9/29/2023

Winter Park Chamber of Commerce

ASHRAE Level II Energy Audit

15 lightyears

Energy Testing | Solar Power | Green Certification

TLC ENGINEERING SOLUTIONS

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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 Chamber of Commerce Building 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 August 15, 2006, 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 controls systems, and observe each space type and its general energy use intensity. During this time, TLC was granted access to the building automation system to view the operation remotely. 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), Facility Improvement Measures (FIMs), and evaluated BAS trends. 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

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General Facility Description

The Winter Park Chamber of Commerce is a two-story civic building of approximately 10,877 square feet, which includes office and community gathering spaces. An aerial view of the Chamber of Commerce is shown below.

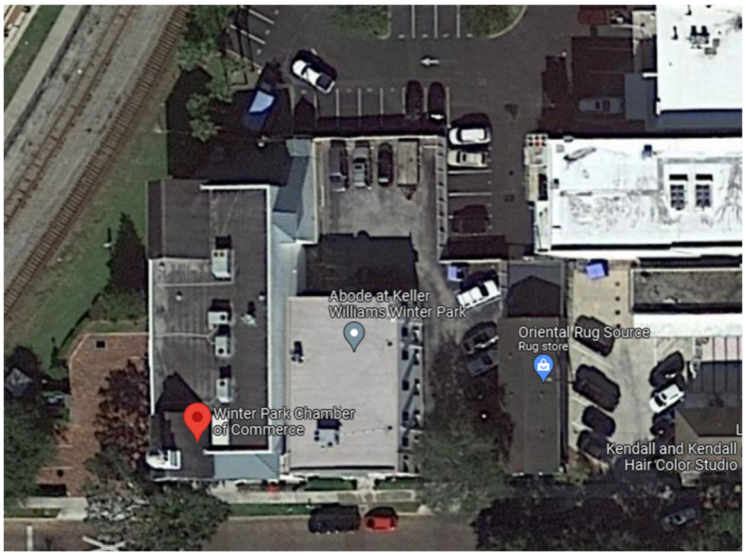


Figure 1: Aerial View of the Winter Park Chamber of Commerce

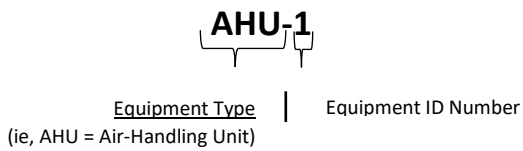
The first level of the building houses the welcome gallery, lobby, storage, community gathering room, restrooms, meeting room, and necessary building's operations rooms. The second level primarily consists of office spaces and conference rooms.

Mechanical Systems

The Winter Park Chamber of Commerce features mechanical systems mostly dating back to 2007. Overall, the building utilizes packaged rooftop air conditioning units (RTUs), split-system air conditioning units, and exhaust fans. Mechanical system information came from a combination of resources, including information gathered during TLC's audit walk-through of the building and building automation system review, as-built design drawings provided by the City of Winter Park (dated August 15, 2006). 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.



Air Handling Units

The air conditioning for the building is provided by four (4) packaged rooftop conditioning units and one (1) split system air conditioning unit. RTU-1 serves the first-floor meeting room, RTU-2 serves the first-floor gallery, RTU-3 serves the second-floor South offices, RTU-4 serves the second-floor North offices, and AC-1/CU-1 serves the core of the first floor. The units are equipped with a variable frequency drive (VFD) to allow supply air to modulate based on changing load conditions.

Exhaust Fans

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

Building Controls

The building is currently controlled by a centralized Building Automation System (BAS) utilizing Direct Digital Controls (DDC). The BAS allows for monitoring, scheduling and setpoint adjustment of the different HVAC systems. The BAS is a Trane Tracer Ensemble system with graphics for the major pieces of equipment, and is accessible remotely so that CoWP Facilities can view trends and adjust setpoints and schedules.

Lighting Systems

Interior lighting throughout the facility is predominantly linear fluorescent fixtures utilizing T8 lamps. However, there were areas on the first floor of the building such as the gallery and open entrance space that appeared to have been retrofitted with LED lighting. The majority of the lighting is controlled manually without occupancy controls.

Domestic Water Fixture (Plumbing) Systems

The building is served by one (1) electric water heater. The only known information on the water heater is from plumbing drawings (dated August 15, 2006), stating that the electric water heater is to be a 50-gallon Rheem 6 kW model.

