Village of Hastings-on-Hudson Municipal Greenhouse Gas (GHG) Analysis and Action Plan Energy Audit Report

Draft Report for Review and Comment	March 15, 2019
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OLA Project No. NVOH0001.00

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1.0 Executive Summary

Village of Hastings GHG Action Plan Summary

Findings from Study

- Energy Savings Potential: 165.2 kBtu/year
- Cost Savings Potential: $20,042
- CO_2 Savings Potential: 267,844 lb/year

Summary of Recommendations

- LED Lighting Retrofits
- Building Envelope Upgrades
- Steam Boiler Replacement
- Condensing Hot Water Boilers
- Geothermal Heat Pumps
- Air Source Heat Pumps
- Solar PV System
- Heating Night Setback
- DHW Heat Pumps

The Village of Hastings-on-Hudson, NY retained OLA Consulting Engineers to develop an action plan to enable the selection of effective projects the Village can take to reduce green house gas (GHG) emissions. The Village received a grant from NYSERDA for the funding of this effort. The focus of the action plan was to concentrate on seven (7) of the Village's buildings and their impact. This assessment was accomplished by first conducting energy audits of the municipal buildings to assess their current energy use, GHG emissions, and then to develop specific actions and projects the Village can consider to reduce energy use.

The approach was to review the building's operations and utility consumption, and perform multiple site visits to review the existing energy using system, and identify the most inefficient systems. As part of this energy audit process, potential energy saving opportunities were developed, cost and emissions savings potential were analyzed, order of magnitude costing developed, and a draft proposed implementation plan presented for the Village to consider. This study is not intended to be used as a design document, but to recommend options to consider in order to improve the operations, energy performance, and GHG emissions of the buildings from an operational/sustainability perspective.

This report discusses a variety of methods that can be used to reduce the energy consumption, while potentially improving performance of the systems. Further detail including short term and long term recommendations is included in the body of this report and the appendices that follow. The insert above provides a brief summary of the types of measures recommended or considered in this report and a savings potential of all the buildings surveyed. Several measures, including EEM's for the Community Center, Hook and Ladder Company, the Ambulance Corps Garage, and the Chemka Pool building have been identified as having a high potential for energy savings and CO_2 reduction, as well as low implementation costs and relatively short payback periods. Other remaining EEM's have been separated into short-term and long-term measures. Short-term measures were determined primarily from the savings potential of the project and cost of implementation. Long-term measures were determined to have a high potential for energy and CO_2 reduction, but likely have high implementation costs and are considered to be significant capital projects. The energy efficiency measure (EEM) summary are summarized in Section 10 of this report and the recommendations for strategic implementation are outlined in Section 11 of this report.

A centralized utility cost and energy usage spreadsheet was developed for the seven (7) buildings and is included as part of this study for the Village's use. This spreadsheet was created in order for the Village to easily access past energy and utility data, as well as to document future usage for benchmarking purposes. Continuing to track building energy usage is recommended for effective energy management. This study elaborates on the proposed energy savings measures, rough costs to implement them, and the payback associated with implementation. OLA anticipates that a final review of the measures with the Village of Hastings will determine a selected approach for implementation and further inform the draft strategic implementation plan.

2.0 Project Site Overview

Table 1 below shows a summary of the seven (7) buildings included in the scope of this energy audit. Figure 1 shows an aerial view of the locations of each building in the Village of Hastings-on-Hudson. The following sections in this report provide a breakdown of the existing conditions and energy usage for each building.

Table 1. Hastings-on-Hudson Energy Audit Building Information

Building	Estimated Floor Area (ft^2)	Building Space Usage
Village Hall	10,595	Mixed Use (Offices, Courtroom, Police Dept.)
Public Library	13,225	Library
James Harmon Community Center	17,000	Mixed Use (Public Assembly, Recreational, Offices)
Hook and Ladder Fire Company	9,000	Fire Station
Ambulance Corps	2,400	Ambulance Garage
Chemka Pool Building	4,200	Mixed Use (Lifeguard station, Locker rooms, Storage)
DPW Garage	12,000	Maintenance / Storage Facility
TOTAL	**68,420**	

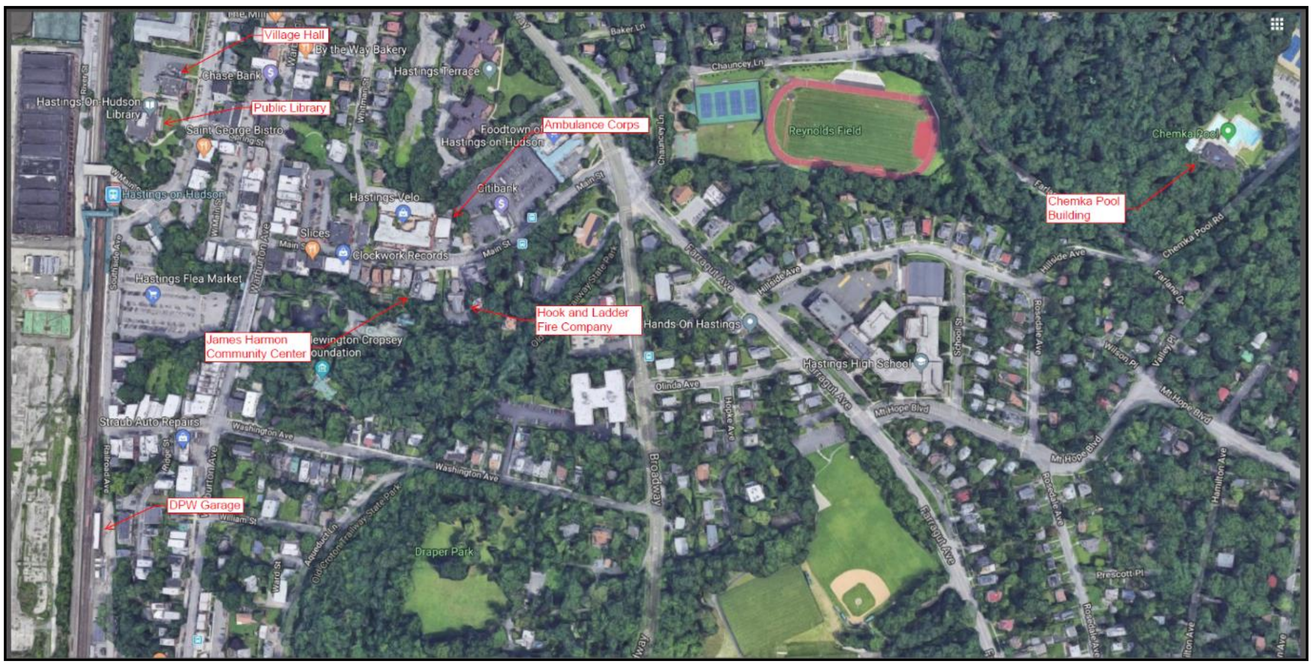

Figure 1. Hastings-on-Hudson site overview

3.0 Project Energy Analysis Approach

3.01 Energy Star and Benchmarking

The EPA's Energy Star Target Finder determines energy performance goals for design projects or existing buildings and provides a method for benchmarking a building's energy use. A rating for actual energy use is determined relative to similar building's average energy consumption on a scale from 0 through 100, with a score of 75 achieving Energy Star status.

Energy Star ratings are based on annual energy use intensity (EUI) measured in terms of kBtu/ft^2. While reducing fuel consumption may not drastically decrease utility costs (relative to higher priced electricity), it will help improve overall energy usage and reduce carbon dioxide emissions. To make a useful comparison for the seven (7) buildings surveyed as part of the energy audit, the energy usage and costs for the building were entered in the Energy Star Target Finder. Unfortunately, most of the buildings are not eligible for an Energy Star score due to building use type or small floor area. It is recommended that the annual energy usage and costs for each of these buildings be consistently updated by the Village of Hastings using Portfolio Manager. Continuous tracking of the annual site and source EUI will help inform which buildings are poor performing and where improvements can be made. The results of this benchmark are provided in Table 2 below (see Appendix A for Energy Star Target Finder Input).

Table 2. Energy Star Target Finder Results Summary

Metric	Existing Building Results	Median Property	Energy Star Design Score (0-100)
Village Hall / Library			
Site EUI (kBtu/ft^2)	102.4	86	N/A
Greenhouse Gas Emissions (CO_2, lb/year)	363,431	304,238	
James Harmon Community Center			
Site EUI (kBtu/ft^2)	107.9	67	N/A
Greenhouse Gas Emissions (CO_2, lb/year)	264,683	163,142	
Hook and Ladder Fire Company			
Site EUI (kBtu/ft^2)	71.1	110	N/A
Greenhouse Gas Emissions (CO_2, lb/year)	76,984	119,050	
Ambulance Corps Garage			
Site EUI (kBtu/ft^2)	68.3	83	N/A
Greenhouse Gas Emissions (CO_2, lb/year)	22,062	26,456	
Chemka Pool Building			
Site EUI (kBtu/ft^2)	89.1	40	N/A
Greenhouse Gas Emissions (CO_2, lb/year)	69,872	30,865	
Department of Public Works Garage			
Site EUI (kBtu/ft^2)	66.3	64	48
Greenhouse Gas Emissions (CO_2, lb/year)	101,647	99,208	

From the above benchmarking analysis, it can be seen that the Village Hall, Library, and Communtiy Center are the most energy intensive buildings. The other buildings are essentially at or below the median EUI, with the exception of the pool building.

4.0 Village Hall (Municipal Building) and Public Library

4.01 Existing Conditions

The Village Hall and Library are located on the same site at 7 Maple Avenue in Hastings-on-Hudson, NY. The Village Hall is a 2-story, 8,700 square foot municipal building and was built in approximately 1930. Typical spaces on the two (2) above grade floors in the building include a courtroom, offices, conference rooms, and the Village Police Department, which occupies part of the first floor. There is also a cellar level, which contains the boiler room, police department locker rooms, and staff lounge.

The public library is a 2-story, 13,225 square foot building and was built in 1965. An addition was added to the building in 2001. The lower level of the library contains the Orr Community room, Barnes Room, staff lounge, as well as mechanical/electrical rooms and storage spaces. The main floor features the adult library, Picture Book Room, and various offices. Photos 1, 2, and 3 below show an aerial and exterior view of the buildings.

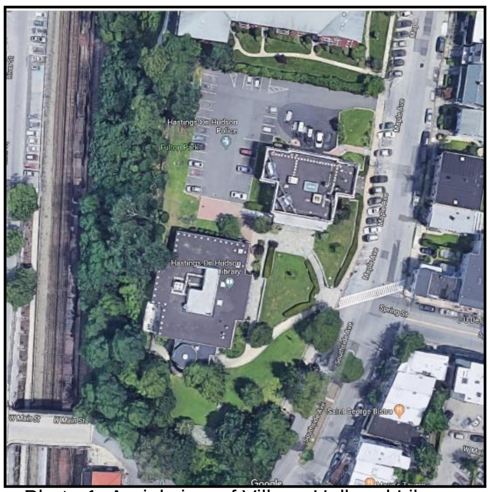

Photo 1. Aerial view of Village Hall and Library

Photo 2. Village Hall exterior

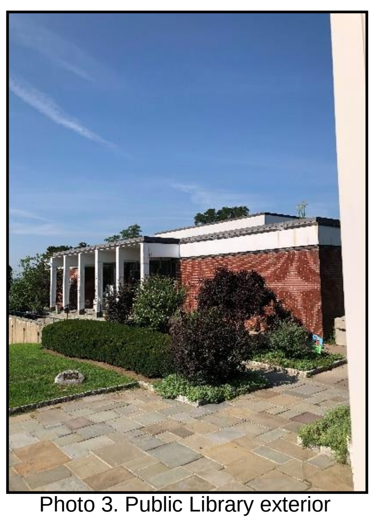

Photo 3. Public Library exterior

Typical building hours for the Village Hall range from 8:30am – 4:00pm Monday through Friday. The building is closed on weekends. However, due to the Police Department presence in the building, the building is occupied 24/7. A breakdown of the building operating hours is shown below in Table 3.

Table 3. Village Hall Operating Hours						
Time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Weekend**
8:30am	Building opens	Building opens	Building opens	Building opens	Building opens	Building Closed
4:00pm	Building closes	Building closes	Building closes	Building closes	Building closes	

*Note building is continuously occupied due to Police Department

Normal building hours for the Library range from 9:30am – 8:30pm on Mondays, Tuesdays, and Thursdays, 9:30am – 6:00pm on Wednesdays, 9:30am – 5:00pm on Fridays and Saturdays, and 1:00pm – 5:00pm on Sundays. A breakdown of the building operating hours is shown below in Table 4.

Table 4. Library Operating Hours						
Time	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Weekend**
9:30am	Building opens	Building opens	Building opens	Building opens	Building opens	Saturday: 9:30am – 5:00pm Sunday: 1:00pm – 5:00pm
5:00pm	-	-	-	-	Building closes	
6:00pm	-	-	Building closes	-	-	
8:30pm	Building Closes	Building Closes		Building Closes		

4.01.1 Existing Heating Systems

Heating for the Village Hall and Library is provided by one (1) dual-fuel fired (natural gas and #2 oil) low-pressure steam boiler. The boiler has a total capacity of 2,452 MBH and is manufactured by Weil McLain (Photo 4). The boiler burner appears to be original to the boiler and has a maximum capacity of 3,103 MBH on natural gas, and 21.5 GPH on oil. It was noted that the boiler is typically run on gas, was installed during a building renovation in 1998, and appears to be in fair condition. Building staff indicated that the boiler is enabled during all hours of the day during the heating season, due to the Hastings Police Department occupying part of the building. A summary of the heating plant is shown below in Table 5.

