9/29/2023

Winter Park Public Safety Facility

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) performed an ASHRAE Level 2 facility energy audit of the Winter Park Public Safety Building as a part of its 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 June 2023, 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 Public Safety Building is a two-story civic building of approximately 35,000 square feet, which includes a police station and fire station, as well as support facilities for each. An aerial view of the Public Safety Building is shown below.

Figure 1: Aerial View of the Winter Park Public Safety Building

The first level of the building houses the reception area as well as offices, conference spaces, evidence lockers, holding cells, training spaces, etc. The second level includes additional office, conference, and support spaces.

Mechanical Systems

The Winter Park Library features mechanical systems mostly dating to the original design in 2002. Overall, the building utilizes Air Handling Units, an Air-Cooled Chiller, CRAC Units, VAV Terminal 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 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.

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 four (4) chilled water air handling units. Each unit serves a dedicated area of the floor plate on a single floor. AHU-4 is located on the roof and provides conditioning for the vehicle evidence area. The units are equipped with a variable frequency drive (VFD) to allow supply air to modulate based on changing load conditions, as well as modulating chilled water control valves to control cooling capacity. Areas served by the AHUs reception areas, training rooms, holding cells, etc.

Air-Cooled Chiller

The building HVAC systems are supplied with cooling capacity via an air-cooled chiller, located to the rear of the building in the parking lot. The chiller includes two refrigeration circuits and VFD-controlled condenser fans to modulate chilled water capacity required to accommodate building load. The chiller is controlled via the building automation system to ensure that the air handling units receive the proper chilled water flow.

CRAC (Computer Room Air Conditioning) Units

Areas of the building that are not conditioned via the air handling units are provided with conditioning via DX CRAC Units. This includes communications spaces and 911 dispatch equipment spaces. There are four (4) DX systems manufactured by Liebert and Trane located in the Public Safety Building.

VAV Terminal Units

Variable Air Volume (VAV) boxes are duct devices that modulate flow to different thermal zones based on changing loads. The VAVs are part of the ductwork distribution from the AHUs and serve the various meeting rooms, offices, and training areas throughout the building.

Exhaust Fans

Exhaust fans were observed on the rooftop, providing general exhaust for restrooms located within the building. Additionally, specialized spaces such as evidence and equipment storage, among others, are provided with exhaust via dedicated fans.

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. 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 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 three (3) natural gas-fired water heaters, and one electric water heater. The water heaters are located in designated water heater rooms along with the hot water recirculation pump for the building. Each water heater has 80-gallon storage capacity with 150 kBTU/hr heating capacity.

Building Envelope

The building envelope systems date to the original 2002 construction of this facility. The façade is stucco over tilt-up concrete panels. All facades have original historic operable windows. The facility includes glazing designated as impact-resistant. The roof is a flat, built-up roof construction. TLC noted that the roof membrane was in the process of being replaced at the time of observation, with new TPO being installed.

Key Operating Parameters

The building is currently operated 24/7 due to the nature of the building mission. There are some areas that will experience typical office hours, but these areas do not currently have any controls schedule or temperature setbacks.

Site Visit

The site was audited by TLC engineers 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 served by electricity and water utilities by the City of Winter Park (CoWP). Electrical utility consumption 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)	1,577,129
Annual Electrical Cost	-

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

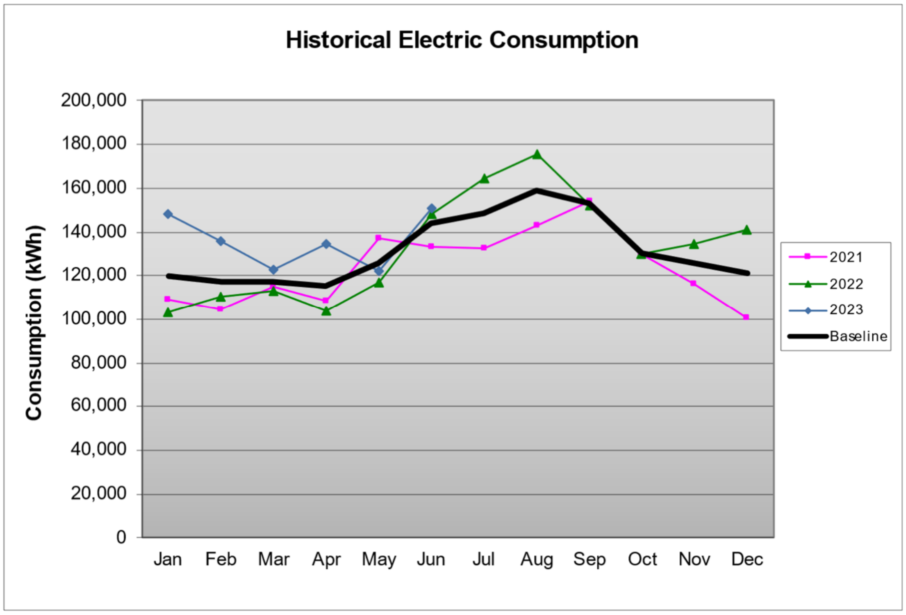


Figure 2: Public Safety Electric Consumption

Table 2: Public Safety Electricity Consumption Data

Date	Consumption (kWh)	Demand (kW)
Jan-21	109,358	447
Feb-21	104,285	474
Mar-21	115,129	476
Apr-21	108,195	502
May-21	136,926	561
Jun-21	133,511	588
Jul-21	132,528	606
Aug-21	142,712	299
Sep-21	154,074	348
Oct-21	130,257	262
Nov-21	116,409	262
Dec-21	100,783	262
Jan-22	102,993	262
Feb-22	110,588	262
Mar-22	113,338	262
Apr-22	104,085	262

Date	Consumption (kWh)	Demand (kW)
May-22	116,967	262
Jun-22	148,083	289
Jul-22	164,676	307
Aug-22	175,787	0
Sep-22	152,291	717.4
Oct-22	130,131	358.7
Nov-22	134,570	358.7
Dec-22	141,209	358.7
Jan-23	147,950	358.7
Feb-23	136,065	358.7
Mar-23	122,705	358.7
Apr-23	134,595	358.7
May-23	122,422	358.7
Jun-23	151,052	402.9

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 Police/Fire Station.

Based on most recent 24 months of utility data, a comparison can be drawn between the Public Safety Building and the average energy use intensity (EUI) of similar buildings throughout the United States. The median EUI for a police/fire station in the United States is 63.5 kBTU/sf, and the calculated EUI of the Public Safety Building is 146.3 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 capabilities present in police and fire stations can vary wildly by jurisdiction and location. Additionally, the building's geographical location necessitates increased operation of HVAC systems, which are the largest consumers of energy nationwide. For these reasons, while the comparison is valuable, it can be difficult to draw specific conclusions based only on the median EUI.

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 $0.1011/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	$0.1011/kWh

Energy Saving Opportunities

The operation and condition of equipment at the Public Safety 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)
E1 - Chiller Optimization	ECM	No Cost	9,710	$982	$0	--
E2 – AHU-4 CV to VAV	ECM	Moderate Cost	4,703	$475	$7,200	15.1
2a: Humidity Sensor	ECM	Low Cost	--	--	$1,200	--
2b: VFD Addition	ECM	Low Cost	--	--	$3,000	--
2c: Controls VAV Programming	ECM	Moderate Cost	--		$3,000	--
E3 - AHU Controls	ECM	Low Cost	22,733	$2,298	$5,990	2.6
E4 - Controls Optimization		Low Cost	2,658	$269	$6,000	22.3
E5 - Lighting Improvements	ECM	High Cost	128,019	$12,943	$62,400	4.8
F1 – DX Unit Retrofits (AC-2)	FIM	Capital Improvement	--	--	$90,000	--
F2 – AHU-4 Motor Replacement	FIM	Capital Improvement	--	--	$2,400	--
F3 – AHU-4 EHC Replacement	FIM	Capital Improvement	--	--	$5,000	--
Totals			**167,823**	**$16,967**	**$88,790**	**5.2**

*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.