Building Envelope

The building envelope systems date to the original 2006 construction of this facility. The façade is stucco and plaster over CMU block. The facility includes the original glazing and R-12 wall insulation per the original design. The roof is a flat, built-up roof construction with insulation below deck.

Key Operating Parameters

The building is currently operated between 8:30am-5pm on Monday through Friday, and 9am-2pm on Saturdays. The building is closed on Sundays.

Site Visit

The site was audited by TLC and 15 Lightyears in January 2023. A full evaluation of existing energy consuming systems, compliant with ASHRAE Standard 211-2019 was performed. During the audit, 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 values and demand values were provided for the months of January 2021 through June 2023. The monthly consumption profile is as expected, where values increase in the warmer months due to cooling needs. No specific 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)	67,433
Annual Electrical Cost	-

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

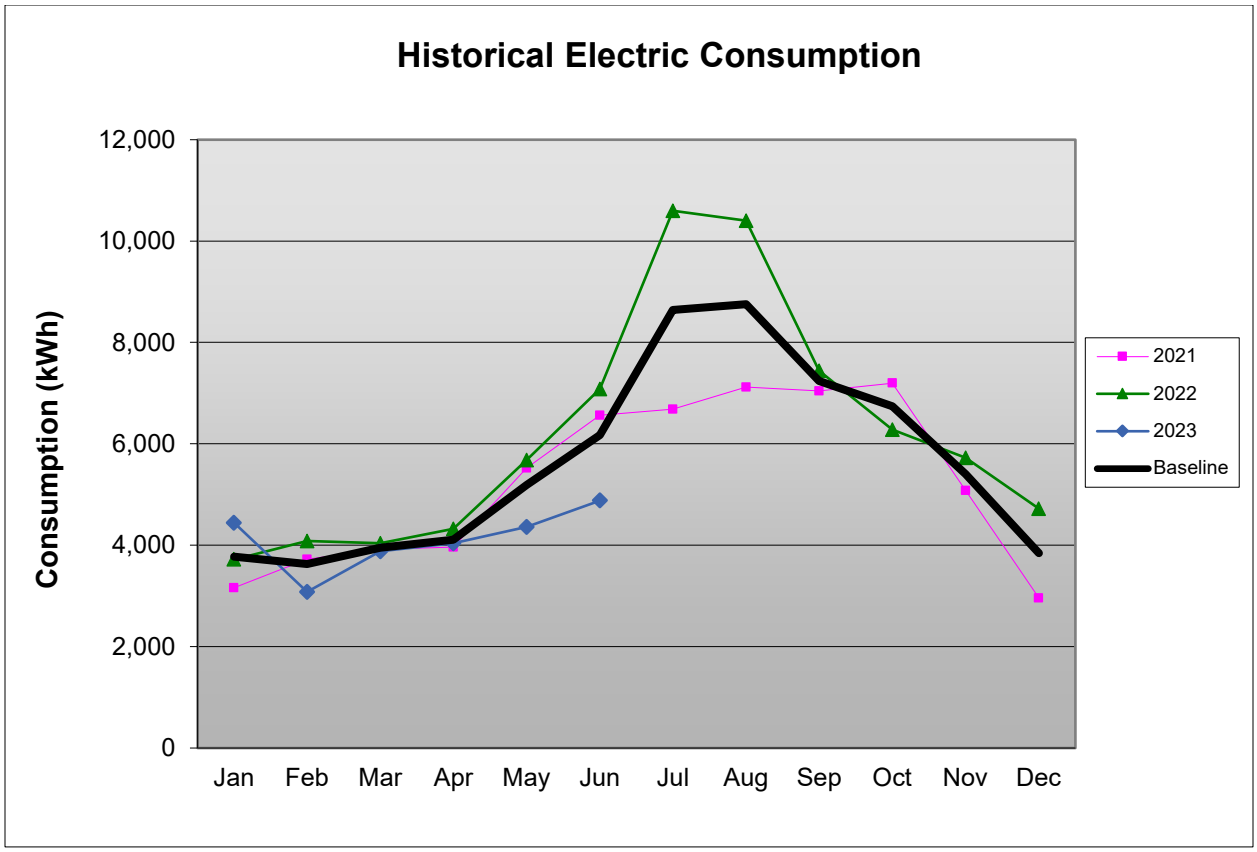


Figure 2: Chamber of Commerce Electric Consumption

Table 2: Chamber of Commerce Electricity Consumption Data

Date	Consumption (kWh)	Demand (kW)
Jan-21	3,160	55
Feb-21	3,720	69
Mar-21	3,920	69
Apr-21	3,960	49
May-21	5,520	51
Jun-21	6,560	53
Jul-21	6,680	68
Aug-21	7,120	17
Sep-21	7,040	27
Oct-21	7,200	27
Nov-21	5,080	27
Dec-21	2,960	30
Jan-22	3,720	30
Feb-22	4,080	36
Mar-22	4,040	36
Apr-22	4,320	22
May-22	5,680	26
Jun-22	7,080	28
Jul-22	10,600	38