Table 5. Village Hall Heating Plant Summary						
Manufacturer	**Type**	**Capacity (MBH)**	**Fuel Source**	**Quantity**	**Year Installed**	**Typical Boiler Start/Shutdown Time**
Weil McLain	Steam	2,452	Natural Gas / #2 Oil	1	1998	Always active


Photo 4. Steam boiler serving Village Hall


Photo 5. Steam condensate pumps

Low-pressure steam generated by the heating plant serves three (3) different heating zones between the two buildings. The steam system is a two-pipe, pumped return system. Steam condensate is returned to the boilers via a duplex condensate pump (Photo 5), which collects and pumps the condensate back into the boiler. Two of the zones serve the northern and southern halves of the Village Hall, while the third zone supplies hot water to the library via a steam-to-hot water heat exchanger. A description of the heating system for the library is provided below. Steam for the Village Hall is distributed to cast iron steams radiators throughout the building perimeter (Photo 6). Each zone is controlled by its own programmable Honeywell thermostat (Photo 7), which is located on the first floor. The thermostat controlling the northern half of the building is located in the Building Department, while the thermostat controlling the southern half is located in the adjacent Clerk's Office. The thermostats have the ability to automatically adjust temperature setpoint based on a programmed occupancy schedule.


Photo 6. Typical steam radiator


Photo 7. Typical Honeywell thermostat

It was noted that there is a fourth heating zone, which supplies hot water to finned tube radiation in the Police Department locker rooms in the basement of the building by means of a separate heat exchanger and two (2) dedicated hot water pumps (Photos 8 and 9). However officers expressed their desire to keep the space cool, so this zone is no longer in use.

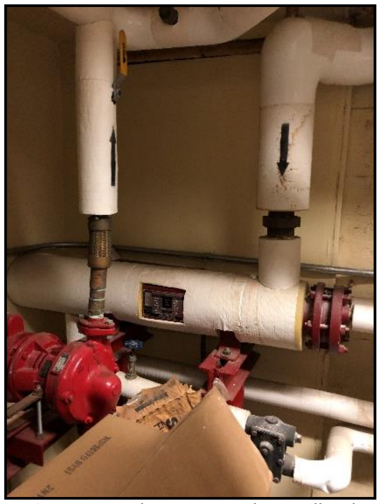

Photo 8. Heat exchanger serving Police locker rooms

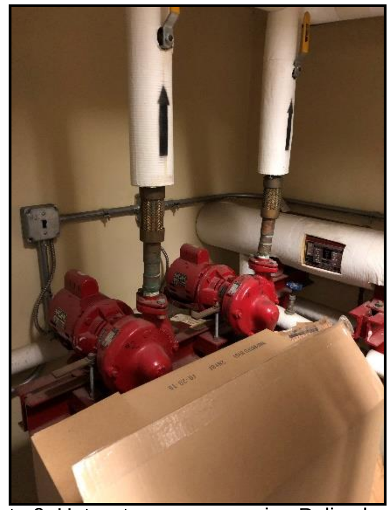

Photo 9. Hot water pumps serving Police locker rooms

Heating for the library is provided by a steam-to-hot water heat exchanger and two (2) dedicated hot water pumps (Photo 10), served by the steam boiler plant at the Village Hall. Hot water generated by the heat exchanger is distributed to perimeter finned tube radiation (Photo 11) and to hot water heating coils located in two (2) AC units and one (1) HV unit serving the building. Each finned tube zone is equipped with an electric control valve and controlled by the Library's building management system (BMS). Heat provided by the AC/HV units and finned tube radiation is controlled by local space temperature sensors, which are all monitored by the BMS. Temperature setpoints for these spaces can be adjusted at the BMS workstation located in the basement electrical room. A full description of the BMS can be found in section 4.01.4.

Photo 10. Hot water pumps serving Library

Photo 11. Typical finned tube radiation

Photo 12. Typical wall mounted temperature sensor

4.01.2 Existing Cooling Systems

Cooling for the Village Hall is provided by a combination of window AC units and packaged terminal AC units (PTAC's) serving offices in the building (Photo 13), a Trane packaged rooftop unit (RTU) serving the second floor courtroom (Photo 14), and two (2) Mitsubishi split AC units serving the Police Department (Photo 15). The RTU and split AC units are all controlled locally by programmable thermostats located in the spaces they serve. It was noted that the packaged RTU serving the courtroom appears to be in poor condition. There are approximately 11 Friedrich window AC units and 2 PTAC's serving the building. Each window AC unit has an approximate capacity of 1.5 tons (18 MBH) of cooling. A summary of the cooling systems at the Village Hall is shown below in Table 6.

Table 6. Village Hall Cooling Plant Summary

Type	**Manufacturer**	**Total Capacity (Tons)**	**Estimated Total Quantity**
Window AC unit	Friedrich	1.5	11
PTAC		1 – 1.5	2
Packaged RTU	Trane	8*	1
Split AC unit	Mitsubishi	1 – 2	2

* Per Village Hall design drawings

Photo 13. Typical window AC unit

Photo 14. Packaged Trane RTU serving courtroom


Photo 15. Split AC unit serving Police Department

Cooling for the Library is provided by a combination of one (1) 40-ton air-cooled Trane chiller (Photo 16), which serves the main floor, Picture Book Room, and Barnes Room via chilled water coils located in AC and HV units, and one (1) City-Multi split AC unit which serves the Orr Community Room on the lower level (Photo 17). A summary of the chiller plant at the Library is shown below in Table 7.

Table 7. Library Chiller Plant Summary

Manufacturer	Type	Total Capacity (Tons)	CHWS Temperature (°F)	Typical Chiller Start Time	Typical Chiller Shutdown Time
Trane	Air-cooled	40	44	8:00am	7:00pm – 9:00pm


Photo 16. Trane air-cooled chiller


Photo 17. City-Multi condensing unit

Chilled water is supplied to spaces via two (2) chilled water pumps located in the penthouse mechanical room. The chiller itself is located on the roof of the building, adjacent to the penthouse. The chiller is automatically controlled by the BMS (Photo 18) and is set to maintain 44°F chilled water supply temperature (CHWS) during occupied hours (determined based on Library hours). The chiller was installed in the 1990's and appears to be in fair condition, while the chilled water pumps appear to be original to the building (1965). The pumps also appear to be in fair condition.

Cooling for the Orr Community Room is provided by a City-Multi split heat pump and is supplied via ductwork in the space. This unit is locally controlled by a wall-mounted thermostat, and cannot be controlled by the BMS (Photo 19). It was noted that this unit was recently installed during expansion of the community room.

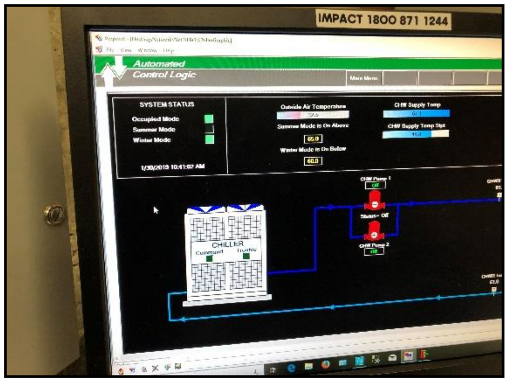

Photo 18. Chiller plant BMS graphic

Photo 19. Thermostat for City-Multi heat pump

4.01.3 Existing Ventilation Systems

Mechanical ventilation for the Village Hall consists of one (1) RTU, which serves the courtroom only. Ventilation for the remainder of the building is provided by opening windows, and through various toilet exhaust fans. Table 8 below shows a summary of the systems serving the Village Hall.

Table 8. Village Hall Mechanical Ventilation System Summary

Unit Tag	Area Served	Motor HP	Max. CFM	100% OA Unit (Y/N)
AC-1	Second Floor Courtroom	2	3,000	No

Mechanical ventilation for the Library consists of two (2) AC units and one (1) Heating and Ventilation (HV) unit that serve all spaces in the building except for the Community Room. HV-1, serving the main floor of the library, is located in the penthouse mechanical room and appears to be original to the building (1965). AC-2, serving the Barnes Room, is located in the ceiling adjacent to the space, and AC-3, serving the Picture Book Room and Director’s Office, is located in a mechanical closet within the space. Both of these units were installed during construction of the new addition. All three (3) of these units are controlled by the BMS. Table 9 below shows a summary of the systems serving the library.

Table 9. Library Mechanical Ventilation System Summary

Unit Tag	Area Served	Motor HP	Max. CFM	100% OA Unit (Y/N)
HV-1	Library Main Floor	10	15,400	No
AC-2	Barnes Room	1	1,925	No
AC-3	Picture Book Room and Director’s Office	¾	1,300	No

4.01.4 Existing Control Systems

Heating at the Village Hall is controlled by two (2) Honeywell wall-mounted programmable thermostats, which control zone valves on the main steam header. The thermostats are set to maintain an occupied and unoccupied heating setpoint, based on a schedule programmed into the thermostats by the building staff. Cooling at the building is all controlled locally via manual switches for window AC units, and thermostats for the split AC units and packaged RTU serving the courtroom.

The library contains a central BMS, which automatically monitors and controls the heating and cooling systems at the building. Heating via the steam-to-hot water heat exchanger is set to maintain 172°F hot water supply temperature (HWST) during occupied hours, while the central chiller plant is set to maintain 44°F chilled water supply temperature (CHWS). The AC / HV units serving the building each have their own BMS graphic (Photo 20), and appear to be controlled based on space temperature setpoint. If the space temperature is above / below setpoint, the BMS will open the associated chilled / hot water valve on the unit until space setpoint is achieved. It was noted that HV-1 appears to have multiple zone dampers, which are also controlled by the BMS and modulate the amount of airflow supplied to each space in order to help meet space setpoint.

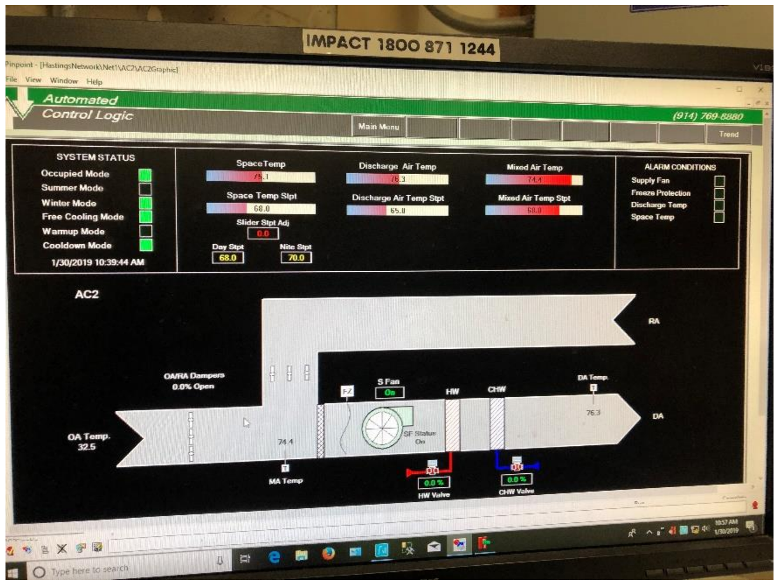

Photo 20. Typical AC unit graphic

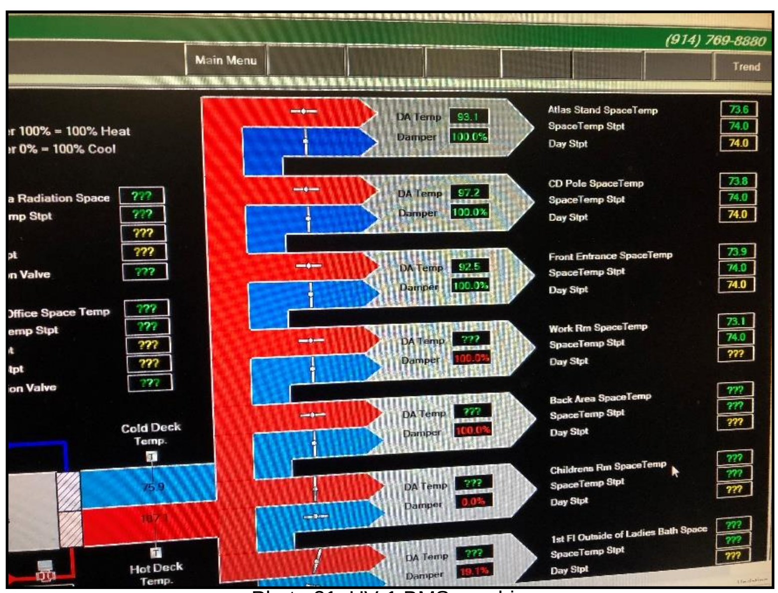

Photo 21. HV-1 BMS graphic

4.01.5 Existing Domestic Water System

Domestic hot water (DHW) at the Village Hall is generated by a combination electric A.O. Smith water heater and storage tank (Photo 22). The DHW heater has a total capacity of 6 kW and a storage capacity of 80 gallons. The age of the DHW heater could not be verified but it appears to be in good condition.