Chiller Optimization

General Description

This measure proposes to optimize the settings and sequences that govern the chiller operation. A chiller and its associated chilled water distribution system have a wide variety of key input parameters and controls strategies that can greatly influence how it operates. Over time, adjustments are often made to chiller controls to either resolve a temporary problem, minimize maintenance requests from occupants, or other reasons. These adjustments can often result in the chilled water system operating in a less optimal way than was originally designed. A chilled water design typically considers different efficiencies at varying operating conditions, meaning a return to design operation can result in energy savings.

Site Specifics

During the on-site audits, it was observed that the chiller provides chilled water at temperatures between 41°F and 42°F. This is lower than the design leaving water temperature of 44°F from the as-built drawings. Operating a chiller at a lower leaving water temperature will cause the chiller to work harder and expend more energy in a less efficient manner. This measure proposes to adjust the chiller settings to provide 44°F water as originally designed. This is a setpoint change that TLC believes building operations should be able to provide as a no-cost change.

DX CRAC Unit Retrofit

General Description

This measure proposes replacing existing DX CRAC 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.

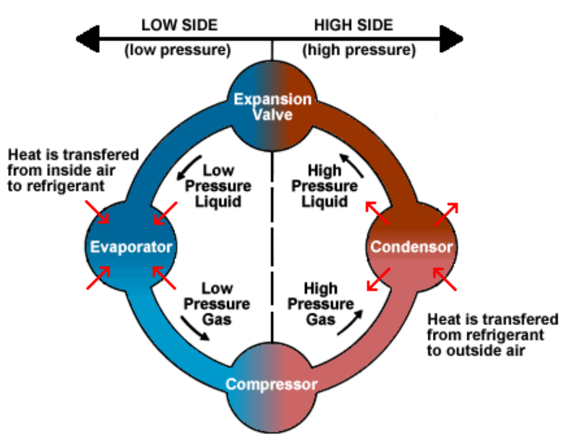


Figure 3: The Refrigeration Cycle

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 Liebert split system that serves the 2nd floor communications room 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.

CV to VAV

General Description

This measure proposes to convert an existing constant volume air handling unit (AHU-4) to be variable air volume (VAV) systems with a single zone. Existing constant volume (CV) air handlers provide constant airflow to the spaces whenever the fan is running. The zone temperatures in these spaces are controlled by varying the supply air temperature or cycling coils on and off. VAV systems allow the fan speed to be reduced for part load conditions, only providing the amount of air that is needed to meet the load. The modulating airflow, in conjunction with changing the supply air temperature, allows for tighter control of thermal comfort for changing space loads.

The air handling unit supply fan motor will be replaced with a premium efficiency inverter duty motor, with a new variable frequency drive (VFD) to vary the supply fan speed/airflow to control space temperature. Varying fan speed can greatly reduce the fan energy and make the system more efficient without sacrificing occupant comfort. The following graphic shows how varying load in the space will change the supply air temperature and fan speed.

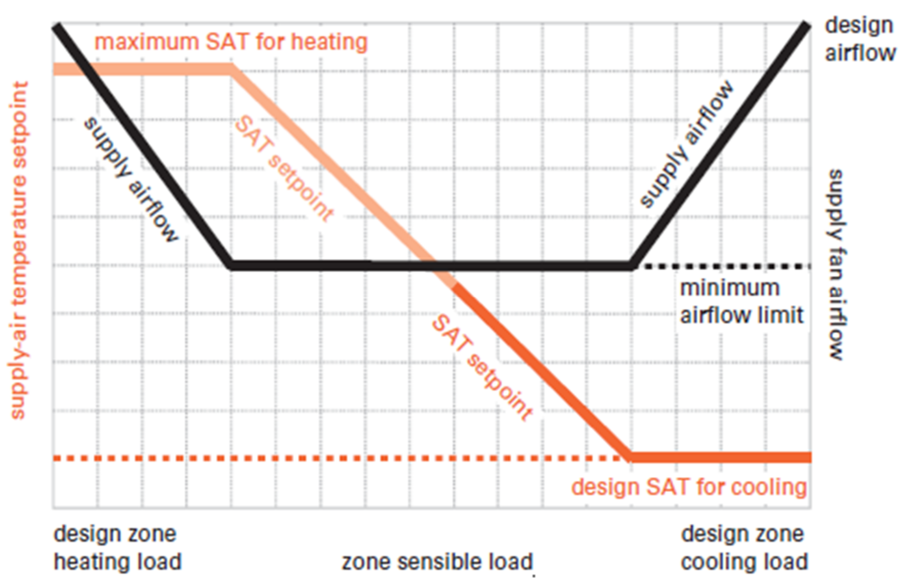


Figure 4: Varying Temperature and Airflow

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.

Site Specifics

The existing AHU-4 will be converted to VAV. During the audit, it was noted that the system is always in dehumidification mode due to a 99% return air humidity reading from a bad sensor. The chilled water valve was open 100% and the electric heat was calling for 100% heating. As the space was noted to be 67°F during the audit, it appears the electric heat is nonfunctional. In addition to converting the system to VAV as described above, the bad sensor and electric heat will be repaired or replaced to full functional condition.

AHU Controls

General Description

This measure proposes to install or update AHU controls. Over time, the control sequences for HVAC equipment such as air handling units will be modified from its original intent. It is also common for the building operation requirements to change, or for manual overrides to be put in place. These changes can result in HVAC systems consuming excess energy and not meeting their original design intent. By optimizing the controls, the HVAC systems can either be returned to their original design intent or can be optimized further than originally intended due to changes to the building operational needs.

Site Specifics

During the audit, it was observed that the VFDs for the outside air fans associated with AHU-1 through 3 were operating in hand at 100%. Further investigation indicated that the return air dampers for the associated AHUs were either removed, rusted, or otherwise rendered inoperable. The outside air fans were likely put into hand to compensate for the lack of return damper control, in order to over-pressurize the outside air duct and force adequate outside air into the AHUs.

While a test and balance report from August 2022 indicated that the outside air being provided was less than the design airflow, it also indicated that the OA fans were not operating. We are unable to confirm at this time, but the outside air fans may be providing excess outside air given their constant 100% operation. If that is the case, resolving the AHU controls issues described will also save energy from conditioning less outside air.

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 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

While the building overall is considered a 24/7 occupancy building, there are areas that are not occupied outside of regular office hours. These noncritical areas would be optimized with controls schedules based on the hours these areas are typically occupied. 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.

DHW Retrofit

One out of the two gas-fired water heaters (GWH) were observed to be out of commission due to a bad firing mechanism. The other water heater is able to function but may be short on capacity at peak design conditions. The nonfunctional water heater should be repaired or replaced if deemed necessary. Having both water heaters functional will allow for the full designed capacity, as well as provide partial redundancy in the event that one needs maintenance or repairs. This redundancy benefit is currently being seen with one of the units down.

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.

Chiller Optimization

Savings for this measure have been based on a reduction in cooling energy due to more efficient chiller operation. The following table shows the major inputs used in the calculation of savings for this measure.

Table 6: Chiller Optimization Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Existing Chiller LWT	Air-Cooled Chiller	41.5°F	Audit observations
Design Chiller LWT	Air-Cooled Chiller	44.0°F	As-built drawings
Efficiency Penalty for LWT	Air-Cooled Chiller	1.5% per degree	Engineering judgment, previous projects

Calculations:

Savings for this measure were based on calculating the change in annual cooling energy based on a more efficient chiller. 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.

