9/29/2023

Winter Park Azalea Lane Recreation Center

ASHRAE Level II Energy Audit

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Executive Summary

TLC Engineering Solutions (TLC) and 15 Lightyears performed an ASHRAE Level 2 facility energy audit of the Winter Park Azalea Lane Recreation Center as a part of a contract with the City of Winter Park.

This report is related to the energy-consuming systems only and is intended to fulfill the requirements of an ASHRAE Level 2 Energy Audit, per the guidelines set forth by the ASHRAE document "Procedures for Commercial Building Energy Audits." The purpose was to observe existing conditions and gather information that would enable TLC to render an opinion concerning conditions or deficiencies that could affect efficient use of this facility, and to identify potential areas for improvement. Neither the field visits nor this report is intended to uncover hidden defects or the presence of hazardous materials.

TLC reviewed the as-built design drawings dated 1975 and 1976, current utility bills from January 2021 through December 2022, subsequent project documentation, and visited the site in January 2023 to review the mechanical and electrical equipment, the HVAC and lighting, and observe each space type and its general energy use intensity. In the course of its work, TLC obtained extensive photo documentation of the conditions of the facility. Several of the photographs are included in Appendix C of this report, and the reader is encouraged to thoroughly review the photographs and descriptions, as they are intended to support and supplement the observations described herein.

After the time on site, TLC developed energy saving spreadsheets to assist with the analysis of recommended Energy Conservation Measures (ECMs) and Facility Improvement Measures (FIMs). The combination of all the walkthrough and post-walkthrough activities led to the development of the ECM and FIM list. A complete description and analysis of each ECM, as well as a table summarizing estimated cost and savings of each measure, can be found later in this report in the Energy Saving Opportunities section.

Project Information & Contacts

ASHRAE Level II Audit of the Winter Park Azalea Lane Recreation Center
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General Facility Description

The Azalea Lane Recreation Center is a one-story civic building of approximately 1,976 square feet. An aerial view of the Azalea Lane Recreation Center is shown below.