Date	Consumption (kWh)	Demand (kW)
Aug-22	10,400	39
Sep-22	7,440	39
Oct-22	6,280	39
Nov-22	5,720	39
Dec-22	4,720	39
Jan-23	4,440	39
Feb-23	3,080	39
March-23	3,880	39
April-23	4,040	39
May-23	4,360	39
June-23	4,880	39

Benchmarking

TLC compared energy consumption utilizing a common benchmark to gauge how the building compares to similar ones nationally. The main 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 facility was entered into Energy Star Portfolio Manager as a social/meeting hall, although the building is partially used as an office space.

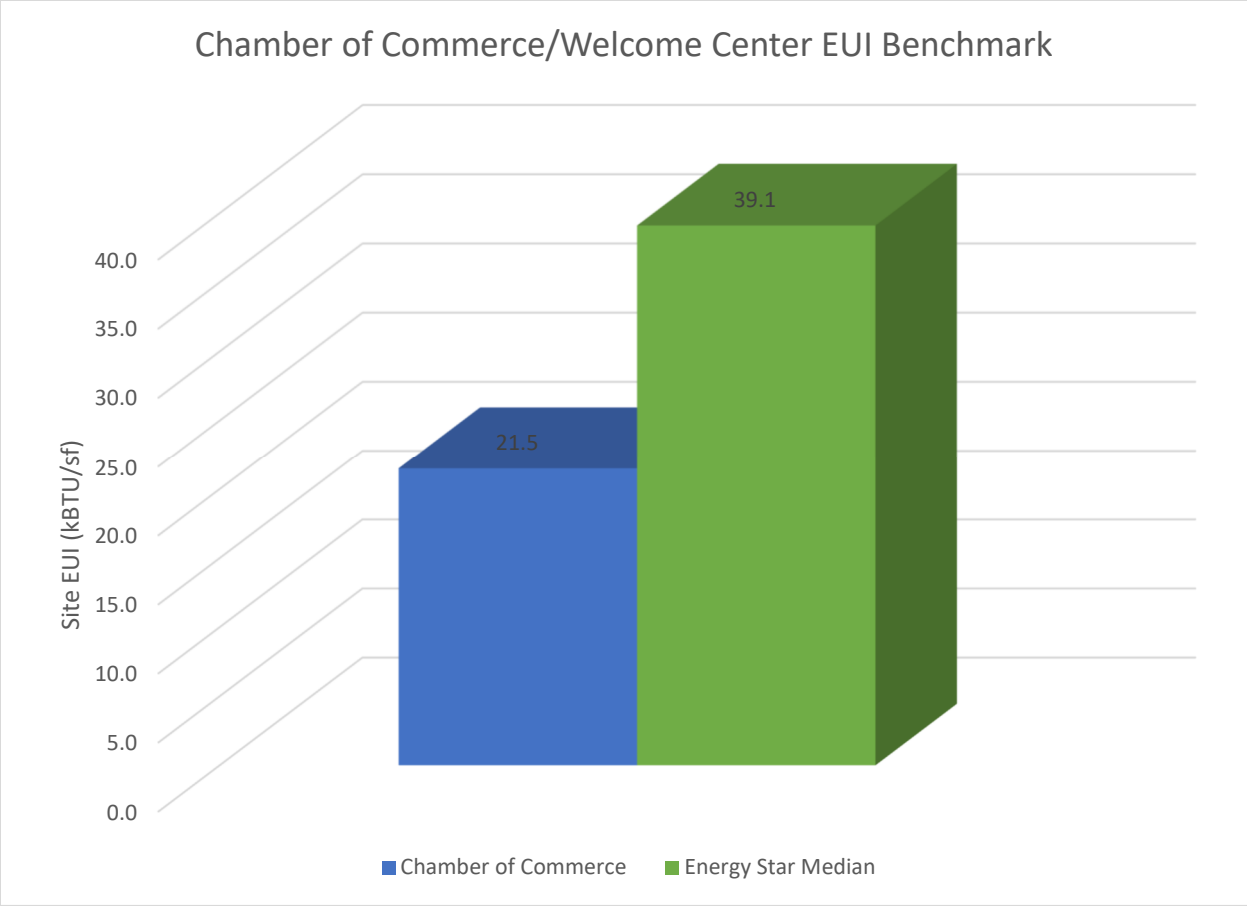


Figure 3: Chamber of Commerce Energy Performance Comparison

Based on most recent 24 months of utility data, a comparison can be drawn between the Chamber of Commerce and the average energy use intensity (EUI) of similar buildings throughout the United States. The median EUI for a social/meeting hall in the United States is 39.1 kBTU/sf, and the calculated EUI of the Chamber of Commerce is 21.5 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 energy conservation measures detailed in this report will serve to further decrease the EUI of the Chamber of Commerce building.

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 $0.1283/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	$0.1283/kWh

Energy Saving Opportunities

The operation and condition of equipment at the Chamber of Commerce 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)
Daylighting Controls	ECM	No Cost	8,575	$1,100	$193	0.2
DX Unit Retrofits	ECM	Capital Improvement	27,850	$3,573	$104,476	29.2
AHU Controls	FIM	--	--	--	$1,200	--
Total			**36,425**	**$4,673**	**$105,869**	22.7

*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.

DX Unit Retrofit

General Description

This measure proposes replacing existing DX equipment, 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.

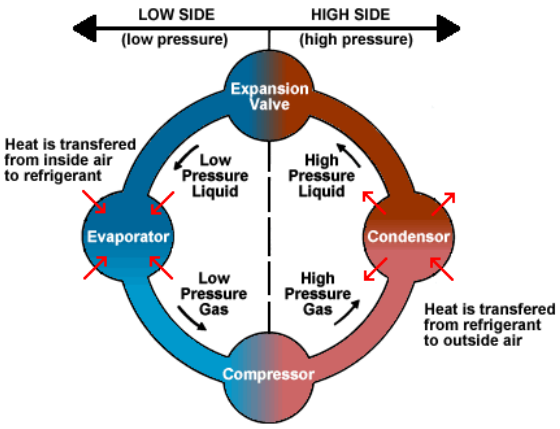


Figure 4: The Refrigeration Cycle

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 Winter Park Chamber of Commerce has three (3) Roof Top Packaged Units manufactured in 2007 that are due for replacement within the next 2 years. They are each 10-ton capacity units and serve the 1st floor gallery and the offices on the 2nd floor. This measure proposes to replace the existing RTUs with like-for-like replacements. As stated above, the newer system will be more efficient than the existing system and will result in slight energy savings.

Daylighting Controls

General Description

