



**ENERGY SERVICES PROPOSAL
FOR WASHINGTON STATE SUPREME COURT
TEMPLE OF JUSTICE PHASE I**

**PREPARED BY
UMC, INC.**

DES AUTHORIZATION #: 2021-054 A (1)

July 9, 2021

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1.0 Project Contact Page

Client Name: Washington Supreme Court

Client Contact: Steve Bolinger

Energy Services Company: UMC

Energy Services Company Contact: Brian Maxwell

Washington Department of Enterprise Services Contact: Steve Bolinger

Electric Utility: Puget Sound Energy

Electrical Utility Contact (if incentives are considered): Tyson Schmitt (Potential 250 or 258 Grants)

Natural Gas Utility: Puget Sound Energy

Natural Gas Utility Contact (if incentives are considered): Tyson Schmitt (Potential 250 or 258 Grants)



2.0 Executive Summary

UMC is pleased to present this Energy Savings Proposal (ESP) to the Department of Enterprise Services (DES). This project has been developed to provide an energy efficient infrastructure renewal of the primary mechanical, HVAC, piping, domestic water, lighting, and control systems serving the Temple of Justice, which houses the Washington State Supreme Court. Utilizing the state Energy Savings Performance Contracting (ESPC) program, as administered by DES, provides a turnkey design-build approach that will deliver the entire project including engineering development, design, construction, commissioning, training, and measurement & Verification. The integral elements of this ESP that are guaranteed include system performance, implementation costs, and energy savings.

This project is intended to replace and renew vital infrastructure of this 100 year old historic structure in preparation for efficient operation over the next century. Several of the building's key systems such as the hot water distribution piping and air handling units are nearing end of life. Revitalizing the infrastructure will mitigate risks and guarantee long-term improved performance. This project will give new life to the Temple of Justice, avoid unpredictable equipment failures, and reduce energy consumption by over 20%.

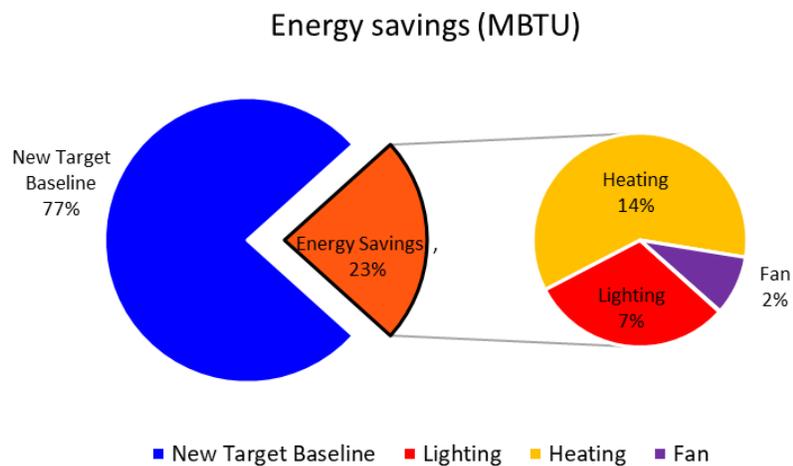
The renewal projects as detailed in this proposal will include the following highlights (See Section 5 for a more detailed scope of work)

- **New Efficient Heating & Cooling Systems:** Energy efficient redesign, replacement, and upgrade of Heating, Ventilating and Air Conditioning Equipment (HVAC), piping, ducting, radiators & controls will incorporate the following improvements.
 - Improved controllability and occupant comfort in the entire building, including the courtroom, offices, library, and the rest of the facility
 - Incorporate filtering and ventilation improvements in response to new Covid related awareness as well as recent wildfire driven smoke events
 - Improved humidity-control in the Temple's historic books section
 - Prepared for the future. Proposed system will incorporate an integral design that will prepare the facility to operate efficiently and effectively with the proposed new Next Century Campus district energy system. This will enable the elimination of end-use steam heating within the facility as well as allow newly designed heating equipment to operate at a much lower hot water temperature in the future (once additional upgrades are made to the facility envelope) providing additional energy savings
- **New Domestic Water Infrastructure:** Replacement of all domestic water and domestic heating water piping throughout the facility
 - Replace failing infrastructure that has had numerous leaks over the last few years
- **New System Controls Throughout Facility:** Upgrade and expansion of the building control system for optimization and ongoing monitoring

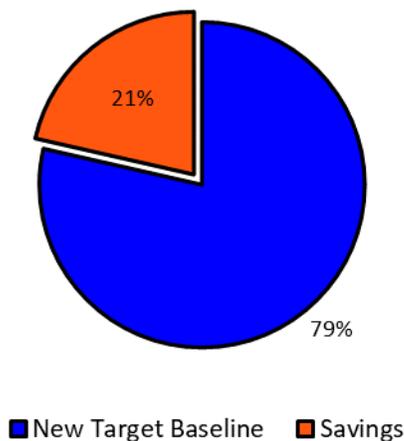


- This will allow for increased occupant comfort and decreased response time to maintenance issues
- **New, Efficient Lighting System:** Replacement and upgrade of all existing non-LED lighting to new LED
 - Lighting upgrades have been selected to provide significant energy savings while maintaining the historic look of the iconic building
 - Historic fixtures will be retrofitted with new historically accurate LED lamps
 - Non-historic fixtures will be retrofit with new LED fixtures
 - Upgraded controls will provide operational flexibility (dimming and occupancy) and additional energy savings

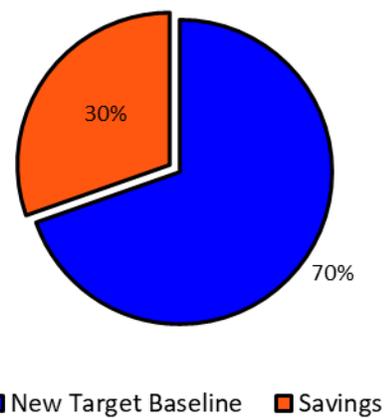
This building refresh **will reduce the energy intensity of the facility by 23%**! This project will ensure the building is compliant with the new Clean Building Act.



Natural gas savings (Therm)



Electricity savings (kWh)



The financial table shown below provides the guaranteed costs and guaranteed savings associated with work to be accomplished as part of this infrastructure renewal. All construction related costs are guaranteed, excluding taxes and DES fees.

Table - Guaranteed Project Costs

Resource Conservation Measures	Estimated Annual Energy Savings	Guaranteed Annual Energy Savings ⁽¹⁾	Annual Operational Savings	Incentives ⁽²⁾	Turnkey Project Cost ⁽³⁾
	\$	\$	\$	\$	\$
RCM-1 HVAC and Controls Infrastructure Upgrade & Renewal	\$ 6,289	\$ 7,562	\$ -	\$ -	\$ 14,788,700
RCM-2 Domestic Water System Upgrade & Renewal	\$ -	\$ -	\$ -	\$ -	\$ 2,492,600
RCM-3 Lighting and Controls System Upgrade	\$ 12,900	\$ 7,954	\$ 5,714	\$ 16,590	\$ 636,190
Totals	\$ 19,189	\$ 15,516	\$ 5,714	\$ 16,590	\$ 17,917,490
Project Supervision, Builders Risk Policy and Bond					\$ 411,592
Professional Services					\$ 5,281,295
Apprenticeship Incentive (\$1000 fee including tax)					\$ 914
Total Construction Cost - (All Measures / Excluding Tax)					\$23,611,291
Contingency - Construction					\$ 1,027,863
Contingency - Routing of Security Systems (Raceways & Conduits)					\$ 75,000
Contingency - Architectural Finishes (Marble & Hardwood)					\$ 234,425
Contingency - Hazardous Material					\$ 396,719
Guaranteed Max Project Cost (including Contingency)					\$25,345,298
WA State DES Project Management Fee					\$ 316,995
Estimated Tax					\$ 2,219,461
Total Installed Cost					\$27,881,754

Table - Guaranteed Project Savings

Resource Conservation Measures	Estimated			Guaranteed		
	Energy/Utility Savings			Energy/Utility Savings		
	Electric		Natural	Electric		Natural Gas
	kW/yr	kWh/yr	Gas therms	kW/yr	kWh/yr	Gas therms
RCM-1 HVAC and Controls Infrastructure Upgrade & Renewal	(586)	(22,158)	17,817	-	(25,482)	15,144
RCM-2 Domestic Water System Upgrade & Renewal	-	-	-	-	-	-
RCM-3 Lighting and Controls System Upgrade	610	165,655	(5,143)	-	149,090	(5,657)
Totals	24	143,497	12,674	-	123,608	9,487



Project Timeline and Key Requirements

The overall project implementation timeline is anticipated to occur over a 2-year period; including 5 months for final design and a 19-month construction period to reach “substantial completion” (see Section 9 for a detailed preliminary construction schedule). The following notes provide some key assumptions and requirements utilized in developing both the cost estimate and the project timeline.

- It is assumed that the facility will be unoccupied except for the courtroom and main library; and that construction can occur during normal work hours whenever the court is not in session. Working within a (primarily) unoccupied facility will greatly reduce the construction timeline and overall cost; and will help to prevent potential inconveniences that could affect occupants. Over and above the current assumption, any additional opportunity to fully abandon the facility during the construction period (including both the court and library) will further increase efficiency and reduce cost.
- Due to the highly invasive nature of this overall infrastructure renewal, there will be long periods of time when the facility will not have heating, cooling, ventilation, or domestic water. The exception will be the library & courtroom which will be provided with temporary heating and ventilation. With the exclusion of these two identified areas, there is no viable opportunity to provide these required services in a temporary fashion to the core areas of the facility during construction. Once demolition begins for both the HVAC and DW systems, these areas must be vacated.
- It should be noted that the projected timeline and guarantee does not include any specific requirements associated with the “Pre-Design” process.
- Due to the current pandemic, there are some uncontrollable aspects of construction projects; including the lead time required to obtain key equipment and materials. As such, if DES and the Washington Courts wishes to move the project forward at a quicker pace, the option exists to approve the final design process prior to giving a Notice to Proceed for construction. This would allow UMC to work through final equipment selection/approval and purchase long-lead equipment at an earlier date.

Historical Preservation Requirements

The historical nature of the TOJ facility will require significant care and planning while preparing the facility for these significant construction upgrades. Following are some key items that must be addressed.

- The facility contains a large amount of historical documents, furniture, personal items, and expensive furnishings (draperies, etc) that must be fully protected during this construction project. UMC plans to cover and protect items that remain. However, due to the invasive construction, anything that is left in place will run the risk of damage or coating with excessive dust. It is assumed that these items will be removed and stored by DES and/or the personal owners.



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- The facility also contains a significant number of architectural finishes (marble, hardwood, lath & plaster; historical bathroom fixtures and metal grates) that must be removed, stored, and then replaced following the invasive construction period.
 - The carpeting within the facility will remain. However, construction will be required at each window mounted radiator throughout the facility and as such could affect some portions of the carpeting that abut these areas. Every precaution will be taken to reasonably protect these carpet finishing's.
 - During this final design development period, it is assumed that all proposed upgrades will be discussed and reviewed with the Department of Archaeology and Historic Preservation to make sure the project meets the historic requirements due to this type of facility.

UMC is excited to be a part of this project that will revitalize the facilities infrastructure, bringing stability, cost savings, and carbon emission reductions to the historic Temple of Justice building. We look forward to working with DES and the Washington State Courts on this necessary project.



3.0 Project Development

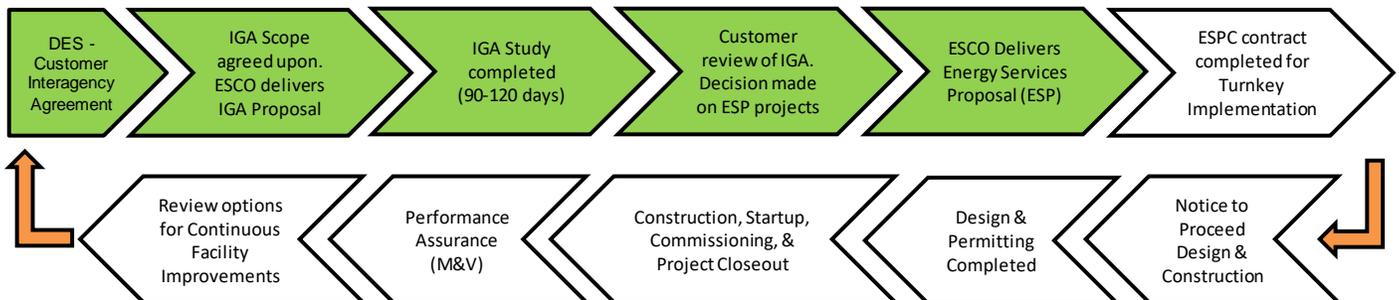
3.1 Project Overview

3.1.1 Background

In October, UMC was selected to develop energy infrastructure upgrade projects for the TOJ in partnership with DES, utilizing the state Energy Savings Performance Contracting program. The purpose of this Energy Services Proposal (ESP) is to provide a turn-key energy-infrastructure upgrade for the Washington State Temple of Justice (TOJ). During the development of this proposal, UMC provided the professional services to develop the technical scope, conceptual design, and utility & financial analysis for the proposed resource conservation measures (RCMs) as identified and documented in this report. In addition, this ESP provides a construction plan and schedule for each selected RCM. The intent of this proposed project is to renew and revitalize the utility infrastructure for the TOJ; while increasing energy efficiency, improving occupant comfort and providing a solution that reflects the historical nature of the facility. This ESP provides the following items:

- Conceptual Design & Project Scopes
- Guaranteed Energy/Utility Savings for the selected RCMs
- Guaranteed Maximum Project Costs
- Project Financials
- Measurement and Verification Plan
- Projected Construction Implementation Plan

Energy Performance Contracting Process:



4.0 Facility Site Assessment

4.1 Facility Description and Overview

The following information provides an overview of the existing facility systems currently serving the TOJ.

Building Overview

Temple of Justice was constructed in 1913 and was the first building completed on the Capital Campus. Since that time, the TOJ has served as the home for the Washington Supreme Court and Law Library. Similar to the state Capital Building, the TOJ's façade utilizes sandstone mined from quarries in Pierce County and features impressive columns. There are also historical single pane windows with metal frames located throughout the facility. The thick walls are built with a combination of bricks, stone and marble. The interior of the facility is an impressive combination of marble and hardwoods with soaring ceiling heights in the courtroom, lobby, and main law library.

There were significant seismic, architectural, mechanical and electrical upgrades that began in 1987; with the building closed during the construction period from 1987 to 1989.

System Overview

HVAC Systems:

The TOJ is heated and cooled via steam and chilled water (CHW) distribution that is provided from the central campus district energy plant. Both steam and CHW enters the facility at the basement level and are distributed directly to two Rooftop Air Handling Units (RTUs) that utilize the steam for preheating and CHW for cooling of return air and ventilation air. This air is then distributed to VAV boxes that control the air supply to the individual temperature-controlled zones throughout the facility. The two RTUs are currently configured so that one serves the east side of the facility (all floors) while the other serves the west side of the facility.

In addition, there is a heating hot water (HW) loop that distributes HW to perimeter radiators located beneath each of the windows around the perimeter of the facility. There is a shell & tube heat exchanger located in the main basement mechanical room that generates the HW for this radiant loop from the central steam distribution. There is a single 5 horsepower CHW pump located in the basement mechanical room that was installed to provide additional pumping capacity (over and above that which is provided from the central District Energy pumps) when needed. However, according to system operators, this pump is not needed and thus does not operate.

There are two exhaust fans that currently serve the existing restrooms. Both fans are located in the attic space; one on the east side of the facility and one on the west.



Controls:

The HVAC system is currently controlled by pneumatics throughout the building (VAV boxes and Thermostats) with some Direct Digital Controls (DDC) overlay (primarily at the RTUs and energy transfer stations). An air compressor is located in the room next to the main mechanical room on the lower floor. This compressor is used to maintain system pressure for all pneumatic controls. The original thermostats are still in the spaces along with the updated thermostats installed during the 1987 system upgrades.

There are many pieces of equipment throughout the facility that do not have any form of automated controls and are currently operated manually as time allows. This includes the cabinet heaters that currently serve the main lobby as well as about 80% of the window located HW radiators.

Skylight Ventilation:

There are two skylight areas that are part of the original building construction. Each of these has three panels that were designed to be operable. Currently the pneumatic actuators do not appear to be operating. These panels were designed to open in the event of smoke with exhaust fans on the roof. The exhaust fans have been removed and it is now ducted to the West RTU return/exhaust system.

Domestic Water and Plumbing System:

The domestic water (DW) distribution piping serving the facility is copper and has had numerous leaks over the years. The DW supply main enters the facility in the main basement mechanical room. There is also a steam heat exchanger in the main mechanical room that generates domestic hot water for use in the restroom sinks. The DHW system was designed to be a recirculating system but does not appear to be functioning adequately at present.

Standby Generator:

There is a small, stand-alone diesel standby backup generator located on roof. The fuel piping runs from the unit on the roof down through the main vertical piping chase on the west side of the facility to the basement mechanical space.

Lighting Systems:

There is a variety of lighting systems throughout the building; ranging from old, fluorescent T-12 to incandescent and a few LEDs. The fluorescent T-12 lamps were phased out in 2012 and are no longer manufactured. These lamps are very inefficient and have excessive heat gain which adds to the comfort issues within the facility.

The courtroom has both incandescent and HID lamps that generate significant heat, adding to the current issue of overheating in this space. There are some historic fixtures on the main and upper floors but most of the fixtures were replaced in 1987 and are no longer considered historic.



Current Condition and Issues with the Existing Systems

HVAC – Current Condition & Issues

The existing HVAC system was updated in 1987, but still maintains significant portions of the original HW, CHW & Steam piping that was installed in prior years. The majority of the system is at, or well past, its useful life and in need of full renewal and upgrades. There are comfort issues throughout the facility due to limitations incurred by the building envelop and single pane, drafty windows; as well as issues created by poor airflow and limited control capabilities.

The piping located throughout the facility is well past its useful life and in need of replacement. There have been some instances of leaking throughout the facility that need to be resolved to prevent additional degradation of the facility and potential loss of important books or historical documents. Also, since the long-term plan is to serve the facility with a lower temperature HW (to improve efficiency and drive to higher system standards), some of the piping, as well as radiators and coils will need to be increased in size to help meet heating needs.

The RTUs need to be replaced due to the age and redesigned due to efficiency issues related to the current system's zoning. The west RTU provides supply air to offices and conference rooms in the west half of the facility as well as the main Court Room. Due to the significant needs of the court, this creates an issue when attempting to control the distribution air efficiently when court is in session as the court often needs cooling while the offices may be in heating mode. Similarly, the east unit has the same issue while trying to serve offices in combination with the main law library.

Due to age and failure of the equipment, the humidity controls originally installed in the RTUs are no longer operational. The facility also houses some very important and historical books that may be irreplaceable. At present, there is no place to store these books that has sufficient humidity control to maintain the condition of these books over the long-term.

There are supply air distribution issues throughout the facility that create comfort problems due to the inability to either flow adequate air or to get the supply air to the area in which it is needed. As an example, the Main Courtroom is a historical area that was originally designed to distribute supply air through high, wall diffusers located at about 30' above the floor. As such, when the room needs cooling (which is often when court is in session), the chilled air has a hard time reaching the occupants at floor level with sufficient airflow to keep the area comfortable. In addition, much of the primary central core of the facility is not heated or cooled (lobbies, hallways, and some offices).

Additional comfort and efficiency issues often arise due to the limited control capability of the HW radiators located in each window. Only about 20% of these radiators have control valves that can automatically control the heating needs of these units. This can cause comfort problems if HW is



flowing through the window radiator while the VAV box serving the interior of the same zone is trying to cool the space. The VAV boxes themselves do not operate well due to the age and obsolescence of the equipment. Additional upgrades and controls added throughout would help solve some of these problems.

Standby Generator – Current Condition & Issues

The standby diesel generator on the roof is served by a fuel line that runs through the west vertical piping chase in the facility. This fuel line does not meet current code as it is not housed in an isolated fire rated enclosure. Also, as the fuel pump is not sufficient to lift fuel to the generator, diesel barrels are manually brought up to the roof top which is very difficult to access. This creates a potential hazard.

Plumbing – Current Condition & Issues

The plumbing system has had recent issues with leaks in the distribution system that seem to indicate an increasing, inherent problem with the piping that may only grow worse in the coming years. In a historical facility that houses important and irreplaceable books, this can become a major issue.

In addition, the domestic hot water (DHW) recirculation system is in poor shape and does not provide sufficient water distribution to allow for quick access to DHW throughout the facility.

Lighting – Current Condition & Issues

The lighting throughout the facility is antiquated technology incandescent and 1st generation fluorescent. These systems are extremely inefficient and add to the comfort issues throughout the facility due to the high heat loads they create. This is especially noticeable in the Main Courtroom that has numerous incandescent lamps as well as high output metal halides; both of which add significantly to the heating issues felt in this venue.

Throughout the office areas and workspaces, there are old generation parabolic fluorescent fixtures that need to be upgraded for both efficiency and light quality reasons. In addition, there are old, 40-watt fluorescent lamps that present a very unappealing aesthetic throughout the mezzanine levels of the law library.



Photos of Mechanical and Plumbing Systems

Following are photos that provide an overview of the existing condition of the HVAC and plumbing systems.



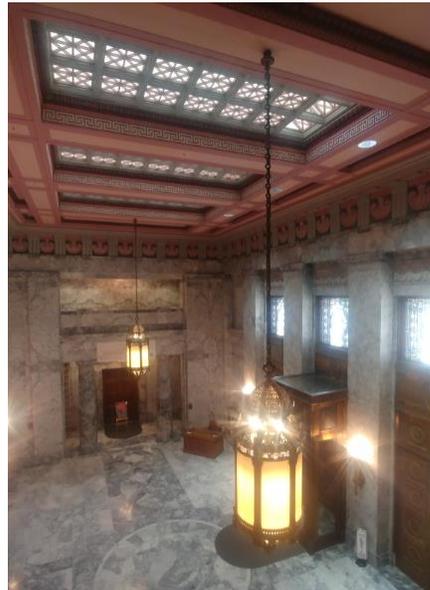
Single Pane Windows



Exterior Stone Facade



Basement Level Entry Doors



Lobby - Marble Interior



Heating Water Pumps



Chilled Water Pump



Steam and CHW piping



West RTU



VAV Boxes (box with a pneumatic damper)



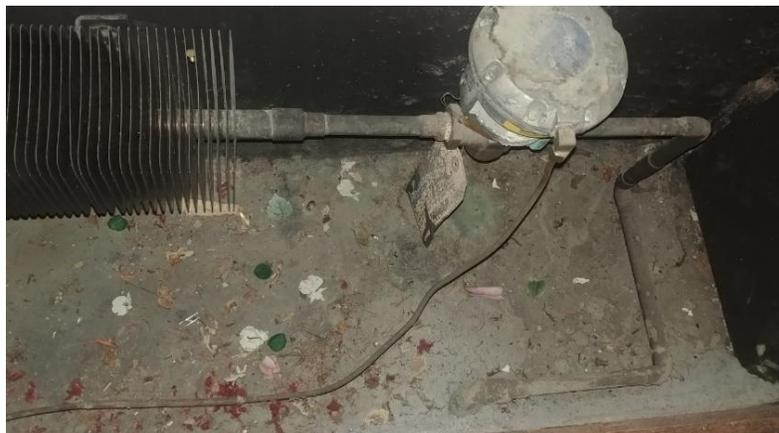
Smoke Evacuation fans (SF-3 and SF-4)



Exhaust Fan in Attic Space



Steam to Hot Water Heat Exchanger



Radiator and Pneumatic Control Valve. Shows HW piping buried in concrete



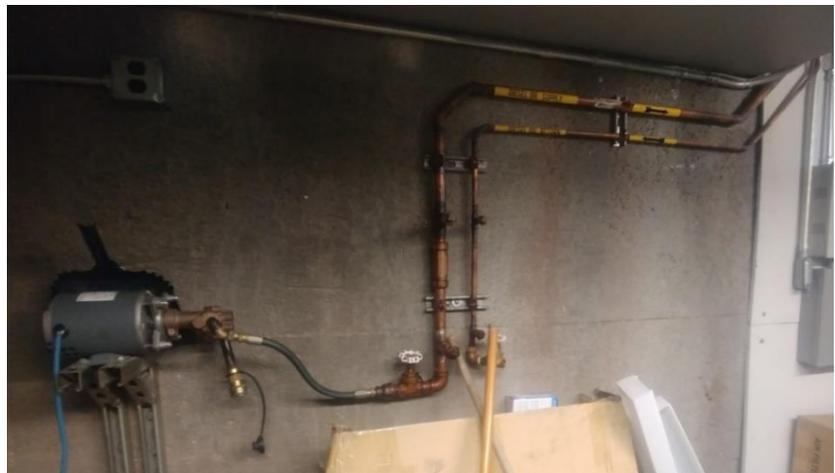
Pneumatic Thermostat (Installed in 1987)



Air Compressor for Pneumatic System



Typical Restroom with Plumbing Fixtures



Diesel Generator on Roof and fill piping in lower mechanical room



Lower Floor Lighting and a few Conference Spaces – Mostly 2x4 Parabolic Fixtures with T-12 Lamps that were replaced in 1987



Fixtures on 2nd and 3rd Floor that the lamps will be replaced and leave the existing fixture



Typical Restroom Type Fixtures



Library T-12 Fluorescent Fixtures installed in 1987



Library High Bay Lighting



Courtroom Lighting



Exterior Lighting – LED



Dimming Panel in Courtroom

4.2 System Upgrade Alternatives Explored

The following system upgrade alternatives were explored for renewal and replacement of the existing systems.