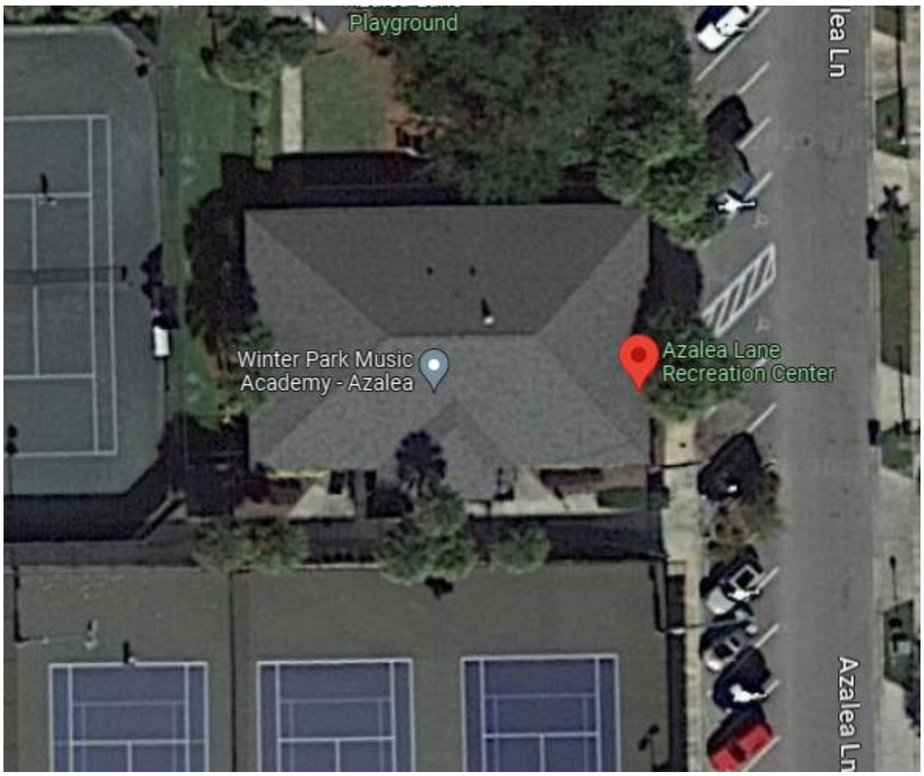


Figure 1: Aerial View of the Azalea Lane Recreation Center

The recreation center houses a meeting room, a recreation room, an office, a game storage room, a kitchen, and a restroom.

Mechanical Systems

The original mechanical systems for the Azalea Lane Recreation Center appear to have been replaced between 1997-2013, depending upon the individual piece of equipment. Overall, the building utilizes split-system air conditioners and exhaust fans to provide heating, cooling, and ventilation. Mechanical system information was obtained from a combination of resources, including information gathered during TLC's audit walk-through of the building and building automation system review, and drawings provided by the City of Winter Park (dated April 14, 1976). The below breakdown of the mechanical systems and areas they serve is TLC's best attempt to consolidate all avenues of information into one master list.

Equipment Naming Convention

The general naming convention used on the mechanical drawings is shown below. Please note, this convention applies to most of the equipment, but not all equipment.

AHU-1

Equipment Type (ie, AHU = Air-Handling Unit) | Equipment ID Number

Air Handling Units

Air conditioning for the majority of the building is provided by two (2) split-system air conditioning units and two (2) packaged air conditioning units. AHU-1 serves the West side of the building, while AHU-2 serves the East side of the building. The split-systems were installed in 1997 and 1998 and have a capacity of 5 tons each. The wall-mounted packaged AHUs each have a capacity of 2 tons.

Exhaust Fans

Exhaust fans were observed, providing general exhaust for restrooms located within the building.

Building Controls

The building is not currently controlled by a centralized Building Automation System (BAS). The HVAC equipment operates in a standalone manner, with each unit operating via a thermostat located in the space. Exhaust fans are energized and de-energized via the wall switch that controls the restroom lights.

Lighting Systems

Interior lighting throughout the facility is predominantly linear fluorescent fixtures utilizing T8 lamps. The lighting is controlled manually with no occupancy controls.

Domestic Water Fixture (Plumbing) Systems

The building is served by one (1) electric water heater. The water heater has a capacity of 30 gallons, and uses up to 4500 watts.

Building Envelope

The building envelope systems date to the original construction of this facility. The Recreation Center is a block building with a sloped asphalt shingle roof and operable windows. The attic is vented through the eaves at the perimeter to prevent overwhelming heat buildup in the attic. However, the level of attic insulation was unable to be verified at the time of the audit and may contribute to the high EUI of the building.

Key Operating Parameters

The park is currently operated 8am to dusk. The Recreation Center is open during this window of time; however, the building is available for rent and operating hours may vary due to the timing of events.

Site Visit

The site was audited by TLC engineers and 15 Lightyears personnel in January 2023. A full evaluation of existing energy consuming systems, compliant with ASHRAE Standard 211-2019 was performed. During the audit, TLC personnel were escorted by the City of Winter Park facilities manager, Leif Bouffard. He, as well as any facility staff that were available for comment, were questioned on system operation, condition, and maintenance of the building systems.

Utility Analysis

Historical Utility Data

The building is currently provided with electricity and water utilities by the City of Winter Park. Electrical utility consumption and demand values were provided for the months of January 2021 through June 2023. The monthly consumption profile appears to vary throughout the year with seasonal usage of the Recreation Center. No specific costs or utility bills were provided, but a blended rate for kWh savings was determined based on the published rates for consumption and demand. Calculation of the blended utility rate takes into account the non-fixed costs associated with electrical utilities use by the facility, including fuel charges, per-kWh cost, demand charges, etc. Table 3 details the components of the blended rate calculation.