This measure involves utilizing natural illumination to meet minimum lighting requirements in an indoor space, thus minimizing the amount of artificial lighting energy needed. It is most common for building lighting systems to be designed to meet code-required lighting levels by themselves, ensuring proper light is present in the building even at night. Because most lighting systems are on/off or manually dimmed, most lighting systems do not respond to the presence of natural light during the day. This leads to spaces that are over-lit when natural lighting is considered. Over-lit spaces end up using more lighting energy than is needed, and as a result use more HVAC energy as well.

For each affected space, a new light level sensor will be placed near the perimeter of the room to measure real-time light levels at desk height. These sensors will communicate with the local lighting system which will dim or brighten the artificial lights in order to meet pre-programmed lighting level setpoints. By responding to the changing natural light levels from windows and skylights, the artificial

systems will only provide the additional lighting needed to meet the optimal light level. This will greatly reduce the energy required to illuminate the interior of the building. This also reduces the amount of energy needed to cool the space with the HVAC system.

Site Specifics

For the Chamber of Commerce, there is an opportunity for lighting controls optimization as the existing exterior lighting fixtures have been observed to be always operating. Daylighting control sensors will be provided for the lighting in the gallery area on the 1st floor so that excessive lighting energy usage will be reduced when there is ambient daylight illuminating the space. Note that lighting controls may come with some annual maintenance savings. Because the burn hours will be reduced, the fixtures will not burn out as quickly and will not be replaced as often. No maintenance savings are included in the calculations at this time but may be calculated in a future phase of the project.

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.

AHU Controls

It has been reported by staff that a new variable speed RTU has caused a number of difficulties for the occupants and maintenance staff, including high humidity in the areas served. It is possible that the unit may not be functioning or operated as intended. To address these issues, it is recommended that a commissioning task be undertaken to verify that the RTU is meetings its design standards and is functioning correctly.

