Team, the design team, and the general contractor did an excellent job of incorporating sustainability into this small remodel project. However, there are a couple areas with room for improvement:

Recycling

Recycling cabinets were built, but not competed due to communication issues. Placement of the recycling cabinets was removed from final architectural plans despite locations being agreed upon and approved.

Energy Efficiency

Four out of five sub-meters have not yet been connected to the building automation system.

Suggestions for Improvement

- Ensure agreement and communication regarding recycling stations is followed through in final documents and construction.
- Ensure that design team and contractors understand Lane's indoor trash and recycling standards.
- Determine and implement a methodology for ensuring that sustainability features are completed by substantial completion. The methodology may be providing an incentive for completing these items by the move in date.