9/29/2023

Winter Park Farmers' Market & Historical Museum

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 Farmers Market & Museum 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 April 7, 2003, 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. 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 B 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 Farmers Market & Museum
200 W New England Ave, Winter Park, FL 32789

Gloria Eby
Natural Resources and Sustainability Director
geby@cityofwinterpark.org
Office: 407.599.3471

Lisa Pearcy
CEO, 15 Lightyears
lpearcy@15lightyears.com
Office: 855.438.1515

Eric McEwen
Principal, TLC Engineering Solutions
eric.mcewen@tlc-eng.com
Office: 407-487-1240
Cell: 904-635-0129

General Facility Description

The Winter Park Farmers Market & Museum Building is a one-story civic building of approximately 936 square feet, which includes exhibit space for Winter Park history and an events space. An aerial view of the Farmers Market & Museum building is shown below.

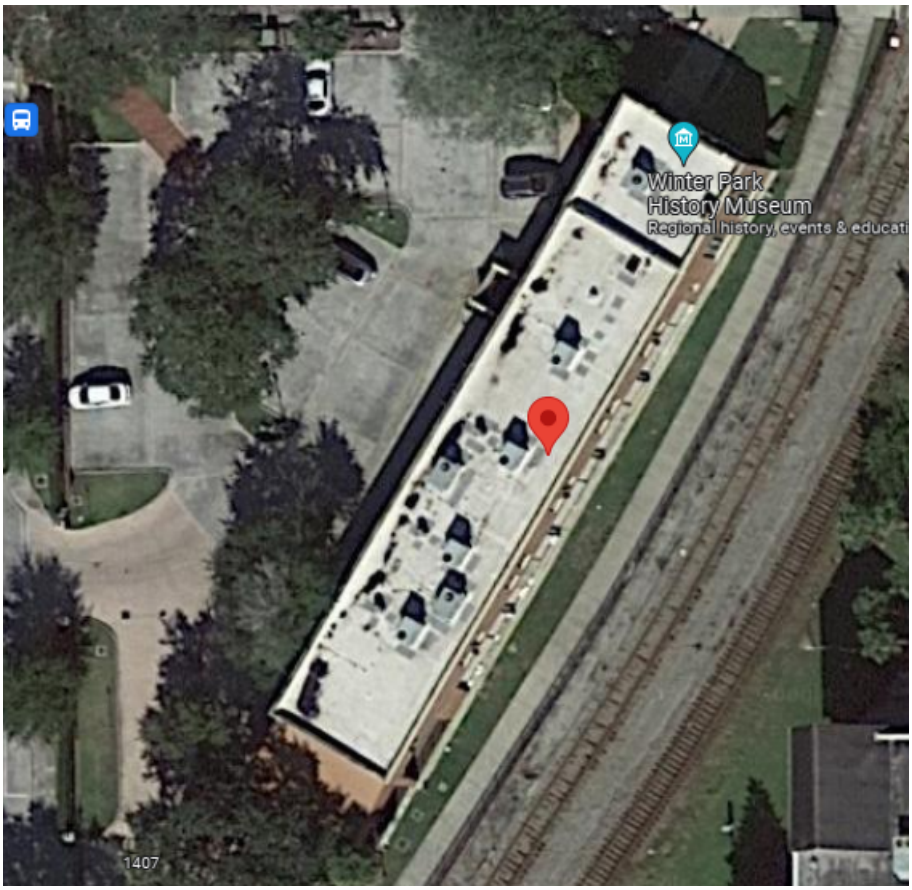


Figure 1: Aerial View of the Winter Park Farmers Market and Museum Building

The building houses permanent and revolving exhibits related to the history of the city of Winter Park. There is a separate space dedicated as an event space for speakers, meetings, and other activities. The farmer's market is held outside of the building itself, with a variety of different vendors in attendance.

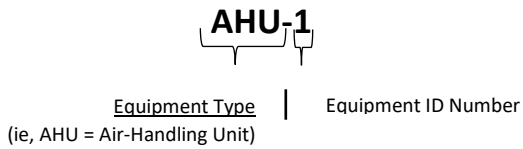
Mechanical Systems

The Winter Park Farmers Market and Museum features mechanical systems that are dated between 2017-2019, showing that the mechanical system equipment has all been updated within recent years. Overall, the building utilizes packaged rooftop air handling units and exhaust fans for cooling and ventilation.