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.

Daylighting Controls

Savings for this measure have been based on a reduction in the burn hours of interior lighting fixtures through the incorporation of daylight sensors and controls. The following table shows the major inputs used in the calculation of savings for this measure.

Table 5: Daylighting Controls Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Watts/ square foot	Fixture Type “LED”	0.6 W/sf	Engineering judgement

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Affected square footage	Fixture Type "LED"	5,439 sf	Only applies to 1st floor, half of building square footage
Affected lighting system wattage	Fixture Type "LED"	3,263 W	Calculated from W/sf and square footage
Existing Burn Hours	Fixture Type "LED"	8,760 Hrs	Lights always on
Proposed Burn Hours	Fixture Type "LED"	6,132 Hrs	Engineering judgement of 30% reduction in burn hours by daylighting

Calculations:

Savings for this measure were comprised of energy savings. The energy savings were the difference in the existing and proposed kWh for the exterior lighting fixtures at the building. The energy usage in kWh for a particular light fixture was calculated using the following formula:

$$Energy\ Usage = \frac{Burn\ Hours \times Fixture\ Wattage}{1{,}000}$$

In the formula above, burn hours represents the annual hours that the light fixture was estimated to be energized.

DX Unit Retrofits

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
Existing Equipment Rated Capacity	RTU-2, RTU-3, RTU-4	10 tons (each)	Manufacturer info
Existing Equipment Existing Efficiency	RTU-2, RTU-3, RTU-4	8.86 SEER	Mfg. info and typical degradation for age
Proposed Retrofit Efficiency	RTU-2, RTU-3, RTU-4	15.5 SEER	Engineering judgment
Effective Full Load Hours	RTU-2, RTU-3, RTU-4	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.

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 7: Lighting Improvements Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Building Area	Entire building	36,535sf	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	8,760	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.

LIGHTING FIXTURE SCHEDULE

FIXTURE	DESCRIPTION	MANUFACTURER	CATALOG NO.	LAMPS			VOLT	MOUNTING	NOTES	REMARKS
				QTY	TYPE	WATTS				
A	2X4 (3) LAMPS DIRECT/INDIRECT LIGHT FIXTURE	WILLIAMS	DIG-S24-332WPR-EB3-120	3	F32T8 3500K	32	120	RECESSED	–	LAMP W/ FIXTURE
B	4" LOW VOLTAGE LIGHT FIXTURE	LITON	LH1499-LR1467W	1	75W/MR16	75	120	RECESSED	–	LAMP W/ FIXTURE
C	INCANDESCENT LOW VOLTAGE COVE LIGHT	TOKISTAR	AV-3-101/JBOX/T24	–	3" O.C.	5	120	COVE	1.	LAMP W/ FIXTURE
D	WRAP AROUND WITH EMERGENCY BATTERY	WILLIAMS	37-4-2-32-A-EM7-EB2-120	2	F32T8 3500K	32	120	WALL MOUNTED	–	LAMP W/ FIXTURE
E	WALL LUMINARIES 6" DIAMETER	BEGA	3532P	2	PL-T26W/35/4P/ALTO	26	120	WALL MOUNTED	–	LAMP W/ FIXTURE
F	TRACK LIGHT	CAPRI	CT2335W	1	75W/PAR30	75	120	SURFACE	2.	LAMP W/ FIXTURE
G	4' STANDARD STRIP	WILLIAMS	76-4-232-EB2-120	2	F32T8 3500K	32	120	SURFACE	–	LAMP W/ FIXTURE
H	PENDANT	MURRAY FEISS	BOULEVARD COLLECTION BRONZE 34759	3	A-19, 100W	300W	120	PENDANT	–	LAMP W/ FIXTURE
OB	CUPOLA EXTERIOR FLOODLIGHT	EXTERIUR VERT	PY-7-32-100-150-1-1-2-BD1	1	150W MH	150	120	SURFACE	–	LAMP W/ FIXTURE
OC	CUPOLA INTERIOR FLOODLIGHT	NITE BRITES	DSS-150-M-12-LP-DPM	1	150W MH	150	120	SURFACE	–	LAMP W/ FIXTURE
EM	EMERGENCY BATTERY UNIT	BEGHELLI	EL28-SE-UNV	2	HALOGEN	28	120	WALL	–	INSTALLED IN EXIT
EM1	EMERGENCY BATTERY UNIT	SIGNTEX	CBR-20-LC-1.5-C	2	HALOGEN	28	120	RECESSED	–	INSTALLED IN EXIT
X	SINGLE FACE LIGHT WITH BATTERY EXIT	BEGHELLI	CYC-SA-LG-1-C-CS-W	–	LED	–	120	CEILING	3.	INSTALLED IN EXIT