Table 1: Annual Baseline Energy Consumption

Utility	Total
Annual Electrical Consumption (kWh)	148,764
Annual Electrical Cost	-

The following graph and table show the total consumption and demand per monthly billing period for electricity.

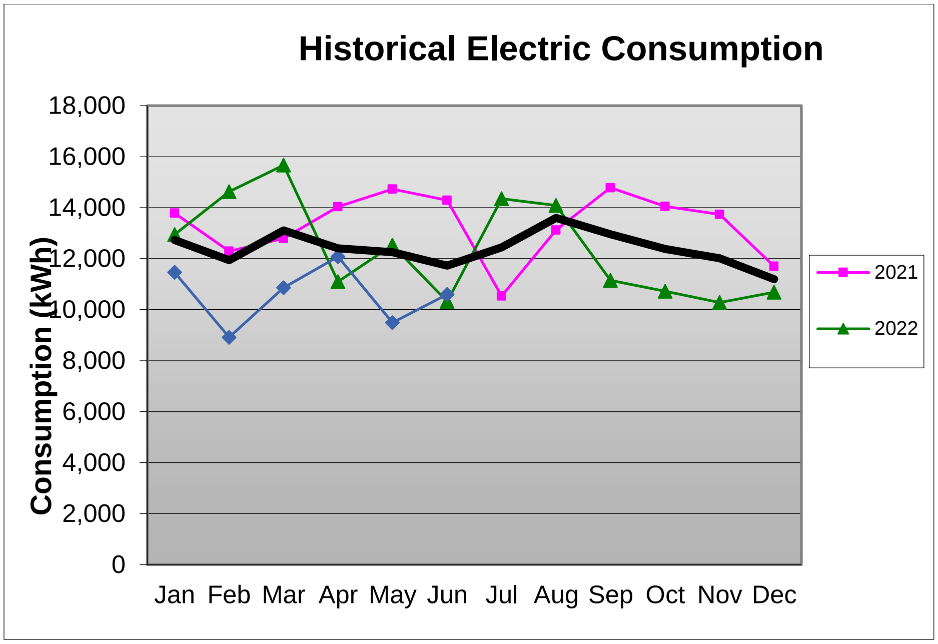


Figure 2: Azalea Lane Recreation Center Electric Consumption

Table 2: Azalea Lane Recreation Center Electricity Consumption Data

Date	Consumption (kWh)	Demand (kW)
Jan-21	8,700	89.4
Feb-21	8,940	100.2
Mar-21	9,420	95.4
Apr-21	9,600	94.8
May-21	10,800	91.8
Jun-21	11,100	91.8
Jul-21	8,220	91.8
Aug-21	10,260	45.6
Sep-21	11,520	44.4
Oct-21	10,320	44.4
Nov-21	8,880	45.6
Dec-21	7,200	45.6
Jan-22	8,700	45.6
Feb-22	8,940	51
Mar-22	9,420	46.2
Apr-22	9,600	46.2
May-22	10,800	46.2
Jun-22	11,100	46.2
Jul-22	8,220	46.2
Aug-22	10,260	45.9
Sep-22	11,520	45.9
Oct-22	10,320	45.9
Nov-22	8,880	45.9
Dec-22	7,200	45.9

Date	Consumption (kWh)	Demand (kW)
Jan-23	8,640	45.9
Feb-23	6,540	45.9
Mar-23	8,580	45.9
Apr-23	9,900	45.9
May-23	8,220	45.9
Jun-23	9,600	45.9

Benchmarking

TLC compared energy consumption utilizing a common benchmark to gauge how the Recreation Center compares to similar buildings nationally. The primary means of comparison is the Energy Use Intensity (EUI), which is used by energy engineers to determine overall energy consumption to a common unit of measure. The Energy Use Intensity measures annual consumption of electricity per square foot, in kBTU/sf/year.