Mechanical system information came from a combination of sources, including information gathered during TLC's audit walk-through of the building and previous design drawings (dated April 7, 2003). 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

Air conditioning for the majority of the building is provided by seven (7) packaged rooftop air handling units. The units consist mainly of a two-position ventilation damper, supply fan, and DX cooling coil to provide conditioning to the facility. All air handling units are located on the roof of the building, with most serving the open events space to provide cooling and dehumidification. However, facility staff experience humidity issues in the spaces regularly due to unconditioned outside air entering the facility during events. The drawings provided to TLC depict the majority of the current rooftop air handling units; however, it appears that not all units' information is captured in the drawings that were available.

Exhaust Fans

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

Building Controls

The building is not currently controlled by a centralized Building Automation System (BAS). All mechanical, electrical, and plumbing systems operate in a standalone fashion. However, the rooftop units have been outfitted with Ecobee smart thermostats. The Ecobee system allows for some monitoring, as well as remote scheduling and setpoint adjustment of the different HVAC systems It was observed during the onsite audits that exhaust fans are manually set to run at all times.

Lighting Systems

Interior lighting throughout the facility is predominantly fluorescent fixtures and LED lighting. The lighting is controlled manually via wall switch.

Domestic Water Fixture (Plumbing) Systems

The building is served by one (1) electric water heater. The water heater is located in the designated water heater room and has a 19-gallon storage capacity. Other plumbing related fixtures include an electric water cooler, water closets, urinals, bathroom sinks, a mop sink, and a kitchen sink.

Building Envelope

The building was originally a train depot before it was renovated into the Museum and Farmer's Market that exists today. The original exterior envelope was kept and the interior of the building was renovated

to fit the needs of the museum, including fixing concrete floors. Furthermore, an addition was built alongside the original building to act as a covered patio for the farmer's market. Hardware, window frames, and doors were replaced and upgraded, and air conditioning was added via packaged DX rooftop air handling units. However, due to the historic nature of the building envelope, additional insulation or infiltration reduction methods may be needed in order to improve energy performance of the building.

Key Operating Parameters

The building is open to the public 10am-4pm on Tuesday-Saturday, making it open 6 hours a day for five days of the week. In addition, the building is available for rent for events such as wedding receptions, professional society meetings, etc., so the hours of operation are subject to scheduled change.

Site Visit

The site was audited by TLC engineers 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, 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 billing statements were provided, but a blended rate for kWh savings was determined based on published rates. 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)	86,855
Annual Electrical Cost	-