Domestic hot water at the Library is generated by a combination electric American water heater and storage tank (Photo 23). The DHW heater has a total capacity of 4.5kW and a storage capacity of 40 gallons. The DHW heater was installed in 2017 and appears to be in good condition. A summary of the DHW systems serving the two buildings is shown below in Table 10.

Table 10. DHW System Summary

Area Served	Manufacturer	Fuel Source	Heating Capacity (kW)	Storage Capacity (Gal)	Quantity	Year Installed
Village Hall	A.O. Smith	Electric	6	80	1	Unknown
Library	American	Electric	4.5	40	1	2017

Photo 22. Electric DHW heater serving Village Hall

Photo 23. Electric DHW heater serving Library

4.01.6 Existing Lighting System

Interior lighting at the Village Hall primarily consists 3-bulb ceiling pendants which contain 13W Fluorescent bulbs, and 2-bulb ceiling pendants containing 28W Fluorescent bulbs. These fixtures are found in all spaces throughout the building (Photos 24 and 25).

Interior lighting fixtures at the Library primarily consists of 12W and 18W LED lamps, which are found on the main floor, Orr Community Room, Barnes Room, Picture Book Room, and offices (Photos 26 and 27). There are additional wall-mounted lighting fixtures on the lower level of the Library that contain 22W Fluorescent lamps (Photo 28).


Photo 24. Typical Village Hall corridor lighting

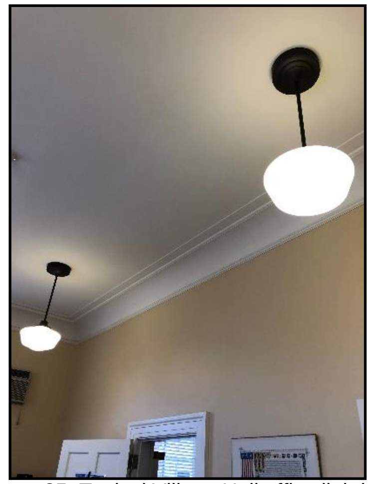
Photo 25. Typical Village Hall office lighting

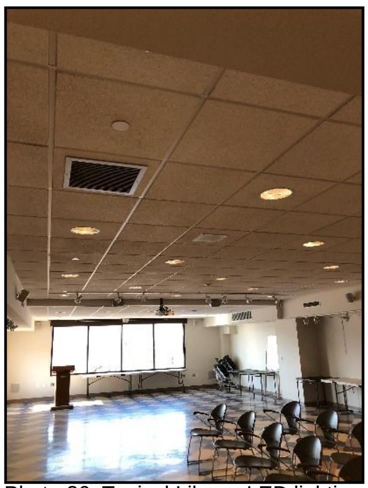
Photo 26. Typical Library LED lighting

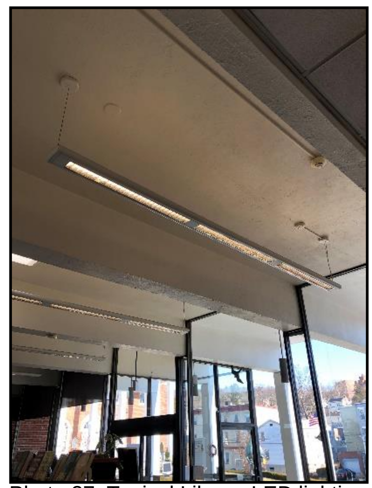
Photo 27. Typical Library LED lighting

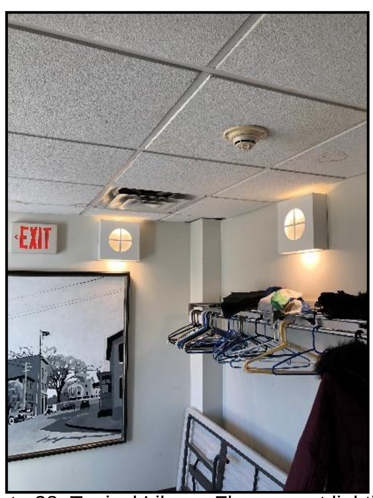

Photo 28. Typical Library Fluorescent lighting

4.01.7 Existing Lighting Controls

All interior lighting at the Village Hall and Library is controlled manually by toggle switches. Lighting is turned on at the beginning of each day by building staff and typically remains on until the end of the day. It was noted that both buildings have occupancy sensors installed, however building staff indicated that they were intended to be used for security measures and are no longer in use (Photo 29).

Exterior lighting control at the Village Hall could not be verified during the site visit. Exterior lighting at the Library is controlled by timers (Photo 30).

Photo 29. Typical occupancy sensor

Photo 30. Typical timer for exterior lighting

4.02 Village Hall and Library Analysis of Present Energy Use

A historical energy use analysis was performed for the energy sources at the Village Hall and Library. The following data was analyzed based on 2017-2018 energy consumption and costs. Historical utility bills detailing usage earlier than 2017 were provided, however they were not complete and therefore not included in this analysis. Based on the utility bills provided, OLA was able to calculate a combined site EUI for the two (2) buildings. The Village Hall and Library used approximately 102.4 kBtu/ft^2 site energy and had a combined total energy cost of $58,494 based on 2017-2018 data. OLA could not calculate an average EUI over multiple years due to the limited amount of utility bills provided. Table 11 below provides a summary of the annual energy usage and costs for 2017-2018. Note that all fuel usage, costs, and areas are combined values from both buildings.

Table 11. 2017-2018 Annual Overall Site Energy

Energy Source	Energy Usage	kBtu	Cost ($)	Cost ($) per ft^2	Site EUI (kBtu/ft^2)	CO_2 Emissions (lb/year)
Village Hall Electric (kWh)	125,640	428,684	$16,865	$1.59	40.5	80,410
Library Electric (kWh)	126,720	432,369	$21,847	$1.65	32.7	81,101
Natural Gas (therm)	12,107	1,210,700	$13,515	$0.57	50.8	141,758
#2 Fuel Oil (gal)	2,621	366,940	$6,268	$0.26	15.4	60,907
Total		2,438,692	$58,494	$2.46	102.4	363,431
Gross Area (ft^2)		23,820				

Figure 1 provides the annual site EUI per energy type based on analysis of the utility bills for 2017-2018. Figure 2 provides the annual energy cost summary by energy type from the same average year. Natural gas for heating is the dominant energy source for these two buildings, and is projected to account for 50% of the overall energy consumption of the building. However, natural gas only accounts for 23% of the cost, due to the higher cost of electricity. Figure 3 provides the annual CO_2 emissions breakdown by energy type.

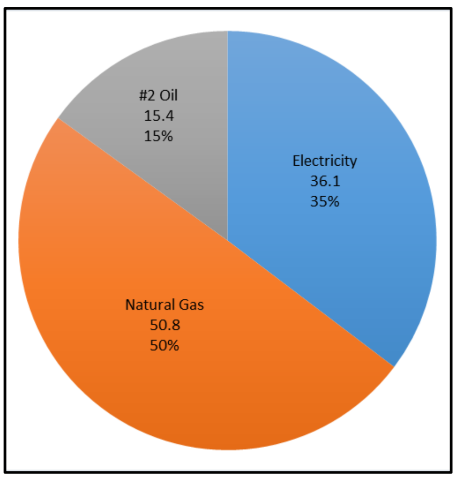

Figure 1. Existing Annual Fuel Type Site EUI Breakdown in kBtu/ft.^{2}

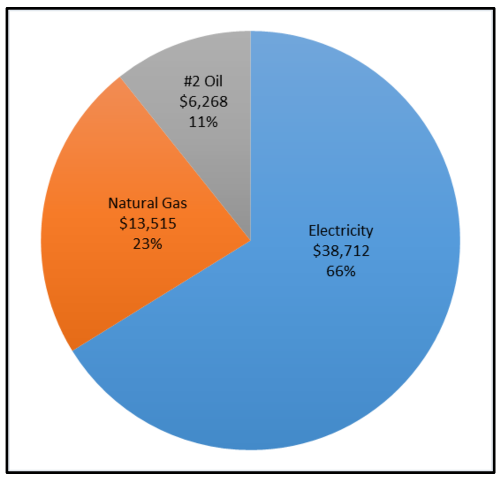

Figure 2. Existing Annual Energy Cost Breakdown

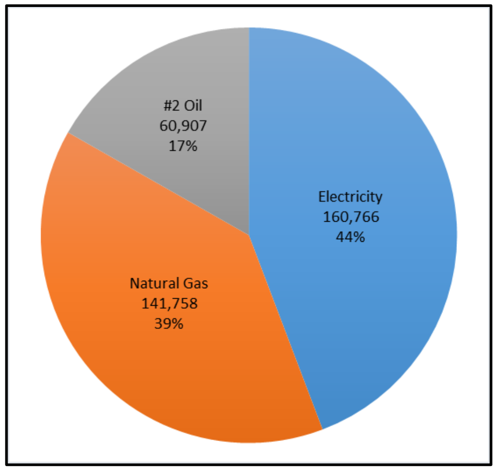

Figure 3. Existing Annual CO_2 Emissions Breakdown in lb/year

4.02.1 Electrical Usage

The historical electric usage for the Village Hall is shown in Figure 4. Peak electricity usage typically occurs during the summer months (May – September), likely due to the need to run the window AC units in order to cool the building. The highest monthly usage recorded during this time was 12,880 kWh during September 2016. It was noted that the usage remains relatively constant throughout the year, likely to the limited amount of window AC units at the building.

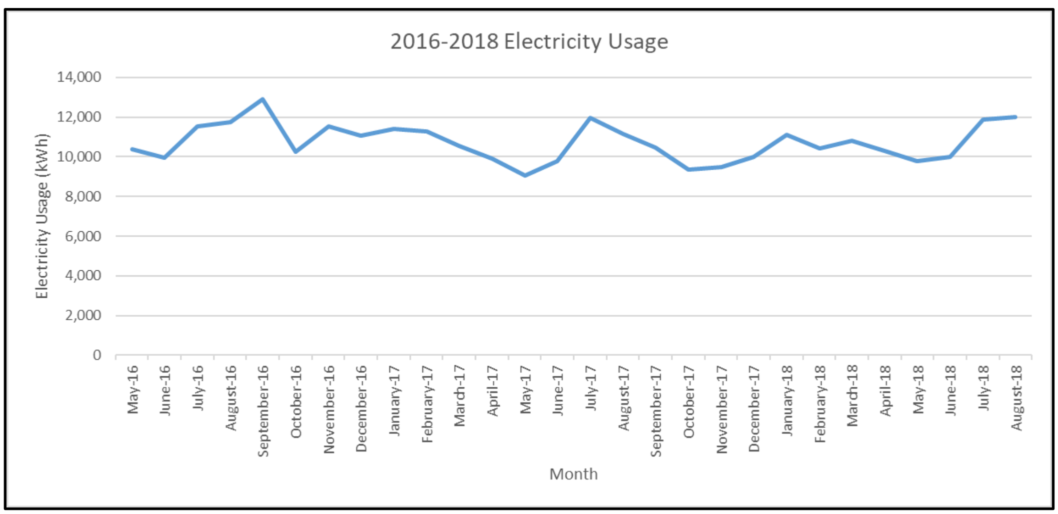

Figure 4. 2016 – 2018 Village Hall Historical Electricity Use

The historical electric usage for the Library is shown in Figure 5. Peak electricity usage typically occurs during the summer months (May – September), likely due to the need to run the air-cooled chiller in order to cool the building. The highest monthly usage recorded during this time was 18,640 kWh during September 2016.

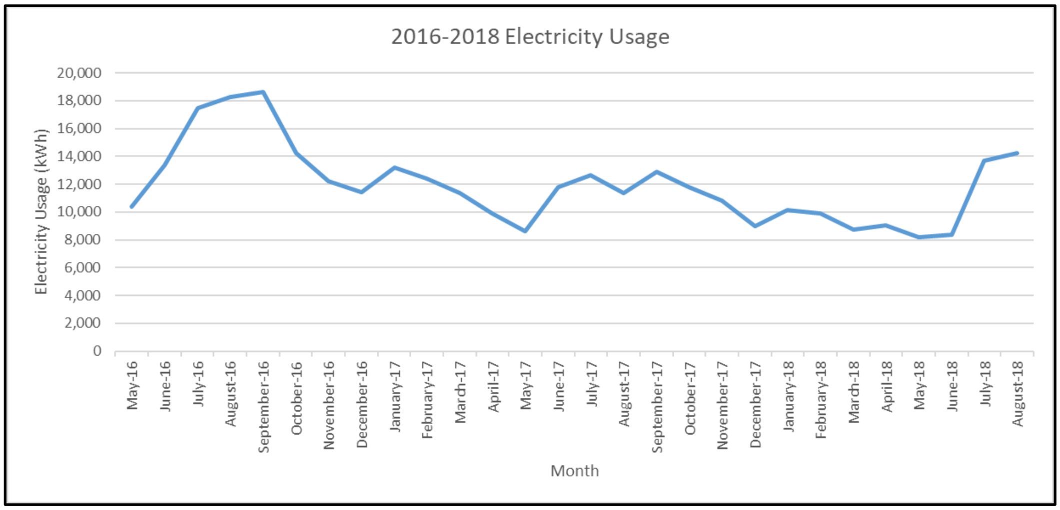

Figure 5. 2016 – 2018 Library Historical Electricity Use

The historical electric demand for the Village Hall is shown in Figure 6. Similar to the historical electricity usage above, the building's peak demand typically occurs between May and September. The highest recorded demand of 38.4 kW occurred in August 2016.