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

In the formula, the baseload month kWh was the consumption for the month with the lowest consumption in the baseline. The efficiency penalty percentage was calculated with the formula below.

$$Efficiency\ Penalty = (1 + 1.5\%)^{(LWT_{Design} - LWT_{Existing})}$$

The proposed cooling energy was then calculated with the following formula. The savings are the difference between the existing and proposed cooling energy.

$$Proposed\ Cooling\ kWh = Existing\ Cooling\ kWh \times \left(\frac{1}{Efficiency\ Penalty}\right)$$

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 7: DX Unit Retrofit Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
CU-2 Rated Capacity	CU-2	2.8 tons	Manufacturer info
CU-2 Existing Efficiency	CU-2	12.79 SEER	Mfg. info and typical degradation for age
CU-2 Proposed Efficiency	CU-2	16.0 SEER	Engineering judgment
Effective Full Load Hours	CU-2	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.

CV to VAV

Savings for this measure have been based on a reduction in the power consumed by the AHU supply fan. The following table shows the major inputs used in the calculation of savings for this measure.

Table 8: CV to VAV Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Fan Motor HP	AHU-4	1.0	As-built drawings
Annual Operating Hours	AHU-4	8,760	Building schedule
Existing Fan Power Ratio	AHU-4	1.00	No reduction, fan always at 100% power
Proposed Fan Power Ratio	AHU-4	0.28	Estimated average condition of 60% flow

Calculations:

Savings for this measure were based on calculating the annual fan energy with the existing and proposed fan power ratios. The fan's annual energy consumption in kWh was calculated with the following formula.

$$Energy\ Consumption = Fan\ HP \times 0.7457 \times Hours \times Fan\ Power\ Ratio$$

AHU Controls

Savings for this measure have been based on a reduction in the power consumed by the outside air fans associated with AHU-1 through 3. The following table shows the major inputs used in the calculation of savings for this measure.

Table 9: AHU Controls Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
Fan Motor HP	AHU-1 OA Fan	3.0	As-built drawings
Fan Motor HP	AHU-2 OA Fan	1.5	As-built drawings
Fan Motor HP	AHU-3 OA Fan	1/3	As-built drawings
Annual Operating Hours	AHU-1,2,3 OA Fan	8,760	Building schedule
Existing Fan Power Ratio	AHU-1,2,3 OA Fan	1.00	No reduction, fan always at 100% power
Proposed Fan Power Ratio	AHU-1,2,3 OA Fan	0.28	Estimated average condition of 60% flow

Calculations:

Savings for this measure were based on calculating the annual fan energy with the existing and proposed fan power ratios. The fan's annual energy consumption in kWh was calculated with the following formula.

$$Energy\ Consumption = Fan\ HP \times 0.7457 \times Hours \times Fan\ Power\ Ratio$$

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 10: Controls Optimization Major Inputs

Input Name	Bldg./Area Affected	Input Value	Basis of Input
% Cooling Energy Reduction	Entire building	1%	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.

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

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 11: 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

Input Name	Bldg./Area Affected	Input Value	Basis of Input
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.