Alternative 1 – Business as Usual

The “Business as Usual” scenario assumes that the operation of the existing system continues; with replacements to equipment and repairs to distribution systems being addressed as required due to critical impacts. Utilizing this alternative would mean continued operation of the existing systems, with replacement and renewal of equipment being performed in a piecemeal fashion as systems are no longer operational and/or can no longer be serviced due to age or inability to acquire replacement parts.

Positive Impacts of Alternative 1: The implementation of this alternative would result in the least expenditure of capital dollars for the upcoming biennium.

Negative Impacts of Alternative 1: This option will not address existing comfort issues or operating concerns. It will also have the highest potential lifecycle cost due to the high cost of replacement of systems and equipment in a “one-off” fashion, emergency O&M responses required due to critical failures, and the highest overall energy costs. In addition, Alternative 1 risks the failure of both HVAC & DW piping distribution throughout the facility which could lead to extensive water damage and loss of historical documents.

Alternative 2 – Convert to Stand-Alone Heating & Cooling Systems

The “Stand-Alone” alternative would include adding heating & cooling equipment at the facility and disconnecting from the central district energy plant. Given the historical nature of the facility (which requires higher temperature water distribution due to limitations of the building envelope), this on-site generation equipment would consist of a heating HW boiler in combination with an air-cooled chiller and/or heat pump system. The boiler would be required to meet peak heating needs of the facility as a heat pump could not deliver the necessary HW temperatures required during peak heating days.

In addition, the primary HVAC system would be replaced and upgraded with new HVAC equipment (RTUs, VAV boxes, controls, etc) to provide a new operating system.

Positive Impacts of Alternative 2: The implementation of this alternative would allow the facility to operate independently from the rest of the campus and would provide an efficient energy option. In addition, the systems and equipment would be new and designed to resolve most comfort issues; while also improving ventilation air filtration, humidity control for historical documents and remove concerns for critical failures and resulting damage to the facility.



Negative Impacts of Alternative 2: This option will not provide the high level of efficiency gains available through a connection to the future Next Century Campus district energy plant. As such, it is limited in its ability to provide future improvements in efficiency and carbon reduction. This system will also require additional expansion of the facility to house the new heating & cooling systems, which will also require access for a boiler stack installation from the lower level to the rooftop. Or it will require all thermal production equipment (boiler & chiller) to be located on the roof, which will cause potential issues with the overall structure supports (due to weight) as well as architectural aesthetics due to the limited roof space available for locating the equipment. In either case, there will be significant potential issues that will arise in consideration of the historical nature of the facility requiring coordination and approval by the Washington State Department of Archaeology and Historic Preservation (DAHP).

Alternative 3 – Redesign, Upgrade and Renew the Entire HVAC System (Recommended and Proposed as part of this project scope)

The Recommended Alternative includes a full renewal and upgrade of all integral infrastructure, including mechanical, HVAC, domestic water, and lighting. In addition to the replacement of the critical systems, this option includes a more efficient redesign of the systems to coordinate with new energy standards, so the facility is renewed for the foreseeable future.

Positive Impacts of Alternative 3: The implementation of this alternative will have the greatest long-term impacts for increasing occupant comfort and improving energy efficiency (ie: reducing carbon impacts). All HVAC systems and equipment will be new and designed to improve ventilation air filtration (for smoke & pandemic concerns), improve heating & cooling in areas not currently served, add humidity control for historical documents, and mitigate concerns for critical failures and resulting damage to the facility. In addition, the HVAC system will be designed to operate effectively & efficiently with the proposed Next Century Campus district energy plant. The system is also designed to be operable at lower (more efficient) HW distribution temperatures when future facility envelope upgrades are implemented.

This alternative will provide the most cost-effective lifecycle of all options for the proposed long-term operation of this facility.

Negative Impacts of Alternative 3: This option will have the highest initial capital cost impact, as well as the longest construction period impacts for occupants.



5.0 Scope of Work

The following is a detailed description of each resource conservation measure (RCM) that is being recommended as part of this proposal.

5.1 RCM Measures

RCM-1 HVAC and Controls Infrastructure Upgrade & Renewal
Overview of Current Situation
See Section 4.0
Proposed Scope of Work
<p>The proposed system renewal and upgrade design is intended to provide better flexibility of operation, increased efficiency, and longevity, as well as solve many of the existing comfort issues. This design is also intended to replace all significant equipment and systems (that can be accessed); while preparing the facility to easily connect to the new HW district energy system (ie: Next Century Campus) when that system is constructed in the near future.</p> <p>The new system will be designed to add flexibility, efficiency and longevity for the MEP infrastructure, and will include full DDC control capabilities throughout, providing better operating efficiency and resolving many comfort issues.</p> <p>In addition, the system will provide the following:</p> <ul style="list-style-type: none">○ Improve comfort and controllability of system for all occupants○ Incorporate filtering and ventilation improvements in response to new Covid related awareness as well as recent wildfire driven smoke events○ Incorporate improved humidity-controlled areas for storing of historic books○ Incorporate an integral design that will prepare the facility to operate efficiently and effectively with the proposed new Next Century Campus district energy system. This will include elimination of end-use steam heating within the facility as well as newly designed heating equipment targeted at allowing the system to operate at a much lower heating hot water temperature (once additional upgrades are made to the facility envelope) <p>The only steam system that will remain in the facility will be located in the main mechanical room and will include a new steam-to-HW heat exchanger connected to the main steam supply line and condensate return line (from the district energy plant). This steam heat exchanger will remain until the new NCC plant is constructed and the heating distribution system for the campus is converted to HW. At that time, the steam heat exchanger will be replaced with a new HW-to-HW heat exchanger.</p> <ul style="list-style-type: none">● Proposed Mechanical System HVAC Upgrades:<ul style="list-style-type: none">○ HVAC Equipment:(<u>Design Considerations</u>: Heat Recovery; Humidification for books; Filtering



for COVID and smoke; lower future hot water temps from a new central plant will require significant envelope upgrades to be able to utilize lower water temp to maintain building temperature)

- Replace and upgrade existing cabinet heaters (CH-1 and CH-2) that currently serve the main Lobby Area. The new cabinet heaters will be controlled via the upgraded DDC system.
- Replace and upgrade the two smoke evacuation fans SF-3 and SF-4. Replace with new fan coil unit capable of providing both smoke evac and comfort heating/ventilation to the central core area of the facility that currently does not have either heating or ventilation. The new unit will have an integral VFD for variable flow capability.
 - Smoke evac capabilities will be maintained at 3,500 CFM.
 - Heating coil sized for 2,000 cfm, with the ability to operate at temperatures down to 120 Deg F heating water.
 - HWS/HWR distribution piping to be provided from the heating water mains currently located in the ceiling of room 145.
- Historical Book Collection - Rooms 146 and 147: Provide humidification unit to serve each location (wall or ceiling unit). Humidifiers to be designed to provide 70 F +/- 2F; 40% RH +/- 5 F with a minimum supply airflow of 25 cfm.
- Demo (2) existing rooftop RTUS and replace with (4) RTUs. The two existing rooftop RTUs are currently designed to serve East and West areas of the facility respectively; and utilize steam heat with CHW cooling coils. The four new units will utilize HW heating coils (rather than steam) and will be designed as follows.
 - RTU-1 will serve West Portion of the building: including offices and miscellaneous spaces but excluding the Courtroom.
 - BASX Custom unit or similar
 - SF 16,000 cfm; EF 14,000 cfm
 - Provide duct transitions to existing duct to bell mouth.
 - RTU-2 will serve East Portion of the building: including offices and miscellaneous spaces but excluding the Library.
 - BASX Custom unit or similar
 - SF 18,000 cfm; EF 14,000 cfm
 - Provide duct transitions to existing duct to bell mouth.
 - RTU-3 will serve the main Supreme Court Room.
 - SF 3,500 cfm @ 1.25" ESP; EF 3,000 cfm @ 0.75" ESP, chilled water coil (45 EWT/60F LWT), down to 120 F heating coil, heat recovery, economizer and humidity control (40-60% RH)
 - All new ducting from RTU to terminal units; to existing high wall diffusers as currently located around the perimeter of the Court Room.
 - Four (4) new 10" Round Air Nozzles will be installed on the East wall; replacing the existing high wall directional lights that are no longer used.
 - RTU-4 will serve the Main Library located on the first floor. This unit will provide humidity capabilities in addition to heating & cooling.
 - SF 2,500 cfm @ 1.25" ESP; 2,000 cfm EF @ 0.75 ESP; chilled water coil (45 F EWT/55 F LWT), down to 120 F heating coil; heat recovery; economizer and humidity control (40-60% RH)
 - All new ducting from RTU to terminal units; to existing high wall diffusers as currently located around the perimeter of the Library.
 - All new return ductwork along roof and down into library



mezzanine area.

- VAV Terminal Boxes (Qty 105)
 - Replace existing VAV terminal units with new pressure independent terminal units with new DDC interface. No temp sensors required at units because units will not have heating coils.
 - Note: There may be issues with fitting in all new boxes and duct connections due to limited space. In this case, consideration will be given to retrofitting and reconditioning the existing VAV terminal units as required; including new airflow measuring for flow rates, converting from pneumatic controls to DDC w/T-stats (by Controls Contractor), replace damper & actuator, cleaning the units and assuring the existing units are fully operational.
- Chilled Water Piping:
 - Remove and replace the chilled water piping that serves the two (2) existing RTUs; starting with the CHW piping at the tunnel entrance in the basement mechanical room. New CHW piping will be routed through the vertical chase on the West side of the facility and will branch off at roof level to serve each of the four (4) new RTUs.
 - Demo chilled water pump and replace with duplex 7.5 HP pumps w/VFDs. New CHW pump will be placed in place of the location where existing air compressor is located in the mechanical room.
 - Note: these pumps may not be needed based on the system pressures from the central plant being adequate. TBD at a later date if this scope can be removed from project.
- Steam:
 - Demo steam to hot water heat exchanger in bottom floor mechanical room and replace with new steam to hot water heat exchanger.
 - Replace existing steam manifold, PRV header, piping, valves, traps and associated appurtenances (blue hatch) in the mechanical room.
 - Demo steam piping from heat exchanger in bottom floor mechanical room up to (2) RTUs. No Steam piping to remain in building other than condensate tank and piping from heat exchanger to utility tunnel.
 - Replace duplex condensate unit (CP-1). Design based on 2.5 HP pumps. Replace valves, gages, piping and pipe insulation. Connect to existing 1-1/4" relief vent.
 - Reuse safety relief and steam vents in mechanical room.
- Hot Water Piping:
 - Demo and replace perimeter hot water heating pumps (P-2 and P-3). Design based on 5 HP Pumps. Integral VFDs to be added for each pump to provide efficiency and better control flexibility.
 - Demo hot water piping to radiators around perimeter of building and replace with new hot water piping properly sized for new radiators and lower water temperatures.
- General Piping
 - Provide RBPB in mechanical room with 1/2" NP water to Rooms 146 and 147, and 1-1/2" NP water to RTU Humidifiers
 - Route 1-1/2" NP water line from the lower level mechanical room RBPB to humidifiers in RTUs. Heat trace, insulate and aluminum jacket exposed piping. Route piping through



- attic space as much as possible.
 - Provide new CHW coil condensate drain piping from rooftop units to nearest roof drains.
- Hot Water Radiators (151 Existing and 154 Proposed):
 - Demo perimeter hot water radiators and replace with new radiators sized based on future lower water temperature design of 140F or less. In addition, radiators on North side of building to be up-sized at 10% larger loads to counteract wind and shading) and (See note above about lower water temps. Most radiators require marble removal and high-end window trim and casing to access)
- Air Ducts
 - Ductwork:
 - Demo ducting from RTUs to place of air distribution or to wall enclosure for those duct and diffusers not accessible without demoing walls. Decorative diffusers to remain but drop ceiling space diffusers to be replace.
 - Add shaft down to mezzanine ceiling from new RTU-4 unit for return air path. (See RTU-4 above)
 - Supply and Return Diffusers
 - Replace 24x24 Perforated Supply and Return Grilles (In ACT Tile Areas)
 - Remove and put back existing Bronze Grilles
- Exhaust Fans
 - Demo and replace (2) exhaust fans
 - Move toilet exhaust fans to allow for duct access from new RTU's serving library and courtroom
- Generator Fuel Piping Modifications
 - Remove existing fuel oil piping and replace piping in existing chase from lower-level mechanical room to rooftop generator.
 - Wrap fuel oil piping with 2-Hour fire wrap within existing rated shaft.
 - Add leak detection as spill containment pallet.
 - Upgrade motor and pump to be able to lift fuel oil (current pump isn't able to lift fuel oil so barrels are brought to the roof)
 - Install pump skid cabinet.
- Insulation
 - Remove and replace piping insulation for HW, CHW, and Steam piping. Provide jacketing as required on exterior applications.
- Weatherstripping of Entry Doors
 - Add seals to main South entrance doors
 - Add seals to double doors on West and East entrances
 - Add seals to door on North entrance
- **Electrical Upgrades:**
 - Replacing (2) RTUs with (4) RTUs. Adding Courtroom and Library RTUs and reducing size of RTU West and East slightly.
 - Add (2) small cooling units to book storage
 - Disconnect and reconnect new cabinet heaters (CH-1 and CH-2) for Lobby Area.
 - Disconnect and wire new smoke evacuation fans SF-3 and SF-4 which will be modified. Adding



- VFDs to fans.
- Replacing or Retrofitting (105) VAV boxes (Includes one added box for courtroom)
- Changing (112) T-stats; pneumatic to DDC (controls/electrical)
- Power on the roof to new humidifiers at the new RTU's
- Heat Trace including power and connections:
 - The new domestic water (serving humidifiers) on the roof
 - New heating water lines on the roof
 - New chilled water lines on the roof
- Pumps
 - Chilled Water: Disconnect single chilled water pump and replace with duplex 7.5 HP pumps w/VFDs. To be placed where existing air compressor is in upper mechanical room. (VFDs provided by mechanical)
 - Heating Water: Disconnect and replace perimeter hot water heating pumps (P-2 and P-3). 5 HP Pumps. VFDs to be added. (VFDs provided by mechanical)
 - Disconnect and reconnect new Condensate Duplex Pumps
 - Plan to combine into just CP-1 rather than CP-1 & 2 if possible.
- Replacing (154) Radiators and control valves
- Replacing (2) Exhaust fans
- ACT Support
 - Drop additional ceiling wires to support the lighting temporarily while under construction
 - Remove and reinstall all fire smoke, fire alarm, paging, and other electrical devices in the ACT
- Generator: Pull wires to pump and alarm panel down in the mechanical room for the fuel System.
- **Control Upgrades:**
 - Demo pneumatic controls and install DDC controls on the following equipment:
 - (4) RTUs
 - (6) HW Control Valves
 - (6) CHW Control Valves
 - CH-1 and CH-2 units for main lobby
 - (2) HW Control Valves
 - SF-3 and SF-4
 - (105) VAV Boxes
 - (154) Control Valves on Radiators
 - (112) T-stats (VAV boxes and Radiators)
 - Heating Water Pumps
 - Chilled Water Pumps
 - Mechanical Room
 - (2) HW Control Valves
 - (1) Steam Control Valves at Heat Exchanger
 - Convert (2) sets of operable skylights to DDC (very hard to access space)
 - Remove pneumatic compressor
 - Add current sensor relay to generator on roof to display run status on BMS.
 - CO2 Sensors for each RTU (Supply and Return), an Outdoor air sensor and (4) conference room sensors; total (13) sensors.
- Provide all commissioning and optimization for the installed systems as required to meet performance guarantees.



-
- Provide training and support for DES operations staff to operate and maintain the equipment.

Benefits

- Significantly reduce facility energy consumption
- Reduce fossil fuel consumption
- Provides needed equipment replacement for end of life heating and cooling equipment
- Addresses avoided infrastructure renewal issues of the heating and cooling system
- Provides more heating and cooling control and better distribution at the courtroom and library
- Eliminates aging controls system

Supporting Documentation

Supporting Documentation including preliminary sketches and savings calculations can be found in the Appendix.



RCM-2 Domestic Water System Upgrade & Renewal

Overview of Current Situation

See Section 4.0



Steam to Hot Water Heat Exchanger



Plumbing Fixtures



Proposed Scope of Work

The DW system upgrades are intended to replace all existing domestic water, domestic hot water and domestic recirculating water piping, as well as associated heat exchangers, pumps and controls. The overall intent is to provide a new system infrastructure that will eliminate the issues created by recent leaks and prepare the facility for the foreseeable future.

- **Plumbing System Renewal and Upgrades:**
 - Remove, re-design and replace the existing DW, DHW & HWC (circulation) piping from the existing Heat Exchanger to the end point. Existing plumbing fixtures were previously upgraded and will be re-used for this project.
 - Remove plumbing fixtures as required for piping replacement and store for reinstallation once the piping is replaced. Retain piping hangers for piping in same locations. Vent, Waste, Fire Sprinkler, and Rainwater piping systems to remain.
 - Remove, store and replace architectural finishes as required to access DW piping.
 - Remove and replace the Hot Water Circulation Pump (P-4) and with new Hot Water Circulation Pump. Design based on ½ HP Pump.
 - Remove and replace the existing steam-to-DHW heat exchanger. This unit will be replaced with a new HW-to-HW heat exchanger.
- **Electrical Upgrades:**
 - Disconnect Domestic Water Circ Pump (P-4) and reconnect new pump.
- **Controls Upgrades:**
 - Convert pneumatic to DDC for:
 - Heat Exchanger
 - (1) HX Control Valve

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- (1) Domestic Water Control Valve
 - Hot Water Circulation Pump (P-4)

Benefits

- Provides needed equipment replacement for end of life heating and cooling equipment
- Addresses avoided infrastructure renewal issues of the heating and cooling system

Supporting Documentation

N/A



RCM-3 Lighting and Controls System Upgrades

Overview of Current Situation

See Section 4.0

Proposed Scope of Work

The proposed lighting design will improve overall efficiency, comfort and light quality while maintain similar light levels and adding controls for operating flexibility. In areas where the lighting is currently historical in nature, the proposed LED lamps/fixtures will strive to maintain these historical requirements.

Below table is a summary of the scope; **see Appendix for line by line details.**

- Electrical Upgrades:**

Location	Existing	Proposed	Notes
Courtroom	Chandeliers with 54W Incandescent Lamps	LED Dimmable, historical style lamps; 9W	
	Can Lighting with 500W Incandescent Lamps	LED Retrofit using existing Cans; 100W	
	Horizontal 500 W Incandescent Lamps on back wall	Fixtures are not used and will be Removed	This location will be utilized to install a higher velocity air diffuser to provide better air distribution and improve comfort as part of the proposed HVAC upgrade
Library	4 Foot T12 Fixtures	New 4 Foot LED square or round lensed fixtures	Foot-candles are currently low at around 9.5; proposed increasing to around 25 Foot-candles. Troffer Retrofit Kits for Troffers.
	CFL Pin Based 9W Lamps	LED Retrofit; 8" Module, 12W	
	Metal Halide 250W Lamp	LED Retrofit using existing Cans; 100W	
	Incandescent Lamps (34W, 50W, 54W, 135W)	Dimmable LED Lamps (9W, 13.5W, 15W)	
Basement Offices/ Library Storage	4 Foot T12 Fixtures	New 4 Foot LED square or round lensed fixtures	Troffer Retrofit Kits for Troffers
	CFL Pin Based 9W Lamps	LED Retrofit; 8" Module, 12W	
	CFL Screw-ins (20W, 27W)	LED Retrofit; 8" Module, 12W	



	Incandescent 50W Lamp	LED Retrofit; 6" Module, 13.5W	
	CFL Lamps 6L 38W	Retrofit LED 16W	
Mechanical Rooms	(4 Foot, 8 Foot) T12 Fixtures	New 4 Foot LED square or round lensed fixtures	Troffer Retrofit Kits for Troffers.
	Incandescent 54W Lamp	Dimmable LED Lamp 9W	Singular incandescent lamp found in periodicals mechanical room
Main and Top Floor Offices	CFL Pin Based Lamps (9W, 26W)	LED Retrofit; 8" Module, 10.5W, 12W, 27W	10.5W or 12W retrofit replace 9W
	CFL Lamps (4L, 5L, 6L) 38W	Retrofit LED 16W	4L, 5L, and 6L variations replaced with same fixture
	Incandescent 50W Lamp	LED Retrofit; 6" Module, 13.5W	
	Incandescent Lamps (34W or 54W)	Dimmable LED Lamp 9W	
	4 Foot T8 and T12 Fixtures	New 4 Foot LED square or round lensed fixtures	Troffer Retrofit Kits for Troffers.
Restrooms	CFL Pin Based 9W Lamps	LED Retrofit; 8" Module, 12W	
	Incandescent Lamps (54W, 100W)	(2) Dimmable LED Lamps 9W	Each 54W or 100W lamp replaced with two (2) smaller lamps
	Incandescent Lamps (34W, 54W, 100W)	Dimmable LED Lamp (9W, 15W)	54W and 100W replaced with 16W fixtures
	(2 Foot, 4 Foot) T12 Fixtures	New 2 Foot or 4 Foot LED square or round lensed fixtures or TLED in some spaces	
Break Rooms	CFL Pin Based 9W Lamps	LED Retrofit; 8" Module, 12W	
	4 Foot T8 and T12 Fixtures	New 4 Foot LED square or round lensed fixtures	Troffer Retrofit Kits for Troffers
	Incandescent 3L 34W Lamp	(3) 9W Dimmable LED Lamps	Each 3L 34W Lamp replaced with three (3) 9W Lamps
	Incandescent 50W Lamp	LED Retrofit; 6" Module, 13.5W	
Hallways	Incandescent Lamps (34W, 3L 34W, 7L 34W, 54W, 2L 54W, 75W, 100W)	Dimmable LED Lamps (9W, 9W(2), 9W(3), 9W(7), 15W, 19.5W)	2L fixtures replaced with two (2) 9W Lamps, 3L fixtures replaced with three (3) 9W Lamps, 7L fixtures replaced with seven (7) 9W Lamps
	CFL Screw-ins (16W)	LED Retrofit; 8" Module, 12W	
	Incandescent Lamp 50W PAR30 RC	LED Retrofit; 6" Module, 13.5W	



	CFL Lamp 5L 38W	Retrofit LED 16W	
	Can Lighting with 250W Incandescent Lamps	LED Retrofit using existing Cans; 100W	
	4 Foot T8 and T12 Fixtures	New 4 Foot LED square or round lensed fixtures	Troffer Retrofit Kits for Troffers
Storage	4 Foot T8 and T12 Fixtures	New 4 Foot LED square or round lensed fixtures or TLED in some spaces	Troffer Retrofit Kits for Troffers
	CFL Pin Based 9W Lamps	LED Retrofit; 8" Module, 12W	
	CFL Screw-ins (16W, 23W)	LED Retrofit; 8" Module, 12W, Dimmable LED Lamp 9W	16W Screw-ins replaced with Retrofit
	Incandescent Lamps (25W, 135W)	LED Lamps (5W, 15W)	25W Lamps replaced by five (5) 5W Lamps each
Emergency Lighting	Halogen Bug-Eyes	New LED Bug-Eyes	One for One Replacement; Leave any existing LED Bug-Eyes
Exit Signs	Already LED	Leave Existing	
Dimming	Only Courtroom	Courtroom, Offices, Library	



Lighting Replacement Visual Examples:

Courtroom Can Fixture Replacement

Existing



Proposed



Library Fixture Replacement

Existing



Proposed



Existing



Proposed





Existing



Proposed



Existing

(No Existing Picture)





- **Controls Upgrades:**
 - Connect exterior lighting to BAS Metasys System (Interior lighting to remained controlled in building like it is currently)

Benefits

- Installs highly efficient LED lighting for the interior to make the building fully LED. Exterior is already LED
- Reduces maintenance requirements due to longer burn hours of new lights
- Provides dimming and occupancy sensors to further reduce lighting energy.
- Reduces large heat load in the courtroom that has been an issue with it already being difficult to maintain a cool temperature in that space.