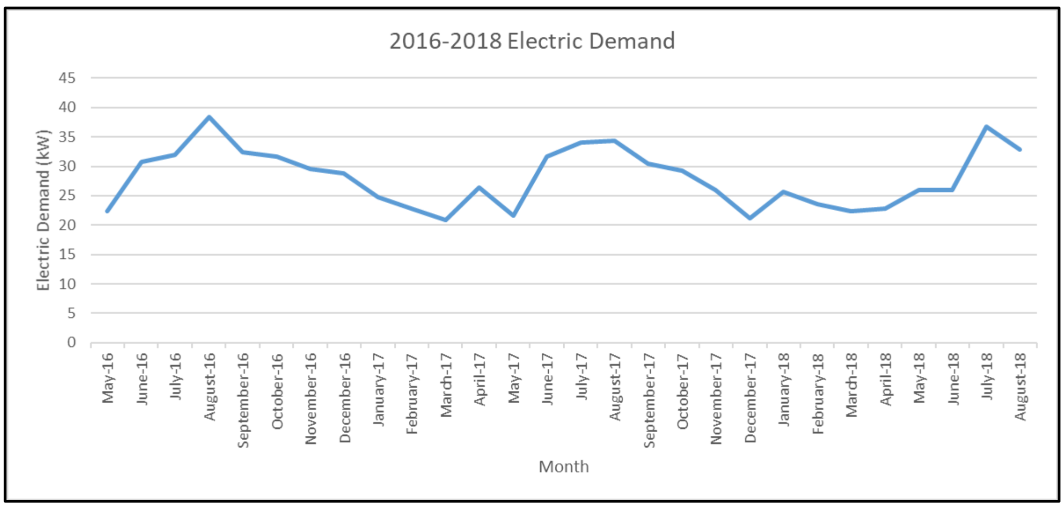

Figure 6. 2016 – 2018 Village Hall Historical Electric Demand

The historical electric demand for the Library is shown in Figure 7. Similar to the historical electricity usage above, the building's peak demand typically occurs between May and September. The highest recorded demand of 64.0 kW occurred in September 2016.

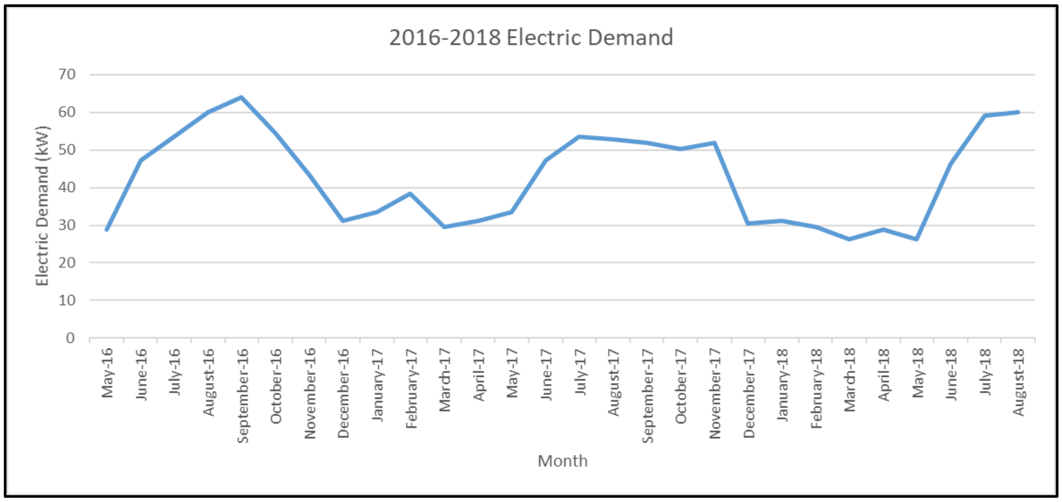

Figure 7. 2016 – 2018 Library Historical Electric Demand

4.02.2 Natural Gas Usage

Figure 8 below shows the historical 2017-2018 natural gas usage for the Village Hall and Library. Since these two buildings share a heating plant, and because gas is used for heating only, usage is found to be highest during the winter months. A peak usage of 3,715 therms was recorded in January 2018.

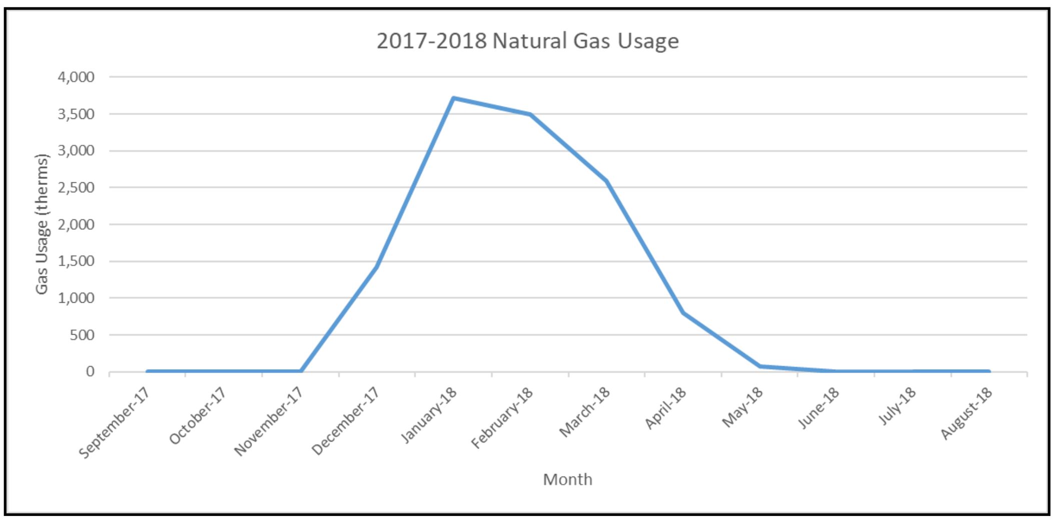

Figure 8. 2017 – 2018 Historical Natural Gas Usage

OLA was provided with complete utility bills for this analysis and determined a natural gas of 1.12 $/therm based on the bills provided. For the purposes of this study, this calculated rate was used to estimate energy cost savings.

4.02.3 #2 Fuel Oil Usage

The historical monthly oil usage for the Village Hall and Library is shown in Figure 9. It was noted that these two buildings stopped using oil for heating in 2017, and only two months of bills from that year were provided. Note that the figure below is a reflection of gallons delivered to the building per month, and not an actual trend of the usage.

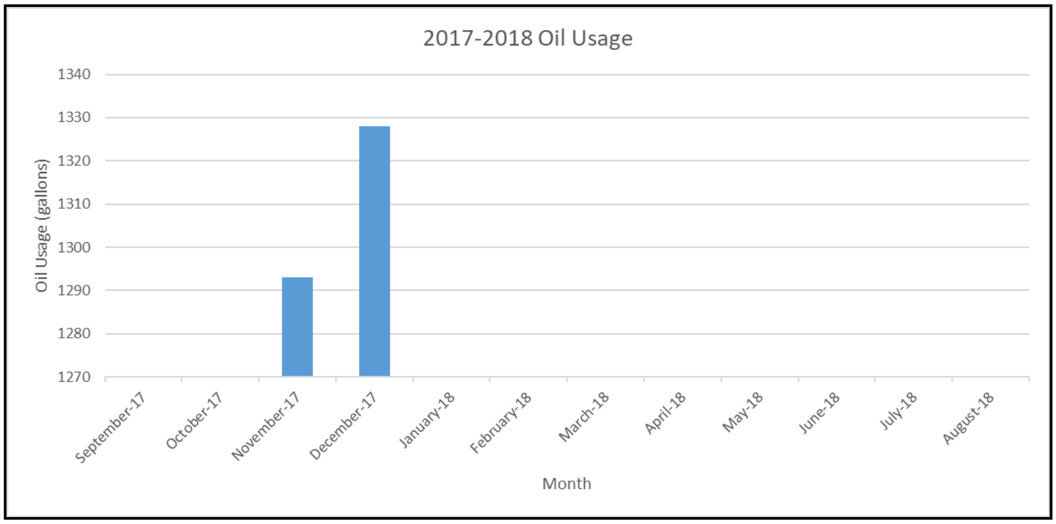

Figure 9. 2017 – 2018 Historical Oil Usage

For the purposes of this study, the provided oil rate of 2.39 $/gallon based on 2017 utility bills was used to estimate energy cost savings.

4.02.4 Utility Rates and Costs

The Village Hall and Library are each served by one (1) electric meter and one (1) common gas meter located at the Village Hall. An estimated demand, energy, and blended electric rate for each of the two buildings and a common gas rate were determined based on monthly usage and monthly charges. For the purposes of this study, all energy cost savings were based on 2017/18 utility rates. Electricity energy cost savings were based on 2017/18 demand and energy charges. Table 12 below shows a breakdown of the utility rates for each fuel source.

Table 12. Utility Rates

Utility	Unit	2016/17	2017/18
Electric (Village Hall)	$/kW	$25.09	$27.28
	$/kWh	$0.060	$0.064
	$/kWh (Blended)	$0.125	$0.134
Electric (Library)	$/kW	$25.11	$27.18
	$/kWh	$0.063	$0.067
	$/kWh (Blended)	$0.150	$0.172
Natural Gas (common)	$/therm	-	$1.12
Fuel Oil #2 (common)	$/Gallon	-	$2.39

4.02.5 Energy Utilization

Figure 10 below shows the breakdown of energy intensity (kBtu/ft^2) by end use type. The results confirm that fuel consumed to run the heating plant accounts for the largest portion of the site energy use and cost.

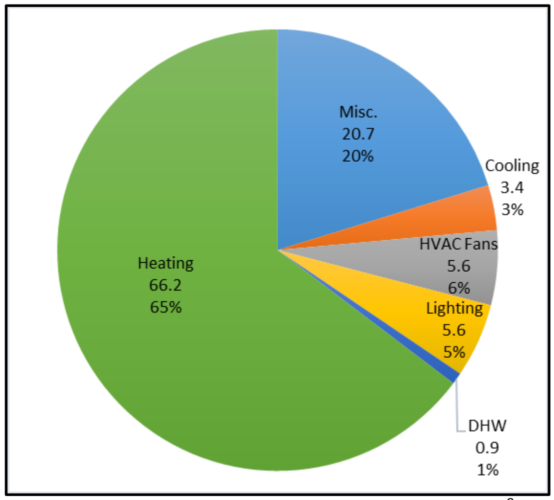

Figure 10. Energy End Use Breakdown in kBtu/ft.^{2}

4.03 Energy Efficiency Measures (EEMs)

Short Term EEM's

4.03.1 EEM 1 – Village Hall LED Lighting Retrofit and Lighting Controls Upgrade

This measure investigates the impact on energy consumption of reduced lighting power density utilizing high efficiency LED lighting technology and retrofit products throughout the building. The new LED lighting will result in a reduced lighting power density and potential for high savings. All of the typical 13W and 28W compact fluorescent lighting, as well as the 32W T8 fluorescent lighting in the basement of the building could be replaced with LED retrofit products. The existing lighting power density of the Village Hall is estimated to be 0.52 W/ft^2. The resulting lighting power density of the entire facility is estimated to be in the range of 0.26 W/ft.^{2} after a complete retrofit.

In addition, installing occupancy sensors could result in further energy reduction. This building currently has no form of automatic lighting controls installed. The occupancy sensors would automatically turn lights on and off depending on whether the space is occupied. This measure will prevent lights from staying on for extended periods of time while the spaces are not being used.

Figure 11. Proposed Philips LED fixture


Figure 12. Typical occupancy sensor

4.03.2 EEM 2 – Library Lighting Controls / Daylighting Upgrades

This measure investigates the energy reduction associated with installing occupancy lighting control sensors and photocells for natural daylighting. This building currently has no form of automatic lighting controls installed. The occupancy sensors would automatically turn lights on and off depending on whether the space is occupied. This measure will prevent lights from staying on for extended periods while the spaces are not in use. The photocells will dim and/or turn the lights off in a space based on the current level of daylight measured by the photocell. We estimate the following spaces/zones would be ideal for occupancy and/or daylighting sensors:

- Main Library Entrance
- Main Library Rear
- Picture Book Room
- Barnes Room
- Director's Office
- Staff Office
- Book Shop
- Staff Lounge
- Restrooms

Long Term EEM's

4.03.3 EEM 3 – Village Hall Upgraded Windows

This measure assesses the energy savings associated with replacing the existing windows with higher thermal performance, high efficiency, low-e double glazing with thermally broken framing (U-0.40 assembly and SHGC 0.45). Although there was found to be considerable energy savings with this measure, the high cost to replace the glazing in each building results in a long payback.

4.03.4 EEM 4 – Village Hall Upgraded Wall Insulation

This measure assesses the energy savings associated with improving the thermal performance of the walls of the Village Hall by adding R-7.5 insulation throughout the building. Although there was found to be considerable energy savings with this measure, the high cost to implements these envelope improvements results in a long payback.