This common benchmark for energy usage is nationally recognized. Using the utility billing information, performing energy analysis and observing the system operation allows the energy profiles to be broken down to greater detail. The building was entered into Energy Star Portfolio Manager as a meeting hall.

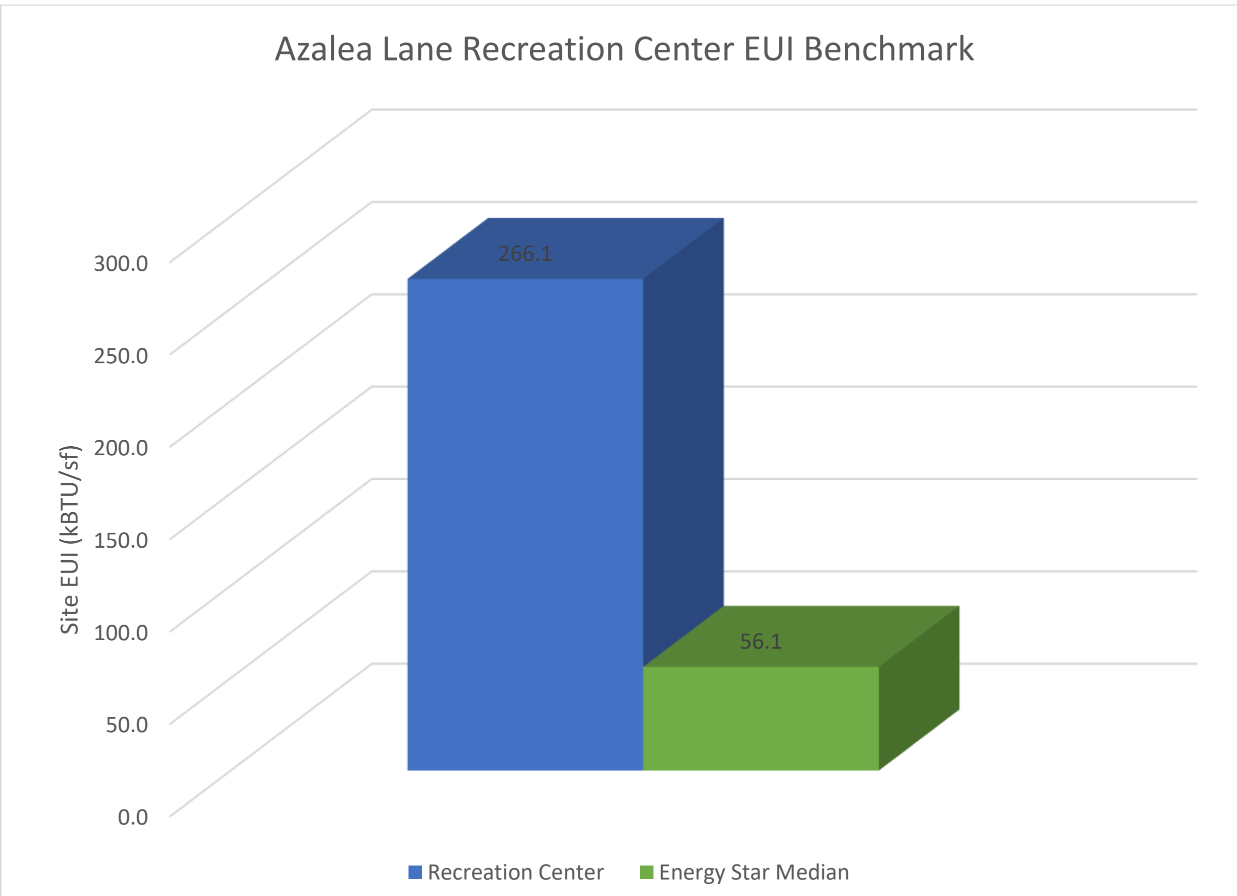


Figure 3: Azalea Lane Recreation Center Energy Performance Comparison

Based on most recent 24 months of utility data, a comparison can be drawn between the Recreation Center and the average energy use intensity (EUI) of similar buildings throughout the United States. The median EUI for a meeting hall in the United States is 56.1 kBTU/sf, and the calculated EUI of the Community Center is 266.1 kBTU/sf. It is worth noting that the median value reported by Energy Star is dependent on the annual responses from building surveys, and that the occupant load of buildings of the same type can vary significantly. The Recreation Center's EUI is significantly higher than the median. The energy conservation measures detailed in this report will serve to decrease the EUI of the facility.