FIXTURE SCHEDULE

TYPE	DESCRIPTION	TOTAL WATTS	LAMPS NO.	LAMPS WATTS	LAMPS TYPE	MOUNTING
FA	MAIN LOBBY FIXTURE. EQUIP WITH PORCELAIN LAMP SOCKETS FOR 120V MEDIUM BASED LAMPS, MOTTLED BRASS FINISH, GOLD-WHITE SHADE GLASS. REJUENATION MODEL C321	240	12	15	CF15EL/830/ MED/1	PENDANT
FA1	COMMUNITY ROOM FIXTURE. EQUIP WITH PORCELAIN LAMPHOLDERS FOR 120V MEDIUM BASED LAMPS, MOTTLED BRASS FINISH, GOLD-WHITE SHADE GLASS. REJUENATION AMHERST MODEL C656	80	4	15	CF15EL/830/ MED/1	PENDANT
FA2	ENTRANCE LOBBY FIXTURE. EQUIP WITH PORCELAIN LAMPHOLDERS FOR 120V MEDIUM BASED LAMPS, MOTTLED BRASS FINISH, #174CE SHADE GLASS. REJUENATION FRANKLIN MODEL C400	80	4	15	CF15EL/830/ MED/1	PENDANT
FA3A	ENTRANCE CORRIDOR FIXTURE. EQUIP WITH PORCELAIN LAMPHOLDERS FOR 120V MEDIUM BASED LAMPS, MOTTLED BRASS FINISH, PORCELAIN GLASS SHADES, EXTEND OVERALL LENGTH TO 42 INCHES INCLUDING SHADES. REJUENATION ARGYLE MODEL C246	40	2	15	CF15EL/830/ MED/1	PENDANT
FA3B	ENTRANCE CORRIDOR FIXTURE. EQUIP WITH PORCELAIN LAMPHOLDERS FOR 120V MEDIUM BASED LAMPS, MOTTLED BRASS FINISH, PORCELAIN GLASS SHADES, EXTEND OVERALL LENGTH TO 36 INCHES INCLUDING SHADES. REJUENATION ARGYLE MODEL C246	40	2	15	CF15EL/830/ MED/1	PENDANT
FB	PENDANT INDIRECT FLUORESCENT FIXTURE CONSISTING OF PERFORATED EXTRUDED ALUMINUM BOTTOM SUPPORTED BY CRS STEEL CHASSIS WHICH ALSO SUPPORTS AN EXTRUDED SLOTTED ALUMINUM REFLECTOR, AN OPAL ACRYLIC DIFFUSER ABOVE THE LOWER HOUSING, LAMPHOLDERS AND 277V FUSED ELECTRONIC BALLAST FOR TWO F32T8RS LAMPS PER FOUR FOOT SECTION. EACH EIGHT FOOT SECTION TO BE EQUIPPED WITH REGRESSED INTERMEDIATE CONNECTOR AND EACH RUN IS TO BE EQUIPPED WITH MATCHING REGRESSED END CAPS. FINISH EXPOSED METALLIC PARTS IN POWDER POLYESTER ENAMEL OF COLOR SELECTED BY ARCHITECT. LITECONTROL "CLASSICA" OR EQUAL APPROVED BY ENGINEER	70	2	32	F032/ 835	PENDANT
FB1	SIMILAR TO FIXTURE TYPE "FB" EXCEPT WALL MOUNTED.	70	2	32	F032/ 835	WALL
FC	FLOURESCENT TROFFER, 2'x2' NOMINAL, FORMED CRS STEEL CHASSIS FINISHED IN HIGH REFLECTANCE BWE, WHITE FLAT SPRING-LOADED STEEL HINGE AND LATCH DOOR FRAME WITH INTEGRAL LIGHT TRAPS, VIRGIN PRISMATIC ACRYLIC DIFFUSER IN PATTERN 12.EQUIP WITH LAMPHOLDERS, AND 277 VOLT FUSED ELECTRONIC BALLAST FOR TWO F32T8U LAMPS. LITHONIA #2SP SERIES, COLUMBIA #J24 SERIES, DAYBRITE #2P3 SERIES	70	2	32	F3031/ 835	RECESSED
FD	FLOURESCENT TROFFER, 2'x4' NOMINAL, FORMED CRS STEEL CHASSIS FINISHED IN HIGH REFLECTANCE BWE, WHITE FLAT SPRING-LOADED STEEL HINGE AND LATCH DOOR FRAME WITH INTEGRAL LIGHT TRAPS, VIRGIN PRISMATIC ACRYLIC DIFFUSER IN PATTERN 12.EQUIP WITH LAMPHOLDERS, AND 277 VOLT FUSED ELECTRONIC BALLASTS (2/1) FOR THREE F32T8 LAMPS. LITHONIA #2SP SERIES, COLUMBIA #J24 SERIES, DAYBRITE #2P3 SERIES	100	3	32	F032/ 835	RECESSED
FD1	FLOURESCENT TROFFER, 1'x4' NOMINAL, FORMED CRS STEEL CHASSIS FINISHED IN HIGH REFLECTANCE BWE, WHITE FLAT SPRING-LOADED STEEL HINGE AND LATCH DOOR FRAME WITH INTEGRAL LIGHT TRAPS, VIRGIN PRISMATIC ACRYLIC DIFFUSER IN PATTERN 12 AND GASKETING FOR DAMP LOCATION LABEL. EQUIP WITH LAMPHOLDERS, AND 277 VOLT FUSED ELECTRONIC BALLAST FOR TWO F32T8 LAMPS. LITHONIA #2SP SERIES, COLUMBA #J24 SERIES, DAYBRITE #2P3 SERIES	70	2	32	F032/ 835	RECESSED
FE	FLOURESCENT TROFFER, 1'x4' NOMINAL, FORMED CRS STEEL CHASSIS FINISHED IN HIGH REFLECTANCE BWE, WHITE FLAT SPRING-LOADED STEEL HINGE AND LATCH DOOR FRAME WITH INTEGRAL LIGHT TRAPS, VIRGIN PRISMATIC ACRYLIC DIFFUSER IN PATTERN 12 AND GASKETING FOR DAMP LOCATION LABEL. EQUIP WITH LAMPHOLDERS, AND 277 VOLT FUSED ELECTRONIC BALLAST FOR TWO F32T8 LAMPS. LITHONIA #2SP SERIES, COLUMBA #J24 SERIES, DAYBRITE #2P3 SERIES	70	2	32	F032/ 835	RECESSED
FF	WET LOCATION INDUSTRIAL FLOURESCENT FIXTURE, 10"x4' NOMINAL, FORMED CRS STEEL BODY FINISHED IN HIGH REFLECTANCE BWE, MOLDED HIGH-IMPACT ACRYLIC DIFFUSER SECURED BY CORROSION-RESISTANT FASTENERS. EQUIP WITH LAMPHOLDERS AND 277 VOLT FUSED ELECTRONIC BALLAST FOR TWO F32T8 LAMPS. LITHONIA #DMSW SERIES, COLUMBA #LU4 SERIES, DAYBRITE # VD SERIES	70	2	32	F032/ 835	SURFACE
FG	SURFACE MOUNTED SECURITY FLUORESCENT FIXTURE OF WELDED 16GA. COLD ROLLED STEEL WITH SMOOTH GROUND JOINTS MOUNTED ON A COLD ROLLED STEEL BACK PLATE, 20 INCHES WIDE BY 48 INCHES LONG BY 5 INCHES DEEP, THREE APERTURES FOR COMPOSITE DIFFUSERS CONSISTING OF PRISMATIC 0.156" POLYCARBONATE INNER LENS WITH 0.250" CLEAR SMOOTH POLYCARBONATE OUTER DIFFUSER SECURED IN A STEEL FRAME. ACCESS ONLY BY TORX HEAD RETAINED FASTENERS. EQUIP WITH 277 VOLT FUSED ELECTRONIC BALLASTS FOR INDIVIDUAL OPERATION OF TWO F32T8RS LAMPS, ONE F32T8RS LAMP AND ONE 9W CFL NIGHT LIGHT. FINISH EXPOSED METALLIC PARTS IN WHITE POWDER POLYESTER ENAMEL OVER MFRS'. RECOMMENDED PRE-TREATMENT. KENALL "MIGHTY MAC" SERIES, MORLITE "SUPERMAX" SERIES, NEW STAR "53UMS" SERIES	100 15	3 1	32 9	F032/ 835 9W CFL	SURFACE
FH	STANDARD COMMERCIAL STRIP FLUORESCENT FIXTURE, FOUR FOOT WHITE PAINTED STEEL CHASSIS WITH LAMPHOLDERS AND 277V FUSED ELECTRONIC BALLAST FOR TWO F32T8 LAMPS. COLUMBIA "CS" SERIES, COOPER LIGHTING "SN" SERIES, LITHONIA "S" SERIES	70	2	32	F032/ 835	SURFACE
FJ	COMPACT FLOURESCENT VERTICAL DOWNLIGHT, 9" NOMINAL APERTURE, SEMI-SPECULAR CLEAR ALZAK REFLECTOR, REGRESSED FLAT DOOR WITH FLAT FRESNEL LENS. FINNED DIE-CAST ALUMINUM HEAT SINK, THROUGH WIRE JUNCTION BOX ACCESSIBLE FROM BELOW CEILING, 26" MOUNTING BARS. EQUIP WITH LAMPHOLDER AND FUSED 277 VOLT ELECTRONIC BALLAST FOR ONE 32TRT LAMP. LABEL FOR WET LOCATIONS. LITHONIA #LGFV SERIES, PRESCOLITE #PBX SERIES, CAPRI #C8 SERIES	40	1	32	32W TRT	RECESSED
FK	COMPACT FLOURESCENT VERTICAL DOWNLIGHT, 8" NOMINAL APERTURE, SEMI-SPECULAR CLEAR ALZAK REFLECTOR SELF FLANGED IN PAINTED WHITE, FINNED DIE-CAST ALUMINUM HEAT SINK, THROUGH WIRE JUNCTION BOX ACCESSIBLE FROM BELOW CEILING, 26" MOUNTING BARS. EQUIP WITH LAMPHOLDER AND FUSED 277 VOLT ELECTRONIC BALLAST FOR ONE 42TRT LAMP. LITHONIA #LGFV SERIES, PRESCOLITE #PBX SERIES, CAPRI #C8 SERIES	50	1	42	42W TRT	RECESSED
FL	SQUARE COMPACT FLOURESCENT RECESSED FIXTURE, 11" NOMINAL SQUARE OPENING, CLEAR SEMI-SPECULAR ALZAK UPPER REFLECTOR, FLUSH DIE-CAST ALUMINUM DOOR FINISHED IN BWE AND GASKETED FLANGE , THROUGH WIRE JUNCTION BOX ACCESSIBLE FROM BELOW CEILING, 26" MOUNTING BARS. EQUIP WITH LAMPHOLDERS AND FUSED 277 VOLT ELECTRONIC BALLAST FOR TWO F42TRT LAMPS. WET LOCATION LABELED. LITHONIA #LAF SERIES, PRESCOLITE #PBX SERIES, CAPRI #C8 SERIES	100	2	42	42W TRT	RECESSED
FL1	SIMILAR TO TYPE 'FL' AND OF THE SAME MANUFACTURER, EXCEPT EQUIPPED WITH DIMMING BALLAST PROVIDING DIMMING TO ONE PERCENT OF THE OUTPUT AND COMPATIBLE WIRH PROVIDED WALL BOX DIMMER.	100	2	42	42W TRT	RECESSED
FM	WALL MOUNTED UP-DOWN FLUORESCENT FIXTURE CONSISTING OF STEEL CHASSIS MOUNTING BLACK POWDER POLYESTER FINISHED EXTRUDED ALUMINUM BODY, INJECTION MOLDED CLEAR PRISMATIC BASKET DIFFUSER WITH PYRAMID PRISMS ON BOTTOM AND LINEAR PRISMS ON ENDS AND SIDES, PRISMATIC ACRYLIC UPPER DIFFUSER FOR UP LIGHT, LAMPHOLDERS ANDFUSED 277 VOLT ELECTRONIC BALLAST FOR TWO F32T8RS LAMPS. DAYBRITE "AZTEC" SERIES, METALUX "BUI" SERIES, OR EQUAL APPROVED BY ENGINEER	70	2	32	F032/ 835	WALL
FM1	SIMILAR TO FIXTURE TYPE "FM" AND OF SAME MANUFACTURER EXCEPT EQUIPPED WITH LAMP SEPARATOR, SWITCHED NIGHT LIGHT (9W CFL) AND PULL SWITCH FOR OTHER LAMPS.	70	2	32	F032/ 835 9W CFL	WALL
FN	FLUORESCENT WALL PACK, POLYCARBONATE BODY ON STEEL MOUNTING PLATE, INJECTION MOLDED POLYCARBONATE PRISMATIC DIFFUSER SEALED AND GASKETED TO BODY, EQUIP WITH 277V FUSED LOW TEMPERATURE BALLAST AND LAMPHOLDER FOR ONE 42W TRT FLUORESCENT LAMP. LITHONIA # TWL SERIES, GENERAL ELECTRIC #WM SERIES	50	1	42	42W TRT	RECESSED
FO	FLUORESCENT TROFFER, 2'x4' NOMINAL, FORMED CRS STEEL CHASSIS FINISHED IN HIGH REFLECTANCE BWE WITH INDIVIDUALLAMP COMPARTMENTS WHEN ASSEMBLED WITH LOUVER, FLOATING BLACK REVEAL MITER CUT ALUMINUM DOOR FRAME WITH INTEGRAL LIGHT TRAPS HOLDING A NOMINAL THREE INCH DEEP SEMI-SPECULAR LOW IRIDESCENT PARABOLIC LOUVER WITH 18 CELLS. EQUIP WITH LAMPHOLDERS, AND 277 VOLT FUSED ELECTRONIC BALLASTS (2/1) FOR THREE F32T8 LAMPS. MFR.; LITHONIA #2PM3 SERIES, COLUMBIA #P224 SERIES, DAYBRITE #2U SERIES	100	3	32	FBO 32/ 835	RECESSED
FP	PARABOLIC FLUORESCENT TROFFER, 2'x2' NOMINAL, FORMED CRS CHASSIS FINISHED IN HIGH REFLECTANCE WHITE POLYESTER POWDER COAT; BLACK, REGRESSED FLOATING, SPRING-LOADED, ALUMINUM, MITERED CORNER, HINGE AND SPRING LATCH, DOOR FRAME WITH INTEGRAL LIGHT TRAPS; 1-1/2" x1-1/2"x3/4" ALUMINUM WHITE PAINTED LOUVER; EQUIP CHASSIS WITH LAMPHOLDERS AND 277 VAC FUSED ENCAPSULATED AND POTTED ELECTRONIC BALLAST FOR TWO F31T8URS (1-58" LEG) LAMPS. MFR: LITHONIA "2PM3" SERIES, DAYBRITE "2P3" SERIES, COLUMBIA "P4" SERIES.	70	2	31	FBO 31/ 835	RECESSED
FP1	SIMILAR TO TYPE 'FP' AND OF SAME MANUFACTURER, EXCEPT EQUIPPED WITH TWO ONE LAMP BALLASTS FOR SPLIT CIRCUITING.	70	2	31	FBO 31/	RECESSED
FR	FLUORESCENT DIRECT/INDIRECT GRID TROFFER, 2'x4' NOMINAL, FORMED CRS STEEL CHASSIS FINISHED IN HIGH REFLECTANCE BWE, MATTE WHITE POLYESETER REFLECTORS, PERFORATED METAL DIFFUSER FINISHED IN MATTE WHITE, EQUIP WITH LAMPHOLDERS, AND 277 VOLT FUSED ELECTRONIC DIMMING BALLAST FOR ONE F32T8 LAMP AND ONE TWO LAMP 277 VOLT FUSED ELECTRONIC BALLAST FOR TWO F32T8 LAMPS. DIMMING BALLAST RATED FOR ONE PERCENT MINIMUM OUTPUT AND COMPATIBLE WITH THE WALL BOX DIMMER CONTROLLING. MFR.: LITHONIA "AVANTE" SERIES, COLUMBIA "STR" SERIES, DAYBRITE "AROISO" SERIES	100	3	32	FBO 32/ 835	RECESSED
FR1	SIMILAR TO TYPE "FR" AND OF SAME MANUFACTURE EXCEPT ALL THREE LAMPS EQUIPPED WITH FUSED 277 VOLT ELECTRONIC DIMMING BALLASTS FOR ALL THREE LAMPS.	100	3	32	FBO 32/ 835	RECESSED
FT	FLUORESCENT UNDERCOUNTER FIXTURE CONSISTING OF THREE FOOT SOLID FRONT, LOW PROFILE METAL HOUSING FINISHED IN GLOSS-WHITE ENAMEL, ACRYLIC PRISMATIC DIFFUSER, EQUIP WITH LAMPHOLDERS, AND 277 VOLT FUSED ELECTRONIC BALLAST FOR ONE F25T8 LAMP . MFR: LITHONIA "N2S" SERIES OR APPROVED EQUAL BY ALKO OR LIGHTOLIER	35	1	25	FO 25/ 835	SURFACE
FU	SURFACE WALL MOUNTED FLUORESCENT FIXTURE CONSISTING OF TRAPEZOIDAL DIE CAST ALUMINUM BODY FINISHED IN BLACK POWDER COATED POLYESTER, RECTANGULAR PRISMATIC TEMPERED GLASS LENS, TOP AND BOTTOM, WITH SMOOTH EXTERIOR AND EQUIPPED WITH NEOPRENE GASKET BETWEEN LENS AND BEZEL, CAST ALUMINUM BEZEL FINISHED IN POWDER COAT POLYESTER TO MATCH HOUSING, SECURED TO HOUSING BY TOREX SS SCREWS AND EQUIPPED WITH CLOSED CELL NEOPRENE GASKET BETWEEN HOUSING AND BEZEL, EQUIP WITH INTERNAL REFLECTORS, FUSED 277VACLOW TEMPERATURE ELECTRONIC BALLAST FOR TWO 26W CFL LAMPS. MFR: REBELLE 2626 SERIES" OR APPRVOED EQUAL	60	2	26	CF260T/ E/IN/835	SURFACE WALL