4.03.5 EEM 5 – Steam Boiler Replacement and Radiator Valves for Village Hall

As the existing steam boiler is at the end of its useful life, this measure analyzes replacing the equipment with a new higher efficiency steam boiler. The increased heating plant efficiency will provide opportunity to reduce natural gas usage and CO_2 emissions. Current best achievable steam boiler efficiency is in the range of 80% - 83%. In addition, it was noted during the site survey that many of the windows at the Village Hall are kept open by occupants during the winter time due to overheating generated by the steam radiators. We recommend installing new manually adjustable thermostatic valves on every operating steam radiator in the building if this option is pursued. These valves will allow for greater control of the steam supplied from the radiators, and will also reduce the amount of waste heat energy generated by the heating plant. Note that due to the complex nature of quantifying waste heat generated from the opening of windows, energy savings associated with installing radiator valves was not calculated for this measure.

4.03.6 EEM 5A – Condensing Gas-Fired Hot Water Boilers

This project would eliminate the existing dual fuel fired steam boiler and convert the Village Hall to a hot water system utilizing new gas-fired, high efficiency condensing boilers as the primary source of heating. The low cost of natural gas will reduce operating costs compared to oil. In general, hot water heating systems are more efficient than steam heating systems. Installing a hot water boiler plant will allow the building to move away from the obsolete steam heating system along with their associated system losses and higher maintenance issues and costs. This project would necessitate a complete replacement of the heating distribution system. Current best achievable hot water boiler efficiency is in the range of 90% – 91%. Note that the new system would still serve the hot water heating system at the library.

Figure 13. Aerco condensing boiler

4.03.7 EEM 5B – Geothermal Heat Pumps for Village Hall

An alternative to EEM 5A would be to disconnect the steam heating system from the Village Hall and heat/cool the building using geothermal water source heat pumps. As there is available space in the parking lot for a well field, it is estimated that about 30 geothermal wells could be installed. Utilizing a closed loop geothermal system would remove the high energy costs of natural gas and #2 oil for heating and provide an overall energy use intensity (EUI) reduction and cost savings due to high heat pump operating efficiencies. We estimate the building has enough space for a 30 – 40 ton well field, which could potentially satisfy the entire Village Hall heating and cooling loads. Each zone in the building would be retrofitted with console units, which would provide heating and cooling to the spaces they serve (picture below). Note that the hot water heating system for the Library would remain in place, since the well field would not likely be able to support both buildings. Savings for this measure were calculated based on the existing steam boiler still serving the library.

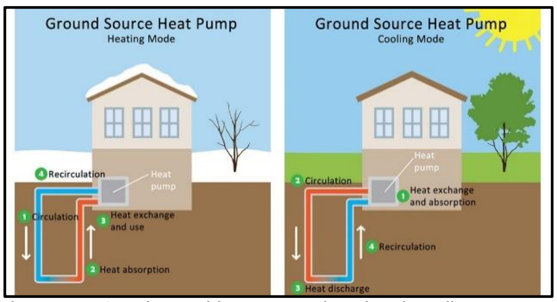

Figure 14. Geothermal heat pump heating / cooling process

Figure 15. Water Furnace console heat pump

4.03.8 EEM 5C – Air Source VRF Heat Pumps for Village Hall

Another alternative to EEM 5A and 5B would be to remove the existing steam heating system and convert the Village Hall to a more traditional air source heat pump system with variable refrigerant flow (VRF). Air source heat pumps typically offer high heating and cooling efficiencies, which could result in an overall EUI reduction and cost savings. Indoor units would be installed where appropriate, providing heating and cooling to the spaces they serve. Note that the hot water heating system for the Library would remain in place. Savings for this measure were calculated based on the existing steam boiler still serving the library.

Figure 16. City-Multi VRF heat pump units

4.03.9 EEM 5D – Air Source VRF Heat Pumps for Village Hall and Condensing Gas-Fired Hot Water Boiler for Library

This measure combines EEM 5C with the replacement of the existing steam boiler (serving only the Library in this scenario), addressing the heating plants for both buildings. The boiler would be replaced with a new gas-fired, hot water condensing boiler to exclusively serve the Library. The increased heating plant efficiency will reduce natural gas usage and CO_2 emissions. Hot water boiler efficiency is expected to be in the range of 90% – 91%, due to the use of the existing building distribution systems. Note that the existing steam heating distribution system serving the Village Hall could be demolished as part of this project, or could alternatively be abandoned in place depending on field conditions and project cost.

4.03.10 EEM 6 – Roof-Mounted Solar Photovoltaic (PV) System for Library

As there is available space on the roof of the library, the installation of solar electric PV panels has been reviewed. It is estimated that about 2,000 ft^2 of roof is available for solar panels. The general orientation of the building is favorable for solar collection, and there are no nearby tall buildings or trees that could potentially cause shading. This makes the library a good candidate for solar PV, and this upgrade would provide significant energy savings toward electricity usage. We estimate the library would have enough roof space for a 30 – 40 kW PV system, which could potentially provide up to 33% of the building's current annual electricity usage.

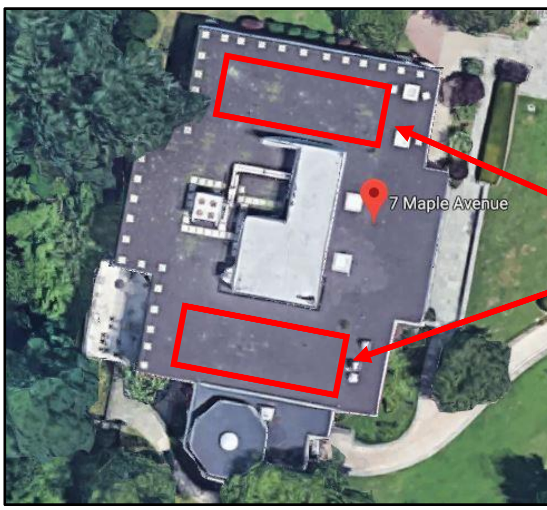

Figure 17. Proposed PV cell locations

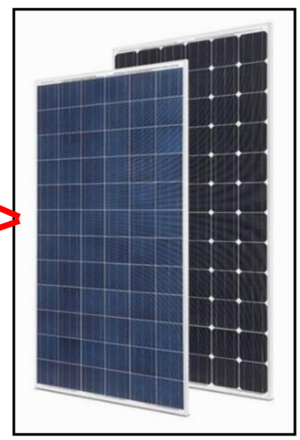

Figure 18. Typical PV cell

4.03.11 EEM 7 – Library AHU Replacement

HV-1, serving the main floor of the Library, appears to be original to the building and although still in fair condition is beyond its useful life and should be replaced. We recommend replacing the unit with a new variable air volume (VAV) air-handling unit with VAV boxes replacing each of the existing zone dampers. The new unit would be equipped with supply and return fan variable frequency drives (VFD's), which would allow the fans to modulate speed based on the building load. Allowing the fans will modulate to a minimum speed would reduce fan energy costs and provide an overall energy savings compared to the existing HV-1.

4.03.12 EEM 8 – Village Hall / Library Plug Load Management and Reduction

This measure analyzes the savings associated with plug load management. Plug loads include miscellaneous equipment such as computer monitors, phone chargers, and others. Incorporating smart energy efficient strategies to reduce plug load usage could result in a reduction of approximately 5% of the current plug load electric consumption. Strategies to reduce plug load usage include using smart power strips, which cut power to devices based on a schedule or timer, and smart devices that use occupancy sensors to switch off the power to a nearby receptacle.

Figure 19. Typical Occupancy Sensor and Plug Load Receptacle

Figure 20. Typical smart power strip

5.0 James Harmon Community Center

5.01 Existing Conditions

The James Harmon Community Center is a 4-story, 17,000 square foot multi-use building located at 44 Main Street in Hastings-on-Hudson, NY and was constructed in 2007. The building contains three (3) above grade floors, as well as a basement level. The lower level contains the Youth Center, the first floor contains offices and the community room, and the second floor contains the TV / Media center and various offices. Photos 31 and 32 show an aerial and exterior view of the building.

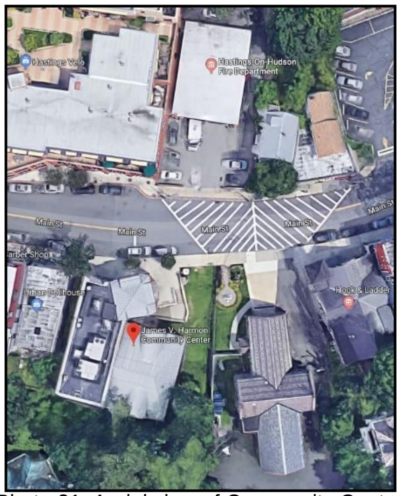

Photo 31. Aerial view of Community Center

Photo 32. Community Center exterior

Typical building hours for the Community Center range from 9:00am – 4:30pm Monday through Thrusday, and 9:00am – 1:00pm on Fridays. It was noted that the Recreation Department is officially closed on weekends, however the building occasionally allows residents to rent out the large community room on the first floor for parties and events on Saturdays. The Youth Services center on the lower level is also open to students on weekends. A breakdown of the building operating hours is shown below in Table 12.

Table 12. Community Center Operating Hours

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Weekend
9:00am	Building opens	Building opens	Building opens	Building opens	Building opens	Building occasionally open on Saturdays
1:00pm	-	-	-	-	Building closes	
4:30pm	Building closes	Building closes	Building closes	Building closes	-	

5.01.1 Existing Heating Systems

Heating for the Community Center is provided by one (1) gas-fired hot water boiler manufactured by Weil McLain (Photo 33). The boiler has a gross output capacity of 991 MBH, and is equipped with a Power Flame burner that has a maximum capacity of 1,232 MBH. It was noted that the boiler appears to be in good condition. A summary of the heating plant is shown below in Table 13.

Table 13. Community Center Heating Plant Summary

Manufacturer	Type	Capacity (MBH)	Fuel Source	Quantity	Year Installed	Typical Boiler Operating Time
Weil McLain	Hot Water	991	Natural Gas	1	2007	3:30am – 7:00pm

The boiler is automatically controlled by the building's digital building management system (BMS), and typically initiates occupied mode at approximately 3:30am Monday through

Friday during the heating season (Photo 34). The boiler then cycles on/off in order to achieve the BMS hot water supply temperature setpoint of 165°F. It was noted that the boiler operates in unoccupied mode from 7:00pm – 3:30am Monday through Friday. According to the BMS, the boiler is not active during weekends.

Photo 33. HW boiler serving Community Center

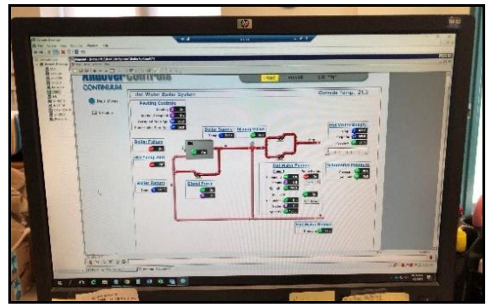

Photo 34. Hot water system BMS graphic

Hot water generated by the boiler is distributed throughout the building via two (2) 3 HP hot water pumps (Photo 35) and serves various perimeter radiation (Photo 36) as well as hot water coils located in the four (4) RTU's and one (1) HV unit serving the building. It was noted that the hot water pumps are equipped with variable frequency drives (VFD's) and have the ability to modulate speed based on heating demand.

Photo 34. Hot water pumps

Photo 35. Typical finned tube radiation

Heating for each space in the building is controlled remotely by the BMS through wall-mounted temperature sensors (Photo 36). Since the majority of spaces in the building are served by variable air volume (VAV) boxes, each temperature sensor typically monitors one zone and an associated finned tube radiation valve grouped with that specific zone. It was noted that space temperature setpoints can be adjusted via the BMS workstation located in the Recreation Department on the first floor of the building. A description of the BMS can be found in section 5.01.4.

Photo 36. Typical temperature sensor

5.01.2 Existing Cooling Systems

Cooling for the Community Center is provided by a total of four (4) packaged Carrier rooftop units (RTU's) equipped with DX cooling. Cold air is generated by the RTU's and then supplied to spaces throughout the building via individual VAV boxes. Cooling setpoints for each space are controlled by the BMS and monitored by wall-mounted temperature sensors. A summary of the cooling capacities for each RTU is provided in section 5.01.3.

5.01.3 Existing Ventilation Systems

Mechanical ventilation for the Community Center consists of the four (4) Carrier RTU's (Photo 37) and one (1) Magic Aire HV unit (Photo 38) that serve the entire building. The four RTU's are all located on the roof of the building, while the HV unit is located in the basement. There are also various corresponding exhaust fans that serve these spaces (Photo 39).

It was noted that three (3) of the RTU's (RT-1, RT-2, RT-4) serve multiple spaces and contain VAV boxes. All of these systems are controlled by the BMS. Table 14 below shows a summary of the major systems serving the building.

Table 14. Community Center Mechanical Ventilation System Summary

Unit Tag	Area Served	Cooling Capacity (Tons)	Heating Capacity (MBH)	Motor HP	Max. CFM	100% OA Unit (Y/N)
RT-1	Second Floor	6	48.2	3	2,100	No
RT-2	First Floor	5	42.2	2	1,750	No
RT-3	Community Room	25	414.4	10	10,000	No
RT-4	Lower Level	20	138.8	5	6,000	No
HV-1	Basement	-	24	1/3	1,000	Yes

Photo 37. Typical RTU serving Community Center

Photo 38. HV-1 serving Community Center

Photo 39. Typical exhaust fan serving Community Center

5.01.4 Existing Control Systems

All of the HVAC systems at the Community Center are controlled by the building's BMS. The BMS has system summary pages for the hot water system, four (4) RTU systems, and one (1) HV unit system. There are also individual VAV graphics for each of the VAV boxes in the building.

