CHAPTER 2: LEED EBOM

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2.1 Introduction

This chapter of the 2015 audit focuses specifically on Chapman University's iconic Argyros Forum. Using the LEED Existing Building Operations and Maintenance guidelines, recommendations will be made for Argyros Forum with the goal of making the building more environmentally sustainable, decreasing energy consumption, decrease material use and saving money for the university. LEED for Existing Buildings: Operations & Maintenance (LEED EBOM) is a certification system by the US Green Building Council (USGBC). A LEED certification qualifies buildings that are constructed to conserve money and resources through sustainable building designs and thorough consideration of the building occupants comfort level.

LEED EBOM looks specifically at improving the operations and maintenance of existing buildings. The structure of the LEED EBOM certification is broken down into five categories of credits. Each category approaches different aspects that relate to a buildings operation and maintenance. The five categories are the following:

1) Sustainable Sites
2) Water Efficiency
3) Energy and Atmosphere
4) Materials and Resources
5) Indoor Environmental Quality

The USGBC uses a checklist system that allows for participants in the program to score the building to determine whether it qualifies for certification.

This chapter will utilize the LEED EBOM checklist on Argyros Forum. Argyros Forum is a symbolic building on Chapman University's main campus. The building plays a central role in the daily life of students, faculty, staff as well as visitors on main campus. Within Argyros Forum, there are several types of spaces, including lounge areas, offices, classrooms and dining areas. Argyros Forum was built in 1991 and went through a remodel and add-on of 23,361 square feet in 2011.

This project will focus on Argyros Forum because of its prominence in Chapman's culture. According to the Chapman's sustainability policy, the university is "committed to a campus culture that promotes a sustainable future." By taking a step forward and pursuing green building certification, Chapman would demonstrate a commitment to the sustainability policy and appearing as a leader in sustainable building management. This chapter will focus primarily on Sustainable Sites, Energy and Atmosphere, and Materials and Resources due to the relevance to the overall focus of the 2015 audit, examining building construction and energy consumption.

2.1.2. History of Green Building at Chapman University

Chapman University in recent years has taken significant steps to becoming a sustainable and environmentally conscious campus. The university has undertaken many initiatives such as environmental audits, water refill stations and electric vehicle charging stations to further this goal. The Cypress Street School House is Chapman's only building that has received a LEED certification. The Cypress Street School House earned LEED Gold recognition. The building features green cleaning, reduced light pollution, sustainable landscaping and other sustainable features. Even though the Cypress Street School House is the only building with LEED certification, buildings such as Doti Hall, the Digital Media Arts Center (DMAC) and the upcoming Musco Center for the Arts are also built with sustainable design practices that are derived from LEED standards.

2.1.3. Case Study – JohnsonDiversey Global Headquarters, Sturtevant, WI

The JohnsonDiversey Global Headquarters in Strutevant, Wisconsin, went through the LEED EBOM certification[2]. This case study was chosen as a comparison because the headquarters building has many similar characteristics to Argyros Forum. Both buildings include a lounge area, dining services, offices and conference and lecture style rooms. By looking at this case study, the Chapman community can see the financial and environmental benefits for buildings to pursue LEED certification. JohnsonDiversey, now Diversey Inc. has similar commitments to sustainability as Chapman University. Diversey Inc. has many sustainability initiatives, quoted below is Diversey's commitment to the environment.

"Our commitment to reduce our greenhouse gas emissions, our leadership in water management and our partnerships to project the earth are essential elements of our dedication to environmental stewardship and industry leadership."

By going through the LEED EBOM process, Diversey Inc. was able to contribute to this mission. Benefits that were due to the process of LEED EBOM include the following:

- $90,000 energy savings per year
- 2-4 million gallons of potable water saved per year
- 50% of solid waste now gets recycled
- Increased occupant comfort levels in terms of lighting, air and temperature
- Increased interest in environmental issues and the building's environmental impact among the buildings occupants
- $137,320 annual net savings with a 0-5 year return of investment

This case study also demonstrates several challenges and limitations that JohnsonDiversy faced. These challenges and limitations are important to note because they might be ones that Chapman University may face as well. Certain challenges that are applicable include:

- Cooperation and implementation of new standards to contractors
- Communicating new policies to building occupants and encouraging occupants to embrace changes
- Planting of native species in areas that had already been disturbed

