



Sustainable Existing Buildings Through LEED v4 Operations + Maintenance

Sustainable Built Environments Spring 2017 Capstone Janice Eda Mentor: Colby Moeller



Certification

Certified 40-49 Points	Silver 50-59 Points	Gold 60-79 Points	Platinum 80+ Points
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Introduction

Buildings use up most of the earth's energy, resources, and account for a significant portion of greenhouse gas emissions and global warming. Leadership in Energy & Environmental Design (LEED) uses rating systems to help us understand opportunities for a building to reduce environmental issues and impacts, therefore becoming more sustainable. LEED developed by the U.S. Green Building Council (USGBC) is based on a point system providing awareness and implementation options for buildings to become efficient, regardless if for new construction or one already existing. Whether having a building LEED certified or just want to practice sustainable strategies, concepts from LEED rating systems is a beneficial tool to use as a reference guide. **This capstone was meant to acknowledge and assist the already built structures become a part of the sustainable built environments through the organs of the buildings operations and maintenance.**

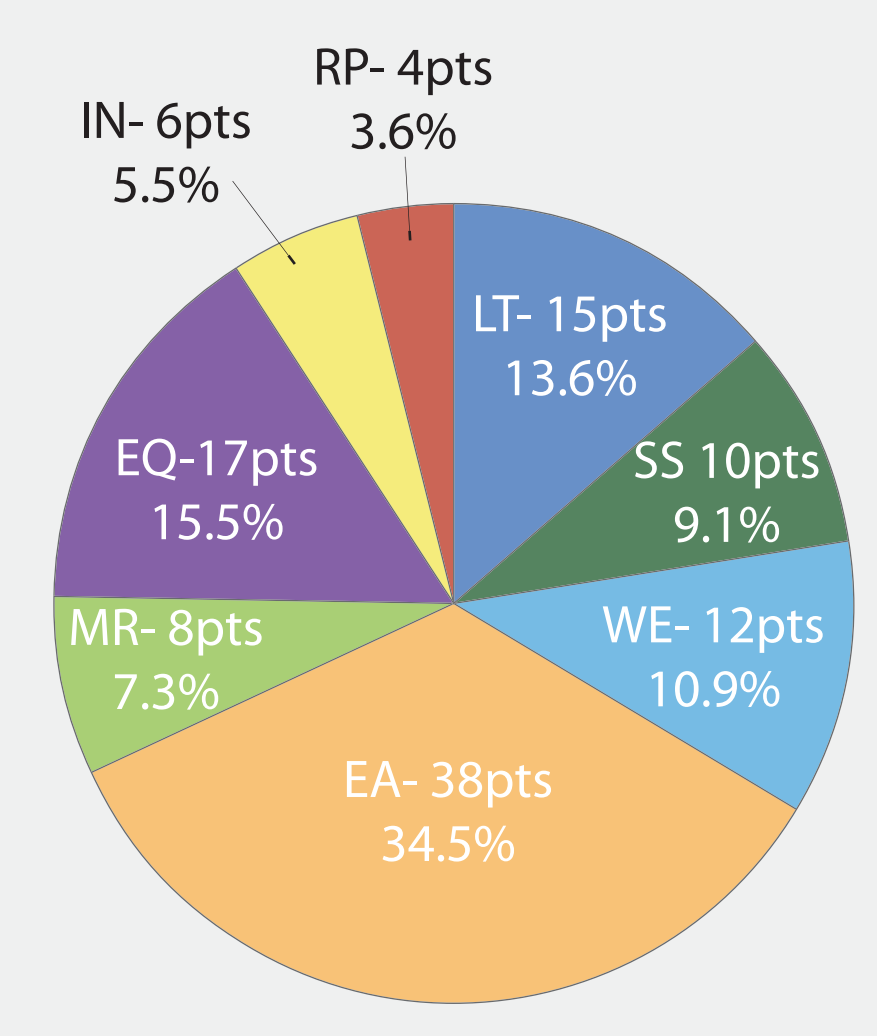
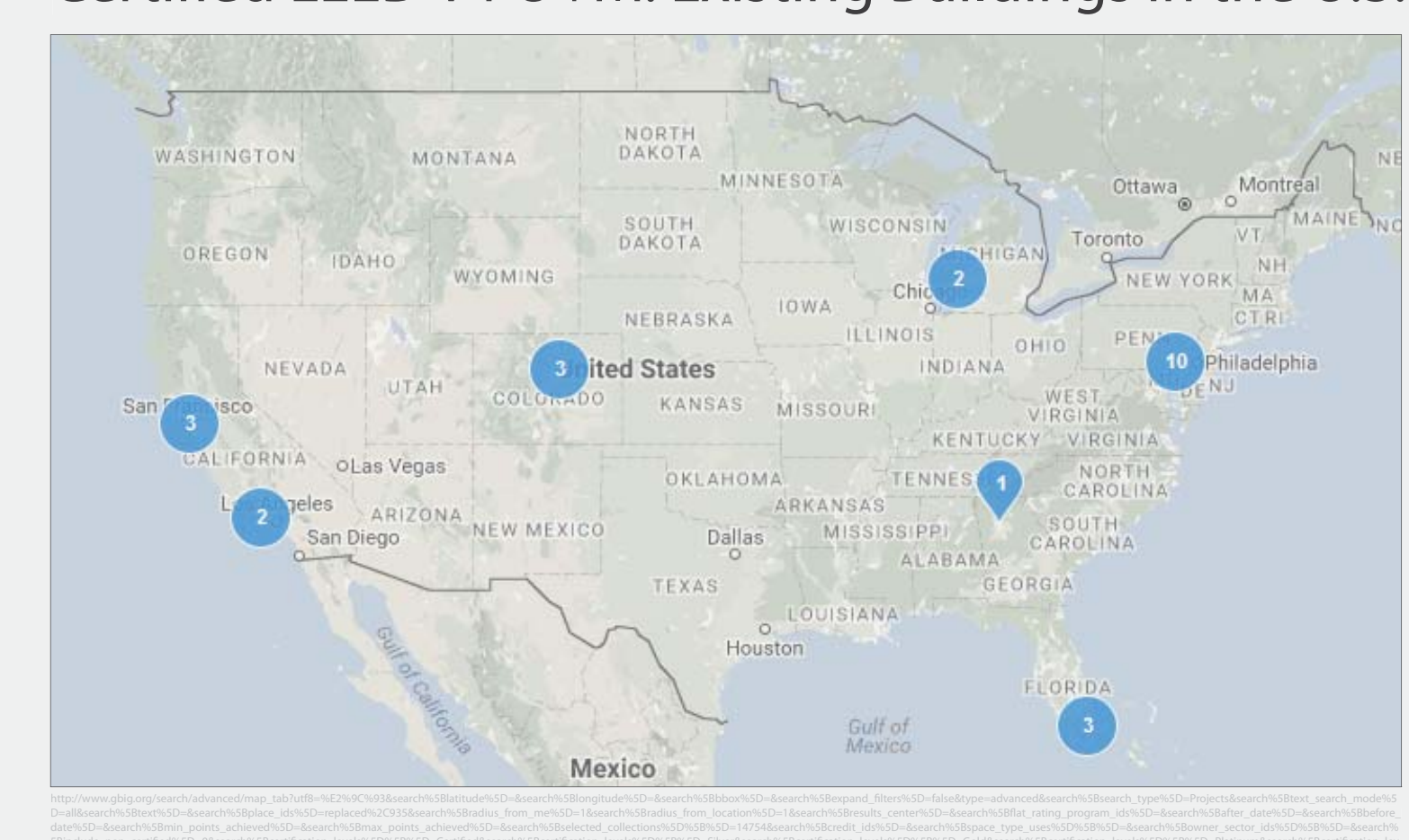
Methods