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

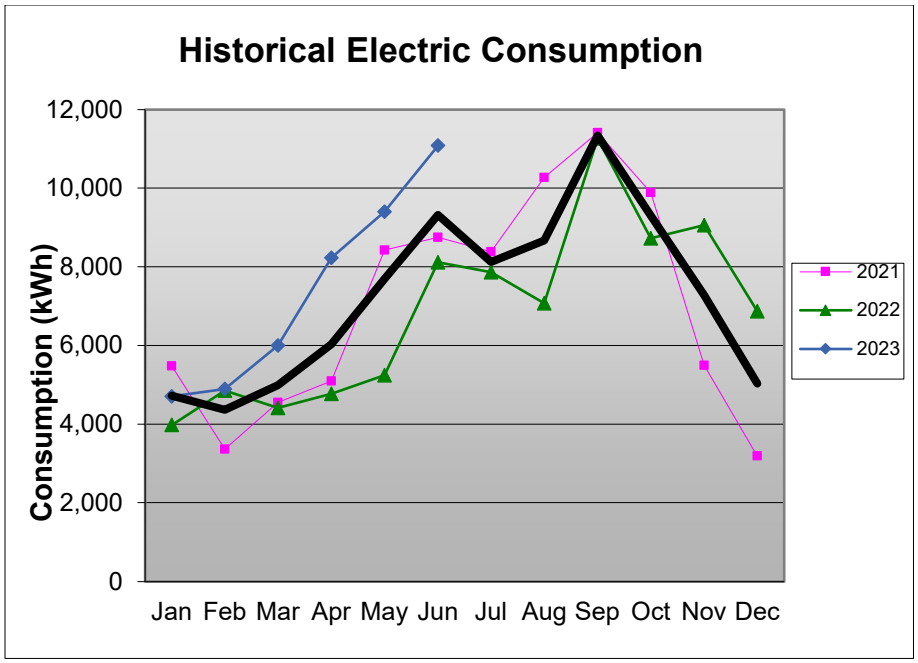


Figure 2: Farmers Market & Museum Electric Consumption

Table 2: Farmers Market & Museum Electricity Consumption Data

Date	Consumption (kWh)	Demand (kW)
Jan-21	5,474	
Feb-21	3,360	
Mar-21	4,551	
Apr-21	5,093	
May-21	8,420	
Jun-21	8,752	
Jul-21	8,384	
Aug-21	10,269	
Sep-21	11,412	
Oct-21	9,889	
Nov-21	5,493	
Dec-21	3,190	
Jan-22	3,978	
Feb-22	4,849	
Mar-22	4,408	
Apr-22	4,768	
May-22	5,240	
Jun-22	8,116	
Jul-22	7,865	
Aug-22	7,069	
Sep-22	11,268	109
Oct-22	8,722	64
Nov-22	9,061	59
Dec-22	6,873	65

Date	Consumption (kWh)	Demand (kW)
Jan-23	4,707	60
Feb-23	4,892	54
March-23	6,001	54
April-23	8,226	54
May-23	9,404	66
June-23	11,082	60

Benchmarking

TLC compared energy consumption for the site using common benchmarks to gauge how the site compares to similar ones both regionally and nationally, principally through the use of Energy Star Portfolio Manager. The building's Energy Use Intensity (EUI), which is used by energy engineers to determine overall energy consumption to a common unit of measure, was compared to other similar buildings throughout the United States. The Energy Use Intensity measures annual consumption of electricity per square foot, in kBTU/sf/year.

These benchmarks were developed by the Department of Energy and are based on feedback from building operators all over the country. Using the utility billing information and observing the system operation allows the energy profiles to be broken down to greater detail. It is TLC's understanding that the facility primarily serves as an events venue, and was modeled as such in Portfolio Manager.

The historical energy consumption from the previous 24 months was entered into Portfolio Manager. The chart below compares the Farmer's Market and Museum to the average energy use intensity (EUI) of similar buildings in Energy Star's database.