**The case study can be found here*

2.2. Applying LEED EBOM Checklist to Argyros Forum

The LEED checklist is separated into different categories. In each category, there are various "credits". Buildings earn points for fulfilling the requirement for each credit. The various LEED EBOM rankings are determined by the amount of points that are earned by each credit as follows:

- LEED EBOM certified – 40 to 49 points
- LEED EBOM silver – 50 to 59 points
- LEED EBOM gold – 60 to 70 points
- LEED EBOM platinum – 80 to 110 points

For example, in the Materials and Resources section, credit 5 looks at sustainable purchasing of foods. If food products provided in Argyros Forum are purchased from local vendors (100 mi radius) and are certified to be sustainable then 1 point is given. It is also important to note that not all credits need to be fulfilled. As shown above, the amount of points earned determines various levels of certification, the more points earned the higher level of qualification is received.

**An in-depth explanation of each credit can be found in the LEED EBOM 2009 Manual*

2.3 Sustainable Sites: findings and recommendations

Yes	?	No	Credit	Sustainable Sites	Points possible (26)
		x	1	LEED Certified Design and Construction	4
	x		2	Building exterior and hardscape management plan	1
	x		3	Integrated pest management, erosion control and landscape management	1
	x		4	Alternative commuting transportation	3 - 15
	x		5	Site development – protect or restore open habitat	1
	x		6	Storm water quantity control	1
	x		7.1	Heat island reduction – non roof	1
	x		7.2	Heat island reduction – roof	1
x			8	Light pollution reduction	1

Findings show that Argyros Forum has the potential to fulfill many of the sustainable site LEED requirements, despite not having gone through the LEED process. The LEED credits for items such as building exterior and hardscape management plan, integrated pest management, and erosion control could easily be implemented. The majority of these credits are actually already common practice in Argyros Forum; however, there are no written policies or documentation indicating these practices. Sustainable Sites also addresses the transportation means of building occupants. Chapman University has several sustainable transportation incentives. Programs include bike voucher programs, public transportation rebates programs, rideshare incentives, bicycle parking and electric vehicle charging stations. Within the 2015 Environmental Audit: Energy and Building Construction Survey that was distributed among faculty and staff at Chapman University, collected data suggesting that some of Argyros Forum's building staff and faculty take alternative transportation to work, however, the majority still drive a single occupant vehicle.

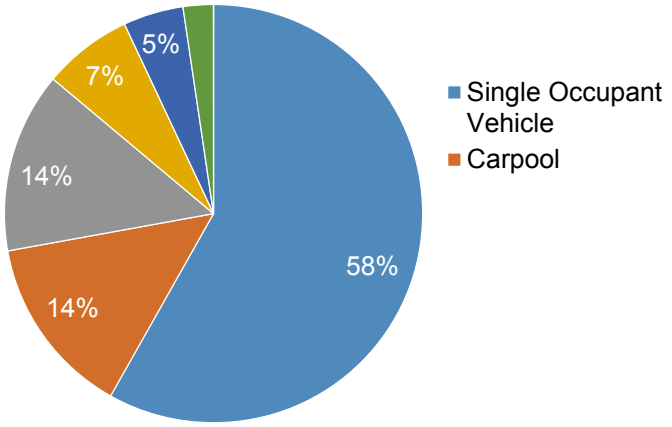

Figure 1: Responses from faculty and staff on which of the following methods of transportation do they use to get to campus? (Faculty and staff that work in AF)

Facilities management has also been working on improving areas around Argyros Forum and installing bioswales to capture storm water and provide quantity control, in addition to adding and native landscape. Several areas around the building are being restored with native plants such as the area between Argyros Forum and Hashinger Science Center. BioSwales are systems that control storm water runoffs that have the ability to absorb a certain amount of water and direct excessive water to storm sewer inlets. BioSwales are beneficial because they work to filter out pollutants that usually flow straight into storm sewers[3].

There are no current plans or policies that address heat island reduction on the roof and of the building, however, the Argyros Forum's roof has potential for changes to address these issues. Lastly, with compliance to the City of Orange's regulations, lights around the building exterior of Argyros Forum are controlled for light pollution.

Recommendations

A substantial portion of the Sustainable Sites requirements calls for implementation of formal plans for how the buildings and surrounding areas are managed. These plans are highly feasible for Argyros Forum considering most of these practices are already taking place. The development of formal plans and policies would ensure that building management and contractors that work in areas such as cleaning and pest management follow guidelines that promote a healthy workspace and are environmentally sustainable. These plans could be adapted from plans that exist for the Cypress Street School House.