Utility Rate Analysis

The building is provided with electricity by the City of Winter Park (CoWP), following their Rate Schedule GSD-1, General Service – Demand. The utility rate charges shown below were used to calculate the costs associated with the provided consumption and demand. Energy savings calculated for this building have been assigned a blended rate of $0.1127/kWh, which is the calculated blended rate not including fixed customer charges.

Table 3: Utility Rate Schedule

Description	Charge
Demand Charge	$5.05 per kW of billing demand
Energy Charge	$0.04216 per kWh
Fuel Cost Recovery Factor	$0.02281 per kWh
Gross Receipts Tax	2.5641%
Franchise Fee	6.00%
Electric Utility Tax	10.00%
EL State Sales Tax (Commercial Only)	7.45% (First $5,000)
EL State Sales Tax (Commercial Only)	6.95% (Over $5,000)

Average Rates

As noted above, a blended cost per kWh has been calculated from the rate schedule. Savings for this building have been calculated using the blended rate. The following table details the average rate over the period of analysis.

Table 4: Average Utility Rate

Utility	Average
Electricity	$0.1127/kWh

Energy Saving Opportunities

The operation and condition of equipment at the Azalea Lane Recreation Center building was observed to offer a few different avenues for improvement. This is to be expected given the age of the equipment itself and how long it has been in service. Improvements can be made by replacing the aging equipment as well as optimizing the control sequences and settings. The following table summarizes the recommended ECMs for this facility that should be considered for future projects. In addition, the table distinguishes between measures specifically intended to save energy (ECMs) and facility improvement measures (FIM) that benefit the overall operation of the facility but may not provide significant energy savings.

Table 5: ECM/FIM Summary

Energy Savings Measure	FIM/ECM	ECM Category	Annual kWh Savings	Annual $ Savings	Cost $	Payback (years)
HVAC Dx Unit Replacement	ECM	Moderate Cost	2,302	$259	$6,145	23.7
HVAC Controls Optimization	ECM	Low Cost	991	$112	$610	5.5
Interior Lighting	ECM	Low Cost	2,885	$325	$1,344	4.1
DHW Retrofit	FIM	Capital Improvement	--	--	$1,189	--
Totals			**6,178**	**$696**	**$8,099**	**11.6**

*ROI calculations exclude capital improvement items, as they are intended more for facility improvement than for energy savings.

The cost and paybacks shown in the table above are estimates based on the information gathered during the auditing process. TLC utilized RSMeans 2023, as well as engineering best practices, to estimate the cost of these suggested measures. Final pricing will vary based on contractors' estimation and final equipment selections. Final payback periods are also dependent on contractor pricing and the facility's negotiated utility price.

Packaged DX Unit Replacement

General Description

This measure proposes replacing an existing Bard Packaged Wall Unit, which is at or nearing the end of its predicted useful life. Direct expansion (DX) air conditioning equipment consists of a refrigerant loop, in which the refrigerant is compressed and expanded at different points of the loop to transfer thermal energy. Typically, a refrigerant coil is placed directly in the supply air stream, where the refrigerant absorbs thermal energy as it evaporates and expands. Thermal energy is rejected at a compressor, where the refrigerant is compressed and condenses, rejecting the heat that was removed from the supply air steam.