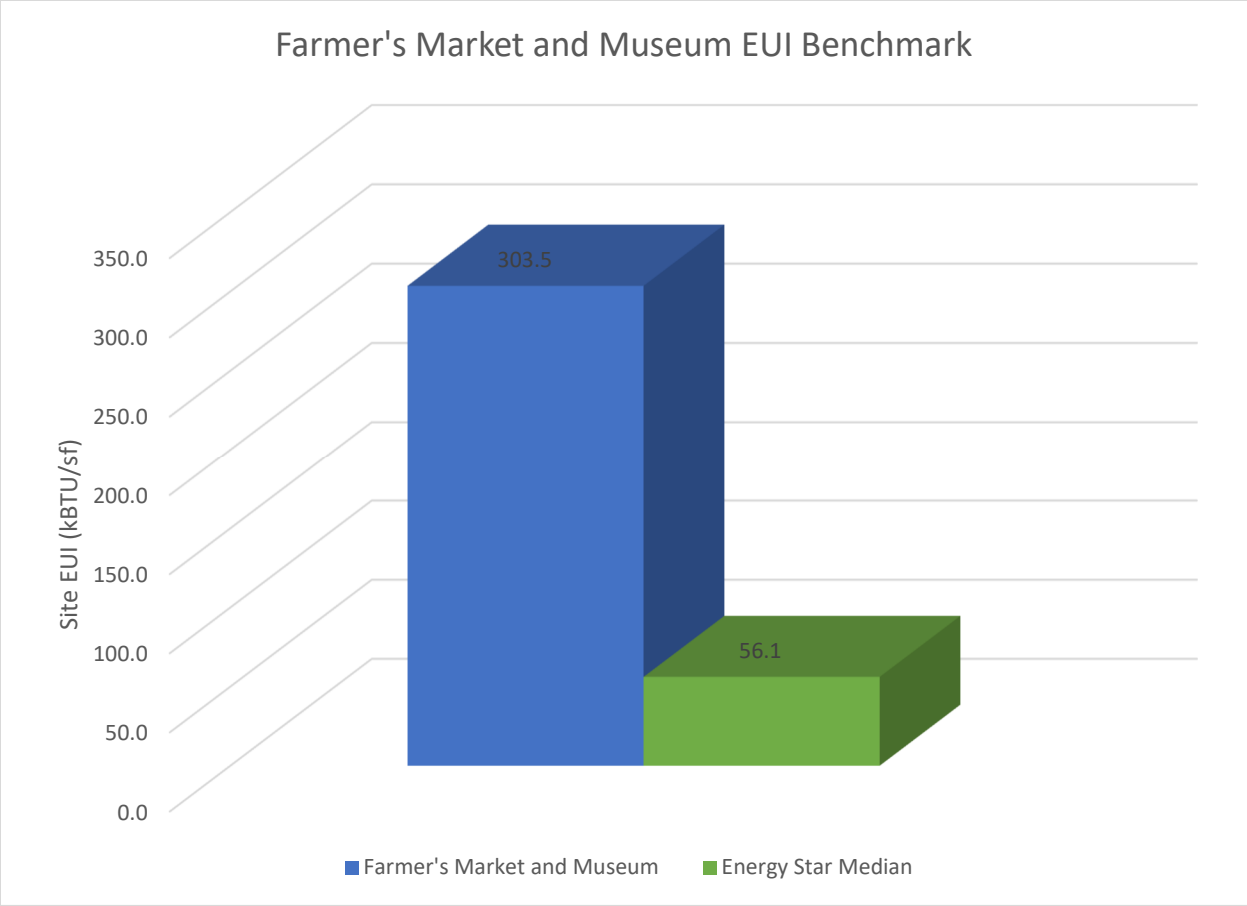


Figure 3: Farmer's Market Energy Performance Comparison

The building's calculated site energy use intensity – the amount of electricity consumed onsite per square foot of building area – of the Farmer's Market of 303.5 kBTU per square foot is approximately 441 percent higher than the baseline Energy Star comparison value of 56.1 kBTU per square foot.

This measure is based upon the feedback of building owners and operators for the previous year, and does not account for every variable in the operation and construction of the building. For example, the historic nature of the Farmer's Market is likely a significant contributing factor to its higher energy use, as the building's intended use has changed and construction standards for energy efficiency have become more strict in the subsequent decades. Additionally, air infiltration due to the historic doors to the train platform was specifically noted as a concern relating to the air conditioning and humidity control for the facility. The energy conservation measures detailed later in this report are intended to improve the EUI of the buildings and reduce their overall energy consumption.

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 assumed to have charges of $0.1033/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	$0.1033/kWh

Energy Saving Opportunities

The operation and condition of equipment at the Farmer's Market & Museum 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 4: ECM/FIM Summary

Energy Savings Measure	FIM/ECM	ECM Category	Annual kWh Savings	Annual $ Savings	Cost $	Payback (years)
Lighting Improvements	ECM	Low Cost	10,807	$1,116	$3,088	2.8
Weatherization	ECM	Low Cost	68,924	$7,120	$100,000	14
Ceiling Fan Controls	FIM	Low Cost	--	--	$200	--
Exterior Lighting Controls	FIM	Low Cost	--	--	$744	--
Total			**79,731**	**$8,236**	**$103,088**	**12.5**

*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.

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 incandescent fixtures. 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.

Weatherization

General Description

This ECM provides for sealing cracks, gaps, and holes in the building envelope to reduce the amount of infiltration into the building. Unintended openings in the building envelope form over time due to degrading door and window seals, building settling, general wear and tear, or from repairs over time. These gaps in the envelope allow air infiltration and exfiltration, which is uncontrolled air passing into and out of the building envelope. Infiltration air is unconditioned, which can result in humidity problems and must eventually be conditioned, which increases energy consumption. Exfiltration allows conditioned air to escape the building and must be made up with conditioned outside air, which increases energy consumption.

Existing cracks, gaps, and holes will be sealed as identified below to reduce building infiltration and exfiltration. By reducing the air transfer through the building envelope, less outside air will need to be conditioned, which reduces the amount of energy expended by the HVAC systems. Because excess infiltration can result in drafts and humidity problems, this measure will also improve thermal comfort and allow the HVAC systems to better maintain their comfort setpoints. Cracks and holes in the envelope can sometimes be detected with the naked eye but are often detected using infrared thermal imaging and smoke testing.

Site Specifics

The Winter Park Farmers Market & Museum has 10 barn door panels along the west side of the building that each have a 1" gap around the perimeter of the panels that outside air can infiltrate through. Sealing these gaps will reduce load on the HVAC systems of conditioning the infiltrated outside air. Instead of reducing infiltration on existing doors, the City has received a price to replace the existing doors with new sliding doors intended to better seal the building envelope while maintaining the historic integrity of its appearance. Pricing for these doors has been reflected in the payback calculation above ($10,000 per door).