The research examines three case studies of existing buildings that have become LEED certified using the current rating system of LEED v4: Operations and Maintenance. These three case studies are of different certification levels: Platinum, Gold, and Silver to provide greater feedback on methods implemented and common used strategies. This analysis helps understand how older generation buildings may still rejuvenate and be sustainable to benefit the people, planet, and profit. Other observations include how a Platinum certification building exceeds expectation to receive its recognition. These case studies are located in the United States for better interpretation. The projects are: Energy Resource Center in Downey, California; UCSB Student Resource Building in Santa Barbara, California; and Two PNC Plaza in Pittsburgh, Pennsylvania.

Conclusion

Regardless whether a building was constructed in the mid 1970's, 1990's or just ten years ago, as analyzed with these three case studies, there are strategies and methods to make them sustainable. The greatest contributor among all three case studies involved optimizing energy performance which is the section with the most credits available. As the rating system is titled, operations and maintenance, **each project was improved by readjusting schedules and monitoring the energy use of lighting, sensor readings, and mechanical systems.** The performance period evaluations provide the best feedback to the building owner and manager for areas of improvement. LEED certification does have some drawbacks with its universal approach. Some acquired credits for certification are not always applicable to all buildings causing to lose points, which is how LEED certification is achieved. Another is their certification fees may be considered costly and the process period time consuming.

Certified LEED v4 O+M: Existing Buildings in the U.S.

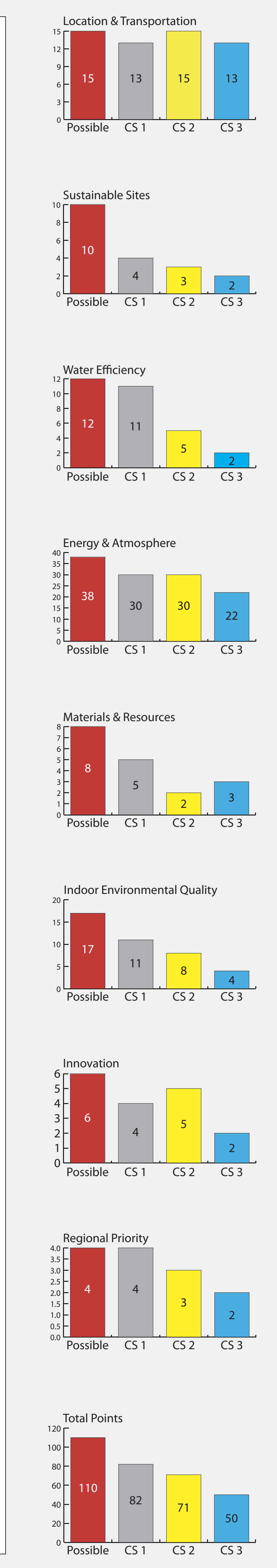


PIE CHART: Each category contribution towards LEED Certification for rating system: OPERATIONS and MAINTENANCE