Hot water heating is primarily controlled based on hot water supply temperature. The hot water system is currently set to maintain a constant hot water supply temperature of 165°F. The BMS graphic of the hot water system also allows the user to monitor various control points such as return water temperature, hot water pump status and speed, and system differential pressure (Photo 40).

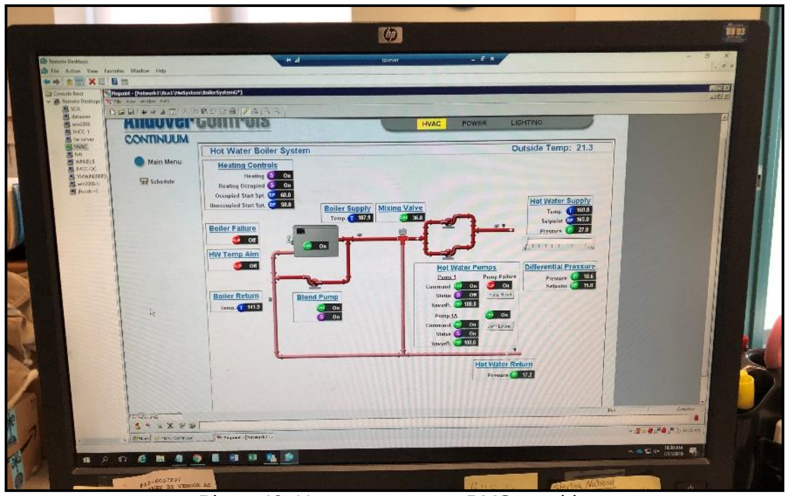

Photo 40. Hot water system BMS graphic

The four (4) RTU's serving the building appear to be controlled by discharge air temperature or static pressure, depending on the unit. Each RTU has its own BMS graphic, where the user can monitor various points such as fan status, damper position, temperature setpoints, and static pressure (Photo 41). It was noted that HV-1, serving the basement, appears to be controlled based on discharge air temperature and does not have the same control points as the RTU's as it is a less complex system (Photo 42).

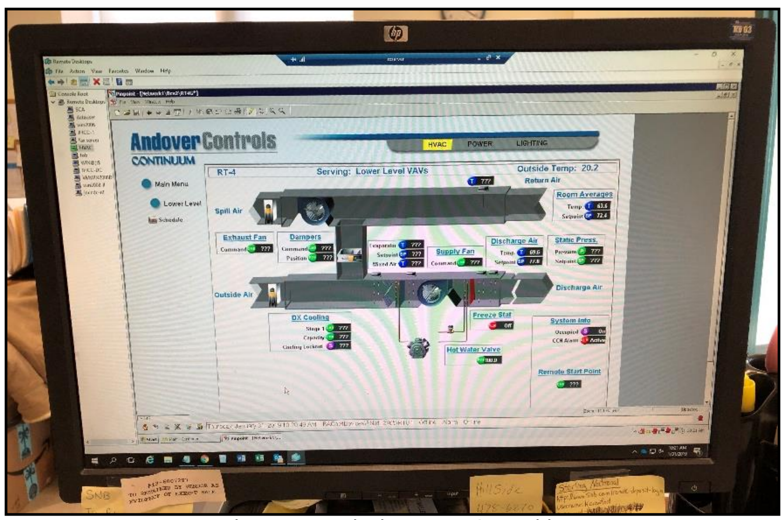

Photo 41. Typical RTU BMS graphic

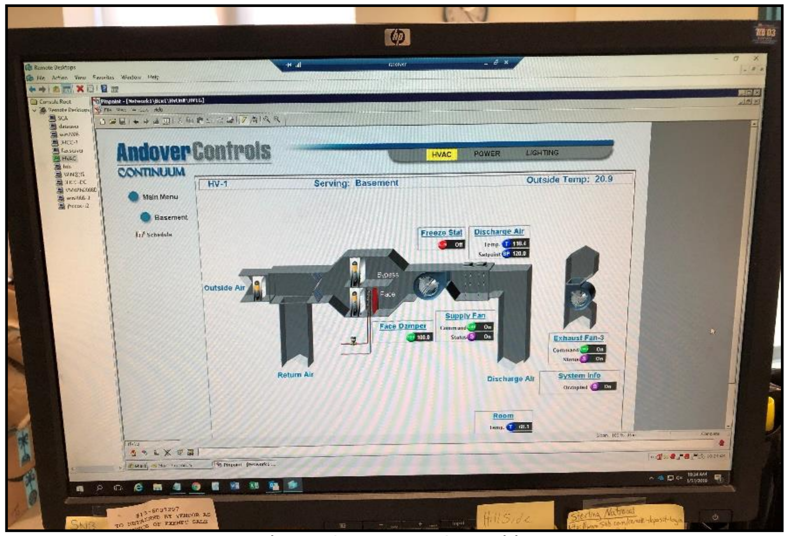

Photo 42. HV-1 BMS graphic

The spaces in the building are separated into zones by VAV boxes on every floor. Each VAV box has an associated wall-mounted temperature sensor, and controls the amount of airflow supplied to the space based on whether it needs heating or cooling. Each VAV box also has its own BMS graphic, where the user can monitor various parameters including damper position and airflow and temperature setpoints (Photo 43). If a VAV box has an associated finned tube radiation zone, the radiation valve status is shown on the graphic as well.

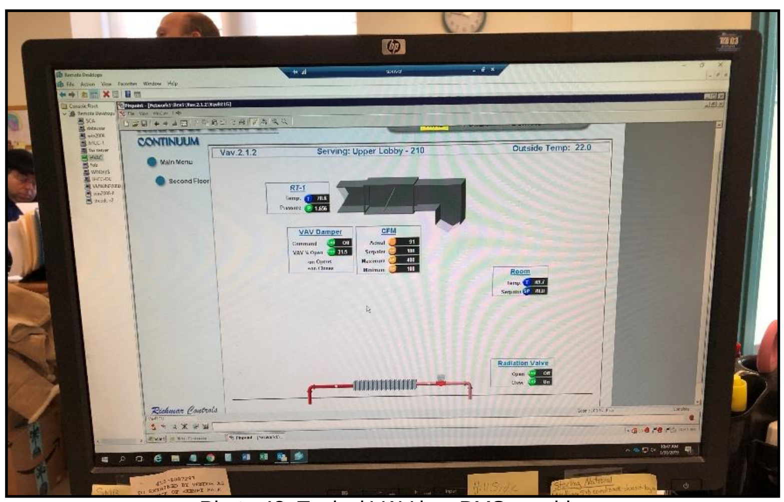

Photo 43. Typical VAV box BMS graphic

5.01.5 Existing Domestic Water Systems

Domestic hot water (DHW) is generated by a combination gas-fired PVI DHW heater and storage tank (Photo 44). The DHW heater has a total capacity of 140 MBH and storage capacity of 125 gallons. The domestic hot water loop is controlled by an aquastat and is set to supply 110°F throughout the building. A summary table of the DHW system is shown below in Table 15.

Table 15. DHW System Summary						
Manufacturer	**Fuel Source**	**Heating Capacity (MBH)**	**Storage Capacity (Gal)**	**HWS Temperature (°F)**	**Quantity**	**Year Installed**
PVI	Natural Gas	140	125	110	1	2007


Photo 44. PVI DHW heater and storage tank

5.01.6 Existing Lighting System

Interior lighting fixtures primarily consist of 32W T8 LED and Fluorescent lamps, which are in all spaces throughout the building (Photos 45 and 46). The lobby and community room have additional ceiling pendants and wall-mounted fixtures that all contain fluorescent lamps (Photos 47 – 49). It was noted that the Community Center is in the process of converting all fixtures to LED lamps.


Photo 45. Typical 32W T8 lighting fixtures in offices

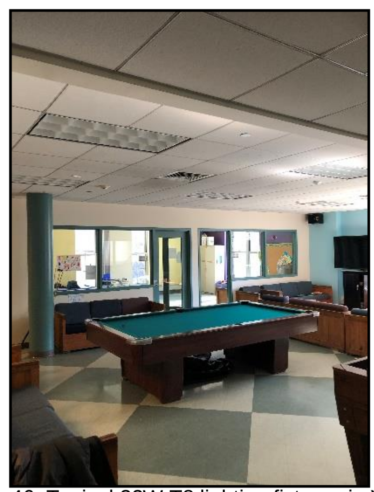
Photo 46. Typical 32W T8 lighting fixtures in Youth services

Photo 47. Lobby ceiling pendants and wall-mounted light fixtures

Photo 48. Community room ceiling pendants

Photo 49. Community room wall-mounted light fixtures

5.01.7 Existing Lighting Controls

Interior lighting is primarily controlled by ceiling-mounted occupancy sensors in each space (Photo 50). Lighting in the community room is controlled manually.

Exterior lighting is controlled by a timer located in the basement electrical room (Photo 51).

Photo 50. Typical occupancy sensor

Photo 51. Timer for exterior lighting

5.02 Community Center Analysis of Present Energy Use

A historical energy use analysis was performed for the energy sources at the Community Center. The following data was analyzed based on 2016-2018 energy consumption and costs. Based on the utility bills provided, OLA was able to calculate a combined site EUI for the building. The Community Center used approximately 107.9 kBtu/ft^2 site energy and had a total energy cost of $43,027 based on 2016-2018 data. Table 16 below provides a summary of the annual energy usage and costs for 2016-2018.

Table 16. 2016-2018 Annual Overall Site Energy

	Energy Usage	kBtu	Cost ($)	Cost ($) per ft^2	Site EUI (kBtu/ft^2)	CO_2 Emissions (lb/year)
Electric (kWh)	209,400	714,473	$30,700	$1.81	42.0	133,399
Natural Gas (therm)	11,213	1,121,250	$12,327	$0.73	65.9	131,284
Total		1,835,723	$43,027	$2.53	107.9	264,683
Gross Area (ft^2)		17,000				

Figure 21 provides the annual site EUI per energy type based on analysis of the utility bills for 2016-2018. Figure 22 provides the annual energy cost summary by energy type from the same average year. Natural gas for heating is the dominant energy source for this building, and is projected to account for 61% of the overall energy consumption of the building. However, natural gas only accounts for 29% of the cost, due to the higher cost of electricity. Figure 23 provides the annual CO_2 emissions breakdown by energy type.

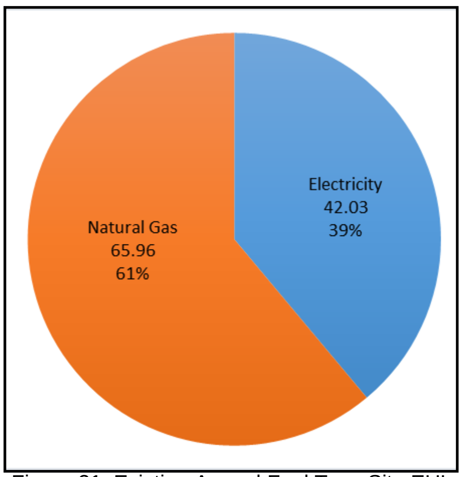

Figure 21. Existing Annual Fuel Type Site EUI Breakdown in kBtu/ft.^{2}

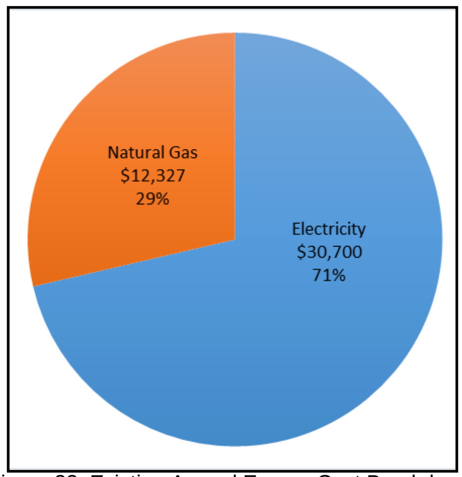

Figure 22. Existing Annual Energy Cost Breakdown

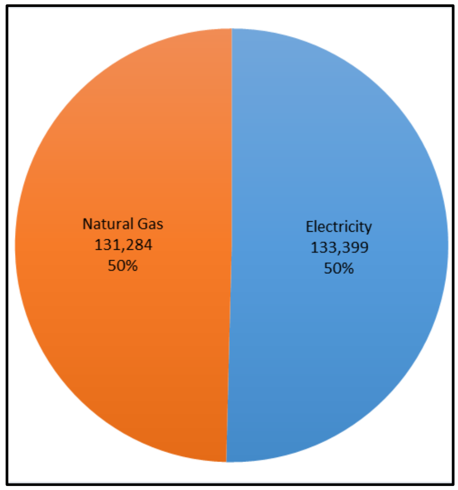

Figure 23. Existing Annual CO_2 Emissions Breakdown in lb/year

5.02.1 Electrical Usage

The historical electric usage for the Community Center is shown in Figure 24. Peak electricity usage typically occurs during the summer months (May – September), likely due to the need to run the window AC units in order to cool the building. The highest monthly usage recorded during this time was 21,680 kWh during August 2018.