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.

Ceiling Fan Controls

During the walkthrough, ceiling fans were observed to be operating continuously throughout the space during unoccupied hours. They were also observed to all be rotating in different directions. Ceiling fans

have an optimal direction to turn in regard to either cooling, or heating demand. For improved energy consumption and comfort in the space, it is recommended to utilize system controls to synchronize fan operation and set occupancy and run time schedules.

Exterior Lighting Controls

Exterior lights for the facility are currently being operated through a timer. Occasionally, the facilities maintenance staff has had to adjust the timer with regard to changing daylight hours throughout the year. To cut down on maintenance efforts, it is recommended to replace the timer control with a simple photo cell controller to synchronize exterior lighting hours in conjunction with daylight hours from day to day.

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.

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 5: Lighting Improvements Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Building Area	Entire building	936 sf	Provided value
Existing Lighting Power Density	Entire building	8.53 W/sf	Typical value for incandescent lamps throughout
Proposed Lighting Power Density	Entire building	0.6 W/sf	Typical value for LED lamps throughout
Annual Burn Hours	Entire building	1,456 hours	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.

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

Infiltration Reduction

Savings for this measure have been based on reducing the amount of infiltration into the building. The following table shows the major inputs used in the calculation of savings for this measure.

Table 6: Infiltration Reduction Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Infiltration Reduction	Entire Building	8,300 cfm	Based on total gap area with 500 fpm air speed
Heating Efficiency	Entire Building	1.0 COP	Electric strip heat
Cooling Efficiency	Entire Building	0.93 kW/ton	Manufacturer info and typical degradation
Cooling Setpoint/Setback	Entire Building	72°F/80°F	Engineering judgment
Heating Setpoint/Setback	Entire Building	70°F/60°F	Engineering judgment
Controls Occ. Schedule	Entire Building	M-F 8am-10pm Sat 10am-midn.	Building schedule

Calculations:

Savings for this measure were based on calculating the heating and cooling energy due to the infiltration air that would be eliminated because of this measure. For each hour of the year, the outside air temperature was compared to the setpoints and balance points to determine whether the building HVAC equipment was in cooling, heating, economizer, or drift mode. The amount of infiltration reduction for each hour was determined based on the existing infiltration, reduction percentage, and the building schedule.

The energy savings for each hour were calculated with the following formulas. The cooling equation was only used for hours that the equipment was in "cooling" mode, while the heating equation was only used for hours that the equipment was in "heating" mode. There were no savings for hours when the equipment was in "economizer" or "drift" mode.

$$Cooling\ Savings = \frac{1.08 \times Airflow \times \Delta T \times Efficiency}{12000 \times Sensible\ Heat\ Ratio}$$

$$Heating\ Savings = \frac{1.08 \times Airflow \times \Delta T}{Efficiency}$$

In the formulas above, the cooling savings were in kWh and the heating savings were in BTU. The airflow was the infiltration reduction in CFM and ΔT was the difference in the outside air temperature and the cooling setpoints or heating balance points, depending on the calculation. The cooling efficiency was in kW/ton and the heating efficiency was a percentage. The heating savings were then converted to either kWh for electrically heated systems or therms for fuel-fired equipment.

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. It should also be noted that this fixture schedule is from undated drawings provided to TLC, and some fixtures listed below may have been updated since the building was renovated.