Supporting Documentation

Supporting Documentation including savings calculations can be found in the Appendix.



5.2 Project Notations/Clarifications/Exclusions

1. Guaranteed pricing is good for 180 days after which, pricing must be reviewed and for impacts due to changes in the market.
2. Adequate space will be provided for the staging of equipment, materials, work trailers and dry shacks.
3. The TOJ facility will be unoccupied during the entire construction period.
4. DES shall provide access as required per the coordinated schedule.
5. This project does not include any specific costs for hazardous materials / asbestos testing or abatement, lead paint or mold remediation. If during the construction process, UMC notes any areas that look suspicious; it will be brought to the attention of the owner and a plan will be put in place as to how to handle testing and remediation.
6. This project does not include any upgrades to the existing electrical system except for what is required to complete the outlined scope.
7. This project does not include any upgrades to the existing fire protection system except for what is required to complete the outlined scope.
8. This project will not require any temporary construction utilities or heating/cooling services. Any temporary shutdown to utility services will be coordinated appropriately.
9. This project excludes any upgrades (for code compliance or other) of systems not included in this proposal.
10. DES to allow UMC to temporarily connect to existing electrical systems to execute scope of work outlined.
11. All work as proposed is expected to be done during normal working hours and does not include any nighttime work. However, there may be situations where shifting schedules earlier or later in the day for limited portions of the project to improve construction efficiency may be acceptable as mutually agreed.
12. This project excludes the repair of the existing building structure including but not limited to any damage from past water infiltration.
13. Due to the shortened period of project development, the measures recommended in this proposal have not yet been reviewed by the Washington Department of Archeology and Historic preservation. It is anticipated that this will occur at a later date and modifications to the project and cost will be updated at that time as required.
14. The current project cost is developed assuming that the facility will be occupied and much of the work will occur during periods when court is not in session, the facility is lightly occupied, or at nights and on weekends.
15. This proposal does not include scope for removal or replacement of any personal items, library books or historical documents that will need to be moved temporarily to allow for construction.



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16. All artwork, tapestries, draperies and personal items shall be removed and protected by the Owner throughout the work area.
 17. All ornate, historic, or high value furniture and casework will be moved, handled, and stored by the Owner.
 18. UMC will cover the bookshelves for protection. Any cleaning of books or protection and or relocation of books is to be provided by the Owner.
 19. All Furniture, Fixtures, and Equipment (FFE) that cannot be simply moved or covered will be relocated or stored by the Owner. This can include, but not limited to, copy machines, plotters, printers, computers, and monitors.
 20. Every precaution will be made to protect historical finishing's. However, if, during the implementation of this project, architectural hard wood or marble/granite moldings, trims, finishes, surrounds, enclosures, casework, wainscot effect, and toilet partitions are damaged the cost for repair/replacement covered from the contingency and will be reasonable matched in color, texture, and finish.
 21. As noted in Section 9, the onsite construction period is estimated to be 19 months. However, this implementation schedule is subject to change based on constraints caused by the extra safety measures regarding any Governors mandates (associated with pandemic or otherwise) that affects changing worksite safety policies, imposed construction site shut downs, supplier lead time(s) or other related items.
 22. There are no known requirements or existing application of sound proofing or acoustical applications on the existing HVAC system. Therefore, this proposal does not currently include any acoustical engineering or application for the recommended HVAC system.
 23. This project excludes the repair of the existing building structure that has been damaged previously.



Architectural Finishes:

The following pictures provide an overview of typical types of architectural finishes that must be removed, stored, protected, and replaced as part of this project. Many of these finishing's are historical in nature and no longer available for purchase if something is damaged during the process.







Remove Marble
Casing to Access
Radiators



6.0 Project Financials

This section provides an overview of the financial impact provided through implementation of this program. We have attempted to convey this information in a manner that identifies the costs, savings, fees, rates and structures along with a cash flow analysis.

6.1 Project Cost Structure

For development and performance of the Work described in this proposal, the client shall pay to UMC the Contract Sum of \$23,611,291 (excluding contingency, estimated WA State Sales Tax and estimated WA State DES Project Management Fees). The following table outlines all of these costs, including UMC's fees and compensation.

Table – UMC Fee Summary

CATEGORY	COST (\$)	% OF CONSTRUCTION COST
CONSTRUCTION COST (MTRL & LBR)		
Mechanical/Electrical Upgrades	\$ 17,917,490	
Project Supervision (on-site)	\$ 115,200	
Subtotal	\$ 18,032,690	
Builders Risk Policy	\$ 80,000	
Performance & Payment Bond	\$ 216,392	1.2%
Subtotal	\$ 18,329,082	
PROJECT DEVELOPMENT		
Investment Grade Audit	\$ 51,300	
Subtotal	\$ 51,300	
PROJECT IMPLEMENTATION		
UMC MEP Design	\$ 881,346	5.1%
UMC Lighting Design/Assist	\$ 31,810	5.0%
UMC Arch/Civil/Structural Design/Assist	\$ 259,220	1.5%
Project Management	\$ 985,462	5.5%
Subtotal	\$ 2,157,837	
PERFORMANCE MEASUREMENT & VERIFICATION		
MEASUREMENT & VERIFICATION (YR 1)	\$ 6,600	
MEASUREMENT & VERIFICATION (YRS 2 - 3)	\$ -	
Subtotal	\$ 6,600	
OTHER PROJECT COSTS		
Overhead	\$ 1,803,269	10.0%
Profit	\$ 1,262,288	7.0%
Apprenticeship Incentive (\$1000 fee including tax)	\$ 914	
Subtotal	\$ 3,066,471	
TOTAL CONSTRUCTION COST - (EXCLUDING TAX)	\$ 23,611,291	
CONSTRUCTION - CONTINGENCY	\$ 1,027,863	
ROUTING OF SECURITY SYSTEMS - CONTINGENCY	\$ 75,000	
ARCHITECTURAL FINISHES - CONTINGENCY	\$ 234,425	
HAZARDOUS MATERIALS - CONTINGENCY	\$ 396,719	
GUARANTEED MAX PROJECT COST	\$25,345,298	
WA STATE DES PROJECT MANAGEMENT FEE	\$ 316,995	
ESTIMATED TAX	\$ 2,219,461	
TOTAL INSTALLED COST	\$27,881,754	

Notes: Project Management, bond and O&P fees are % of total construction cost
Estimated Tax applies to Total Project Cost (excluding contingency)



6.2 RCM Investment Summary

Investment Grade Audit (IGA)

The Cost for the IGA is per Contract Agreement No. 2021-054 A (1) between the WA State Department of Enterprise Services and UMC.

Labor and Materials

Details of the Scope of Work associated with the Labor and Material Costs are provided in the Section 4.0.

Guarantees:

Project Cost Guarantee Policies

All proposed costs are based on a “not to exceed” guaranteed maximum price with identified construction contingency. Project costs will be revised in the event that owner implements changes to the scope of the project, or project exclusions or unforeseeable latent conditions are identified that affect the proposed project. Guaranteed project cost excludes tax and DES fee.

Performance Guarantee

Operating systems are guaranteed to operate as defined and deliver the identified results; except in the event that there are extenuating issues outside the scope of this project that affect the overall performance.

UMC will coordinate with equipment manufactures and owners to implement and adhere to warranty. UMC also provides guarantees on mechanical systems fabricated in house. UMC will coordinate and manage factory start up and training to assure that the customer understands ongoing operating requirements of the system.

Energy Guarantee

See section 6.3

Construction Contingency

Construction Contingency is defined within the DES General Conditions contract document. It accounts for the following: (1) Latent Conditions, (2) Owner Directed Contingency, (3) Design Contingency, (4) Scheduling Contingency and (5) Re-commissioning Contingency.

As approved by Owner, UMC is authorized to utilize this contingency for items necessary to complete the original intended scope of this project. This can be done following review and approval by the Owner and Washington State DES.

- 1) Latent Conditions Contingency is an allowance provided within the contract on the assumption that latent or unknown conditions do exist related to existing systems, facilities or the facility sites. The discovery of these latent conditions could not have been reasonably known prior to



construction. Furthermore, the owner has disclosed all adverse conditions that are known or could be reasonably known prior to construction. These conditions may include, but are not limited to: defects, malfunctions or obsolescence in systems being modified or in supporting systems; systems and conditions required to be upgraded to meet current or new building or safety codes; defective structures; discovery of hazardous materials including asbestos; buried utilities or underground obstructions; etc. Such conditions when uncovered shall be dealt with in the course of the project and the project responses to the unknown conditions shall be treated as Change Orders.

- 2) Owner Contingency is an allowance to accommodate adjustments to scope directed by the Owner through change orders as outlined below:
 - a) Change Orders for Owner Directed Changes requiring price adjustments, if any, shall be funded from the Construction Contingency Allowance; but only when additional funds are available following the completion of the primary scope of work identified in this document. Owner may contribute additional funds for additions or changes to the scope if available.
 - b) In addition, such changes may delay the Contract Schedule or contiguous tasks or both. The contractor shall be entitled to equitable adjustments to the schedule. Such schedule adjustments and the resultant price of such adjustments shall be included in the Change Order.
- 3) Re-commissioning Contingency is provided to allow for repair/replacement of control & operational issues identified during the re-commissioning process. This contingency is wholly Owner Directed.

Inclusion Plan

The purpose of the UMC Diverse Business Enterprise Inclusion Program (as developed and adopted in 2014) is to foster a healthy and diverse marketplace in our local communities. UMC is committed to diversity. Our main goal is to create an environment of mutual respect, tolerance and equal opportunity to all persons we serve without regard to race, color, sex, religion, creed, age, marital status, national origin, sexual orientation, disabled veteran, Vietnam era veteran, recently separated veteran and other protected veterans' status or the presence of any physical, sensory or mental disability.

This plan also serves as UMC's formal statement of awareness and company commitment to reach out to diverse businesses, and to help Washington State meet or exceed the state's diverse businesses utilization goals.

UMC employs a set of specific strategies for communicating and contracting with W|M|D|V|SDV|SBE companies on projects to ensure the highest level of small business opportunities, and regardless if there are stated participation goals.



Goals for Diverse Business Inclusion

% of Contract (Goal)

Minority-owned business	10%
Women-owned business	6%
Veteran-owned business	5%
Small/mini/micro business	5%

RCM Design Costs:

The following items and tasks are included in the fee:

- ✓ Conduct Design Analysis
- ✓ Evaluate Design Alternatives
- ✓ General Project Engineering
- ✓ Preliminary and Final design submittal and review
- ✓ Design documentation
- ✓ Review, selection and approval of materials and systems

Construction Management / Administration:

The following items and tasks are included in the construction management / administration fee:

- ✓ General Quality Oversight
- ✓ Project Progress Reports
- ✓ Permitting Process
- ✓ Coordination with civic, county and/or federal code officials
- ✓ Subcontractor Contract Development
- ✓ Construction Administration
- ✓ Coordination with Client
- ✓ Project Accounting and Invoicing
- ✓ Commissioning Co-ordination
- ✓ Project Logs and Records
- ✓ MEP Redlines and As-Built Development
- ✓ Project Close-Out
- ✓ Release of Purchase Orders
- ✓ Site General Conditions
- ✓ Start-up of Systems
- ✓ Performance Testing
- ✓ Training Administration/Coordination with factory representatives
- ✓ Onsite Subcontractor/Discipline Coordination
- ✓ Quality Assurance/Quality Control
- ✓ Inventory of materials and equipment received
- ✓ Site Safety Administration
- ✓ Punch list Development/Resolution



The following table summarizes the total investment summary per RCM. Also, please note that estimated rebates and grants that have been developed during the process are not guaranteed and are subject to Utility availability and approval.

Table – Project Summary

Resource Conservation Measures	Annual Savings ⁽¹⁾	Estimated Operational Savings	Estimated Grants & Incentives⁽²⁾	Project Cost
	\$	\$	\$	\$
Mechanical/Electrical Upgrades				
RCM-1 HVAC and Controls Infrastructure Upgrade & Renewal	\$ 7,562	\$ -	\$ -	\$ 14,788,700
RCM-2 Domestic Water System Upgrade & Renewal	\$ -	\$ -	\$ -	\$ 2,492,600
RCM-3 Lighting and Controls System Upgrade	\$ 7,954	\$ 5,714	\$ 16,590	\$ 636,190
Subtotal - All Upgrades	\$ 15,516	\$ 5,714	\$ 16,590	\$ 17,917,490
Project Supervision (on-site)				\$ 115,200
Subtotal - All Construction (excluding bond)	\$ 15,516	\$ 5,714	\$ 16,590	\$ 18,032,690
Builders Risk Policy				\$ 80,000
Performance & Payment Bond			1.2%	\$ 216,392
Subtotal - Construction Cost	\$ 15,516	\$ 5,714	\$ 16,590	\$ 18,329,082
Professional Services			% of Const Cost	
Investment Grade Audit				\$ 51,300
UMC MEP Design			5.1%	\$ 881,346
UMC Lighting Design/Assist			5.0%	\$ 31,810
UMC Arch/Civil/Structural Design/Assist			1.5%	\$ 259,220
Project Management			5.5%	\$ 985,462
M&V (Years 1)				\$ 6,600
M&V (Years 2 - 3)				\$ -
Overhead			10.0%	\$ 1,803,269
Profit			7.0%	\$ 1,262,288
Apprenticeship Incentive (\$1000 fee including tax)				\$ 914
Total Construction Cost - (All Measures / Excluding Tax)				\$ 23,611,291
Contingency - Construction			5.7%	\$ 1,027,863
Contingency - Routing of Security Systems (Raceways & Conduits)				\$ 75,000
Contingency - Architectural Finishes (Marble & Hardwood)			1.3%	\$ 234,425
Contingency - Hazardous Material			2.2%	\$ 396,719
Guaranteed Max Project Cost (including Contingency)				\$ 25,345,298
				\$ -
WA State DES Project Management Fee				\$ 316,995
Estimated Tax ⁽³⁾			9.4%	\$ 2,219,461
Total Installed Cost				\$ 27,881,754

Notes:

- (1) Annual utility savings (\$) are based on current utility rate schedule
- (2) Rebates & Incentives are estimated, but not guaranteed
- (3) Estimated tax applies to total construction cost, excluding contingency



7.0 Facility Resource Baselines

7.1 Utility Suppliers

The individual utility suppliers for the Temple of Justice are listed below. Detailed baseline utility rates for each utility are in the section 5.4.

Electricity

Puget Sound Energy provides electricity for the Building. The observed electrical blended rate is \$0.07722758/kWh for energy and \$5.48/kW for demand. As provided by DES.

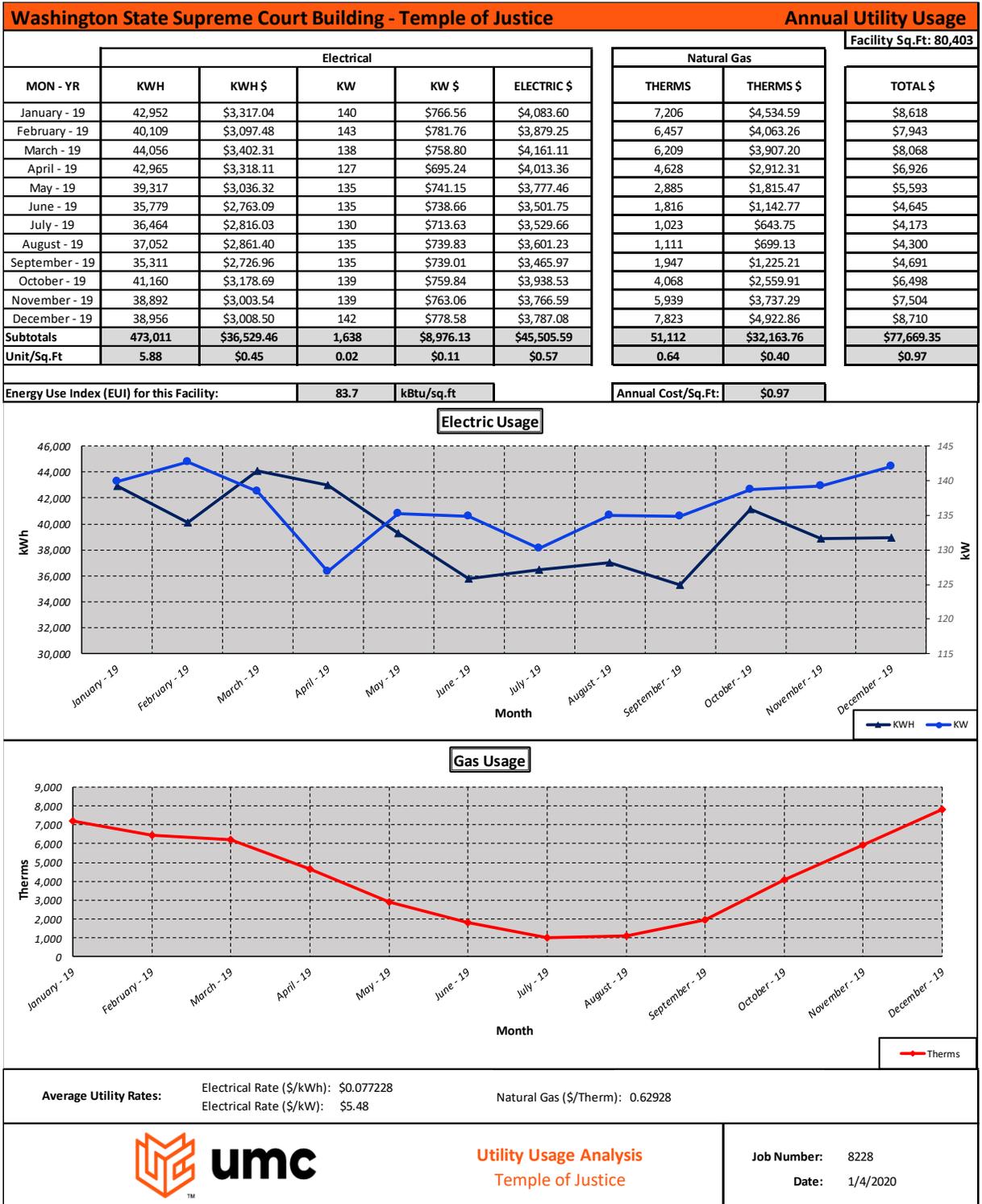
Natural Gas

Puget Sound Energy provides natural gas for the Steam Plant. The observed natural gas blended rate is \$0.62928/Therm with a \$595.08 base charge per month.



7.2 Building Utility Data

The following tables provide an overview of 2019's utility usage and cost. This year was chosen as a representative year for historical usage (ie: prior to the changes brought on by the pandemic).



7.3 Measure Baselines

7.3.1 Baseline Energy Units

The IES energy model adjusted baseline numbers are as follows broken out in energy bins. The baseline was adjusted to account for the existing steam (natural gas) humidifiers operating properly. Further details of how model was developed is shown in below sections between electrical utility data, site observations and building trending.

Energy (MBTU)	Baseline	Adjusted Baseline
Interior Lighting	923.2	923.2
Exterior Lighting	41.5	41.5
Receptacle Equipment	219.5	219.5
Elevators & Escalators	49.7	49.7
Space Heating	4,865.2	5,667.3
Service Water Heating	246.0	246.0
Space Cooling	31.7	31.6
Heat Rejection	-	-
Interior Central Fans	334.6	334.6
Exhaust Fans	1.5	1.5
Pumps	15.1	15.1
Total	6,727.9	7,530.0

7.3.2 Climate Analysis

The following section provides an overview of the baseline operating information as developed through the IES Virtual Environment modeling software. IES-VE is one of the most comprehensive facility energy modeling software platforms available and has been used to develop both the baseline and future projected energy use for this project.

Background information utilized to develop the energy model:

Weather: USA_WA_Olympia.AP.727920_TMY3.epw

ASHRAE 90.1 Climate class: 4C, Mixed Marine

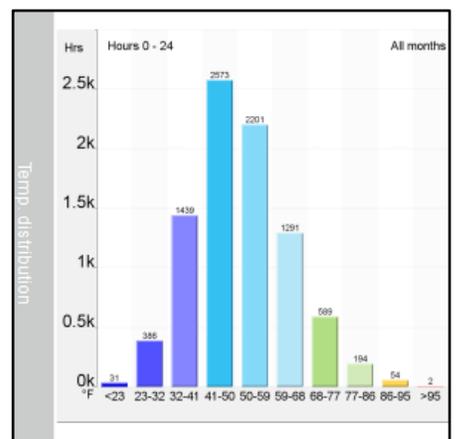
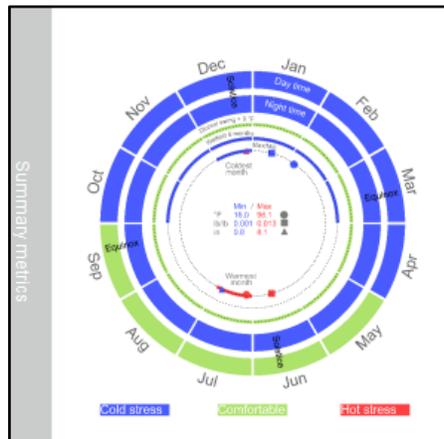
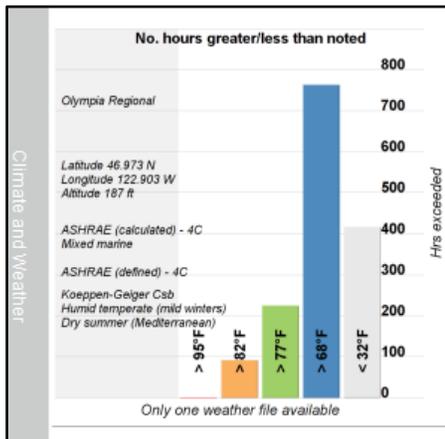
Analysis: Winter is potentially most dominant – the design must minimize heating energy. Summer is warm, but also has a large diurnal range, and has cool summer nights.