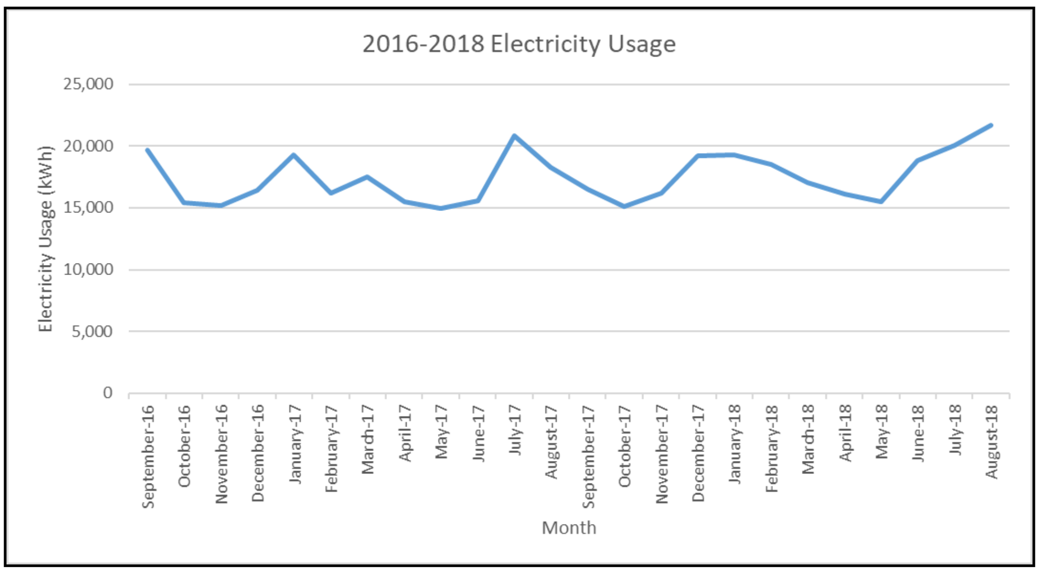

Figure 24. 2016 – 2018 Historical Electricity Use

The historical electric demand is shown in Figure 25. Similar to the historical electricity usage above, the building's peak demand typically occurs between May and September. The highest recorded demand of 81.6 kW occurred in September 2016.

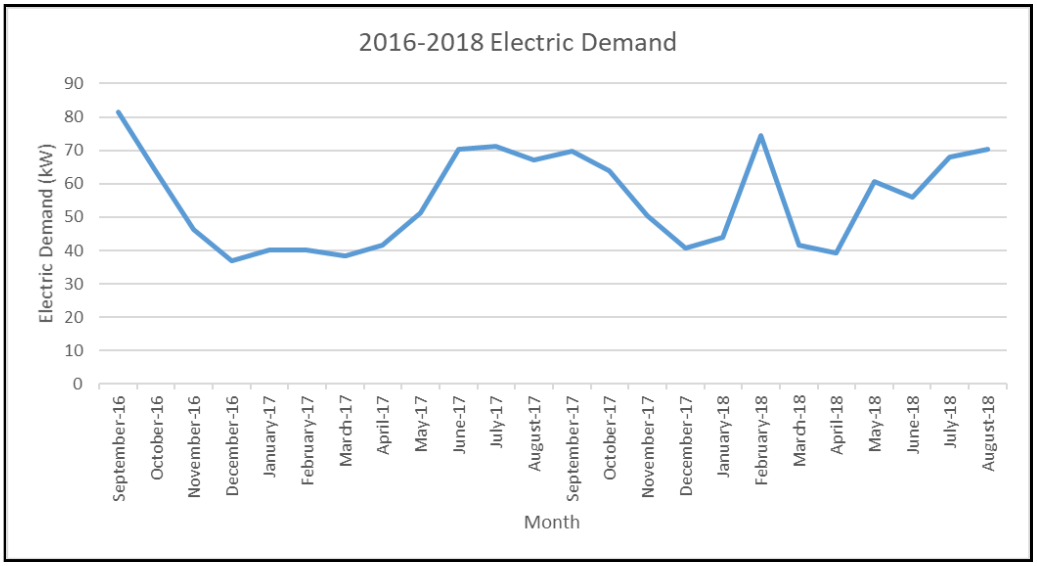

Figure 25. 2016 – 2018 Historical Electric Demand

OLA was provided with complete electric utility bills for this analysis, and determined an average blended electricity rate of 0.147 $/kWh based on the bills provided.

5.02.2 Natural Gas Usage

Figure 26 below shows the historical 2016-2018 natural gas usage for the Community Center. Since gas in this building is used for heating only, usage is found to be highest during the winter months. A peak usage of 2,726 therms was recorded in December 2017.

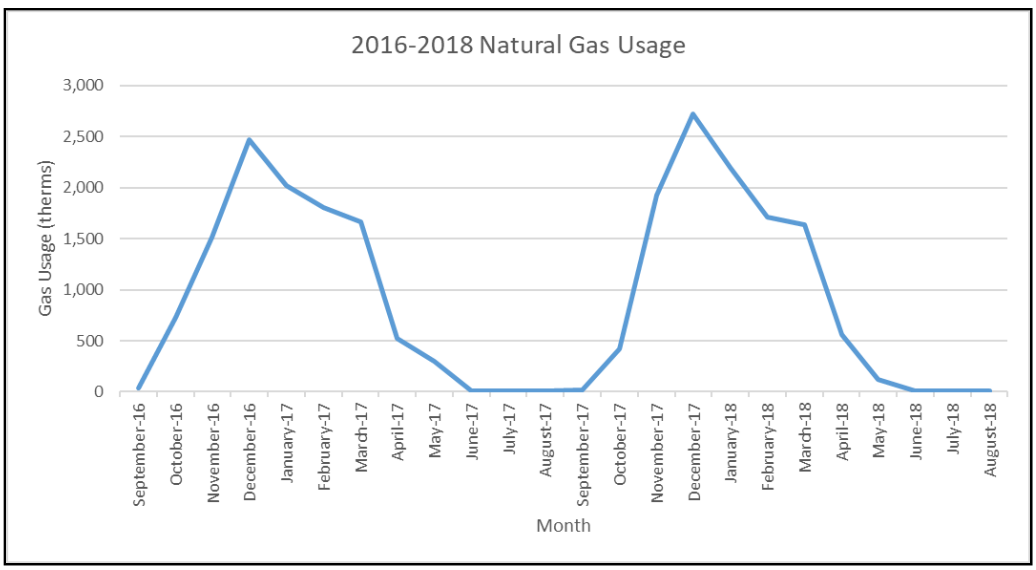

Figure 26. 2016 – 2018 Historical Natural Gas Usage

OLA was provided with complete utility bills for this analysis and determined a natural gas of 1.10 $/therm based on the bills provided. For the purposes of this study, this calculated rate was used to estimate energy cost savings.

5.02.3 Utility Rates and Costs

The Community Center is served by one (1) electric meter and one (1) gas meter. Estimated demand, energy, and blended electric and gas rates for the building were determined based on monthly usage and monthly charges. For the purposes of this study, all energy cost savings were based on calculated average utility rates. Electricity energy cost savings were based on average demand and energy charges. Table 17 below shows a breakdown of the utility rates for each fuel source.

Table 17. Utility Rates

Utility	Unit	2016/17	2017/18	Average
Electric	$/kW	$25.08	$27.13	$26.11
	$/kWh	$0.062	$0.065	$0.064
	$/kWh (Blended)	$0.142	$0.151	$0.147
Natural Gas	$/therm	$1.05	$1.15	$1.10

5.02.4 Energy Utilization

Figure 27 below shows the breakdown of energy intensity (kBtu/ft^2) by end use type. The results confirm that fuel consumed to run the heating plant accounts for the largest portion of the site energy use and cost.

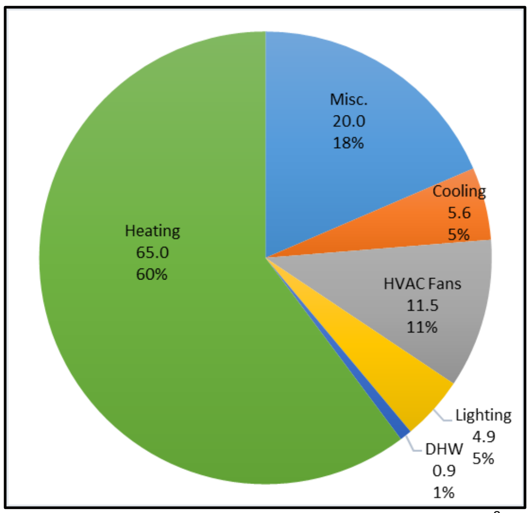

Figure 27. Energy End Use Breakdown in kBtu/ft.^{2}

5.03 Energy Efficiency Measures (EEMs)

Short Term EEM's

5.03.1 EEM 1 – LED Lighting Retrofits

This measure investigates the impact on energy consumption of reduced lighting power density utilizing high efficiency LED lighting technology and retrofit products throughout the building. The new LED lighting will result in a reduced lighting power density and potential for high savings. All of the typical 32W T8 fluorescent lighting throughout the Community Center and the existing wall-mounted fluorescent fixtures in the multi-purpose room could be replaced with LED retrofit products. The existing lighting power density of the building is estimated to be 0.56 W/ft^2. The resulting lighting power density of the entire facility is estimated to be in the range of 0.42 W/ft.^{2} after a complete retrofit. Note that the Community Center is already in the process of converting all fixtures to LED lamps.

5.03.2 EEM 2 – Rescheduling of RTU's

The current operating hours of the HVAC equipment at the Community Center appears to not be synchronized with the actual weekly occupied hours at the building. This measure studies the potential savings from reducing the run hours on the four (4) RTU's serving the building. Adjusting the run hours could provide a significant electricity savings, and reduce the overall site and source EUI.

5.03.3 EEM 3 – Variable Frequency Drives (VFD's) on RT-3 and RT-4

Installing VFD's on RT-3 and RT-4 and making these units variable air volume (VAV) systems would allow the supply and exhaust fans on these units to modulate based on space temperature (or duct static pressure in the case of RT-4). If space temperature setpoint is met, the fans will modulate to a preset minimum speed, thereby reducing fan energy costs while still providing ventilation.

Long Term EEM's

5.03.4 EEM 4 – Heating Plant Upgrades: High Efficiency Gas-Fired Hot Water Boiler

This project would eliminate the existing standard efficiency gas-fired boiler at the community center and install a new high efficiency, condensing boiler for heating. We estimate that the boiler efficiency of the existing heating plant is approximately 81%. Current best achievable hot water boiler efficiency is in the range of 90% – 91% when used to serve an existing building.

Figure 28. Aerco condensing boiler

5.03.5 EEM 5 – Supplemental Domestic Hot Water Heat Pump

Supplementing the existing gas-fired domestic hot water heater with a 125-gallon electric heat pump system should be considered in the future. Providing the building with a high efficient electric heat pump water heater would reduce the site EUI of the building and CO_2 emissions.

Figure 29. Typical residential style DHW heat pump

6.0 Hook and Ladder Fire Company

6.01 Existing Conditions

The Hook and Ladder Fire Company building is a 2-story, 9,000 square foot volunteer fire department located at 50 Main Street in Hastings-on-Hudson, NY and was constructed in the early 1900s. It was noted that the building has been converted for many different purposes and the original construction has been altered significantly over time. The first floor contains the main garage, kitchen, workout room, and lounge area for the fire company, while the second floor contains the chief's office and additional lounge space. There is also a basement level that contains the mechanical equipment serving the building. Photos 52 and 53 shows an aerial and exterior view of the building.

Photo 52. Aerial view of Hook and Ladder Co.

Photo 53. Hook and Ladder Co. exterior

As Hook and Ladder Co. is considered a volunteer fire department, at least one volunteer is present at the building on a daily basis. However, based on observations made during the survey and through interviewing building staff it appears the building is unoccupied at night. Volunteers will typically only occupy the building in the case of a fire call during these hours.

6.01.1 Existing Heating Systems

Heating for the building is provided by one (1) gas-fired hot water boiler manufactured by Weil McLain (Photo 54). The boiler has a gross capacity of 296 MBH. Hot water generated by the boiler is distributed throughout the building via four (4) inline hot water recirculation pumps that separate the building into four (4) separate zones which include the Chief's office, truck room (main garage), bar room, and the second floor lounge space. Each zone contains perimeter finned tube radiation for heating (Photo 55). It was noted that the large majority of hot water piping is uninsulated. A summary of the heating plant is shown below in Table 18.

Table 18. Hook and Ladder Heating Plant Summary

Manufacturer	Type	Capacity (MBH)	Fuel Source	Quantity	Year Installed	Typical Boiler Operating Time
Weil McLain	Hot Water	296	Natural Gas	1		Always active

Photo 54. HW boiler serving Hook and Ladder Co.

Photo 55. Typical finned tube radiation

Each heating zone is controlled by a local wall-mounted thermostat, which controls the finned tube radiation in that particular zone (Photo 56). It was noted that the thermostat controlling the finned tube radiation in the bar room appears to have recently been replaced. Building staff indicated that thermostats are typically kept at a constant temperature setpoint (approximately 70°F) during the heating season.