Appendix B – Mechanical Equipment

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

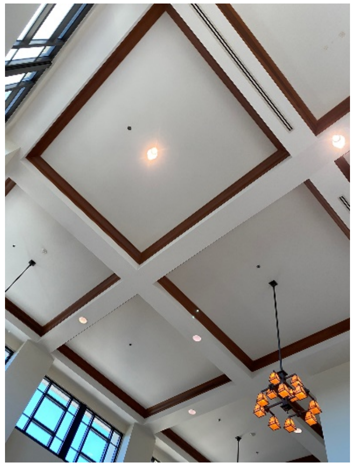
Building	Type	Equip	Location Served	Tag	Qty	Capacity	Units	Make	Model	Serial Number	Year
Public Safety	Air Handling Unit	AHU	First Floor	AHU-1	1	110.9	Tons	Trane	MCCA066GAZ0ABC000M0	K02G16670A	2002
Public Safety	Air Handling Unit	AHU	Second Floor	AHU-2	1	76.0	Tons	Trane	MCCA050BBK0C0DA	K02G16674A	2002
Public Safety	Air Handling Unit	AHU	Second Floor	AHU-3	1	35.0	Tons	Trane	MCCB025N0A000	K02H18932A	2002
Public Safety	Air Handling Unit	AHU	Vehicle Evidence	AHU-4	1	5.39	Tons	Trane			
Public Safety	Outdoor Air Fan	OAF	AHU-1 OA	OAF-1	1		kWh	Trane			
Public Safety	Outdoor Air Fan	OAF	AHU-2 OA	OAF-2	1	23409.0	kWh	Greenheck	RSF-100-15-X	21112107	
Public Safety	Outdoor Air Fan	OAF	AHU-3 OA	OAF-3	1	10710.0	kWh	Greenheck	RSF-100-3-X	21112131	
Public Safety	Chiller	Air Cooled Chiller	All Areas	CH-1	1	200.0	Tons	Trane	RTAC 2004 U1DH UAFR L1TY NN5T A10A N0EX N	U17B07220	2017
Public Safety	Pumps	Pumps	Chiller	P-1	1	25.0	HP	Armstrong	4030	466831	
Public Safety	Pumps	Pumps	Chiller	P-2	1	25.0	HP	Armstrong	4030	466832	
Public Safety	Air Conditioning Unit	AC	1st Floor Com	AC-1	1	1/2	HP				