Degree days

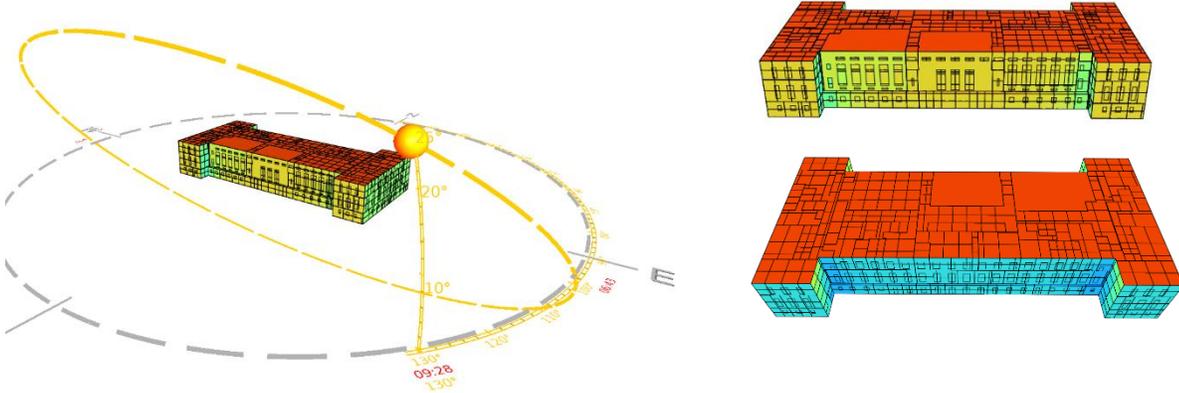
Heating degree days (HDD, 65) = 5370.2

Cooling degree days (CDD, 50) = 1660.3

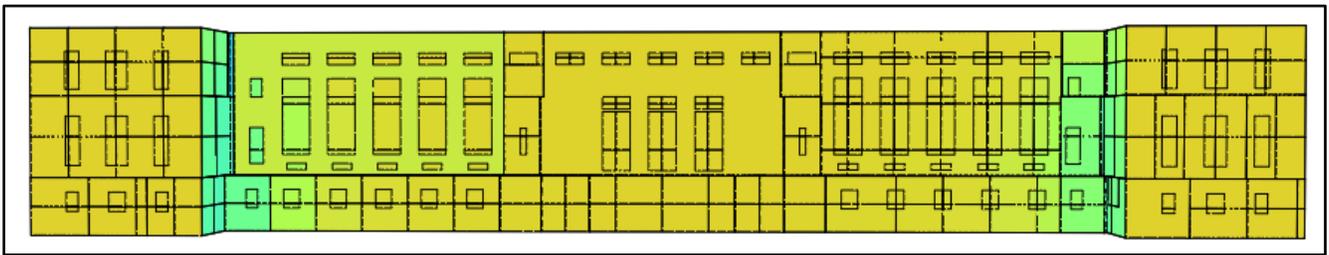




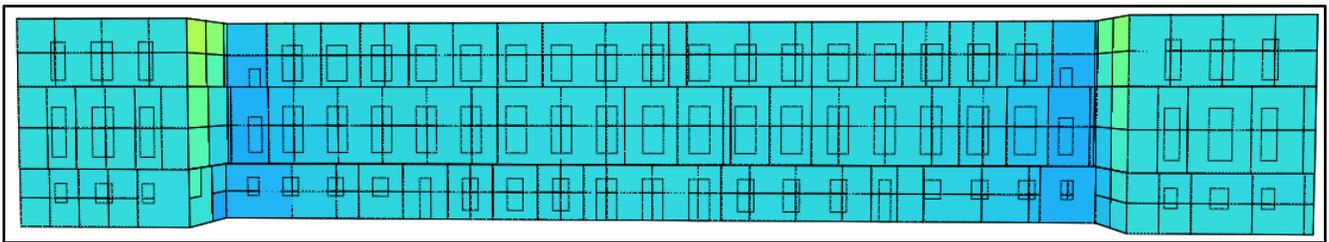
7.3.3 Solar Analysis



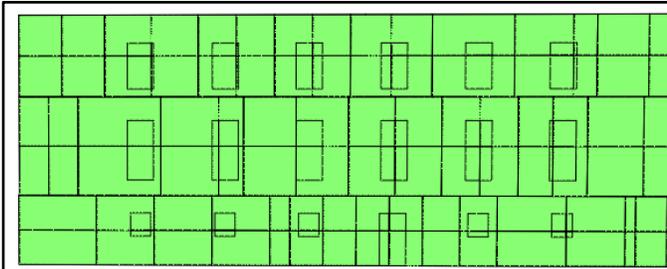
South



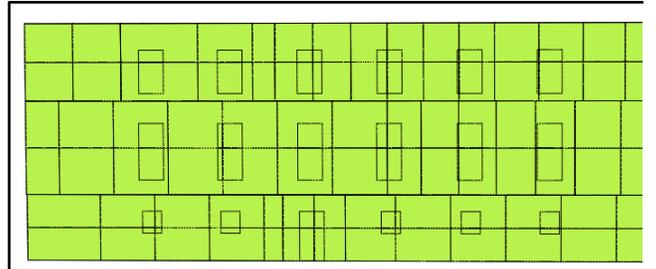
North



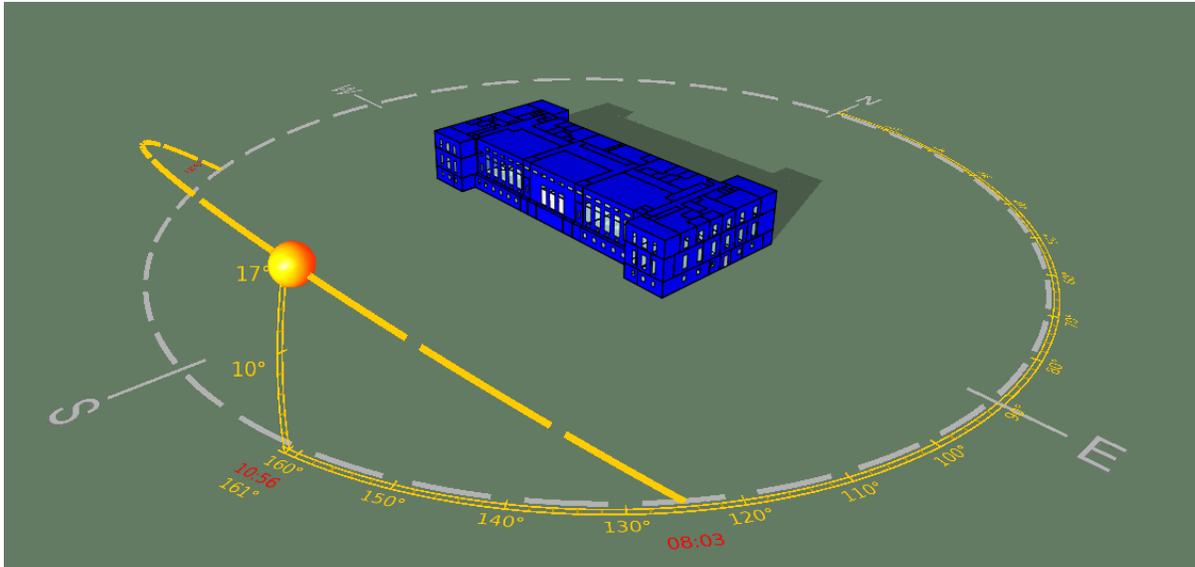
East



West



7.3.4 Energy Model - Calibration



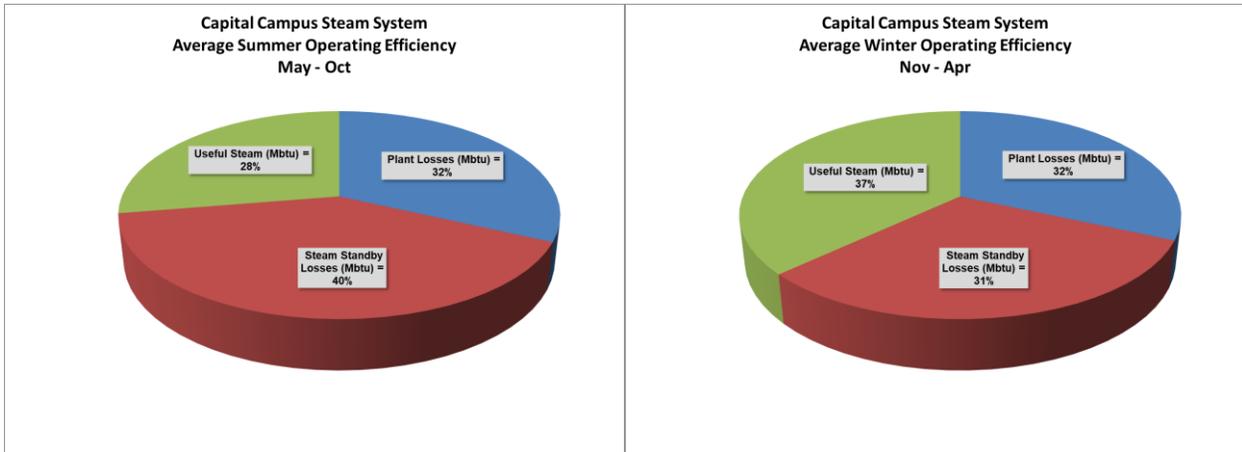
IES VE, energy modeling tool, is utilized to demonstrate energy savings for RCMs. Building area summary for the energy model is shown below.

Building Area	Total Square Ft
Office	23,446
Conference	2,028
Corridor (conditioned)	10,922
Courtroom	2,512
Electrical/Mechanical	995
Elevator	232
Library	17,268
Lobby/Foyer	4,142
Restroom	1,835
Stair	3,033
Storage	3,150
Total Project Square Footage	69,564

Note: Building EUI is based on 80,403 square feet which includes other areas that are not conditioned.



The energy model is calibrated based on measured data. Steam flow rate data for the perimeter heating from 2015 is used to calibrate the heating portion of the energy model. Control sequence of steam valves changed during the time of data collection, where valve schedule was properly adjusted during calibration process. Perimeter radiant heating load is calculated considering steam standby losses percentages. Overall steam standby losses are 40% and 31% during summer and winter, respectively. Overall steam standby loss of 35% is utilized for the energy model.

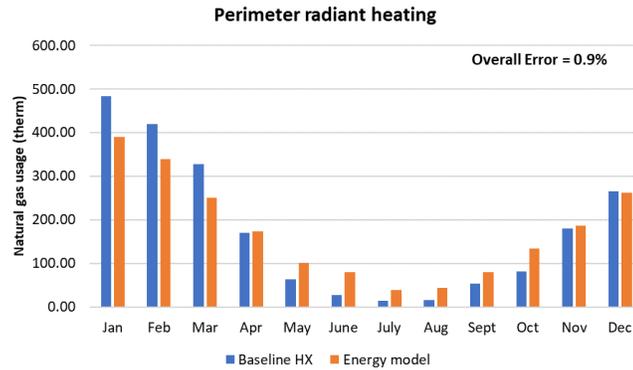


Plant losses and boiler efficiency are not considered during calibration process for simplicity, assuming as 100% efficient. Based on the steam flow rate, the baseline load for perimeter radiant heating is summarized in the following table.

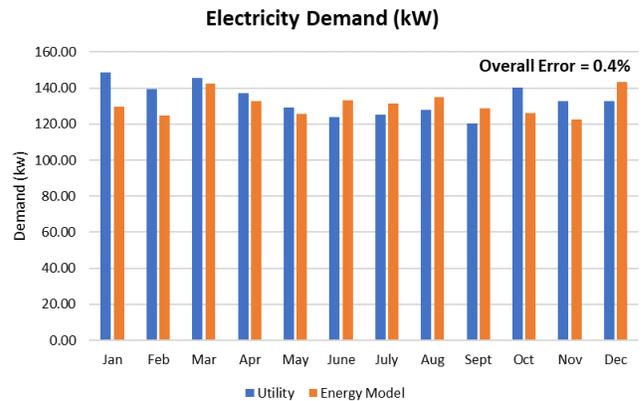
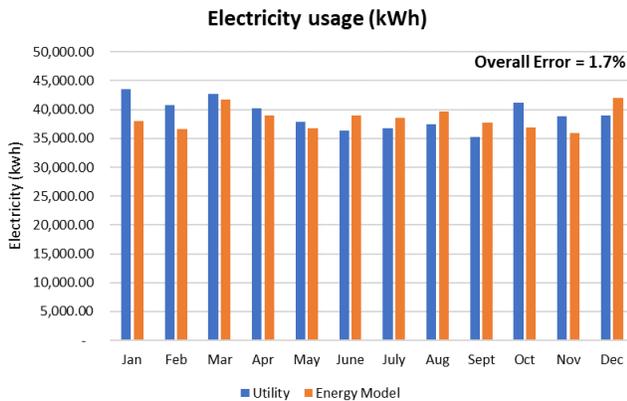
Month (2015)	Baseline Load - Perimeter radiant heating - Adjusted (therm)	Operation
Jan	4,834.3	Running all the time except holidays
Feb	4,198.2	Running all the time except holidays
Mar	3,278.6	Running all the time except holidays until 11th, then 4:30 am to 8 pm
Apr	1,696.5	4:30 am to 8 pm, Weekend off
May	636.7	4:30 am to 8 pm, Weekend off
June	277.6	5:30 am to 8 pm, Weekend off
July	136.0	5:30 am to 8 pm, Weekend off
Aug	155.8	5:30 am to 8 pm, Weekend off
Sept	529.6	5:30 am to 8 pm, Weekend off
Oct	818.8	5:30 am to 8 pm, Weekend off
Nov	1,793.7	5:30 am to 8 pm, Weekend off
Dec	2,645.9	5:30 am to 8 pm, Weekend off
Total	21,001.6	



The energy model's natural gas usage for perimeter radiant heating is compared to baseline load in the following chart. The difference is less than 1%.

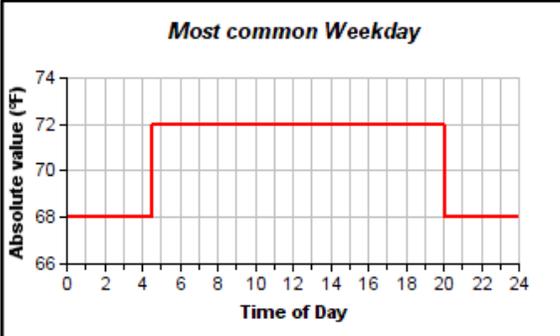
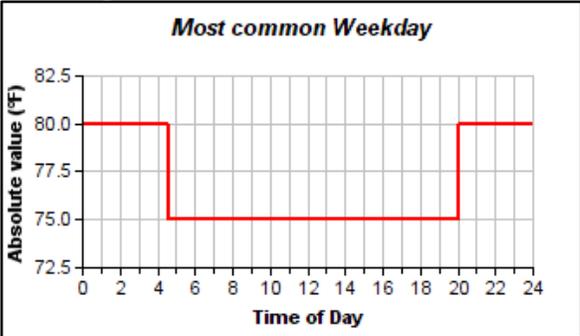


Similarly, electricity usage (kwh) and demand (kw) are compared in the following charts. Overall difference is less than 2% for both electricity usage and demand. The model is a statistically sound representation of the building and can be used to model potential alternatives.



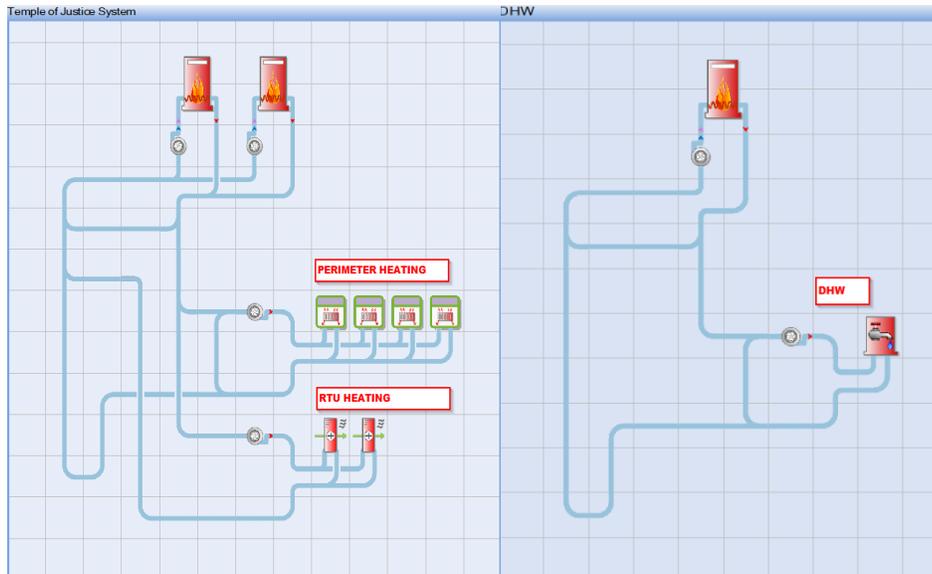
7.3.5 Energy Model – Baseline

The Baseline energy model is built utilizing a calibrated energy model, only modifying schedules to reflect pre-COVID building operations. General information/schedules utilized in the energy model are shown below. Schedules are kept consistent between baseline and proposed energy model during the study.

Weather file	USA_WA_Olympia.AP.727920_TMY3.epw
Building schedule	M-F 8:00 am - 5:00 pm
Baseline Main HVAC Systems	(2) Rooftop Unit – Steam heat/chilled water Perimeter hot water heating – Finned radiation
HVAC schedule	Weekdays M-F 4:30 am – 8:00 pm Weekend off
Set-points	<p>Heating: 70°F / setback 68°F</p>  <p>Cooling: 75°F / setback 80°F</p> 
Lighting	Average lighting power density (LPD) = 2.04 W/SF
Equipment	Office equipment load = 0.5 W/SF Individual electricity heater = 1.02 W/SF (diversity factor 15%)



Below shows the heating/cooling system for Temple of Justice. The energy model is incapable of modeling steam system. Thus, the model was properly adjusted to account for the steam system during the calibration process by adjusting loss coefficients and constant high-temp hot water system. Perimeter heating and RTU heating operate independently using secondary loops. Pump energy for RTU heating is set to zero to represent steam heat. Domestic hot water heating is modeled in a separate loop.



Heating loop

Reference: Temple of Justice System

Hot water loop: Pre-heating Heating equipment set Sizing status:

Hot water loop capacity: 2903.95 kBtu/h A

Over sizing factor for loop autosizing: 1.25

Force loop capacity to suit only heating equipment that will operate in the max part-load range:

Loop configuration: Primary-Secondary Distribution losses: 35.00 %

Primary supply Primary demand Secondary Loops (2)

- Heating perimeter
- RTU heating

Design loop capacity: 2259.39 kBtu/h A

Design loop flow rate: 451.72 gpm

Design loop temperature difference: Independent delta-T 10.00 °F

Enable independent secondary loop supply water temperature control

Design hot water supply temperature: 180.00 °F

Supply temperature setpoint: Reset per outdoor temperature None

Outdoor temperature low threshold: 40.00 °F

Supply temperature at or below low threshold: 180.00 °F

Outdoor temperature high threshold: 60.00 °F

Supply temperature at or above high threshold: 160.00 °F

Pumps

Specific pump power: Detailed inputs Edit 17.50 W/gpm Electricity: TOJ

Pump heat gain to loop (fraction): 0.90

Performance curve: Constant speed pump riding curve Edit constant speed

Optional loads

DHW branch: -

Scheduled load Design Load: 0.00 kBtu/h Profile: Steam Load kBtu/h

Delta-T: 30.00 °F Min leave temp: 170.00 °F Location: Parallel

Reference: Temple of Justice System

Hot water loop: Pre-heating Heating equipment set Sizing status:

Hot water loop capacity: 2903.95 kBtu/h A

Over sizing factor for loop autosizing: 1.25

Force loop capacity to suit only heating equipment that will operate in the max part-load range:

Loop configuration: Primary-Secondary Distribution losses: 35.00 %

Primary supply Primary demand Secondary Loops (2)

- Heating perimeter
- RTU heating

Design loop capacity: 554.09 kBtu/h A

Design loop flow rate: 110.78 gpm

Design loop temperature difference: Use primary supply delta-T 10.00 °F

Enable independent secondary loop supply water temperature control

Design hot water supply temperature: 185.00 °F

Supply temperature setpoint: Constant 185.00 °F

Hot water demand-side load fraction high threshold: 0.50

Supply temperature at or above high threshold: 185.00 °F

Hot water demand-side load fraction low threshold: 0.30

Supply temperature at or below low threshold: NO PUMP ENERGY FOR STEAM

Pumps

Specific pump power: Detailed inputs Edit 0.00 W/gpm Electricity: TOJ

Pump heat gain to loop (fraction): 0.90

Performance curve: Constant speed pump riding curve Edit constant speed

Optional loads

DHW branch: -

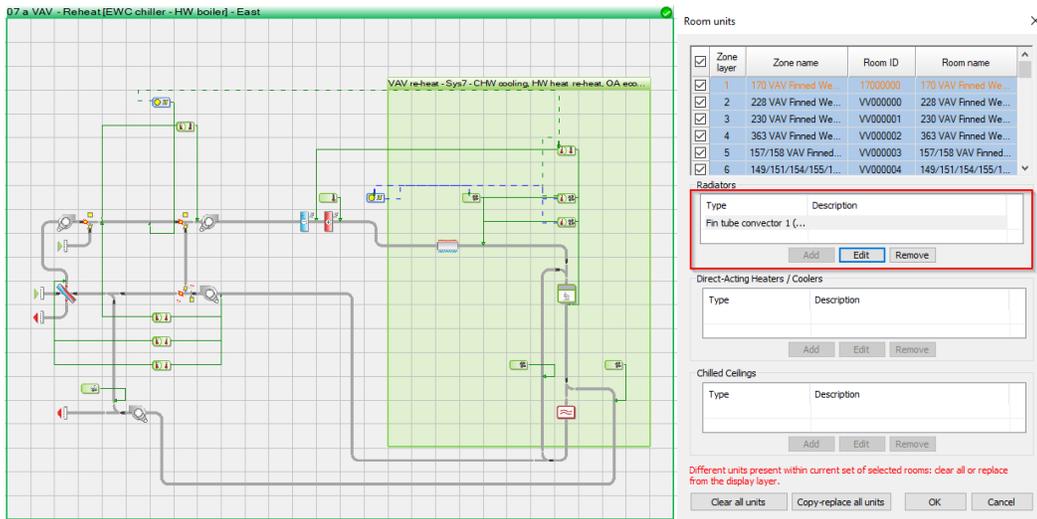
Scheduled load Design Load: 0.00 kBtu/h Profile: constant 0 kBtu/h

Delta-T: 10.00 °F Min leave temp: 175.00 °F Location: Parallel

Secondary loop operations (left – perimeter heating, right – RTU heating)

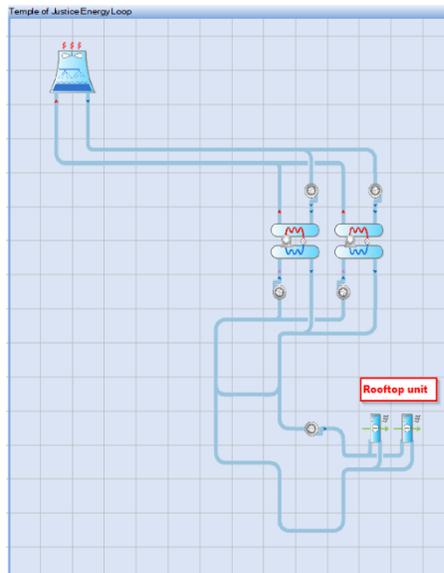


Finned convector is added to each perimeter room.



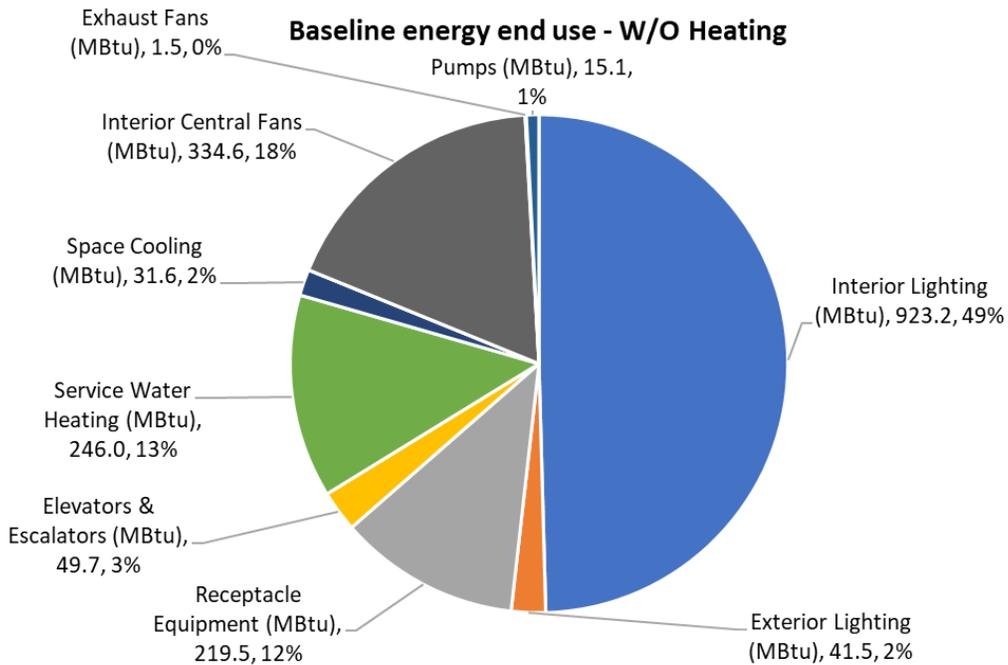
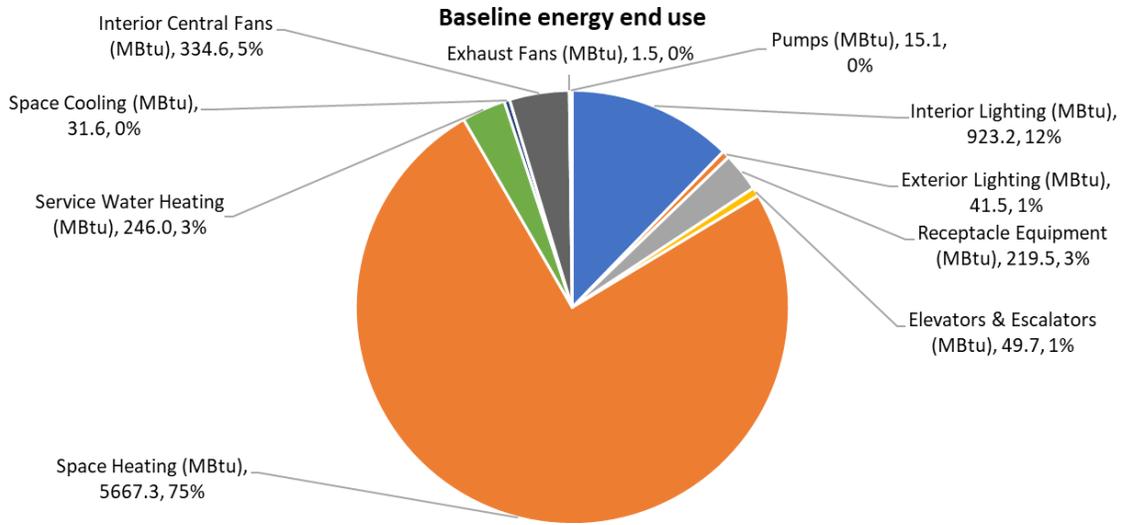
Typical rooftop unit + Finned convector

Chilled water system only serves rooftop unit for TOJ. The current energy model considers efficiency of central plants, but not necessarily total energy use for the central plant. The study focuses on individual load/energy use/savings for the Temple of Justice building.