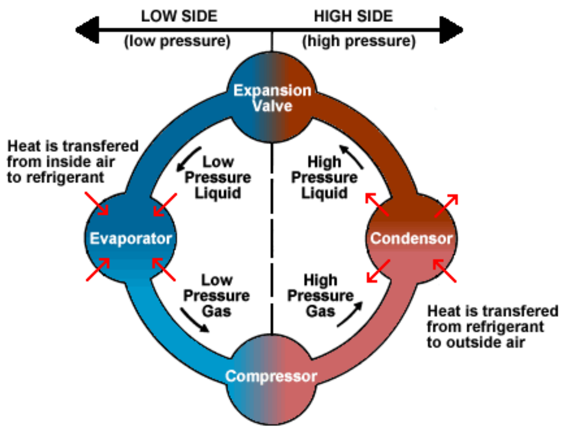


Figure 4: The Refrigeration Cycle

Over time, HVAC units degrade in operational efficiency as coil surfaces oxidize on the exterior and sometimes scale on the interior which reduces heat transfer efficiency. The moving mechanical components also wear, which further reduces the operational efficiency of the equipment. The new equipment will be installed in place of the existing equipment, including providing new refrigerant line sets for all split systems.

Advances in technology and improvements necessitated by energy code updates have led to DX equipment available today with far higher efficiencies than what was used in the past. Replacing the existing systems with new higher efficiency systems will reduce energy consumption and provide improved occupant comfort.

Site Specifics

The Bard Wall Unit was observed to be nearing the end of its expected useful life and in need of replacement. This measure proposes to replace the existing split system with a like-for-like replacement. As stated above, the newer system will be more efficient than the existing system and will result in slight energy savings.

When applying this strategy, consideration will be taken to maintain high enough airflow to keep sufficient ventilation in all spaces, and enough air velocity to maintain proper throw from diffusers.

HVAC Controls Optimization

General Description

The scope for this ECM involves optimizing the building HVAC controls through one or multiple controls strategies. For this project, the controls strategy recommended would be replacing the existing thermostats for HP-1 and HP-2 with smart thermostats capable of occupancy scheduling with setback temperatures.

Consistent occupied and unoccupied temperature settings will be implemented based on the building type and their needs. Occupied schedules for the HVAC controls will be set up to dictate the hours when the building is considered occupied versus unoccupied. Whenever a building enters unoccupied mode, the building HVAC controls will utilize the unoccupied settings in lieu of the occupied settings.

Site Specifics

Even though the building is not a 24/7 facility, the thermostats have been found to be set to 73F at all times. This facility would benefit from the implementation of controls schedules based on its hours of operation of 8am – 6pm 7 days a week. HVAC controls will be given setback temperature settings to use during unoccupied conditions. Operating portions of the building at setback temperatures will result in energy savings due to the HVAC systems not having to work as hard to condition these areas when unoccupied.

Lighting Improvements

General Description

This measure involves converting older style lighting fixtures, such as fluorescent and incandescent, to modern LED lighting fixtures and lamps. Unless a building has been built or renovated in the past few years, it is common to find extensive use of fluorescent and incandescent fixtures throughout the building. Fluorescent and incandescent lighting technologies are a product of their time and often remain without intentional replacement. Older lighting technologies require more wattage to produce the same amount of light as LED fixtures. This also results in a higher heat output from the lamps which raises HVAC cooling costs.

Existing fluorescent and incandescent lighting fixtures will be replaced/retrofitted with new LED lighting fixtures. This will greatly reduce the energy required to illuminate the building. Additionally, cooling systems will have to run less often to offset the heat generated by the lighting. There are several additional benefits to LED lighting technology. LED lighting has longer burn hour life, faster on/off response time, and easier dimming capabilities compared to fluorescent and incandescent technologies. Because LED light fixtures have longer burn hour life, this will reduce the material and time cost of replacing burned out lamps.

Site Specifics

The facility was observed to have predominantly linear fluorescent fixtures with T8 lamps. Existing non-LED lighting will be replaced with new LED lighting on a one-for-one basis. Existing lighting material waste will be disposed of according to local regulations.