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
Chamber of Commerce	Rooftop Unit	Packaged Rooftop Air Conditioning Unit	1st Floor Meeting	RTU-1	1	12.5	Tons	Trane	TZD150F3RND13F6C1A2A6000A000001000000000	203611029D	2020
Chamber of Commerce	Rooftop Unit	Packaged Rooftop Air Conditioning Unit	1st Floor Gallery	RTU-2	1	10.0	Tons	Trane	TSC 120		2007
Chamber of Commerce	Rooftop Unit	Packaged Rooftop Air Conditioning Unit	2nd Floor South Offices	RTU-3	1	10.0	Tons	Trane	TSC 120	709100240L	2007
Chamber of Commerce	Rooftop Unit	Packaged Rooftop Air Conditioning Unit	2nd Floor North Offices	RTU-4	1	10.0	Tons	Trane	TSC 120		2007
Chamber of Commerce	Air Conditioning	Split System Air Conditioning Unit	First Floor Core	AC-1	1	1.0	HP	Trane	TWE060A300EL	7072S8LBD	2007
Chamber of Commerce	Condensing Unit	Split System Condensing Unit	First Floor Core	CU-1	1	6.0	Tons	Trane	3 TTA 072A3000AA	7022YEH2F	2007
Chamber of Commerce	Exhaust Fan	Exhaust Fan	Toilet Room	EF-1	1	77.0	HP (Watts)	Penn	Z-8-S		
Chamber of Commerce	Exhaust Fan	Exhaust Fan	Toilet Room	EF-2	1	77.0	HP (Watts)	Penn	Z-8-S		
Chamber of	Exhaust Fan	Exhaust Fan	Janitor Closet	EF-3	1	77.0	HP (Watts)	Penn	Z-8-S		

Commerce									
Chamber of Commerce	Exhaust Fan	Exhaust Fan	Equipment Room	EF-4	1	77.0	HP (Watts)	Penn	Z-8-S
Chamber of Commerce	Exhaust Fan	Exhaust Fan	Equipment Room	EF-5	1	77.0	HP (Watts)	Penn	Z-8-S
Chamber of Commerce	Exhaust Fan	Exhaust Fan	Toilet Room	EF-6	1	77.0	HP (Watts)	Penn	Z-8-S
Chamber of Commerce	Exhaust Fan	Exhaust Fan	Toilet Room	EF-7	1	77.0	HP (Watts)	Penn	Z-8-S
Chamber of Commerce	Exhaust Fan	Exhaust Fan	Janitor Closet	EF-8	1	77.0	HP (Watts)	Penn	Z-8-S
Chamber of Commerce	Water Heater	Electric Water Heater	All Areas	EWH-1	1	6000.0	Watts	Rheem	

Appendix C – Site Walkthrough Photos

C-1: Chamber of Commerce

C-2: Packaged RTU (photo 1)

C-3: Rooftop

C-4: Packaged RTU (photo 2)

C-5: Packaged RTU (photo 3)

C-6: Conference Room

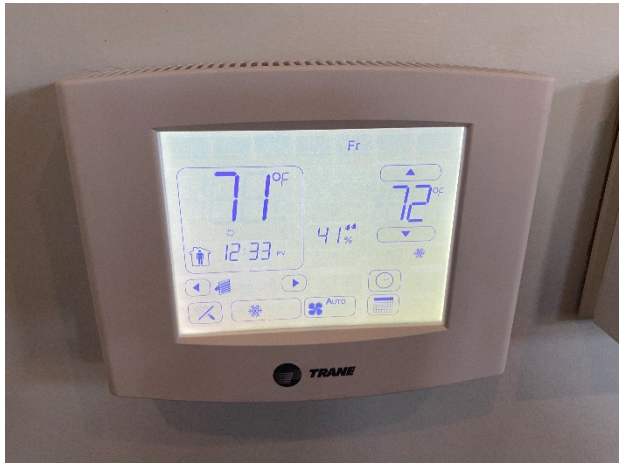
C-7: Fluorescent Lighting

C-8: Gallery

C-9: Thermostat

C-10: Lighting

C-11: Exterior Lighting Fixture



C-12: Thermostat