Public Safety	Air Conditioning Unit	AC	2nd Floor Com	AC-2	1	1/2	HP	Liebert	MMD36EA HEDF	0244N70291	2002
Public Safety	Air Conditioning Unit	AC	Com Center	AC-3	1	2.00	HP	Liebert	VH125AHA AEI	529890-001	2002
Public Safety	Air Conditioning Unit	AC	Tele Switch	AC-4	1	1.50	HP	Trane	TEM4A0B3 65315BA	203956H73V	2002
Public Safety	Condensing Unit	Air Cooled Condenser	1st Floor Com	CU-1	1	2.8	Tons	Liebert			
Public Safety	Condensing Unit	Air Cooled Condenser	2nd Floor Com	CU-2	1	2.8	Tons	Liebert	DCDF165-A	C14K2F2629	2014
Public Safety	Condensing Unit	Air Cooled Condenser	Com Center	CU-3	1	10.0	Tons	Libert			
Public Safety	Condensing Unit	Air Cooled Condenser	Tele Switch	CU-4	1	4.9	Tons	Trane	4TTR4036L 1000AA	203910263F	2002
Public Safety	Exhaust Fans	EF	Crew Area Toilets	EF-1-1	1	[175]	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	Crew Area Janitor	EF-1-2	1	[100]	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	First Floor Lobby Toilets	EF-1-3	1	1/3	HP	Greenheck	CSP-264		2002
Public Safety	Exhaust Fans	EF	Crew Area Toilets	EF-1-4	1	[150]	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	Elev Equipment	EF-1-5	1	[150]	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	First Floor Toilets	EF-1-6	1	1/3	HP	Greenheck	CSF-264		2002
Public Safety	Exhaust Fans	EF	Apparatus Bay	EF-1-7	1	3	HP	Greenheck	GB-330-30-X	02H25627	2002
Public Safety	Exhaust Fans	EF	Paper Shredder	EF-1-8	1	1/3	HP	Greenheck	CSP-264		2002
Public Safety	Exhaust Fans	EF	Hose Storage	EF-1-9	1	1/6	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	Bunker Gear	EF-1-10	1	1/8	HP	Greenheck			2002

Public Safety	Exhaust Fans	EF	Maintenance/Decon Room	EF-1-11	1	[350]	HP	Greenheck	CSP-264	2002
Public Safety	Exhaust Fans	EF	EMS Storage	EF-1-12	1	1/3	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Compressor/Scba Room	EF-1-13	1	[250]	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Kitchen Hood	EF-1-14	1	1/4	HP	Captive Aire	DU50HPA	2002
Public Safety	Exhaust Fans	EF	Evidence Toilet	EF-1-15	1	[100]	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Evidence Storage	EF-1-16	1	1/3	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Cell Area	EF-1-17	1	1/3	HP	Greenheck	BSQ-120-3	2002
Public Safety	Exhaust Fans	EF	Locker Rooms	EF-1-18	1	1/4	HP	Greenheck	BSQ-160-4	2002
Public Safety	Exhaust Fans	EF	Haz Mat Storage	EF-1-19	1	[100]	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Ammo Room	EF-1-20	1	[200]	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Elev Equipment	EF-1-21	1	[150]	HP	Greenheck	TEM4A0B3 65315BA	2002
Public Safety	Exhaust Fans	EF	Blood Drying	EF-1-22	1	[100]	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	K-9 Area	EF-1-23	1	1/8	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Decon Room	EF-1-24	1	1/25	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Haz Evidence Storage	EF-1-25	1	1/20	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Armory	EF-1-26	1	[150]	HP	Greenheck		2002
Public Safety	Exhaust Fans	EF	Vehicles	EF-1-27	1	3/4	HP	Greenheck	GB-180-7	2002
Public Safety	Exhaust Fans	EF	2nd Floor Toileta	EF-2-1	1	[100]	HP	Greenheck		2002

Public Safety	Exhaust Fans	EF	Drug	EF-2-2	1	1/20	HP	Greenheck	G-065-D-X	02H25695	2002
Public Safety	Exhaust Fans	EF	2nd Floor Toilets	EF-2-3	1	[100]	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	2nd Floor Toilets	EF-2-4	1	1/6	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	2nd Floor Toilets	EF-2-5	1	1/8	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	2nd Floor Toilets	EF-2-6	1	1/3	HP	Greenheck	G-160-B	02H25780	2002
Public Safety	Exhaust Fans	EF	2nd Floor Toilets	EF-2-7	1	1/20	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	2nd Floor Toilets	EF-2-8	1	1/20	HP	Greenheck			2002
Public Safety	Exhaust Fans	EF	2nd Floor Toilets	EF-2-9	1	1/25	HP	Greenheck	G-095-D-X	02H25746	2002
Public Safety	SF	Supply Fan	Kitchen Hood	SF-1	1	1/4	HP	Captive Aire	INLINEI-G10		2002
Public Safety	Water Heater	Natural Gas Water Heater		GWH-1	1	130000.0	BTU	AO Smith	BTH-150 300	1717105909390	2017
Public Safety	Water Heater	Natural Gas Water Heater		GWH-2	1	150000.0	BTU	RUUD	GHE80ES-130	A341708584	2017
Public Safety	Water Heater	Natural Gas Water Heater		GWH-3	1	130000.0	BTU	AO Smith			2017
Public Safety	Water Heater	Electric Water Heater		EWH-1	1			AO Smith			2002
Public Safety	Pump	Circulator Pump	GWH-1	RCP-1	1			Taco	0011		2002
Public Safety	Pump	Circulator Pump	GWH-2	RCP-2	1			Taco	0010		2002
Public Safety	Condensing Unit	Split System Condensing Unit			1	3	Tons	Daikin	RK36NMVJUA	E002005	2020
Public Safety	Condensing Unit	Split System Condensing Unit			1	4	Tons	Daikin	RK36NMVJUA	E002197	2020

Appendix C – Site Walkthrough Photos

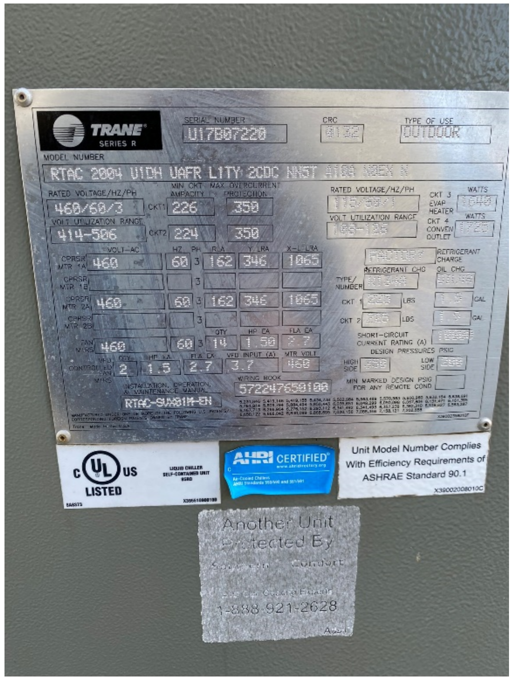
 C-1: Entry/Reception Lighting (1)	 C-2: Entry/Reception Lighting (2)

 C-3: Conference Room Thermostat	 C-4: AHU-2 Outside Air Fan VFD at 100%
 C-5: AHU-3 Supply Fan	 C-6: AHU-3 Supply Fan Motor