Facility Improvement Measures

TLC identified additional Facility Improvement Measures (FIM) that do not provide energy savings but should be addressed. By implementing the recommended FIM, the facility will experience improved equipment reliability, increased thermal comfort for occupants, and be able to operate as originally designed. While it is possible that these measures may decrease energy consumption, this has not been quantified as their purpose is focused on performance and reliability.

DHW Retrofit

Domestic hot water for the facility is provided by an electric water heater manufactured in 1997. This water heater is at the end of its useful life and a scheduled replacement is recommended to preemptively avoid any unplanned maintenance to the facility.

Calculation Methodology – Spreadsheet System Models

Savings for this report were evaluated using spreadsheet building models for the lighting and HVAC systems. The methodologies used for each measure are described separately in this section. Industry Standard methods of evaluation were used and are detailed in this section. Additionally, assumptions made to calculate the energy savings are detailed.

DX Unit Replacement

Savings for this measure have been based on an improvement in the efficiency of the DX equipment. The following table shows the major inputs used in the calculation of savings for this measure.

Table 6: DX Unit Retrofit Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Wall Unit Rated Capacity	Wall Unit	2 tons	Manufacturer info
Wall Unit Existing Efficiency	Wall Unit	8.17 SEER	Mfg. info and typical degradation for age
Wall Unit Proposed Efficiency	Wall Unit	16.0 SEER	Engineering judgment
Effective Full Load Hours	Wall Unit	1,600 hr./yr.	Estimate based on project location

Calculations:

Savings for this measure were based on calculating the energy consumption of the DX equipment with the existing and proposed efficiencies. The unit's energy consumption in kWh was calculated with the following formula.

$$Energy\ Consumption = Tons \times \left(\frac{12}{SEER}\right) \times Effective\ Full\ Load\ Hours$$

In the formula, the terms in the bracket yield efficiency in kW/ton.

HVAC Controls Optimization

Savings for this measure have been based on a reduction in cooling energy due to setting back non-critical portions of the building that are not always occupied. The following table shows the major inputs used in the calculation of savings for this measure.

Table 7: Controls Optimization Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
% Cooling Energy Reduction	Entire building	5%	Engineering judgment

Calculations:

Savings for this measure were based on calculating the annual cooling energy and saving a percentage of it. The existing annual cooling energy was calculated from the electric utility baseline as the sum of all the electrical consumption for each month exceeding the lowest month's consumption. The following formula was used to calculate existing annual cooling energy.

$$Existing\ Cooling\ kWh = Annual\ Total\ kWh - (12 \times Baseload\ Month\ kWh)$$

Interior Lighting Improvements

Savings for this measure have been based on a reduction in the lighting energy based on a reduction in lighting installed wattage. The following table shows the major inputs used in the calculation of savings for this measure.

Table 8: Interior Lighting Improvements Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Building Area	Entire building	1,976sf	Provided value
Existing Lighting Power Density	Entire building	1.0 W/sf	Typical value for T8 lamps throughout
Proposed Lighting Power Density	Entire building	0.6 W/sf	Typical value for LED lamps throughout
Annual Burn Hours	Entire building	3,650	Building schedule

Calculations:

Savings for this measure were comprised of energy savings. The energy savings were the difference in the existing and proposed kWh for all the lighting fixtures in the building. The energy usage in kWh for the building was calculated using the following formula.

$$Energy\ Usage = \frac{Building\ Area \times LPD \times Hours}{1{,}000}$$

Appendix A – Lighting Line by Line

The following table shows a list of design fixtures in the building. This is not a comprehensive list of all fixtures but details a good representation. This includes only permanent fixtures and does not include any construction lighting.