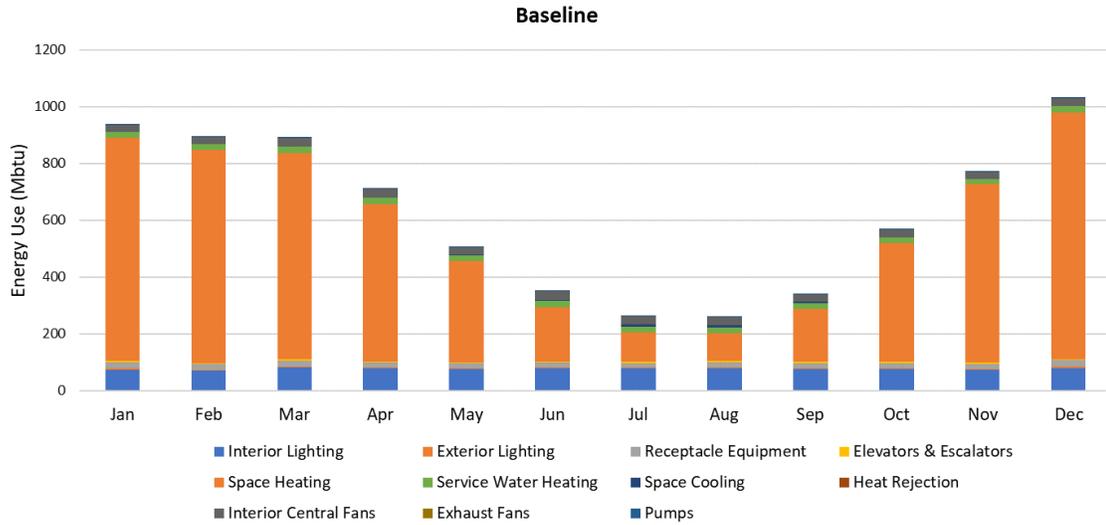


Chilled water loop

Baseline annual energy consumption by end use is shown below. The project is heating dominant as the current building loses a lot of heat during delivery of steam, system operation, and due to poor envelope. Lighting accounts for the second largest energy use for the facility followed by fan energy.



Examining monthly energy consumption by end use: energy uses other than heating stays relatively consistent throughout the year. Large increase in heating energy is noticeable during the winter season.



8.0 Measurement and Verification

8.1 Summary of Total Guaranteed Savings

The tables in this section illustrate the total savings in current dollars and extended over a 20 year life span. All guaranteed savings are based on units of energy (kwh, demand kw, and gallons water). The dollars shown in these tables are calculated by applying the current rates (as defined later in this section) to the guaranteed units of energy saved. The table below shows the cumulative savings over a 20 year period assuming that the cost of energy continues to escalate. This table is shown for illustrative purposes (escalation is not included in any guarantee).

Year	Annual Utility Savings	Annual Operational Savings	Cummulative Project Savings
Construction			
1	\$15,516	\$5,714	\$21,230
2	\$15,826	\$5,829	\$42,886
3	\$16,143	\$5,945	\$64,974
4	\$16,466	\$6,064	\$87,504
5	\$16,795	\$6,185	\$110,484
6	\$17,131	\$6,309	\$133,924
7	\$17,474	\$6,435	\$157,833
8	\$17,823	\$6,564	\$182,220
9	\$18,179	\$6,695	\$207,095
10	\$18,543	\$6,829	\$232,467
11	\$18,914	\$6,966	\$258,347
12	\$19,292	\$7,105	\$284,745
13	\$19,678	\$7,247	\$311,670
14	\$20,072	\$7,392	\$339,134
15	\$20,473	\$7,540	\$367,147
16	\$20,882	\$7,691	\$395,720
17	\$21,300	\$7,845	\$424,865
18	\$21,726	\$8,002	\$454,593
19	\$22,161	\$8,162	\$484,915
20	\$22,604	\$8,325	\$515,844



The following Table summarizes the first year savings of the Total Guaranteed Savings (Total Guaranteed Savings Summary) in Guarantee Type categories as defined by the International Performance Measurement and Verification Protocol (IPMVP). **All guarantees are based on units of energy (not dollars).**

Proposed M&V Type				
Resource Conservation Measure	Measurement & Verification Option Proposed			
	Option A Partially Measured Retrofit Isolation	Option B Retrofit Isolation	Option C Whole Facility	Option D Calibrated Simulation
RCM-1 HVAC and Controls Infrastructure Upgrade & Renewal				X
RCM-2 Domestic Water System Upgrade & Renewal	N/A	N/A	N/A	N/A
RCM-3 Lighting and Controls System Upgrade				X

The following Table illustrates the total guaranteed savings in units of energy. RCM-1 is based on 85% guarantee and RCM-3 is based on 90% guarantee.

Resource Conservation Measures	Energy Savings			Guaranteed	
				Energy/Utility Savings	
	Electric		Natural Gas therms	kW/yr	kWh/yr
RCM-1 HVAC and Controls Infrastructure Upgrade & Renewal	-	(25,482)			
RCM-2 Domestic Water System Upgrade & Renewal	-	-	-		
RCM-3 Lighting and Controls System Upgrade	-	149,090	(5,657)		
Totals	-	123,608	9,487		



8.2 Energy Guarantee

All energy savings guarantees are based on units of energy or utility usage (kWh, therms, gallons, or other appropriate consumption measurements), not specific dollar savings. The applicable dollar savings are calculated based on the utility rate structures in place at the time as defined in the utility baseline (Section 6.4). All savings in excess of the guaranteed savings are the sole property of the customer.

The table shown in section 6.1 provides the specific energy guaranteed consumption savings for each resource conservation measure. Savings calculations are based upon both baseline operating characteristics and proposed operation criteria. These target energy savings are dependent upon the stipulated conditions as defined in the individual RCM M&V plans (as defined later in this section).

The measurement & verification plan provides the specific on-going reporting tasks that will be performed in order to verify that the RCMs are performing as specified. The intent is to measure and verify key indicators on which the energy savings are based. Once these key indicators are verified to be in accordance with the proposed criteria, the savings due to the performance of the equipment or measure shall be deemed as met. The proposed measurements for each RCM are defined in Section 6.3.

Baseline: The “baseline” refers to the current operating characteristics of the facility, system or equipment prior to the implementation of the conservation measures identified in this audit. All parties acknowledge that the baseline characteristics as identified in this audit and as associated with specific measures have been determined based on the following:

- Actual operating information gathered during this audit through field observation, site measurements, occupant interviews, trending or owner operational log books. In certain situations, this information has been used to determine stipulated factors such as occupancy schedules, typical equipment operating hours, operational expenditures, light fixture burn-hours, etc.
- Owner provided information.
- In certain instances, a modified baseline may have been developed and discussed with the owner. A modified baseline is instituted when the pre-retrofit conditions do not reflect a system that is operating per current code or per owner’s desired normally anticipated operating conditions.



Proposed: The proposed operating criteria, including system performance and operational expenditures, which were used for savings calculations are provided in Section 6 of this IGA. Systems must be operated per the proposed criteria to ensure energy cost savings are realized. UMC will provide the initial start-up and commissioning of the system to ensure that the RCMs operate per the proposed operating criteria. The Owner acknowledges responsibility to ensure that these criteria are maintained and associated energy savings are realized. Energy Savings Guarantees are predicated based upon Owner maintaining their responsibilities as provided below in “Owner Responsibilities.”



8.3 Measurement and Verification Plan

Guarantee Savings Types

The IPMVP protocol includes four guarantee options to measure and verify savings: Option A – Partially Measured Retrofit Isolation, Option B – Retrofit Isolation, Option C – Whole Facility, and Option D – Calibrated Simulation. The following table describes these options in more detail.

M&V Option	How Savings Are Calculated	Typical Applications
<p>Option A. Partially Measured Retrofit Isolation</p> <p>This approach is intended for Facility Improvement Measures where a one-time measurement for specific equipment or systems instantaneous baseline energy use, and a one-time measurement for specific equipment or systems instantaneous post-implementation energy use can be measured. Baseline and Post energy consumption is calculated by multiplying the measured end use instantaneous capacity (i.e. – kW, Gal/hr, BTU/hr) by stipulated hours of operation for each mode of operation (i.e. – hours, week, month).</p>	<p>Savings are determined by partial field measurement of the energy use of the system(s) to which an RCM was applied; separate from the energy use of the rest of the facility. Measurements may be either short-term or continuous. Partial measurement means that some but not all parameter(s) may be stipulated, if the total impact of possible stipulation error(s) is not significant to the resultant savings. Careful review of RCM design and installation will ensure that stipulated values fairly represent the probable actual value. Stipulations should be shown in the M&V Plan along with analysis of the significance of the error they may introduce.</p>	<p>Lighting retrofit where power draw is measured periodically. Operating hours of the lights are assumed to be one half hour per day longer than store open hours.</p>
<p>Option B. Retrofit Isolation</p> <p>This approach is intended for Facility Improvement Measures where continuous periodic measurements for specific equipment or systems baseline energy use, and continuous periodic measurements for that equipment or systems post-implementation energy use can be measured.</p>	<p>Savings are determined by field measurement of the energy use of the systems to which the RCM was applied; separate from the energy use of the rest of the facility. Short-term or continuous measurements are taken throughout the post-retrofit period.</p>	<p>Application of controls to vary the load on a constant speed pump using a variable speed drive. Electricity use is measured by a kWh meter installed on the electrical supply to the pump motor. In the base year this meter is in place for a week to verify constant loading. The meter is in place</p>



		throughout the post-retrofit period to track variations in energy use.
<p>Option C. Whole Facility</p> <p>This approach is intended for measurements of the whole-facility where specific meter baseline energy use and measurements of whole-facility or specific meter post-implementation energy use can be measured.</p>	<p>Savings are determined by measuring energy use at the whole facility level. Short-term or continuous measurements are taken throughout the post-retrofit period.</p>	<p>Multifaceted energy management program affecting many systems in a building. Energy use is measured by the gas and electric utility meters for a twelve month base year period and throughout the post-retrofit period.</p>
<p>Option D. Calibrated Simulation</p> <p>This approach is intended for Facility Improvement Measures where the end use capacity or operational efficiency; demand, energy consumption or power level; or manufacturer’s measurements, industry standard efficiencies or operating hours are known in advance, and used in a calculation or analysis method that will calculate the outcome.</p>	<p>Savings are determined through simulation of the energy use of components or the whole facility. Simulation routines must be demonstrated to adequately model actual energy performance measured in the facility. This option usually requires considerable skill in understanding facility interactions and in calibrated simulation.</p> <p>Factors that are stipulated should be shown in the M&V Plan.</p>	<p>Multifaceted energy management program affecting many systems in a building but where no base year data are available. Post-retrofit period energy use is measured by the calibrated simulation using a model (usually Excel or whole facility model such as Trane Trace). Base year energy use is determined by simulation using a model calibrated by the post-retrofit period utility data.</p>



The following information outlines are applicable for this contract:

Measurement and Verification (M&V) methods provided under this Article:

Option A – Partially Measured Retrofit Isolation

Option B – Retrofit Isolation

Option C – Whole Facility

Option D – Calibrated Simulation

General Overview:

The purpose of the Measurement and Verification (M&V) Section is to identify the methods, measurements, procedures and tools that will be used to verify the savings for each RCM. Savings were determined by comparing prior usage, consumption or efficiencies defined as the Baseline to the selected RCMs being implemented against the post RCM implementation usage, consumption or efficiencies. The Baseline usage, consumption or efficiencies are described in this Section, Baseline Data. The usage, consumption or efficiencies associated with the RCM implementation, is defined as the Contracted Baseline, and is described in this Section, Contracted Baseline Data.

The actual guaranteed savings associated with this Program is outlined in this Section, Summary of Total Guaranteed Savings and Guaranteed Savings Types.

TO BE COMPLETED IN THE FINAL PROPOSAL

End of Year One M&V: First year included



8.4 Utility Rate Structure and Escalation Rates

Utility costs used for savings calculations will be based on the utility rate in effect for the predominant bill or the utility rate in effect for the corresponding period of the Baseline period, whichever is greater. The rate, in effect during the Baseline period, will be the designated floor price, and is shown below for each utility.

Electricity		
Utility Name:	Puget Sound Energy	
Rate Structure:	\$0	Basic Charge
Usage	\$0.077228	\$ per kWh
Demand	\$5.48	\$ per kW

Note: Displayed in the Electricity rate table above are the current rolled-up electricity costs from Puget Sound Energy. In January 2021, Puget Sound Energy's Tariff Schedule 139 will be adopted. This Schedule is called Green Direct and the rates for it are not yet available.

Natural Gas		
Utility Name:	Puget Sound Energy	
Rate Structure:	\$595.08	Basic Charge
First 25,000 Therms	\$0.49083	per Therm
Next 25,000 Therms	\$0.43473	per Therm
Over 50,000 Therms	\$0.43188	per Therm
Average	\$0.45248	per Therm
Annual Minimum Load Charge	\$0.12484	per Therm
City Tax	9.0%	Percent
Average cost per Therm	\$0.62928	per Therm



8.5 Applicable Codes

Federal, State, and Local codes or regulations are applicable to the use and operation of the facility. All work installed under this project will meet the requirements of the following codes:

- The International Building Code and appendices thereto pertaining to building accessibility, not including the adoption of the incorporated electrical codes, plumbing codes, fire codes or property maintenance codes other than specifically referenced subjects or sections of the International Fire Code, but including the incorporated International Residential Code; International Mechanical Code; International Fuel Gas Code; International Energy Conservation Code.
- The Washington State Energy Code
- The Uniform Mechanical Code
- The Uniform Code for Building Conservation
- The Safety Code for Elevators and Escalators (ASME/ANSI A 17-.1)
- The NEC
- The NFPA Fire Alarm Systems
- The NFPA 13 Fire Sprinkler Systems
- The Uniform Plumbing Code
- The Washington State Ventilation and Indoor Air Quality Code
- All applicable local city codes

UMC is not responsible for the code compliance of systems not installed under this project.

8.6 M&V Costs

The cost for the first 12 months of M&V reporting is included in the project implementation cost. The owner has the option to continue M&V and associated energy guarantees for the subsequent years at the prices shown below (including a labor escalation rate of 5%). To elect this option owner shall provide written notification to UMC one month after the end of the prior period. In the event this option is not elected for a particular year, it may not be elected in subsequent years. UMC's ongoing fee for M&V for years 2 through 3 is shown below.



Table – Annual M&V Costs

Year	Annual M&V Cost
1	\$6,600
2	\$6,864
3	\$7,139

(1) Included in project cost

8.7 M&V Reporting

UMC will provide a commissioning report to the Owner within 90 days of completion of the project. The Cx report will illustrate that the project is saving as designed or better. This will ensure that equipment savings is being realized.

At the completion of the 12 months of energy savings, UMC will provide the first year of reporting within 90 days of this date.

Ongoing M&V reporting beyond year one is not included as part of this proposal. The annual cost for the continued M&V is shown above in the “Annual M&V Costs) table. The savings guarantee associated with this project will only continue past year one as long as the Owner includes the continuation of M&V services as defined herein.

8.8 Customer Responsibilities

This section details the responsibilities the Owner, in connection with the management and administration of the Performance Guarantee. UMC is not responsible for increased energy or operational issues that result from items beyond its control or in the event that the Owner fails to comply with the following requirements.

- While the M&V agreement is in place, and there are changes within the facility, UMC requests that the customer notify us within 30 days of any:
 - Physical Change to operating schedules, strategies, equipment and conditions in the Facility from those described in the Contracted Baseline data.



-
- Any other Physical Changes in or at the Facility that may increase or decrease energy usage, including without limitation: changes in operations, business conducted, occupancy, hours of operation, and energy consuming equipment and malfunctions, failures and related changes in energy consuming equipment.
 - Any damage to, or destruction of, the installed equipment.
 - The Owner will provide a representative at each facility to coordinate work and provide required data described below. Owner will provide access to all spaces required for pre measurement and post measurement. At the Owner's discretion, one representative will witness all pre and post measurements. UMC will provide calibration reports on all meters as required by the Owner.
 - The Owner will provide UMC with accurate facility operating information, as defined below, and in the Contracted Baseline article of this Section during each Annual Period, as soon as such information becomes available to the Owner.
 - Owner will provide UMC with copies of utility bills within 7 days of receipt by Owner or provide access to utility vendor information.
 - Owner will provide telephone/data remote access as UMC reasonably requests. All charges related to telephone/data line installation, activation and communication services are the responsibility of the Owner.
 - Owner will be responsible for notification of UMC regarding schedule changes of the air handling systems associated with this measure. Owner will be responsible for maintaining proposed schedules and setback temperatures. If, for any reason, schedules or setback temperatures must change, Owner will be responsible to make UMC aware of the change.
 - Owner will maintain all proposed operating schedules as defined in this proposal and as discussed during training. UMC cannot be responsible for excess energy usage that occurs due to atypical operating hours that are the result of equipment overrides, failure to maintain vacation/holiday scheduling or changes in building use or operating characteristics beyond that as identified during the development of the IGA.
 - Owner will provide equipment service and preventative maintenance to keep all equipment installed as part of this project operating efficiently. This includes all service & maintenance as defined in equipment O&M & warranty documents and as discussed during training. Equipment must be maintained in peak operating condition to provide ongoing efficient operation in a



manner to meet the savings estimates set forth in this document. Unless otherwise contracted, UMC will provide no additional equipment maintenance or repairs outside of the warranty period

- Owner agrees that the existing operating schedules and equipment conditions, as provided in this IGA, are complete and correct. If, for any reason, the Owner requires that the equipment be operated in excess of the proposed schedules, UMC will not be responsible for resulting increased energy usage.
- During the performance guarantee period, any post-retrofit changes made by the Owner that may affect the baseline data (i.e., new construction, additional electrical loads, manual control of automatic devices, etc.) shall be reported to UMC so that adjustments can be made to reflect the changes and proper adjustments to the savings guarantees can be made.
- UMC will provide an operations and maintenance manual. Upkeep of the equipment installed as part of this project is the responsibility of the Owner's maintenance personnel. Any loss of efficiency that occurs to the installed equipment caused by a lack of ongoing maintenance or upkeep shall be taken into account and appropriate impact to annual savings adjusted.
- Owner must make every effort to make sure that all appropriate personnel attend equipment/system training provide by UMC during the implementation of this project. These training sessions will be scheduled with the Owner to make sure they are held during a period when appropriate personnel can attend.

8.9 On-Going Space Operating Conditions

The following section provides the space conditions that Owner must maintain to ensure the comfort of the building occupants. These conditions also provide the basis upon which all energy savings calculations have been made. Deviations beyond these conditions that are made at the discretion of the Owner could negatively affect the ongoing savings performance of this project.

HVAC Operating Criteria: Heating, ventilating, and air conditioning (HVAC) systems provided as a part of this project will provide space conditions in accordance with the Standards of Comfort described below. This standard will pertain only to buildings and areas of buildings that are directly affected by measures implemented in this project and under which this HVAC equipment has direct control over space comfort conditions. HVAC comfort conditions cannot be guaranteed when operable windows or doors are open.

Space Conditions:



Occupied:

- Heating Setpoint – 68 to 70 degrees F
- Cooling Setpoint – 75 degrees F

Unoccupied:

- Heating Setback – 55 degrees F
- Cooling Setback – 80 to 85 degrees F (where mechanical cooling systems are employed)

Minimum Outside Air Per Occupant:

In accordance with ANSI/ASHRAE Standard 62.1, standards and the International Mechanical Code as adopted by the Washington State Building Code Council.

Illumination Levels:

Illumination levels shall be as recommended by the Illuminating Engineer's Society of North America.

HVAC Equipment Operating Hours:

The operating schedules for the equipment installed as a part of this project will remain the same as the original baseline operating schedule unless schedule changes have been proposed and implemented as a part of this project.



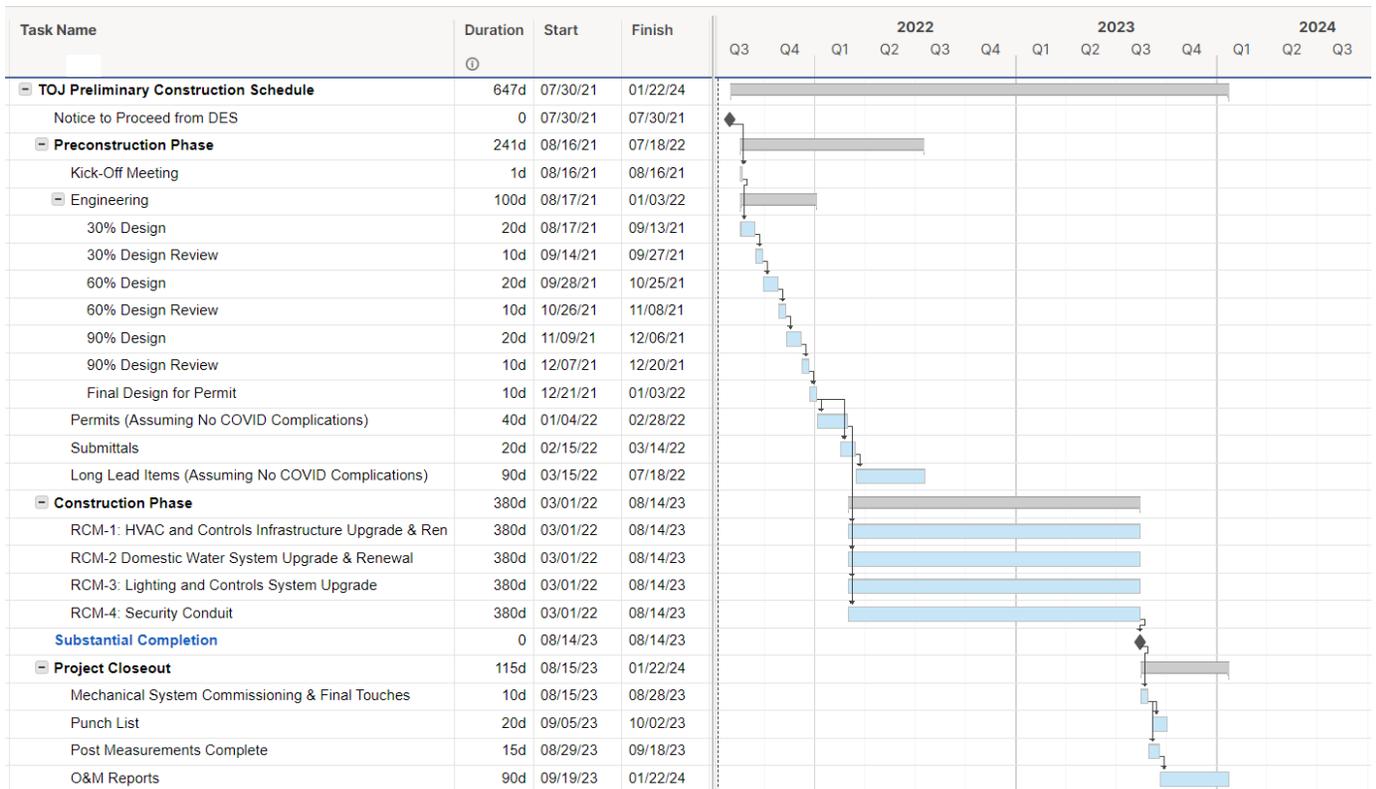
9.0 Implementation Plan

9.1 Preliminary Project Schedule

The following is a preliminary construction schedule to implement the chosen RCMs.

	Calendar Days (Mon-Sun)	Week Days (Mon-Fri)
Complete Project	907	647
Construction Phase	693	495

Table below is in working days(M-F); not calendar days.