LIGHTING FIXTURE SCHEDULE

FIXTURE TYPE	DESCRIPTION	LAMPS		MANUFACTURER		DESCRIPTION
		NO	TYPE	TYPE	CATALOG NO	
A	SURFACE MOUNTED FLOURESCENT FIXTURE WITH SOLID OAK TRIM, ENERGY SAVING BALLASTS AND LAMPS	4	F40	SEAGULL PROGRESS	5924-43/9523-15S	
B	SURFACE MOUNTED FLOURESCENT FIXTURE WITH SOLID OAK TRIM, ENERGY SAVING BALLASTS AND LAMPS	2	F40	SEAGULL PROGRESS	5923-43/9523-15S	
C	SURFACE MOUNTED WRAP-AROUND FLOURESCENT FIXTURE WITH ENERGY SAVING BALLAST AND LAMPS	2	F40	DAYBRITE METALUX	SW142	
D	SURFACE MOUNTED 4'-0" STRIP FLOURESCENT FIXTURE WITH ENERGY SAVING BALLAST AND LAMPS	1	F40	DAYBRITE METALUX	N-140-120	
E	RECESSED FLOURESCENT DOWN LIGHT FIXTURE WITH CLEAR ALZAK REFLECTOR	2	13W/PL	CAPRI HALO	PL26/120-T462	
F	WALL MOUNTED FLOURESCENT FIXTURE WITH POLYCARBONATE DIFFUSER	2	13W/PL	BEGA	2997P	
G	PENDENT MOUNTED INCANDESCENT RLM FIXTURE	1	100W	ABOLITE PROGRESS	RD100 P5094-45	
EM	WALL MOUNTED EMERGENCY BATTERY UNIT WITH (2) HEADS	FURNISHED		EMERGI-LITE SYRE-LITE CHLORIDE	PRO-2B	
X	WALL MOUNTED FLOURESCENT FIXTURE WITH EMERGENCY BATTERY UNIT	FURNISHED		EMERGI-LITE SURE-LITE CHLORIDE	BB-FP-XL-1-R-120	
X1	CANOPY MOUNTED FLOURESCENT EXIT LIGHT FIXTURE WITH EMERGENCY BATTERY UNIT	FURNISHED		EMERGI-LITE	BB-FP-XL-2-R-CM-120	MOUNT TO THE UNDER SIDE OF TRUSSES
X2	PENDENT MOUNTED FLOURESCENT EXIT LIGHT FIXTURE WITH EMERGENCY BATTERY UNIT	FURNISHED		EMERGI-LITE	BB-FP-XL-1-R-CM-120	MOUNT TO UNDER SIDE OF TRUSSES

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
Farmer's Market/Museum	Exhaust Fan	EF		*	1			Centri Master
Farmer's Market/Museum	Rooftop Unit	Packaged Rooftop Unit		*	1	4.0	Tons	Trane
Farmer's Market/Museum	Rooftop Unit	Packaged Rooftop Unit		*	1	3.0	Tons	Trane
Farmer's Market/Museum	Rooftop Unit	Packaged Rooftop Unit		*	1	5.0	Tons	Trane
Farmer's Market/Museum	Rooftop Unit	Packaged Rooftop Unit		ACU #7	1	8.5	Tons	Trane
Farmer's Market/Museum	Rooftop Unit	Packaged Rooftop Unit		*	1	5.0	Tons	Trane
Farmer's Market/Museum	Rooftop Unit	Packaged Rooftop Unit		ACU #3	1	8.5	Tons	Trane
Farmer's Market/Museum	Rooftop Unit	Packaged Rooftop Unit		*	1	5.0	Tons	Trane
Farmer's Market/Museum	Water Heater	Electric Water Heater	All Areas	*	1	2500.0	Watts	AO Smith

*Unit tags worn and illegible

Appendix C – Site Walkthrough Photos

C-1: Exterior Lighting Fixture

C-2: Kitchen refrigerators and ice machine

C-3: Kitchen Sink

C-4: Kitchen Lighting Fixture

C-5: Event Space Picture 1

C-6: Event Space Picture 2

C-7: Men's Restroom Sink and Urinal

C-8: Men's Restroom Sink and Toilet

C-9: Historic Train Depot Door

C-10: Ecobee Smart Thermostat

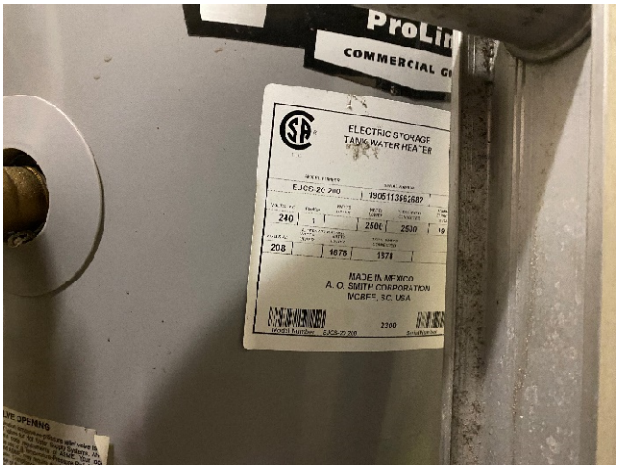
C-11: Exhaust Fan Grille

C-12: Rooftop Unit (Photo 1)

C-13: Rooftop Unit (Photo 2)

C-14: Rooftop Exhuast Fan

C-15: Rooftop Unit (Photo 3)



C-16: Water Heater Tag

C-17: Activity Space