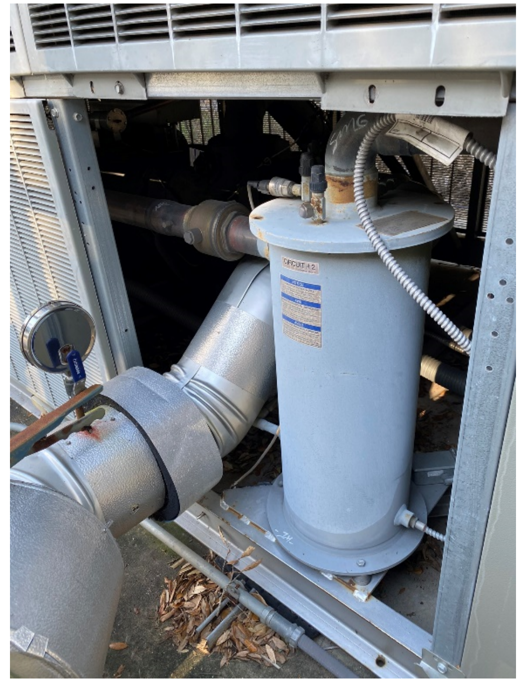
 C-7: Emerson CRAC Condensing Unit	 C-8: Trane Rooftop Condensing Unit

 C-9: Rooftop Exhaust Fan (1)	 C-10: Rooftop Outside Air Fan

 C-11: Rooftop Exhaust Fan (2)	 C-12: Air-Cooled Chiller CH-1



C-13: CH-1 Nameplate



C-14: CH-1 Refrigeration Components


C-15: Air Handling Unit AHU-1


C-16: Outside Air Fan OAF-1

C-17: Chilled Water Pump

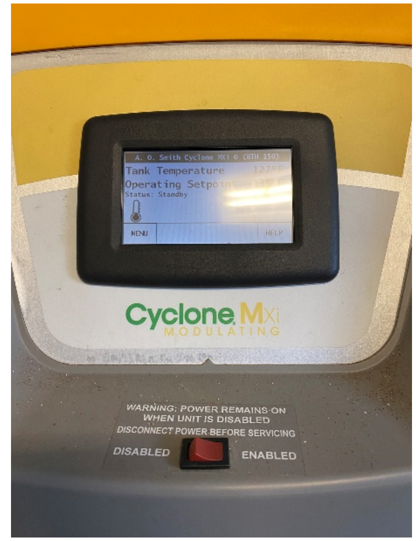
C-18: Chilled Water Pump Nameplate

C-19: Air Handling Unit AHU-4

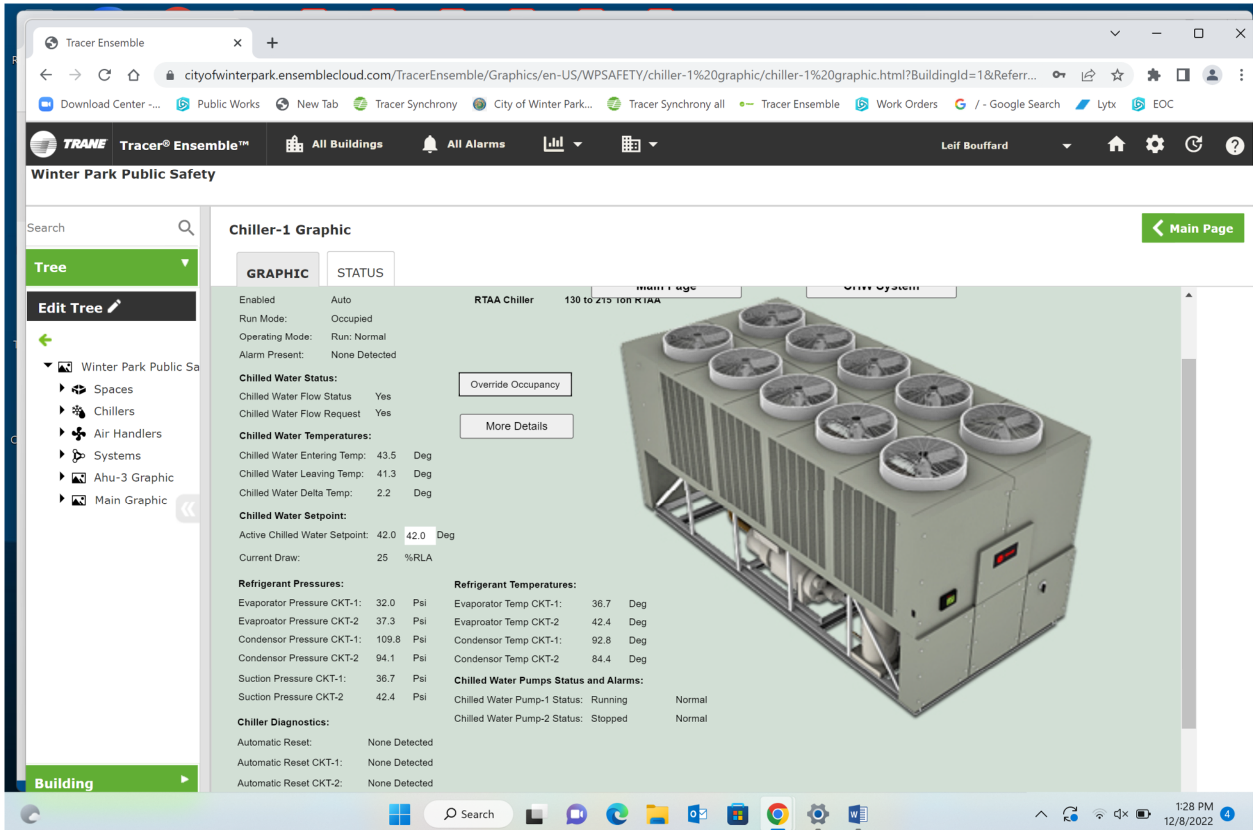
C-20: AHU-4 Chilled Water Coil Condition

 C-21: AHU-4 Heating Coil Condition	 C-22: Gas-Fired Water Heater (1)

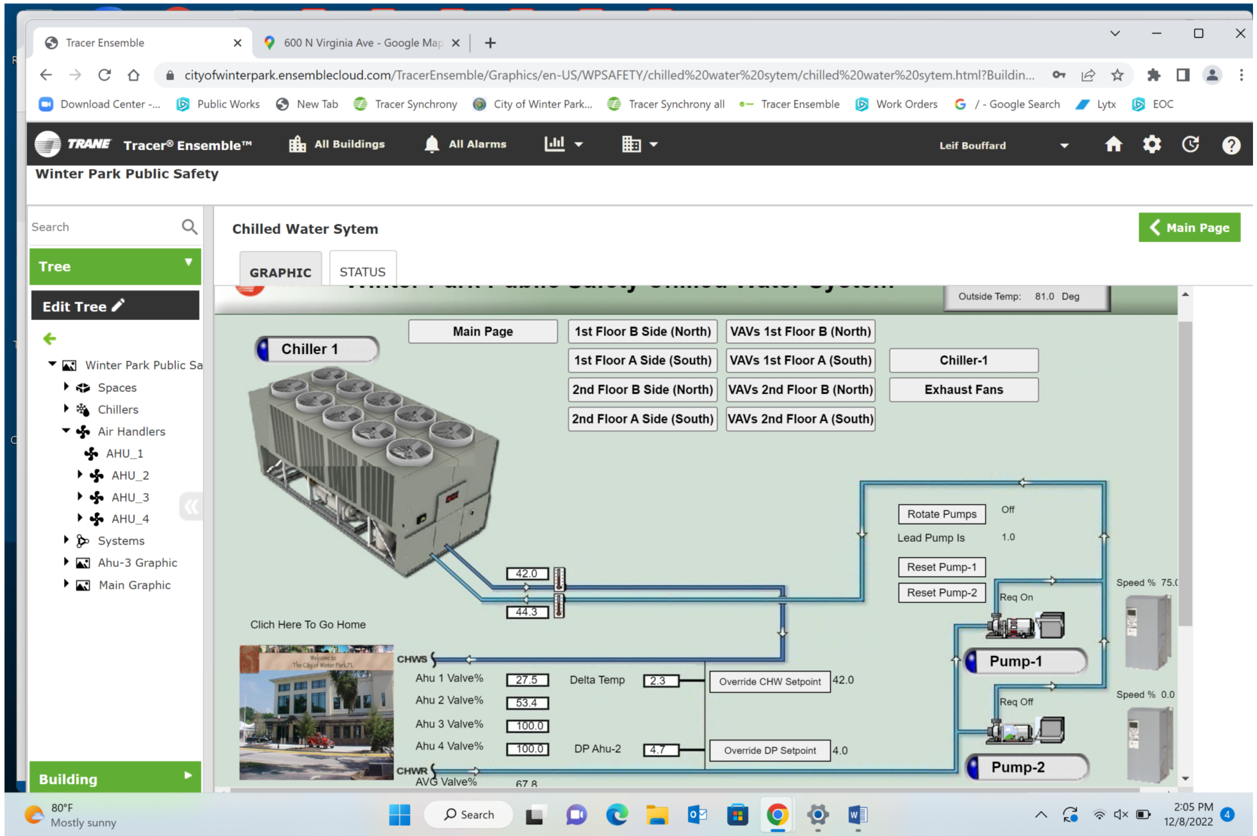
C-23: Gas-Fired Water Heater (2)