Transportation should be addressed university-wide. The City of Orange and Chapman University have easy access to public bus line and train stations. Incentive programs should be increased. For example, programs that give building occupants rewards would highly encourage people to use alternative transportation methods and not commute alone. Santa Monica College in Los Angeles has a “Be Ride Get Green” sustainable transportation incentive program. For faculty, staff or students that use alternative transportation methods, they become eligible to receiving cash back every month[4]. Chapman University should encourage students to participate more in the Bike Voucher Program because a high percentage of students live nearby school but still drive single occupant vehicles. In the 2013 Environmental Audit, survey data showed that 60% of students that drove to school lived less than five miles from campus.[9] More publicity on this program is recommended. Furthermore, it would be helpful if participating bicycle shops in the program tabled on campus to promote their products along with the program.

The roof space of Argyros Forum can be used more efficiently. Currently, the roof acts as a large heat island due to its color. In order to reduce the heat island effect, it is recommended that the roof gets painted white.

2.4 Energy and Atmosphere Energy: findings and recommendations

Yes	?	No	Credit	Energy and Atmosphere	Points possible (35)
		x	1	Optimize energy efficiency performance	1 -18
			2.1	Existing building commissioning – investigation and analysis	2
			2.2	Existing building and commissioning – implementation	2
			2.3	Existing building – ongoing commissioning	2
x			3.1	Performance measurement – building automation system	1
x			3.2	Performance measurement – system level metering	1-2
		x	4	On-site and off-site renewable energy	1 – 6
	x		5	Enhanced refrigerant management	1
		x	6	Emission reduction reporting	1

Argyros Forum has never undergone extensive lighting retrofits and retrocomissioning. An extensive analysis of the lighting used in the building would conserve a significant amount of energy and money. A simple walkthrough of the building showed many inefficient uses of lighting. Several areas in the building receive extensive sunlight during the day; however, lighting fixtures are still being kept on. Areas such as the bookstore and Jamba Juice have lights on throughout the day, which make no difference in brightness during daylight hours.

Another issue in terms of lighting in Argyros Forum is lack of consistency. For example, when walking in the kitchen area, lighting fixtures vary from one side of the kitchen to the other. Some fixtures have been retrofitted to be more efficient, meanwhile others are still the same fixtures from 1991. Other inefficiencies in the building include lights in hallways that shine towards the wall.

The hallways are well lit, making it unnecessary for lights to be shining on walls. Another observation that shows wasteful use of energy is that many empty classrooms were left with lights on.

Argyros Forum has a building automation system that is very efficient. Building automation systems or building management systems are centralized control of a buildings heating, ventilation, air-conditioning, lighting and other systems. These systems can be accessed remotely.[5] This is beneficial because facilities management is able to detect any wasteful use of energy and make changes as needed, however, the systems are not utilized to their full capabilities.

Recommendations

Argyros Forum needs a thorough lighting investigation and retrofit effort. Some changes have been made throughout the years that have updated lighting fixtures to a more environmentally sustainable option; however, these changes are largely inconsistent and located randomly throughout the building. There are several lights that are used that are not contributing to the brightness of a space. Furthermore, many of the areas receive plentiful sunlight that could be used more effectively.

Argyros Forum would benefit from the installation of occupancy sensors, light dimmers and an increase use of task lighting. During a brief walkthrough of the building, many classrooms and offices that were empty still had lights on. Occupancy sensors would help eliminate waste because they would detect when the space is no longer occupied. Light dimmers should also be installed so that users can control the brightness of the room. During the walkthrough of Argyros Forum, it was observed that several offices actually had requested the installation of dimmers because the existing light fixtures were too bright. Dimmers would conserve energy and also increase the comfort of building occupants. Lastly, an increase in the use of task lighting such as lamps in offices would decrease energy consumption.