CATEGORY SCORECARD FOR CERTIFICATION

LEED v4 Operations + Maintenance: Existing Building

Category	Case Study #1	Case Study #2	Case Study #3	
Location and Transportation (15)	13	15	13	
Sustainable Sites (10)	4	3	2	
Water Efficiency (12)	11	5	2	
Energy and Atmosphere (38)	30	30	22	
Materials and Resources (8)	5	2	3	
Indoor Environmental Quality (17)	11	8	4	
Innovation (6)	4	5	2	
Regional Priority (4)	4	3	2	
TOTALS	110	82	71	50



Case Study#1 Platinum

Energy Resource Center - Downey, CA

LEED Facts for LEED O+M: Existing Buildings (v4)

Certification awarded May 2015

Platinum	82
Location & Transportation	13/15
Sustainable sites	4/10
Water efficiency	11/12
Energy & atmosphere	30/38
Material & resources	5/8
Indoor environment quality	11/17
Regional priority credits	4/4

Downey Energy Resource Center is located in Downey, California and initially built in 1957. It was reconstructed in 1995 with 60 percent of the demolition materials reused in new structure or recycled. An additional 20 percent of the building accounts for more recycled and reused materials. The project size is 46,261 square feet. On May 26th 2015, Downey Energy Resource (ERC) scored 82 points out of 110 points total making it LEED Platinum certification. This building was first LEED certified in 2009, then LEED Gold in 2013. Since 2015, it has been awarded the highest certification level and using the most current version of LEED v4 Operations and Maintenance Existing Buildings. The buildings success are the integration of design and building technology. These strategies are: lighting, heating, cooling, insulation, and energy management control systems. Energy usage is 51.39 percent less than the national average and water consumption 38.3 percent less than other commercial buildings its size. This project cost \$7.9 million and estimates saved \$3.2 million in land, utility infrastructure, and building material costs. This upgrade is projected to save \$21,000 to \$30,000 annually in electricity.



Case Study#2 Gold

UCSB Student Resource Building - Santa Barbara, CA

LEED Facts for LEED O+M: Existing Buildings (v4)

Certification awarded Mar 2016

Gold	71
Location & Transportation	15/15
Sustainable sites	3/10
Water efficiency	5/12
Energy & atmosphere	30/38
Material & resources	2/8
Indoor environment quality	8/17
Regional priority credits	3/4

UCSB Student Resource Building (SRB) was built in 2007 as a new construction with sustainability in mind. The building is 68,413 square feet located at in Santa Barbara, Isla Vista, CA. On March 21st 2016, the project was awarded LEED Gold certification using LEED v4 O+M Existing Building. It achieved 71 points out of 110 points possible. This is due to improving operations in regards to lighting, heating, and cooling. Some strategies were surveying users, performing energy audits, updating cleaning and maintenance policies, and replacing aerators on sink faucets. The building has 37 percent energy reduction compared to similar buildings. A contributing factor involves natural ventilation, daylighting, and adjusting lighting and HVAC scheduling. Adjusting the interior lighting schedule estimates saving of about \$3,200 annually. The project was certified by students taking a LEED Lab course on campus led by the two instructors.



Case Study#3 Silver

Two PNC Plaza - Pittsburgh, PA

LEED Facts for LEED O+M: Existing Buildings (v4)

Certification awarded Jan 2017

Silver	50
Location & Transportation	13/15
Sustainable sites	2/10
Water efficiency	2/12
Energy & atmosphere	22/38
Material & resources	3/8
Indoor environment quality	4/17
Regional priority credits	2/4

The Two PNC Plaza is a 34-story office space building originally built in 1975. It is a project size of 605,000 square feet located in Pittsburgh, PA. On January 17th 2017, this building received LEED silver certification for LEED v4 O+M Existing Building. It acquired 50 points out of 110 points possible. Two PNC Plaza is 30 percent more efficient than a comparable building in the United States and reduced utility bills more than 20 percent. Approaches involve: installed LED lights with motion sensors in parking garages and stairwells, eliminating light fixtures and reducing current to remaining fixtures by 50% of most floors, reducing ambient light levels by half in office spaces, programmed lights to automatically shut off during evening hours. An important implementation is the combination of technological and operation behavioral. The renovations plan to payback more for themselves over the next 40 to 50 years and achieve energy savings of \$15 million over five years.