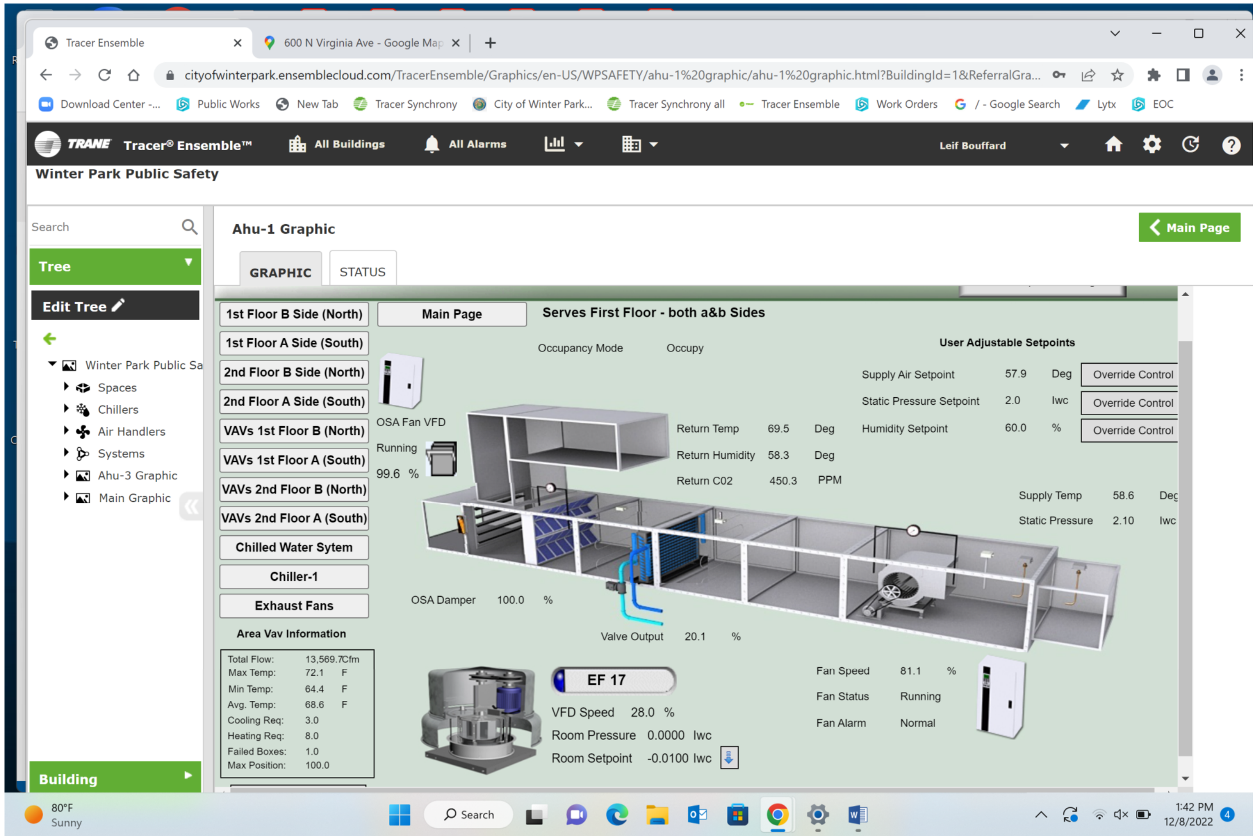
C-24: Water Heater Setpoint Information



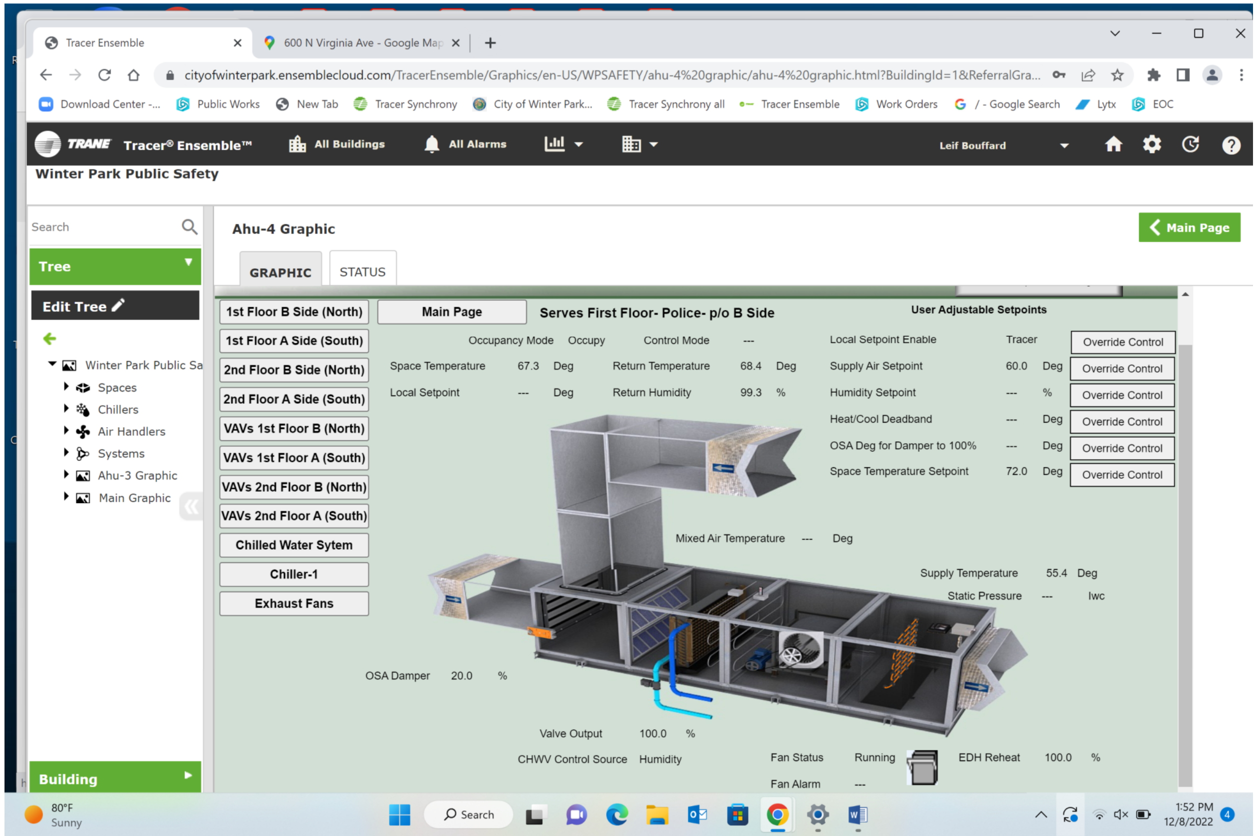
C-25: BAS Chiller Summary



C-26: BAS Chilled Water System Summary



C-27: BAS AHU Graphic



C-28: BAS AHU-4 Graphic