10.0 Appendix



Appendix 1: Conceptual Design Sketches



To Be Provided at a Later Date



Appendix 2: Proposed Lighting Design Details



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor Saving %
1	Exterior	exterior	Ext	South entry	4,200	2	Existing LED Lamp 6 watts	6	2	Leave existing fixture as is	6							
2	Exterior	exterior	Ext	South entry	4,200	25	Existing LED Lamp 6 watts	6	25	Leave existing fixture as is	6							
3	Exterior	exterior	Ext	South Pole LED	4,200	7	Existing Wallpack LED 30 watts	30	7	Leave existing fixture as is	30							
4	Exterior	exterior	Ext	West entry sconces	4,200	2	Existing Wallpack LED 20 watts	20	2	Leave existing fixture as is	20							
5	Exterior	exterior	Ext	West Pole LED	4,200	5	Existing Wallpack LED 30 watts	30	5	Leave existing fixture as is	30							
6	Exterior	exterior	Ext	North Pole LED	4,200	5	Existing Wallpack LED 30 watts	30	5	Leave existing fixture as is	30							
7	Exterior	exterior	Ext	North entry sconces	4,200	4	Existing Wallpack LED 20 watts	20	4	Leave existing fixture as is	20							
8	Exterior	exterior	Ext	North LED roof floods	4,200	2	Existing LED 300w Shoebox Pole Light	300	2	Leave existing fixture as is	300							
9	Exterior	exterior	Ext	Police memorial step lights	4,200	16	Existing Wallpack LED 20 watts	20	16	Leave existing fixture as is	20							
10	Exterior	exterior	Ext	Police memorial step lights	4,200	11	Existing Wallpack LED 10 watts	10	11	Leave existing fixture as is	10							
11	Exterior	exterior	Ext	Police memorial step lights	4,200	16	Existing Wallpack LED 20 watts	20	16	Leave existing fixture as is	20							
12	Exterior	exterior	Ext	Police memorial step lights	4,200	26	Existing LED Lamp 6 watts	6	26	Leave existing fixture as is	6							
13	Exterior	exterior	Ext	East Pole LED	4,200	3	Existing Wallpack LED 30 watts	30	3	Leave existing fixture as is	30							
14	Exterior	exterior	Ext	East entry sconces	4,200	2	Existing Wallpack LED 20 watts	20	2	Leave existing fixture as is	20							
15	Basement	interior	Base	Main hallway	3,120	19	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	19	Retrofit Hybrid Pin LED - (2) lamp 9W - Omni, Green Creative	18							
16	Basement	interior	Base	Main hallway	8,760	6	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	6	Retrofit Hybrid Pin LED - (2) lamp 9W - Omni, Green Creative	18							
17	Basement	interior	Base	Main hallway	3,120	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5							
18	Basement	interior	Base	Main hallway	8,760	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5							
19	Basement	interior	Base	Main hallway	3,120	9	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	9	Retrofit RC LED Module 8", Set to 27w,(12/19/27) 1950lm, Espen, 0-10v	27							
20	Basement	interior	Base	Main hallway	8,760	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
21	Basement	interior	Base	Main hallway	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
22	Basement	interior	Base	Main hallway	3,120	2	Existing Incandescent 54 watt Lamp(s)	54	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
23	Basement	interior	Base	Main hallway	8,760	2	Existing Incandescent 54 watt Lamp(s)	54	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
24	Basement	interior	Base	Main hallway	8,760	7	Existing LED Exit Sign	6	7	Leave existing fixture as is	6							
25	Basement	interior	Base	Vending machine room	520	1	Existing CFL Screw-in 16watts - BR30 in Rec Can	16	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
26	Basement	interior	Base	Vending machine room	520	1	Existing Strip 4' 2 Lamp(s) F34 T12 Standard Ballast	82	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30							
27	Basement	interior	Base	Library break room	1,040	3	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	3	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%
28	Basement	interior	Base	Library break room	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WFP P-D	1	PICO 3B	1	
29	Basement	interior	Base	Law library	520	26	Existing Parabolic Troffer 2x4 2 Lamp(s) F40 T12 Standard Ballast	96	26	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	3	25%
30	Basement	interior	Base	Law library	520	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %	
31	Basement	interior	Base	Law library	520	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
32	Basement	interior	Base	Law library	8,760	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
33	Basement	interior	Base	Law library	520	5	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	5	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	2	25%	
34	Basement	interior	Base	Law library	8,760	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48								
35	Basement	interior	Base	Law library	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6								
36	Basement	interior	Base	Library mech	260	1	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30								
37	Basement	interior	Base	Hall office storage	520	2	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	2	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15								
38	Basement	interior	Base	Hall mech	260	2	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	2	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30								
39	Basement	interior	Base	Hall mech 2	260	1	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30								
40	Basement	interior	Base	Hall mech 2	8,760	1	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30								
41	Basement	interior	Base	Maintenance break room	1,040	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
42	Basement	interior	Base	Maintenance break room	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12		WFP P-D	1	PICO 3B	1			
43	Basement	interior	Base	Maintenance storage	520	4	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	4	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48								
44	Basement	interior	Base	Maintenance storage	1,040	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12		WFP P-D	1	PICO 3B	1			
45	Basement	interior	Base	Maintenance office	2,080	5	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	5	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
46	Basement	interior	Base	Maintenance vault	520	17	Existing Wrap 4' 1 Lamp(s) F40 T12 Standard Ballast	52	17	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15								
47	Basement	interior	Base	RRW	3,120	2	Existing Incandescent 2L 54 watt	108	2	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18								
48	Basement	interior	Base	RRW	3,120	2	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	2	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15								
49	Basement	interior	Base	RRW	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
50	Basement	interior	Base	RRW	8,760	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
51	Basement	interior	Base	RRM	3,120	2	Existing Incandescent 2L 54 watt	108	2	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18								
52	Basement	interior	Base	RRM	3,120	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15								
53	Basement	interior	Base	RRM	3,120	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
54	Basement	interior	Base	RRM	8,760	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
55	Basement	interior	Base	RRM	3,120	1	Existing Strip 2' 1 Lamp(s) F20 T12 Standard Ballast	28	1	Retrofit 1L to 2' TLED type C Dimmable - 8w - (1) Dimming Driver	10								
56	Basement	interior	Base	North entry lobby	3,120	2	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), NBF, Delamped to 2L	84	2	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum	35								
57	Basement	interior	Base	North entry lobby	3,120	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
58	Basement	interior	Base	Lower West library	520	40	Existing Parabolic Troffer 2x4 2 Lamp(s) F40 T12 Standard Ballast	96	40	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	3	25%	
59	Basement	interior	Base	Lower West library	520	5	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	5	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
60	Basement	interior	Base	Lower West library	520	8	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	8	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	2	25%	



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor Savings %		
61	Basement	interior	Base	Lower West library	8,760	3	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	3	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48									
62	Basement	interior	Base	Lower West library	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6									
63	Basement	interior	Base	Lower West library	520	6	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	6	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	3	25%		
64	Basement	interior	Base	Periodicals library	2,080	26	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	26	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	3	25%		
65	Basement	interior	Base	Periodicals library	2,080	8	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	8	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12		WJP P-D	1	PICO 3B	2				
66	Basement	interior	Base	Periodicals library	8,760	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48									
67	Basement	interior	Base	Periodicals library	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6									
68	Basement	interior	Base	Periodicals mech	260	1	Existing Incandescent 54 watt Lamp(s)	54	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9									
69	Basement	interior	Base	Periodicals storage	260	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48									
70	Basement	interior	Base	Periodicals storage 2	260	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48									
71	Basement	interior	Base	Periodicals storage 3	260	1	Existing CFL Screw-in 23 watt Lamp(s)	23	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9									
72	Basement	interior	Base	Hall vault 1	260	1	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30									
73	Basement	interior	Base	Hall vault 2	260	1	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30									
74	Basement	interior	Base	Lower East library	520	39	Existing Parabolic Troffer 2x4 2 Lamp(s) F40 T12 Standard Ballast	96	39	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	3	25%		
75	Basement	interior	Base	Lower East library	520	5	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	5	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12									
76	Basement	interior	Base	Lower East library	520	9	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	9	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	2	25%		
77	Basement	interior	Base	Lower East library	8,760	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48									
78	Basement	interior	Base	Lower East library	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6									
79	Basement	interior	Base	Lower East library	520	9	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	9	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	3	25%		
80	Basement	interior	Base	Lower East library	8,760	1	Existing Parabolic Troffer 2x4 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum	35									
81	Basement	interior	Base	Lower east mech	520	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15									
82	Basement	interior	Base	Lower east server room	260	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48									
83	Basement	interior	Base	Technical support office	2,080	17	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	17	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	3	25%		
84	Basement	interior	Base	Technical support office	2,080	5	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	5	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12		WJP P-D	1	PICO 3B	2				
85	Basement	interior	Base	Technical support office	2,080	2	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	2	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%		
86	Basement	interior	Base	Technical support office	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12		WJP P-D	1	PICO 3B	1				
87	Basement	interior	Base	Library office 75 174	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast, Delamped to 2L	130	2	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%		
88	Basement	interior	Base	Library office 75 174	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12		WJP P-D	1	PICO 3B	1				
89	Basement	interior	Base	Fire sprinkler room	260	1	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30									
90	Basement	interior	Base	Fire sprinkler room	260	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15									



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor Savings %	
91	Basement	interior	Base	Mail room	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
92	Basement	interior	Base	Office 75 102	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
93	Basement	interior	Base	Office 75 103	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
94	Basement	interior	Base	Office 75 104	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
95	Basement	interior	Base	Reporters of decisions office	2,080	6	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	6	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
96	Basement	interior	Base	Reporters of decisions office	2,080	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WFP P-D		PICO 3B	1		
97	Basement	interior	Base	Conference 75 108	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	2	25%	
98	Basement	interior	Base	Conference 75 108	2,080	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1		
99	Basement	interior	Base	L shaped office hall	3,120	5	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	5	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
100	Basement	interior	Base	L shaped office hall	8,760	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
101	Basement	interior	Base	L shaped office hall	8,760	2	Existing LED Exit Sign	6	2	Leave existing fixture as is	6								
102	Basement	interior	Base	Office 75 111	2,080	4	Existing CFL Screw-in 27watts - A23 in Rec Can	27	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12	WCM-O	1	WJP P-D	1	PICO 3B	1	25%	
103	Basement	interior	Base	Office 75 111	2,080	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WFP P-D	1	PICO 3B	1		
104	Basement	interior	Base	Office 75 109	2,080	4	Existing CFL Screw-in 20watts - A23 in Rec Can	20	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12	WCM-O	1	WJP P-D	1	PICO 3B	1	25%	
105	Basement	interior	Base	Office 75 109	2,080	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WFP P-D	1	PICO 3B	1		
106	Basement	interior	Base	Office 75 110	2,080	4	Existing CFL Screw-in 27watts - A23 in Rec Can	27	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12	WCM-O	1	WJP P-D	1	PICO 3B	1	25%	
107	Basement	interior	Base	Office 75 110	2,080	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WFP P-D	1	PICO 3B	1		
108	Basement	interior	Base	Office break room	1,040	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
109	Basement	interior	Base	Office break room	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
110	Basement	interior	Base	Open office 75 106	2,080	9	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	9	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	2	25%	
111	Basement	interior	Base	Open office 75 106	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	2	PICO 3B	2		
112	Basement	interior	Base	Open office 75 106	2,080	8	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	8	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	1	PICO 3B	2		
113	Basement	interior	Base	Open office 75 106	8,760	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
114	Basement	interior	Base	Open office 75 106	8,760	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48								
115	Basement	interior	Base	Open office 75 106	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6								
116	Basement	interior	Base	Office 75 112	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
117	Basement	interior	Base	Office 75 112	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
118	Basement	interior	Base	Office 75 113	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
119	Basement	interior	Base	Office 75 113	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
120	Basement	interior	Base	Copy room 75 119	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %
121	Basement	interior	Base	Office 75 114	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049Im, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%
122	Basement	interior	Base	Office 75 114	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12							
123	Basement	interior	Base	Office 75 115	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049Im, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%
124	Basement	interior	Base	Office 75 115	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12							
125	Basement	interior	Base	Office 75 116	2,080	4	Existing Incandescent 50 watt Lamp PAR30 RC	50	4	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050Im, Espen, 0-10v	13.5		WJP P-D	1	PICO 3B	2		
126	Basement	interior	Base	Office 75 116	2,080	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12		WJP P-D	1	PICO 3B	1		
127	Basement	interior	Base	Office 75 116	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061Im, Cooper, 0-10v	10.5		WJP P-D	2	PICO 3B	2		
128	Basement	interior	Base	Office 75 116	2,080	1	Existing 22.5" 2G11 PLL CFL Lamps 6L 38 watts	240	1	Retrofit 2G11 Pin LED - 16W PLL (6) lamps - Green Creative	96				6CL	1		
129	Basement	interior	Base	Hall storage 75 118	260	1	Existing Incandescent 250 watt Lamp(s)	250	1	19.5 watt Par 38 Dimmable LED Lamp, Green Creative, 3000k	19.5				MRF2 S	1		
130	Basement	interior	Base	Hall under stairs storage	260	1	Existing Incandescent 75 watt Lamp(s)	75	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
131	Basement	interior	Base	Admin office hall	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12							
132	Basement	interior	Base	Admin office hall	2,080	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061Im, Cooper, 0-10v	10.5		WJP P-D	1	PICO 3B	2		
133	Basement	interior	Base	Admin reception	2,080	6	Existing CFL Screw-in 27watts - A23 in Rec Can	27	6	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12		WJP P-D	1	PICO 3B	1		
134	Basement	interior	Base	Admin reception	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12		WJP P-D	1	PICO 3B	1		
135	Basement	interior	Base	Admin office 75 122	2,080	6	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	6	Retrofit RC LED Module 8", Set to 27w,(12/19/27) 1950Im, Espen, 0-10v	27		WJP P-D	1	PICO 3B	1		
136	Basement	interior	Base	Admin office 75 122	2,080	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12		WJP P-D	1	PICO 3B	1		
137	Basement	interior	Base	Admin office 75 122	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061Im, Cooper, 0-10v	10.5		WJP P-D	2	PICO 3B	2		
138	Basement	interior	Base	Admin office 75 122	2,080	1	Existing 22.5" 2G11 PLL CFL Lamps 6L 38 watts	240	1	Retrofit 2G11 Pin LED - 16W PLL (6) lamps - Green Creative	96				6CL	1		
139	Basement	interior	Base	North main lobby	3,120	4	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12							
140	Basement	interior	Base	North main lobby	3,120	7	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	7	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061Im, Cooper, 0-10v	10.5							
141	Basement	interior	Base	North main lobby	3,120	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12							
142	Basement	interior	Base	North main lobby	3,120	4	Existing Incandescent 54 watt Lamp(s)	54	4	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
143	2nd floor	interior	2	Courtroom 75 239	1,350	17	Existing Incandescent 500 watt Lamp(s)	500	17	LED Retrofit Kit for Rec Can - 100w, 15500Im - LED Lighting Supply, 4000K	100		WJP P	17	PICO 3B	2		
144	2nd floor	interior	2	Courtroom 75 239	1,350	24	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	24	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30		WJP P-D	2	PICO 3B	1		
145	2nd floor	interior	2	Courtroom 75 239	1,350	4	Existing Incandescent 500 watt Lamp(s)	500	4	Leave existing fixture as is	500							
146	2nd floor	interior	2	Courtroom 75 239	1,350	3	Existing Incandescent 75 watt Lamp(s)	75	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061Im, Cooper, 0-10v	10.5		WJP P	1	PICO 3B	1		
147	2nd floor	interior	2	Courtroom 75 239	1,350	2	Existing Incandescent 60L 54 watt	3240	2	(60) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	540				MRF2 S	1		
148	2nd floor	interior	2	Courtroom 75 239	8,760	2	Existing Incandescent 7L 54 watt	378	2	(7) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	63				MRF2 S	1		
149	2nd floor	interior	2	Judges hallway	3,120	3	Existing CFL Screw-in 16watts - BR30 in Rec Can	16	3	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12							
150	2nd floor	interior	2	Judges hallway	8,760	2	Existing CFL Screw-in 16watts - BR30 in Rec Can	16	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050Im, Espen, 0-10v	12							



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %
151	2nd floor	interior	2	Judges hallway	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6							
152	2nd floor	interior	2	Judges RRW	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18					MRF2 S	1	
153	2nd floor	interior	2	Judges RRW	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1	
154	2nd floor	interior	2	Judges RRM	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1	
155	2nd floor	interior	2	Judges RRM	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1	
156	2nd floor	interior	B to 3	Judges stairs	8,760	6	Existing CFL Screw-in 16watts - BR30 in Rec Can	16	6	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
157	2nd floor	interior	B to 3	Judges stairs	8,760	1	Existing Incandescent 2L 54 watt	108	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
158	2nd floor	interior	2	Conference 75 255	2,080	12	Existing Incandescent 50 watt Lamp PAR30 RC	50	12	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5	WCM-O	1	WJP P-D	2	PICO 3B	3	25%
159	2nd floor	interior	2	Conference 75 255	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
160	2nd floor	interior	2	Conference Break room	2,080	6	Existing Incandescent 50 watt Lamp PAR30 RC	50	6	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WFP P-D	2	PICO 3B	2	
161	2nd floor	interior	2	Judges elevator lobby	8,760	2	Existing Incandescent 2L 54 watt	108	2	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
162	2nd floor	interior	2	Judges elevator lobby	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6							
163	2nd floor	interior	2	Elevator RR Lobby	8,760	1	Existing Incandescent 2L 54 watt	108	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
164	2nd floor	interior	2	Elevator RRM	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1	
165	2nd floor	interior	2	Elevator RRM	3,120	1	Existing CFL Pin Based 9 watt Lamp(s)	13	1	Retrofit GX23 Pin LED - 5.5W - Horizontal, Green Creative	5.5					MRF2 S	1	
166	2nd floor	interior	2	Elevator RRM	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
167	2nd floor	interior	2	Elevator RRW	3,120	2	Existing Incandescent 34 watt Lamp	34	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1	
168	2nd floor	interior	2	Elevator RRW	3,120	2	Existing CFL Pin Based 9 watt Lamp(s)	13	2	Retrofit GX23 Pin LED - 5.5W - Horizontal, Green Creative	5.5					MRF2 S	1	
169	2nd floor	interior	2	Elevator RRW	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
170	2nd floor	interior	2	Justice office 75 228	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3	
171	2nd floor	interior	2	Justice office 75 228	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
172	2nd floor	interior	2	Private RR 75 230	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
173	2nd floor	interior	2	Private RR 75 230	3,120	1	Existing Incandescent 54 watt Lamp(s)	54	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
174	2nd floor	interior	2	Private RR 75 230	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
175	2nd floor	interior	2	Justice Hall in office 228	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
176	2nd floor	interior	2	Justice open office at stairwell	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
177	2nd floor	interior	2	Justice open office at stairwell	2,080	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1	
178	2nd floor	interior	2	Justice open office at stairwell	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	1	PICO 3B	1	
179	2nd floor	interior	2	Justice open office at stairwell	2,080	6	Existing Incandescent 50 watt Lamp PAR30 RC	50	6	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	1	PICO 3B	1	
180	2nd floor	interior	2	Justice Break room at stairs	2,080	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	2	PICO 3B	2	



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %	
181	2nd floor	interior	2	Justice Break room at stairs	1,040	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5								
182	2nd floor	interior	2	Justice office 75 231	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%	
183	2nd floor	interior	2	Justice office 75 232	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%	
184	2nd floor	interior	2	Office storage 244	260	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w + Plenum	48								
185	2nd floor	interior	2	Justice office 75 245	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1		
186	2nd floor	interior	2	West mezzanine	2,080	9	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	9	Retrofit RC LED Module 8", Set to 27w,(12/19/27) 1950lm, Espen, 0-10v	27			WJP P-D	1	PICO 3B	1		
187	2nd floor	interior	2	West mezzanine	8,760	2	Existing Incandescent 2L 54 watt	108	2	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18								
188	2nd floor	interior	2	West Supreme clerk open office	2,080	8	Existing 22.5" 2G11 PLL CFL Lamps 6L 38 watts	240	8	Retrofit 2G11 Pin LED - 16W PLL (6) lamps - Green Creative	96					6CL	1		
189	2nd floor	interior	2	West Supreme clerk open office	2,080	8	Existing Incandescent 2L 54 watt	108	8	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18					6CL	2		
190	2nd floor	interior	2	West Supreme clerk open office	2,080	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15					6CL	1		
191	2nd floor	interior	2	West Supreme clerk open office	2,080	2	Existing Direct/Indirect Fixture 4' 2L F32 T8 Lamps, NBF Ballast	58	2	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30					6CL	1		
192	2nd floor	interior	2	West Supreme clerk open office	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6								
193	2nd floor	interior	2	West Supreme clerk open office	2,080	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	1	PICO 3B	1		
194	2nd floor	interior	2	Clerk office 243	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1		
195	2nd floor	interior	2	Clerk vault	520	22	Existing Wrap 4' 1 Lamp(s) F40 T12 Standard Ballast	52	22	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15								
196	2nd floor	interior	2	Clerks entry hall	2,080	3	Existing 22.5" 2G11 PLL CFL Lamps 5L 38 watts	200	3	Retrofit 2G11 Pin LED - 16W PLL (5) lamps - Green Creative	80					6CL	1		
197	2nd floor	interior	2	Clerks entry hall	2,080	4	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	4	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1		
198	2nd floor	interior	2	Clerks reception desk	2,080	8	Existing Parabolic Troffer 2x2 2L F32 T8 32 watt U-Tube Lamp(s), Normal Ballast Factor	61	8	Retrofit with 2x2 LDR Troffer,3021 lm, 25w + Lutron Vive Internal Sensor	25					PICO 3B	1	25%	
199	2nd floor	interior	2	Clerk office 241	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%	
200	2nd floor	interior	2	Clerk office 241	2,080	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1		
201	2nd floor	interior	2	Clerk office 240	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%	
202	2nd floor	interior	2	Clerk office 240	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1		
203	2nd floor	interior	2	Reception conference room	520	4	Existing Incandescent 25 watt 25 Lamps	625	4	25 - 5 watt B10C Candle Base, Flame Tip Dimmable LED lamp - Sylvania	125								
204	2nd floor	interior	2	Custodian 236	260	1	Existing CFL Screw-in 23 watt Lamp(s)	23	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1		
205	2nd floor	interior	2 to B	Stairs to basement	8,760	16	Existing Strip 4' 1L F32 T8 32 watt Lamp(s), Normal Ballast Factor	32	16	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15								
206	2nd floor	interior	2	Main entry West RR	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18					MRF2 S	1		
207	2nd floor	interior	2	Main entry West RR	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1		
208	2nd floor	interior	2	Main entry West RR	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3								
209	2nd floor	interior	2	Main entry East RR	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18					MRF2 S	1		
210	2nd floor	interior	2	Main entry East RR	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1		