LIGHT FIXTURE SCHEDULE

TYPE	SYMBOL	DESCRIPTION	LAMPS	SELECTION
A		2'x4' FLOUR. RECESSED TROFFER	4-40W F40 CW	SOUTHERN #26448 FSA
B		1'x4' FLOURESCENT SURFACE MOUNTED	2-40W F40 CW	SOUTHERN #RAA 240
C		INCANDESCENT / RECESSED CHROME TRIM LEXAN	1-100W A-19	
D		2'x4' FLOUR SURFACE MOUNTED	4-40W F40 CW	SOUTHERN
E		EXIT	PROVIDED	STONCO XE20-RW
F		EMERGENCY	PROVIDED	DUAL-LITE 120 CNC 214
G		2-150 WATT INC. FLOODS W/HEAD	2-150W	SUBMIT

Appendix B – Mechanical Equipment

The following table shows a listing of all recorded major equipment in the building.

Building	Type	Equip	Location Served	Tag	Qty	Capacity	Units	Make	Model	Serial Number	Year
Azalea Rec	CU/AHU	Condensing Unit/Air Handling Unit			1	5.0	Ton	Payne	PA13NA060-E	0513X69526	2013
Azalea Rec	CU/AHU	Condensing Unit/Air Handling Unit			1	5.0	Ton	Rheem	13AJN60A01	3395W27110298	2011
Azalea Rec	AHU	Packaged Air Conditioning Unit			1	2.0	Ton	Bard	WA241-A00	.40C981210502-0	1998
Azalea Rec	Water Heater	Water Heater - 30 Gallons			1	4500.0	Watts	Rheem	81SV30D B	R 0897D02637	1997
Azalea Rec	AHU	Packaged Air Conditioning Unit			1	2.0	Ton	Bard			

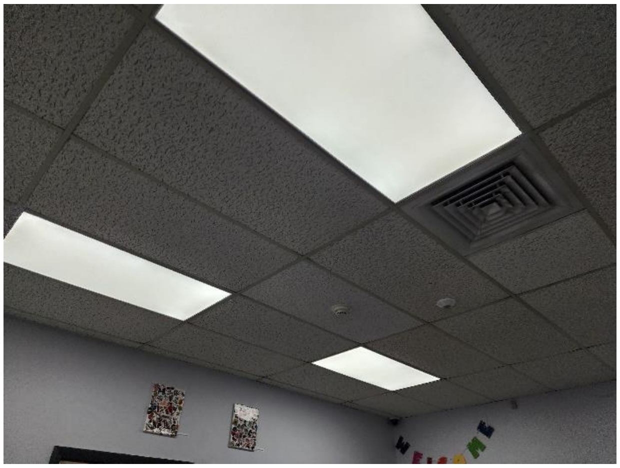
Appendix C – Site Walkthrough Photos

C-1: Condensing Unit (Photo 1)

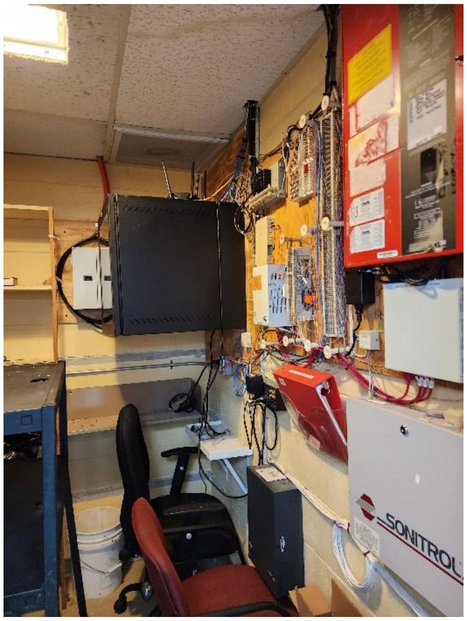
C-2: Condensing Unit (Photo 2)

C-3: Exterior Lighting

C-4: Packaged Air Conditioning Unit (Photo 1)



C-5: Interior Lighting



C-6: Tech Room

C-7: Water Heater

C-8: Packaged Air Conditioning Unit (Photo 2)