2.5 Materials and Resources: findings and recommendations

Yes	?	No	Credit	Materials and Resources	Points possible (10)
		x	1	Sustainable purchasing: ongoing consumables	1
x			2.1	Sustainable purchasing: electric powered equipment	1
	x		2.2	Sustainable purchasing: furniture	1
	x		3	Sustainable purchasing: facility alterations and additions	1
x			4	Sustainable purchasing: mercury lamps	1
	x		5	Sustainable purchasing: food	1
	x		6	Solid waste management: waste stream audit	1
	x		7	Solid waste management: ongoing consumables	1
x			8	Solid waste management: facility alterations and additions	1

As a constantly growing school, Chapman University has a high demand for materials and resources. Chapman University does not have solidified policies regarding sustainable purchasing. The majority of on-going consumables such as office supplies are purchased through Office Solutions. Two policies exist regarding purchasing.

1) All copy paper for campus must be made with 30% post consumer waste content.
2) All electrical equipment purchased for use on campus is required to be Energy Star certified items

Sodexo is the food vendor in Argyros Forum. Purchasing choices made by Sodexo incorporates sustainable purchases. In the 2013 Environmental Audit, dining services on Chapman's campus were examined and findings showed that Sodexo uses only Energy Star equipment and fresh foods purchased by Sodexo are locally sourced when possible (150 miles)[6]. Sodexo as a company is very dedicated to sustainability. They have a corporate program called the "Better Tomorrow Plan" that addresses goals and practices to help make their company choices more sustainable[7]. These choices directly impact the types of foods received on Chapman's campus since Sodexo is the main vendor.

Chapman University does not have any formal policies regarding waste management. Argyros Forum has recycling bins throughout the building and outside Argyros Forum near Jamba Juice and Einstein's Bagels; there are Big Belly Solar compacting trash bins.

* *The "Better Tomorrow Plan" can be found here.*

Recommendations

Chapman University needs to implement a sustainable purchasing policy. Following LEED guidelines, a certain percentage of purchases should be sustainably sourced, recycled and energy efficient. Creating a sustainable purchasing policy is very achievable since many university contractors, such as Sodexo and Office Solutions already makes sustainable choices. Gonzaga University implemented a sustainable purchasing and design policy in November of 2011. Their purchasing policy directly supports the overall sustainability policy. Chapman University has many similar qualities as Gonzaga, making the implementation of a sustainable policy a very feasible option. The population on campus and size of campus are similar. Furthermore, Gonzaga also uses Sodexo as the primary food vendor. Gonzaga's sustainable purchasing policy is quite extensive, addressing purchasing aspects such as furniture, ongoing consumables, bio-based products, packaging, food and landscaping[8].

**For more information on Gonzaga's sustainable purchasing policy here*

A massive amount of materials and resources are brought into the university, however, there are no record keeping or formal policies regarding where or how these materials and resources are discarded once they are no longer needed. Chapman University needs to undergo a thorough waste stream audit in order to identify how much of certain waste types are being produced and to identify whether waste is being properly trashed or recycled. Once that is conducted, formal policies should be made in terms of sustainable waste disposal practices.

2.2 Challenges and Limitations

This project is limited in scope as it only examines three aspects of the LEED EBOM requirements. For a complete analysis of whether Argyros Forum would qualify for LEED certification, water efficiency and indoor environmental quality must also be assessed.

Challenges that were met in this project included gathering data from contractors. Since Argyros Forum is operated with high dependence on contractors, not all data in terms of operation and maintenance are available from these contractors and sometimes communication with contractors is slightly more difficult than communication with university staff. To overcome these challenges, it was important to remain persistent and build a strong communication channel.

2.7.1 Low cost/effort recommendations

Several recommendations made in this project are simple changes that have very low costs. These recommendations include:

1) Implementation of formal plans for how the buildings and surrounding areas of Argyros Forum are managed.

2) Painting the roof of Argyros Forum white to reduce the heat island effect.

3) Improvement on using the building automation system in Argyros Forum to better manage consumption

2.7.2 Moderate cost/effort

Recommendations that involve moderate costs and effort include:

1) An increase in promotion and advocacy of campus alternative transportation incentive programs.
2) Conduct a waste stream audit.

2.7.3 High cost/effort

Recommendations that involve high costs and effort include:

1) A thorough lighting audit for the entire building.
2) Installation of occupancy sensors, light dimmers and increase use of task lighting.
3) Formation of a sustainable purchasing policy.

2.8 Conclusion

Argyros Forum has the potential to be more environmentally sustainable by achieving LEED certification. The recommendations made could decrease resources, energy and increase building occupant comfort. As part of Chapman's effort to fulfill its sustainability policy, green buildings would allow for the university get one step closer to the goal.

2.9. Contacts

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