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %	
211	2nd floor	interior	2	Main entry East RR	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3								
212	2nd floor	interior	2	Custodian 224	260	1	Existing CFL Screw-in 23 watt Lamp(s)	23	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2	1		
213	2nd floor	interior	2	Main lobby	8,760	3	Existing Can Light Metal Halide 250 watt Lamp	295	3	LED Retrofit Kit for Rec Can - 100w, 15500lm - LED Lighting Supply, 4000K	100								
214	2nd floor	interior	2	Main lobby	8,760	6	Existing Incandescent 7L 34 watts	238	6	(7) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	63								
215	2nd floor	interior	2	Main lobby	8,760	4	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12								
216	2nd floor	interior	2	Main lobby	8,760	8	Existing Incandescent 7L 34 watts	238	8	(7) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	63								
217	2nd floor	interior	2	Main lobby	8,760	2	Existing LED (14) Lamp 9 watts	126	2	Leave existing fixture as is	126								
218	2nd floor	interior	2	Main lobby	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6								
219	2nd floor	interior	2	Law Library	1,350	16	Existing Fixture Metal Halide 250 watt Lamp	295	16	LED Retrofit Kit for Rec Can - 100w, 15500lm - LED Lighting Supply, 4000K	100			WJP P-D	16	PICO 3B	1	25%	
220	2nd floor	interior	2	Law Library	1,350	24	Existing Strip 8' 2 Lamp(s) F40 T12 Standard Ballast	96	24	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30			WJP P-D	3	PICO 3B	1	25%	
221	2nd floor	interior	2	Law Library	1,350	2	Existing Incandescent 64L 54 watt	3456	2	(64) 9 watt A-19 Style Dimmable LED Lamp Green Creative, 3000K	576					MRF2 S	1		
222	2nd floor	interior	2	Law Library	1,350	12	Existing Incandescent 3L 34 watts	102	12	(3) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	27					MRF2 S	1		
223	2nd floor	interior	2	Book storage	2,080	120	Existing Wrap 4' 1 Lamp(s) F40 T12 Standard Ballast	52	120	1x4 LED wrap fixture, 35 watt, 4718 lumens, 4000k, Cooper	35	WCM-O	12	WFP P-D	55	PICO 3B	10	25%	
224	2nd floor	interior	2	Book storage	2,080	6	Existing Wrap 2' 1 Lamp(s) F20 T12 Standard Ballast	28	6	1x2 LED wrap fixture, 14 watt, 1960 lumens, 4000k, Cooper	14	CBA						25%	
225	2nd floor	interior	2	Book storage	8,760	4	Existing Wrap 2' 1 Lamp(s) F20 T12 Standard Ballast	28	4	1x2 LED wrap fixture, 14 watt, 1960 lumens, 4000k, Cooper	14								
226	2nd floor	interior	2	Book storage	8,760	4	Existing LED Exit Sign	6	4	Leave existing fixture as is	6								
227	2nd floor	interior	2	Commissioner office 205	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
228	2nd floor	interior	2	Commissioner office 206	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
229	2nd floor	interior	2	Commissioner office 207	2,080	4	Existing Incandescent 50 watt Lamp PAR30 RC	50	4	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5	WCM-O	1	WJP P-D	2	PICO 3B	3	25%	
230	2nd floor	interior	2	Commissioner office 207	2,080	1	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	1	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1		
231	2nd floor	interior	2	Commissioner office 208	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%	
232	2nd floor	interior	2	Commissioner open office 204	2,080	6	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	6	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1		
233	2nd floor	interior	2	Commissioner open office 204	2,080	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1		
234	2nd floor	interior	2	Commissioner open office 204	2,080	4	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	1	PICO 3B	1		
235	2nd floor	interior	2	Commissioner open office 204	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%	
236	2nd floor	interior	2	Commissioner office 209	2,080	7	Existing Incandescent 50 watt Lamp PAR30 RC	50	7	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5	WCM-O	1	WJP P-D	2	PICO 3B	3	25%	
237	2nd floor	interior	2	Commissioner office 209	2,080	1	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	1	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1		
238	2nd floor	interior	2	Commissioner conference 210	2,080	4	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	4	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	2	25%	
239	2nd floor	interior	2	Commissioner library	2,080	6	Existing Incandescent 50 watt Lamp PAR30 RC	50	6	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3		
240	2nd floor	interior	2	Commissioner library	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1		



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor Savings %
241	2nd floor	interior	2	Commissioner office 212	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
242	2nd floor	interior	2	Commissioner office 213	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
243	2nd floor	interior	2	Commissioner office 214	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
244	2nd floor	interior	2	Commissioner RRM	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
245	2nd floor	interior	2	Commissioner RRM	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
246	2nd floor	interior	2	Commissioner RRM	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
247	2nd floor	interior	2	Commissioner RRW	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
248	2nd floor	interior	2	Commissioner RRW	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
249	2nd floor	interior	2	Commissioner RRW	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
250	2nd floor	interior	2	Commissioner break room	8,760	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
251	2nd floor	interior	2	Commissioner break room	1,040	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5							
252	2nd floor	interior	2	Commissioner break room	1,040	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	2	25%
253	2nd floor	interior	2	Commissioner break room	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6							
254	2nd floor	interior	2	Commissioner hall RR	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
255	2nd floor	interior	2	Commissioner hall RR	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
256	2nd floor	interior	2	Commissioner hall RR	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
257	2nd floor	interior	2	Commissioner office 203	2,080	6	Existing Incandescent 50 watt Lamp PAR30 RC	50	6	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5	WCM-O	1	WJP P-D	2	PICO 3B	3	25%
258	2nd floor	interior	2	Commissioner office 203	2,080	1	Existing 22.5" 2G11 PLL CFL Lamps 5L 38 watts	200	1	Retrofit 2G11 Pin LED - 16W PLL (5) lamps - Green Creative	80					6CL	11	
259	2nd floor	interior	2	Commissioner office 202	2,080	1	Existing Incandescent 50 watt Lamp PAR30 RC	50	1	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5	WCM-O	1	WFP P-D	2	PICO 3B	3	25%
260	2nd floor	interior	2	Commissioner office 202	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
261	2nd floor	interior	2	Commissioner hall	3,120	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
262	2nd floor	interior	2	Commissioner hall	8,760	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
263	2nd floor	interior	2	Commissioner hall	3,120	5	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	5	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5							
264	2nd floor	interior	2	Commissioner hall	8,760	1	Existing LED Exit Sign	6	1	Leave existing fixture as is	6							
265	2nd floor	interior	2	Library scary room	260	2	Existing Wrap 8' 2 Lamp(s) F40 T12 Standard Ballast	96	2	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30							
266	2nd floor	interior	2	Library scary room	260	1	Existing Incandescent 135 watt Lamp(s)	135	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
267	2nd floor	interior	2	Library storage	260	2	Existing Wrap 4' 2 Lamp(s) F40 T12 Standard Ballast	96	2	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30							
268	3rd floor	interior	3	Justice office 75 375	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3	
269	3rd floor	interior	3	Justice office 75 375	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
270	3rd floor	interior	3	Justice RR hall	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor Savings %
271	3rd floor	interior	3	Justice private RR	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
272	3rd floor	interior	3	Justice private RR	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
273	3rd floor	interior	3	Justice private RR	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
274	3rd floor	interior	3	Justice open office	2,080	4	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	4	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
275	3rd floor	interior	3	Justice open office	2,080	8	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	8	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5		WJP P-D	1	PICO 3B	1		
276	3rd floor	interior	3	Justice open office	2,080	2	Existing Incandescent 54 watt Lamp(s)	54	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
277	3rd floor	interior	3	Justice office 75 376	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
278	3rd floor	interior	3	Justice office 75 377	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%
279	3rd floor	interior	3	Justice office 75 362	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5		WJP P-D	2	PICO 3B	3		
280	3rd floor	interior	3	Justice office 75 362	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
281	3rd floor	interior	3	Justice RR hall 2	3,120	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
282	3rd floor	interior	3	Justice private RR 2	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
283	3rd floor	interior	3	Justice private RR 2	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
284	3rd floor	interior	3	Justice private RR 2	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
285	3rd floor	interior	3	Justice office 75 365	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
286	3rd floor	interior	3	Justice office 75 366	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%
287	3rd floor	interior	3	Justice open office 2	2,080	4	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	4	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
288	3rd floor	interior	3	Justice open office 2	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5		WJP P-D	1	PICO 3B	1		
289	3rd floor	interior	3	Justice open office 2	2,080	1	Existing Incandescent 54 watt Lamp(s)	54	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
290	3rd floor	interior	3	Justice open office 2	2,080	1	Existing Incandescent 50 watt Lamp PAR30 RC	50	1	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5		WFP P-D	1	PICO 3B	1		
291	3rd floor	interior	3	Justice office 75 345	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5		WJP P-D	2	PICO 3B	3		
292	3rd floor	interior	3	Justice office 75 345	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
293	3rd floor	interior	3	Justice private RR 75 343	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
294	3rd floor	interior	3	Justice private RR 75 343	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
295	3rd floor	interior	3	Justice private RR 75 343	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
296	3rd floor	interior	3	Justice open office 348	2,080	4	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	4	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
297	3rd floor	interior	3	Justice open office 348	2,080	5	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	5	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5		WJP P-D	1	PICO 3B	1		
298	3rd floor	interior	3	Justice open office 348	2,080	2	Existing Incandescent 34 watt Lamp	34	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
299	3rd floor	interior	3	Justice office 75 346	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
300	3rd floor	interior	3	Justice office 75 347	2,080	2	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	2	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %
301	3rd floor	interior	3	Justice office 75 317	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3	
302	3rd floor	interior	3	Justice office 75 317	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
303	3rd floor	interior	3	Justice RR hall in office 317	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
304	3rd floor	interior	3	Justice private RR 319	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
305	3rd floor	interior	3	Justice private RR 319	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
306	3rd floor	interior	3	Justice private RR 319	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
307	3rd floor	interior	3	Justice open office 75 314	2,080	4	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	4	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
308	3rd floor	interior	3	Justice open office 75 314	2,080	8	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	8	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1	
309	3rd floor	interior	3	Justice open office 75 314	2,080	2	Existing Incandescent 54 watt Lamp(s)	54	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
310	3rd floor	interior	3	Justice office 75 316	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
311	3rd floor	interior	3	Justice office 75 315	2,080	2	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	2	Retrofit with 2x4 LDR Troffer, 42971m, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%
312	3rd floor	interior	3	Justice office 75 309	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3	
313	3rd floor	interior	3	Justice office 75 309	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
314	3rd floor	interior	3	Justice RR hall 310	3,120	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
315	3rd floor	interior	3	Justice private RR 311	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
316	3rd floor	interior	3	Justice private RR 311	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
317	3rd floor	interior	3	Justice private RR 311	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
318	3rd floor	interior	3	Justice office 75 312	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
319	3rd floor	interior	3	Justice office 75 313	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 60491m, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%
320	3rd floor	interior	3	Justice open office 75 307	2,080	4	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	4	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
321	3rd floor	interior	3	Justice open office 75 307	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1	
322	3rd floor	interior	3	Justice open office 75 307	2,080	1	Existing Incandescent 54 watt Lamp(s)	54	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
323	3rd floor	interior	3	Justice open office 75 307	2,080	1	Existing Incandescent 50 watt Lamp PAR30 RC	50	1	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WFP P-D	1	PICO 3B	1	
324	3rd floor	interior	3	Justice office 75 334	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3	
325	3rd floor	interior	3	Justice office 75 334	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
326	3rd floor	interior	3	Justice office 75 334	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	1	PICO 3B	2	
327	3rd floor	interior	3	Justice private RR 335	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
328	3rd floor	interior	3	Justice private RR 335	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
329	3rd floor	interior	3	Justice private RR 335	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
330	3rd floor	interior	3	Justice open office 331	2,080	4	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	4	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %
331	3rd floor	interior	3	Justice open office 331	2,080	2	Existing Incandescent 50 watt Lamp PAR30 RC	50	2	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	1	PICO 3B	1	
332	3rd floor	interior	3	Justice open office 331	2,080	2	Existing Incandescent 34 watt Lamp	34	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
333	3rd floor	interior	3	Justice open office 331	3,120	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5							
334	3rd floor	interior	3	Justice office 75 332	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast, Delamped to 2L	130	2	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%
335	3rd floor	interior	3	Justice office 75 333	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
336	3rd floor	interior	3	Justice office 75 302	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3	
337	3rd floor	interior	3	Justice office 75 302	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
338	3rd floor	interior	3	Justice private RR 304	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
339	3rd floor	interior	3	Justice private RR 304	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
340	3rd floor	interior	3	Justice private RR 304	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
341	3rd floor	interior	3	Justice RR hall 303	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
342	3rd floor	interior	3	Justice open office 327	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
343	3rd floor	interior	3	Justice open office 327	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1	
344	3rd floor	interior	3	Justice open office 327	2,080	2	Existing Incandescent 54 watt Lamp(s)	54	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
345	3rd floor	interior	3	Justice open office 327	2,080	2	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	2	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12			WJP P-D	2	PICO 3B	2	
346	3rd floor	interior	3	Justice open office 327	2,080	4	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	4	Retrofit RC LED Module 8", Set to 27w,(12/19/27) 1950lm, Espen, 0-10v	27			WJP P-D	1	PICO 3B	1	
347	3rd floor	interior	3	Justice office 75 329	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast, Delamped to 2L	130	2	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%
348	3rd floor	interior	3	Justice office 75 328	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
349	3rd floor	interior	3	Justice private RR 355	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
350	3rd floor	interior	3	Justice private RR 355	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
351	3rd floor	interior	3	Justice private RR 355	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
352	3rd floor	interior	3	Justice RR hall 354	3,120	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
353	3rd floor	interior	3	Justice office 75 353	2,080	10	Existing Incandescent 50 watt Lamp PAR30 RC	50	10	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WJP P-D	2	PICO 3B	3	
354	3rd floor	interior	3	Justice office 75 353	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
355	3rd floor	interior	3	Justice open office 350	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68					6CL	1	
356	3rd floor	interior	3	Justice open office 350	2,080	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5			WJP P-D	1	PICO 3B	1	
357	3rd floor	interior	3	Justice open office 350	2,080	2	Existing Incandescent 54 watt Lamp(s)	54	2	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					6CL	1	
358	3rd floor	interior	3	Justice open office 350	2,080	1	Existing Incandescent 50 watt Lamp PAR30 RC	50	1	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5			WFP P-D	1	PICO 3B	2	
359	3rd floor	interior	3	Justice open office 350	2,080	4	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	4	Retrofit RC LED Module 8", Set to 27w,(12/19/27) 1950lm, Espen, 0-10v	27			WJP P-D	1	PICO 3B	1	
360	3rd floor	interior	3	Justice open office 350	3,120	1	Existing CFL Pin Based with 2 - 26 watt Lamp(s)	56	1	Retrofit Hybrid Pin LED - (2) lamp 9W - Omni, Green Creative	18							



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor Savings %
361	3rd floor	interior	3	Justice office 75 352	2,080	2	Existing 22.5" 2G11 PLL CFL Lamps 4L 38 watts	160	2	Retrofit 2G11 Pin LED - 16W PLL (4) lamps - Green Creative	68	WCM-O	1			6CL	1	25%
362	3rd floor	interior	3	Justice office 75 351	2,080	2	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	2	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%
363	3rd floor	interior	3	Hall RR 370	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9							
364	3rd floor	interior	3	Hall RR 370	3,120	2	Existing Incandescent 100 watt Lamp(s)	100	2	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15							
365	3rd floor	interior	3	Hall RR 370	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
366	3rd floor	interior	3	Hall storage 367	260	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15							
367	3rd floor	interior	3	Hall copy room 360	2,080	1	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	1	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					6CL	1	25%
368	3rd floor	interior	3	Hall copy room 360	2,080	1	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	1	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					6CL	1	25%
369	3rd floor	interior	3	Hall RRM357	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1	
370	3rd floor	interior	3	Hall RRM357	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1	
371	3rd floor	interior	3	Hall RRM357	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
372	3rd floor	interior	3	Hall RRW 358	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1	
373	3rd floor	interior	3	Hall RRW 358	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1	
374	3rd floor	interior	3	Hall RRW 358	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
375	3rd floor	interior	3	Hall storage 369	260	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15							
376	3rd floor	interior	3	Hall storage 349	260	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15							
377	3rd floor	interior	3	Hall break room 330	1,040	1	Existing Parabolic Troffer 2x4 3L F32 T8 32 watt Lamp(s), Normal Ballast Factor	85	1	Retrofit with 2x4 LDR Troffer, 4297lm, 35w + Plenum + Lutron Vive Internal Sensor	35					PICO 3B	1	25%
378	3rd floor	interior	3	Hall break room 330	1,040	2	Existing Incandescent 3L 34 watts	102	2	(3) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	27							
379	3rd floor	interior	3	Hall break room 330	1,040	1	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	1	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
380	3rd floor	interior	3	East hall copy room 306	2,080	2	Existing Parabolic Troffer 2x4 3 Lamp(s) F40 T12 Standard Ballast	148	2	Retrofit with 2x4 LDR Troffer, 6049lm, 48w, Plenum Rated, Lutron Vive Sensor Dim	48					PICO 3B	1	25%
381	3rd floor	interior	3	Hall storage 308	260	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15							
382	3rd floor	interior	3	Hall lounge 325	260	4	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
383	3rd floor	interior	3	Hall lounge 325	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
384	3rd floor	interior	3	Hall storage 324	260	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15							
385	3rd floor	interior	3	Hall UnisexRR 323	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1	
386	3rd floor	interior	3	Hall UnisexRR 323	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1	
387	3rd floor	interior	3	Hall UnisexRR 323	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							
388	3rd floor	interior	3	Hall UnisexRR 322	3,120	1	Existing Incandescent 34 watt Lamp	34	1	9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	9					MRF2 S	1	
389	3rd floor	interior	3	Hall UnisexRR 322	3,120	1	Existing Incandescent 100 watt Lamp(s)	100	1	16 watt A-21 Style Dimmable LED Lamp, Green Creative, 3000K	15					MRF2 S	1	
390	3rd floor	interior	3	Hall UnisexRR 322	7	1	Existing Halogen BugEye	30	1	New Stand alone Bug-Eyes	3							



Line	Area	Interior / Exterior	Floor	Space	EX Hours	EX Qty	EX Desc	EX Input Watts	PR Qty	PR Desc	PR Input Watts	Sensor Type	Sensor Qty	PowPack Type	PowPack Qty	Switch Type	Switch Qty	Sensor aving %
391	3rd floor	interior	3	East hallway	3,120	8	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	8	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
392	3rd floor	interior	3	East hallway	8,760	4	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
393	3rd floor	interior	3	East hallway	3,120	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5							
394	3rd floor	interior	3	East hallway	8,760	2	Existing LED Exit Sign	6	2	Leave existing fixture as is	6							
395	3rd floor	interior	B to 3	East public stairwell	8,760	4	Existing CFL Screw-in 16watts - BR30 in Rec Can	16	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
396	3rd floor	interior	B to 3	East public stairwell	8,760	9	Existing Incandescent 2L 54 watt	108	9	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
397	3rd floor	interior	2	East public stairwell	8,760	2	Existing LED Exit Sign	6	2	Leave existing fixture as is	6							
398	3rd floor	interior	3	East public stairwell	8,760	1	Existing Incandescent 3L 34 watts	102	1	(3) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	27							
399	3rd floor	interior	B to 3	East private stairwell	8,760	6	Existing CFL Screw-in 16watts - BR30 in Rec Can	16	6	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
400	3rd floor	interior	B to 3	East private stairwell	8,760	1	Existing Incandescent 2L 54 watt	108	1	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
401	3rd floor	interior	3	East hallway 2	8,760	4	Existing CFL Screw-in 16watts - BR30 in Rec Can	16	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
402	3rd floor	interior	3	East hallway 2	8,760	2	Existing Incandescent 3L 34 watts	102	2	(3) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	27							
403	3rd floor	interior	3	East hallway 2	8,760	2	Existing LED Exit Sign	6	2	Leave existing fixture as is	6							
404	3rd floor	interior	3	West hall	8,760	6	Existing Incandescent 50 watt Lamp PAR30 RC	50	6	Retrofit RC LED Module 6", Set to 13.5w,(9.5/13.5/21) 1050lm, Espen, 0-10v	13.5							
405	3rd floor	interior	3	West hall	8,760	2	Existing Incandescent 3L 34 watts	102	2	(3) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	27							
406	3rd floor	interior	3	West hall	8,760	2	Existing LED Exit Sign	6	2	Leave existing fixture as is	6							
407	3rd floor	interior	3	West hallway 2	3,120	8	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	8	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
408	3rd floor	interior	3	West hallway 2	8,760	4	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	4	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
409	3rd floor	interior	3	West hallway 2	3,120	3	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	3	Retrofit RC LED Wall Wash Module 8", Set to 10.5w, 1061lm, Cooper, 0-10v	10.5							
410	3rd floor	interior	3	West hallway 2	8,760	2	Existing LED Exit Sign	6	2	Leave existing fixture as is	6							
411	3rd floor	interior	3	West hallway 2	8,760	2	Existing Incandescent 2L 54 watt	108	2	(2) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	18							
412	3rd floor	interior	3	Central stairs and hall	8,760	12	Existing Can Light Metal Halide 250 watt Lamp	295	12	LED Retrofit Kit for Rec Can - 100w, 15500lm - LED Lighting Supply, 4000K	100							
413	3rd floor	interior	3	Central stairs and hall	8,760	4	Existing Incandescent 7L 34 watts	238	4	(7) 9 watt A-19 Style Dimmable LED Lamp - Green Creative, 3000K	63							
414	3rd floor	interior	3	Central stairs and hall	8,760	10	Existing CFL Pin Based 2 - 9 watt Lamp(s)	20	10	Retrofit RC LED Module 8", Set to 12w,(12/19/27) 1050lm, Espen, 0-10v	12							
415	Attic mech	interior	Attic	Attic mech	8,760	7	Existing Strip 8' 2 Lamp(s) F34 T12 Standard Ballast	82	7	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30							
416	Attic mech	interior	Attic	Attic mech	260	1	Existing Wrap 4' 2 Lamp(s) F40 T12 Standard Ballast	96	1	Retrofit 2L to 4' TLED type C Dimmable - 12w - Dimming Driver	30							
417	Attic mech	interior	Attic	Attic mech	260	1	Existing Strip 4' 1 Lamp(s) F40 T12 Standard Ballast	52	1	Retrofit 1L to 4' TLED type C Dimmable - 12w - Dimming Driver	15							
418	Exterior Controls	Exterior	Exterior Controls	0	0	20	No Fixture Existing - Needs Lighting	0	20	Leave existing fixture as is	0			WJP	20			
419	Controls Decommissioning	Interior	Controls Decommission	0	0	1	No Fixture Existing - Needs Lighting	0	1	Leave existing fixture as is	0							

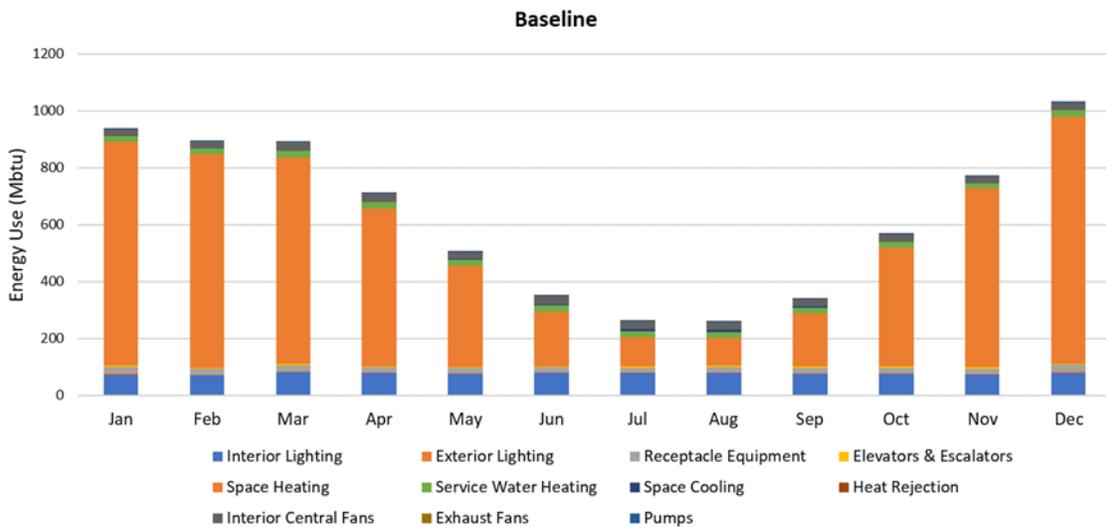
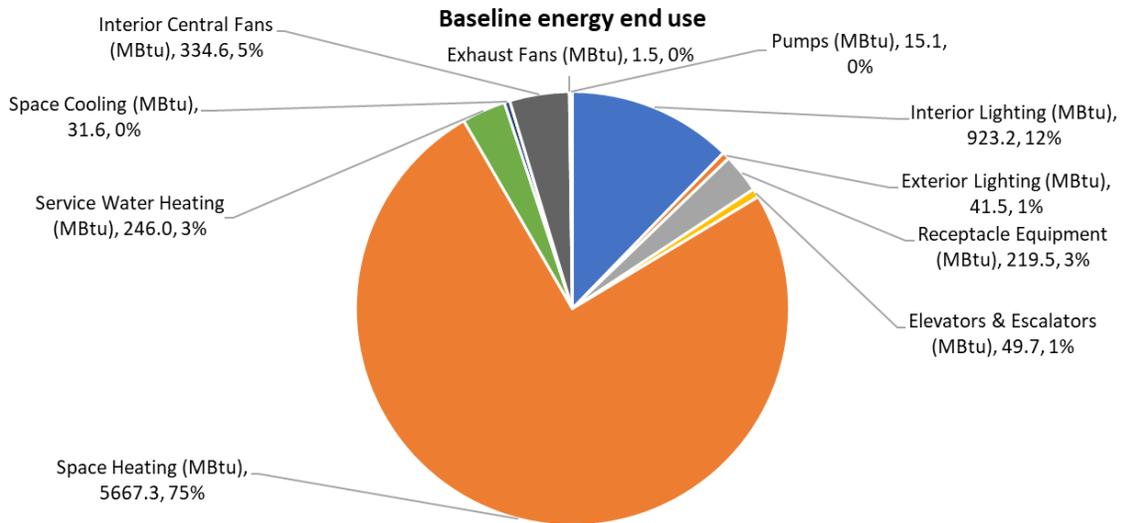


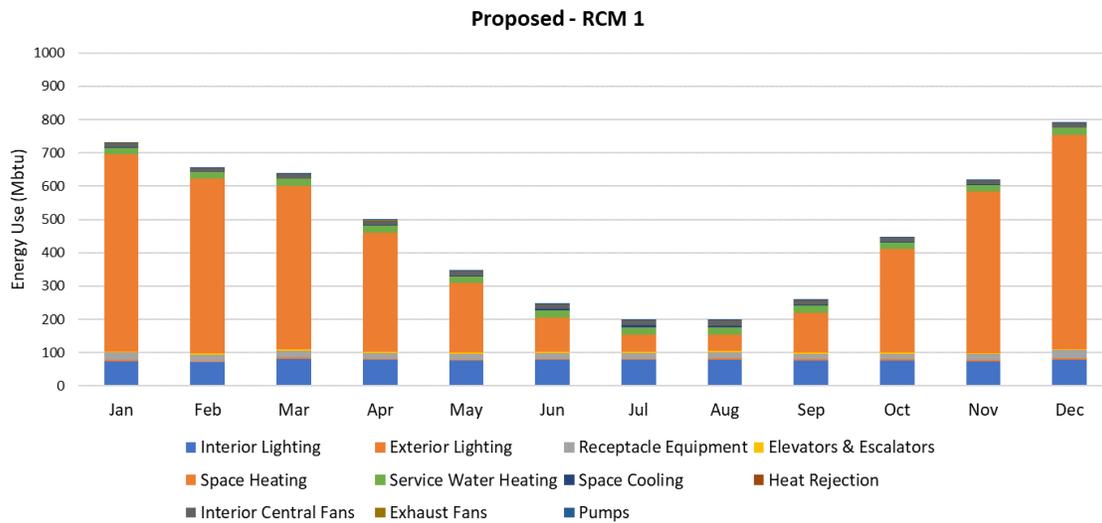
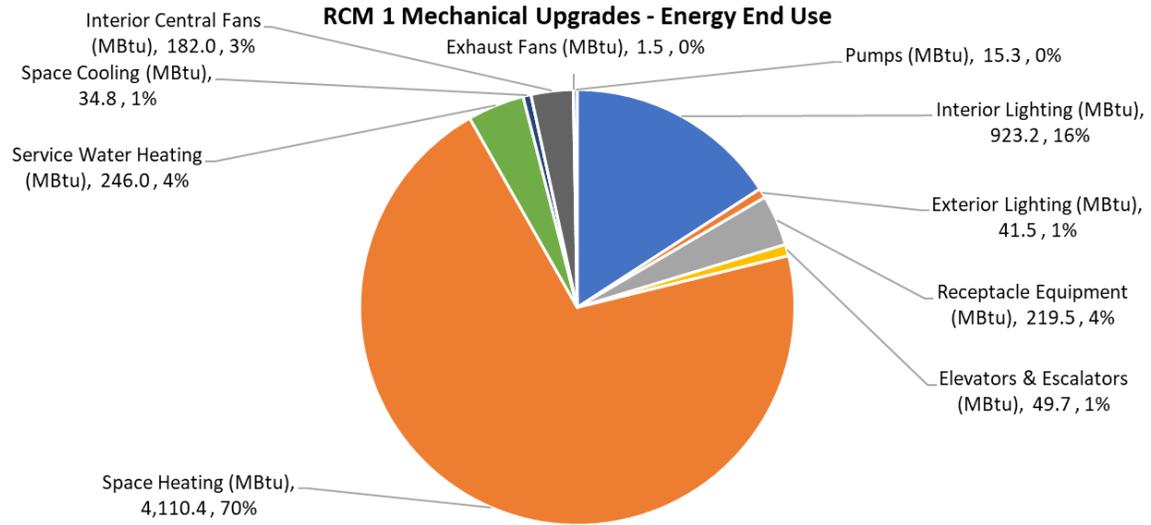
Appendix 3: Savings Calculations



RCM 1 HVAC and Controls Infrastructure Upgrade & Renewal

Annual energy use by end use and monthly energy consumption are shown below for baseline and proposed design RCM-1. Overall energy use distribution is similar between baseline and proposed – RCM 1. Heating energy is dominant year-around, especially during winter. Lighting is the second largest energy use and then fan energy.

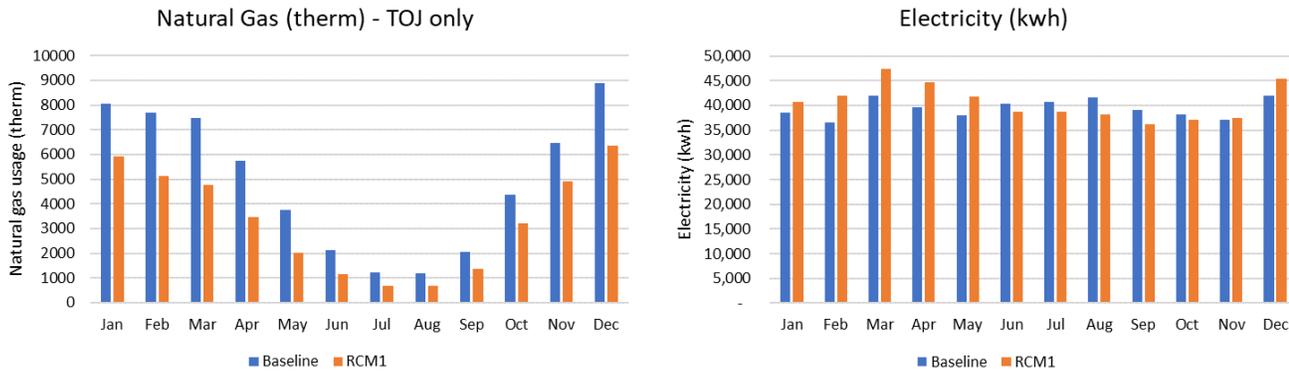




Annual energy use / Monthly energy consumption by end use (Top – baseline / Bottom – RCM-1)



Mechanical upgrade RCM-1 reduces annual natural gas by 17,817 therms, 30% savings. Annual electricity usage increases slightly by 5% as the heat source for humidifier converted from natural gas to electricity. Overall, energy consumption reduces by 1,706 MBTU.



The energy saving by end use is also shown in the following table. Heating energy and fan energy benefits most. Energy saving is mostly driven by upgrading steam to hot water for RTUs, adding energy recovery for RTUs, and optimizing mechanical controls. Slight penalty in pump energy as additional pump will be needed to deliver hot water to RTUs.

Energy (MBTU)	Adjusted Baseline	RCM1	Savings (%)
Interior Lighting	923.2	923.2	0%
Exterior Lighting	41.5	41.5	0%
Receptacle Equipment	219.5	219.5	0%
Elevators & Escalators	49.7	49.7	0%
Space Heating	5,667.3	4,110.4	27%
Service Water Heating	246.0	246.0	0%
Space Cooling	31.6	34.8	-10%
Heat Rejection	-	-	-
Interior Central Fans	334.6	182.0	46%
Exhaust Fans	1.5	1.5	0%
Pumps	15.1	15.3	-1%
Total	7,530.0	5,823.9	23%

The detail of updates in energy model for RCM 1 follows:

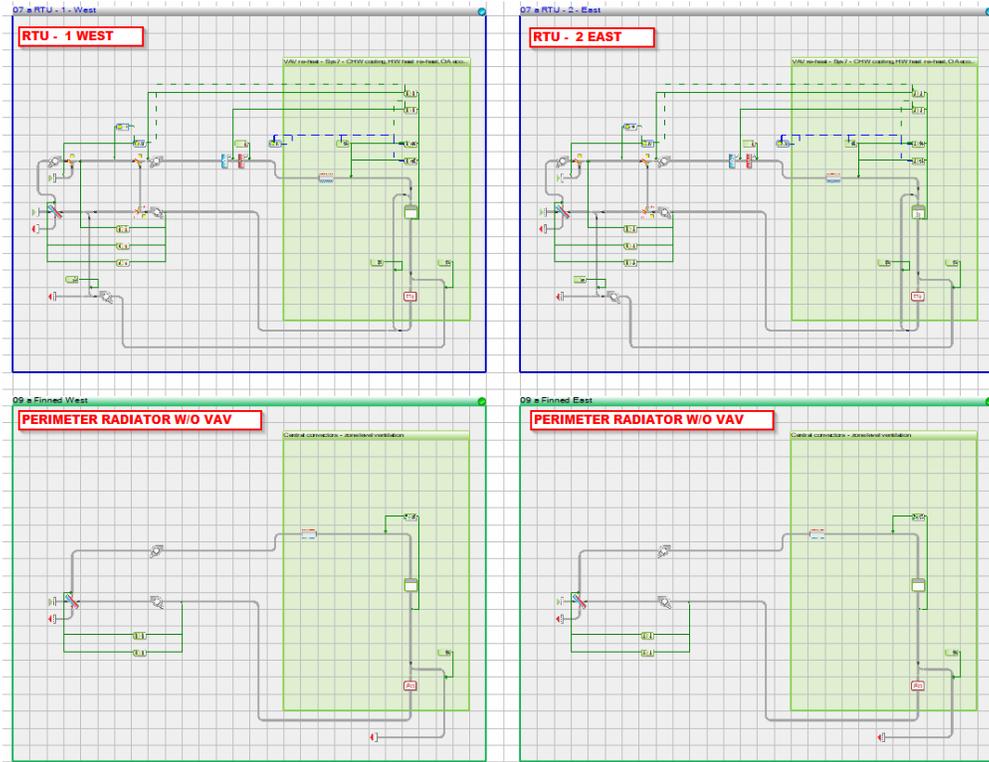
- **RCM 1A Added additional RTUs for courtroom and library**
- **RCM 1B Going from steam to hot water at RTUs**
- **RCM 1C Energy recovery RTUs & economizer**
- **RCM 1D Better controls & VAV replacement**



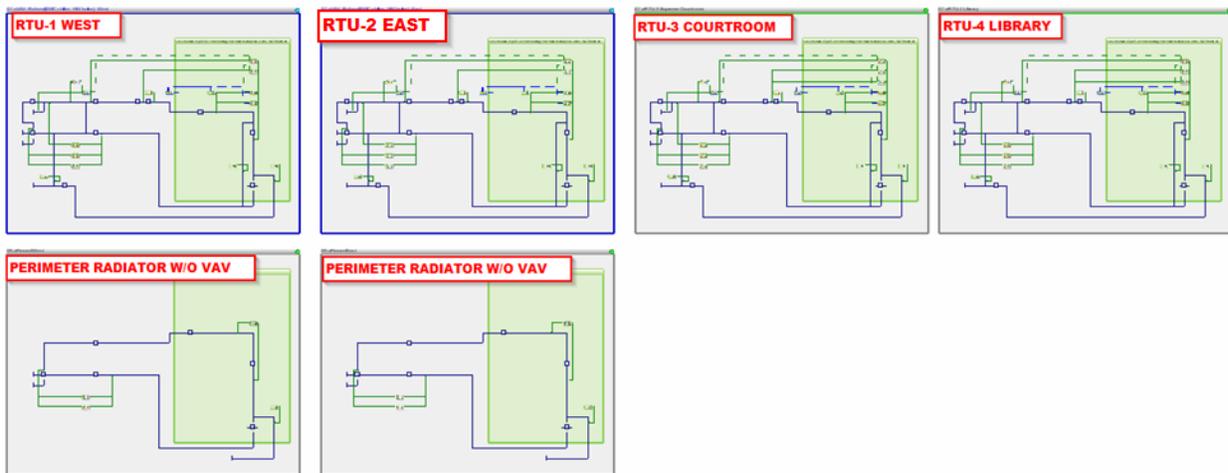
Energy modeling updates – RCM - 1

RCM 1A Added additional RTUs for courtroom and library

- Baseline HVAC systems scheme



- Proposed design HVAC scheme



RCM 1B Going from steam to hot water at RTUs

- **Less distribution losses**
 - 35% to 25% - improvement in distribution losses / less steam pipes within the building
 - Still likely distribution losses from central plant to site
 - Baseline design

Reference: Temple of Justice heating|System

Hot water loop Pre-heating Heating equipment set Sizing status:  

Hot water loop capacity: 2903.95 kBtu/h A

Oversizing factor for loop autosizing: 1.25

Force loop capacity to suit only heating equipment that will operate in the max part-load range

Loop configuration: Primary-Secondary Distribution losses: 35.00 %

- Proposed design

Reference: Temple of Justice System

Hot water loop Pre-heating Heating equipment set Sizing status:  

Hot water loop capacity: 2906.53 kBtu/h A

Oversizing factor for loop autosizing: 1.25

Force loop capacity to suit only heating equipment that will operate in the max part-load range

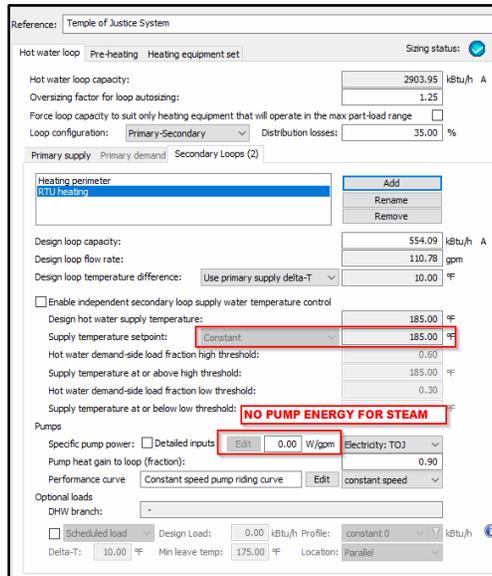
Loop configuration: Primary-Secondary Distribution losses: 25.00 %



- **Hot water heating for RTU**

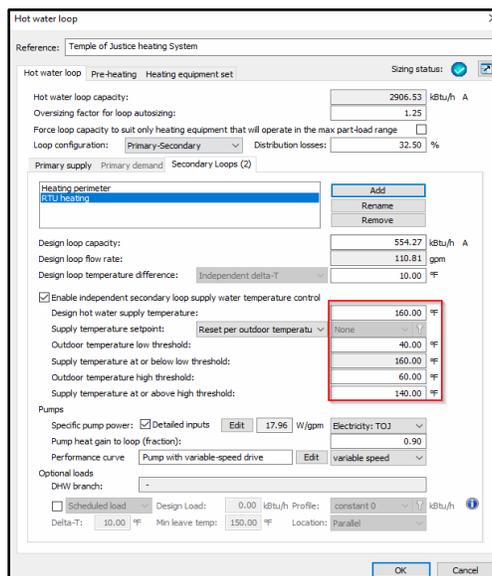
- **Baseline system**

- Constant water temperature (steam system cannot be modeled in energy model. Energy model is calibrated adjusting distribution losses and using constant water temperature to represent actual baseline system. Refer to energy modeling calibration sections for verification process)
 - Pump energy neglected for steam to represent steam system



- **Proposed system**

- Hot water system
 - Reset per outdoor temperature – 140°F to 160°F
 - Pump energy included



RCM 1C Energy recovery RTUs & economizer

Heat recovery & economizer is activated in the energy model for RTUs. Outdoor air economizer temperature high limit is set to 70°F, and RTU has sensible energy recovery effectiveness of 63%.

System Parameters

Tools Help

System name: VAV - Reheat [EWC chiller - HW boiler] - West End

Configuration: Multi-zone system with AHU VAV CAV Two

Schedules System Parameters Zone Temperature, Humidity & Equipment Zone Ventilation & Exhaust Zone L

Outdoor air section

Basis for system outdoor air requirement: ASHRAE 62.1 ⓘ

System uncorrected OA requirement, V_{ou} : 8441 cfm

Ventilation design primary air flow, V_{ps} : cool: 8757 heat: 8757 cfm

System average outdoor air fraction, X_s : cool: 0.96 heat: 0.96

System ventilation efficiency, E_v : -

System minimum outdoor air intake, V_{ot} : 8441 cfm 0.42 cfm/ft²

System exhaust airflow per zone requirements: 400 cfm 0.02 cfm/ft²

System minimum outdoor air intake, $V_{ot}/make-up$: 8441 cfm 0.42 cfm/ft²

100% outside air system

Total of zone minimum primary (OA) flow rates: ⓘ - cfm

Reset system min OA per zone VAV flow fractions to ensure % OA

Outdoor air economizer dry-bulb temperature high limit: 70.00 °F

Outdoor air economizer dew-point temperature high limit: - °F

Outdoor air economizer differential enthalpy limit: - Btu/lb

Bypass for system sizing

Outdoor air pre-heat coil LAT or AHU minimum EAT: - °F

Energy recovery preconditioning of outside air Bypass for system sizing ⓘ

Sensible heat effectiveness: 63.00 %

Latent heat effectiveness: 62.00 %

Power for wheel, pump, etc: 0.000 kW

Exhaust air (in addition to RA) is available for energy recovery

Zones Tabular Edit... Zone Airflow Distribution... Copy Paste



RCM 1D Better controls & VAV replacement

Fan minimum flow is lowered to the minimum outside air CFM level for each RTU with control upgrades and VAV replacement.

Baseline

System Parameters dialog box for RTU - 1 - West. The 'System supply fan minimum flow' is highlighted in red and set to 70.82%.

Parameter	Value	Units
System supply fan design flow rate, Vpsd	19000	cfm
System supply fan minimum flow	70.82	%
Autosized SA fan max flow rate for reference	25203	cfm
System min SAT for space cooling & vent tempering	60.00	°F
System SAT reset (degrees above min SAT)	5.00	°F

Proposed

System Parameters dialog box for VAV - Reheat [EWC chiller - HW boiler] - West. The 'System supply fan minimum flow' is highlighted in red and set to 34.00%.

Parameter	Value	Units
System supply fan design flow rate, Vpsd	16000	cfm
System supply fan minimum flow	34.00	%
Autosized SA fan max flow rate for reference	25173	cfm
System min SAT for space cooling & vent tempering	60.00	°F
System SAT reset (degrees above min SAT)	5.00	°F
Humidification efficiency	85.00	%



RCM 1E Steam Humidifier

(2) steam humidifiers are replaced with (4) electric steam humidifier to efficiently humidify air. The source of heat switches from steam boiler to electric heat.

Baseline	Proposed – RCM 1
Source: Steam boiler, Overall efficiency ~35% H-1: 250 LB/HR H-2: 270 LB/HR	Source: Electric heat, COP = 1 H-1: 126.1 LB/HR, 49.6 kw H-2: 126.1 LB/HR, 49.6 kw (Same as H-1) H-3: 35 LB/HR, 16.7 kw H-4: 14 LB/HR, 7.7 kw

Baseline Humidifier Schedule

HUMIDIFIER SCHEDULE						
MARK	CFM	STEAM PSIG	LB/HR	ORIFICE SIZE	DUCT SIZE	REMARKS
H-1	19,000	7	250	3/8	96 X 77	4 - MANIFOLD
H-2	20,500	7	270	3/8	96 X 77	4 - MANIFOLD

Proposed design Humidifier cutsheets

H-1 & H-2	Calculation Basis																																																																				
	<table border="0"> <tr> <td>Humidification Load (total)</td> <td>126.1 lbs/h</td> <td>Outside Air</td> <td>Temperature 31°F</td> </tr> <tr> <td>Duct Size</td> <td>72 x 108 in.</td> <td></td> <td>Relative Humidity 34 %</td> </tr> <tr> <td>Total Air Volume</td> <td>19000 CFM</td> <td></td> <td>Absolute Humidity 8.6 gr/lb</td> </tr> <tr> <td>Outside Air</td> <td>27 %</td> <td>Before Humidification</td> <td>Temperature 67°F</td> </tr> <tr> <td>Air Velocity</td> <td>351.9 ft./min</td> <td></td> <td>Relative Humidity 38 %</td> </tr> <tr> <td>Altitude</td> <td>433 ft</td> <td></td> <td>Absolute Humidity 38.0 gr/lb</td> </tr> <tr> <td>Air Pressure</td> <td>14.5 psig</td> <td>After Humidification</td> <td>Temperature 67°F</td> </tr> <tr> <td>Humidity Increase</td> <td>40.1 gr/lb</td> <td></td> <td>Relative Humidity 48 %</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Absolute Humidity 48.6 gr/lb</td> </tr> <tr> <td></td> <td></td> <td>Space Design</td> <td>Temperature 70°F</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Relative Humidity 44 %</td> </tr> <tr> <td></td> <td></td> <td></td> <td>Absolute Humidity 48.6 gr/lb</td> </tr> </table>	Humidification Load (total)	126.1 lbs/h	Outside Air	Temperature 31°F	Duct Size	72 x 108 in.		Relative Humidity 34 %	Total Air Volume	19000 CFM		Absolute Humidity 8.6 gr/lb	Outside Air	27 %	Before Humidification	Temperature 67°F	Air Velocity	351.9 ft./min		Relative Humidity 38 %	Altitude	433 ft		Absolute Humidity 38.0 gr/lb	Air Pressure	14.5 psig	After Humidification	Temperature 67°F	Humidity Increase	40.1 gr/lb		Relative Humidity 48 %				Absolute Humidity 48.6 gr/lb			Space Design	Temperature 70°F				Relative Humidity 44 %				Absolute Humidity 48.6 gr/lb																				
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RCM 3 Lighting and Controls System Upgrades

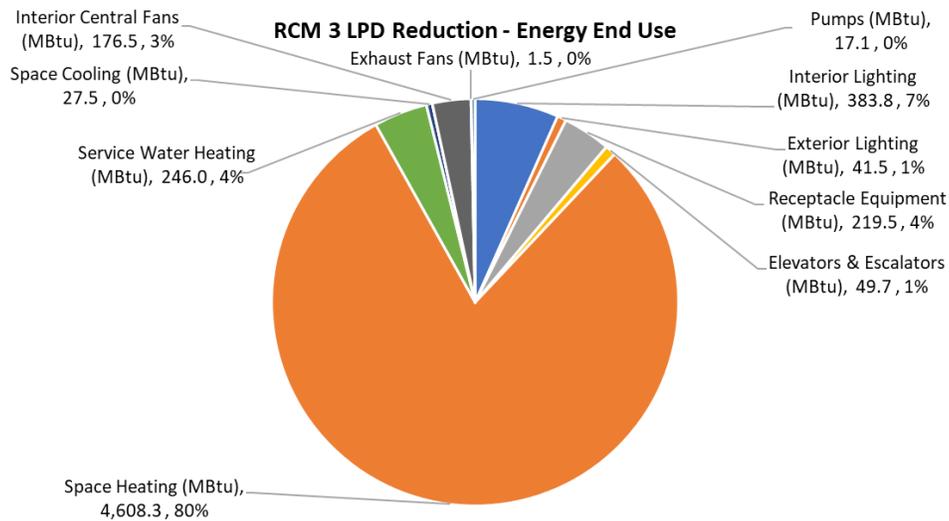
The impact of lighting upgrades on annual energy consumption is studied using energy model. Lighting power density for baseline and proposed design are shown in following table. Current scope improves area weighted LPD from 2.0 W/sf to 0.68 W/sf. Starting point baseline for the current section includes RCM1 mechanical upgrades.

	Baseline (W/SF)	Proposed (W/SF)
Office	2.07	0.85
Conference	2.18	0.57
Corridor (conditioned)	0.50	0.21
Courtroom	8.15	2.27
Electrical/Mechanical	1.76	0.51
Elevator	0.00	0.00
Library	2.11	0.66
Lobby/Foyer	1.57	0.52
Restroom	2.22	0.42
Stair	2.23	0.73
Storage	1.45	0.41
Area Weighted Average	2.00	0.68



Lighting upgrades saves 33% of electricity, approximately 165,656 kwh (565.2 MBTU). The largest savings occur in lighting, cooling, and fan energy. Heating energy increases by 12% with LPD reduction as internal load decreases, but the overall energy consumption is reduced.

Energy (MBTU)	RCM1	RCM3	Savings (%)
Interior Lighting	923.2	383.8	58%
Exterior Lighting	41.5	41.5	0%
Receptacle Equipment	219.5	219.5	0%
Elevators & Escalators	49.7	49.7	0%
Space Heating	4,110.4	4,608.3	-12%
Service Water Heating	246.0	246.0	0%
Space Cooling	34.8	27.5	21%
Heat Rejection	-	-	-
Interior Central Fans	182.0	176.5	3%
Exhaust Fans	1.5	1.5	0%
Pumps	15.3	17.1	-12%
Total	5,823.9	5,771.4	1%



Proposed - RCM 3