Photo 56. Typical heating thermostat

6.01.2 Existing Cooling Systems

Cooling is provided by a combination of window AC units and Mitsubishi split AC units (Photos 57 and 58). There are two (2) window AC units, which serve the first floor workout room and second floor lounge space. Each window AC unit has an approximate capacity of 1 – 1.5 tons (12-18 MBH) of cooling. There are also three (3) Mitsubishi split AC units, which serve the bar room and Chief's office respectively. The two (2) units serving the bar room have a capacity of 2.5 tons (24-30 MBH) each, and the unit serving the Chief's office has a total capacity of 3 tons (36 MBH). A summary of the cooling systems serving the building is shown below in Table 19.

Table 19. Hook and Ladder Cooling Plant Summary				
Type	**Area Served**	**Manufacturer**	**Total Capacity (Tons)**	**Total Quantity**
Window AC unit	Workout room, Second Floor Lounge	-	1.5	2
Split AC unit	Bar Room, Chief's Office	Mitsubishi	2.5 – 3	3

Photo 57. Typical window AC unit

Photo 58. Mitsubishi split AC unit serving bar room

6.01.3 Existing Ventilation Systems

Hook and Ladder Co. does not have any mechanical ventilation systems. Ventilation is only provided when opening windows and doors in the building.

6.01.4 Existing Domestic Water Systems

Domestic hot water (DHW) is generated by a combination gas-fired Rheem DHW heater and storage tank, which is located in the basement (Photo 16). The DHW heater has a total capacity of 40 MBH and storage capacity of 50 gallons. A summary of the DHW system is shown below in Table 20.

Table 21. Hook and Ladder DHW System Summary						
Manufacturer	**Fuel Source**	**Heating Capacity (MBH)**	**Storage Capacity (Gal)**	**HWS Temperature (°F)**	**Quantity**	**Year Installed**
Rheem	Natural Gas	40	50	-	1	2003


Photo 59. Rheem DHW heater

6.01.5 Existing Lighting System

Interior lighting primarily consists of 32W T8 fluorescent and round 13W LED light fixtures found in the main garage, chief's office, bar room, and kitchen (Photos 60 and 61). There are additional light fixtures that contain Satco T8 U-tube shaped fluorescent lamps found in the workout room and second floor lounge (Photo 62).


Photo 60. Typical T8 fluorescent lighting


Photo 61. Typical LED lighting


Photo 62. Typical Satco T8 lighting

6.01.6 Existing Lighting Controls

The majority of lighting in the building is controlled manually by toggle switches. However, there is a row of lights in the truck room that is controlled by a wall-mounted occupancy sensor (Photo 63).

Photo 63. Occupancy sensor in truck room

6.02 Hook and Ladder Fire Company Analysis of Present Energy Use

A historical energy use analysis was performed for the energy sources at Hook and Ladder Fire Company. The following data was analyzed based on yearly energy consumption and costs. Based on the utility bills provided, OLA was able to calculate a combined site EUI for the building. The building used approximately 71.1 kBtu/ft^2 site energy and had a total energy cost of $7,419 based on 2016-2018 data. Table 22 below provides a summary of the annual energy usage and costs for 2016-2018.

Table 22. 2016-2018 Annual Overall Site Energy

	Energy Usage	kBtu	Cost ($)	Cost ($) per ft^2	Site EUI (kBtu/ft^2)	CO_2 Emissions (lb/year)
Electric (kWh)	8,646	29,500	$723	$0.08	3.3	5,508
Natural Gas (therm)	6,105	610,450	$6,696	$0.74	67.8	71,476
Total		639,950	$7,419	$0.82	71.1	76,984
Gross Area (ft^2)		9,000				

Figure 30 provides the annual site EUI per energy type based on analysis of the utility bills for 2016-2018. Figure 31 provides the annual energy cost summary by energy type from the same year. Natural gas for heating is the dominant energy source for this building and is projected to account for 95% of the overall energy consumption of the building, and 90% of the total cost. The large gas usage is likely due to the heating plant constantly running to achieve the building temperature setpoint of 70°F. This is because building staff do not lower the zone thermostats during unoccupied hours. Figure 32 provides the annual CO_2 emissions breakdown by energy type.

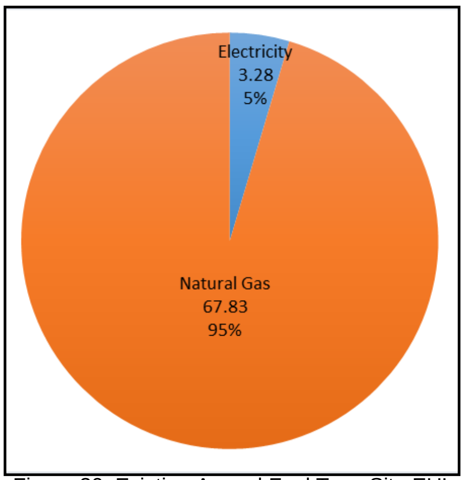

Figure 30. Existing Annual Fuel Type Site EUI Breakdown in kBtu/ft.^{2}

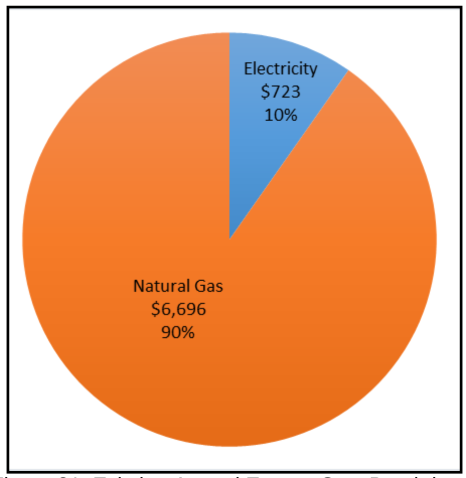

Figure 31. Existing Annual Energy Cost Breakdown

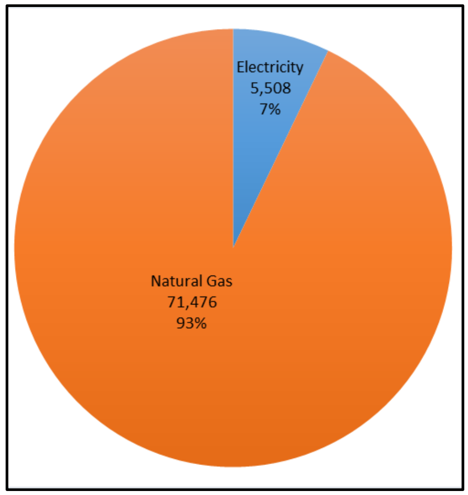

Figure 32. Existing Annual CO_2 Emissions Breakdown in lb/year

6.02.1 Electrical Usage

The historical electric usage for Hook and Ladder Fire Company is shown in Figure 33. Peak electricity usage typically occurs during the summer months (May – September), likely due to the need to run the window AC units in order to cool the building. The highest monthly usage recorded during this time was 1,320 kWh during August 2018.

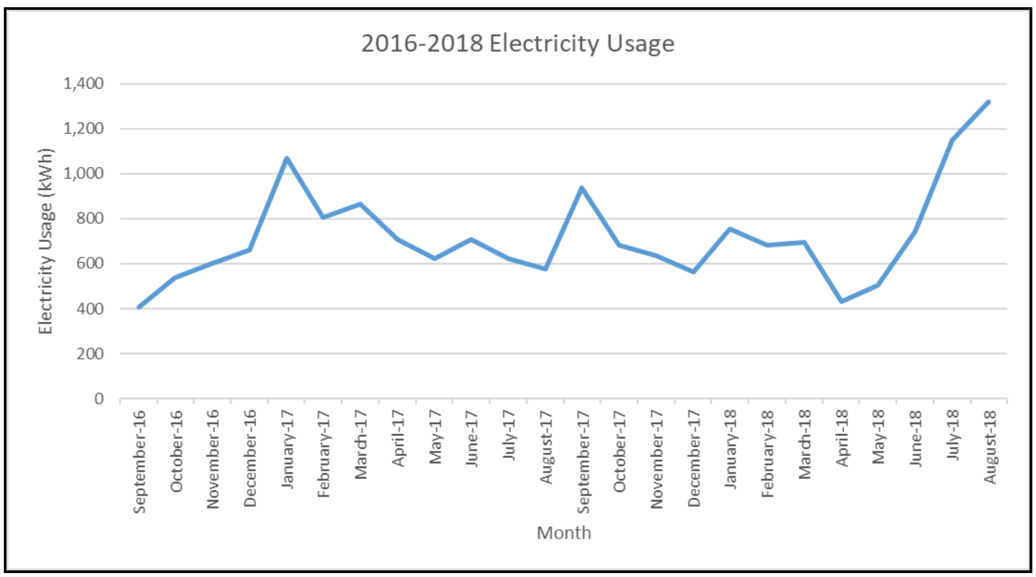

Figure 33. 2016 – 2018 Historical Electricity Use

It was noted that the building moved away from demand based electricity usage in 2017.

OLA was provided with complete electric utility bills for this analysis, and determined an electricity rate of 0.066 $/kWh based on the bills provided. For the purposes of this study, this calculated rate was used to estimate energy cost savings. Note that this rate was determined using the bills from when the building switched to a new rate structure (January 2017 – present).

6.02.2 Natural Gas Usage

Figure 34 below shows the historical 2016-2018 natural gas usage for the building. Since gas in this building is used for heating only, usage is found to be highest during the winter months. A peak usage of 1,366 therms was recorded in December 2017.

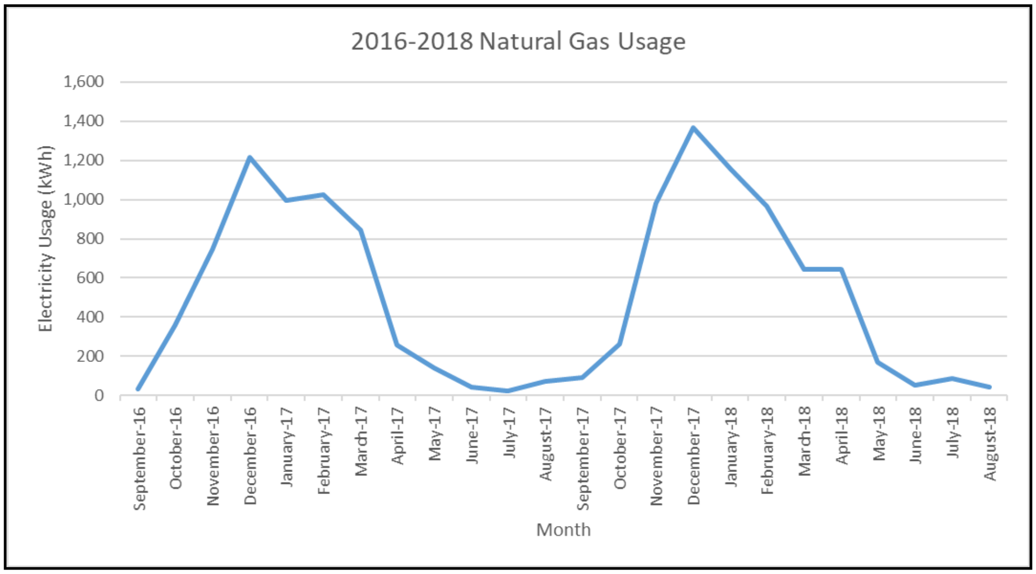

Figure 34. 2016-2018 Historical Natural Gas Usage

OLA was provided with complete utility bills for this analysis and determined an average natural gas of 1.10 $/therm based on the bills provided. For the purposes of this study, this calculated rate was used to estimate energy cost savings.

6.02.3 Utility Rates and Costs

Hook and Ladder Company is served by one (1) electric meter and one (1) gas meter. Estimated electric and gas rates for the building were determined based on monthly usage and monthly charges. For the purposes of this study, electricity energy cost savings were based on the 2017/18 utility rate as mentioned in section 6.02.1. Natural gas energy cost savings were based on the calculated average utility rate. Table 23 below shows a breakdown of the utility rates for each fuel source.

Table 23. Utility Rates

Utility	Unit	2016/17	2017/18	Average
Electric	$/kWh	-	$0.066	-
Natural Gas	$/therm	$1.03	$1.16	$1.10

6.02.4 Energy Utilization

Figure 35 below shows the breakdown of energy intensity (kBtu/ft^2) by end use type. The results confirm that fuel consumed to run the heating plant accounts for the largest portion of the site energy use and cost.

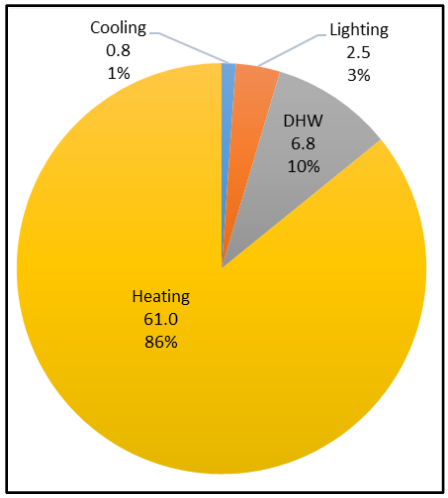

Figure 35. Energy End Use Breakdown in kBtu/ft.^{2}

6.03 Energy Efficiency Measures (EEMs)

Short Term EEM's

6.03.1 EEM 1 – LED Lighting Retrofits

This measure investigates the impact on energy consumption of reduced lighting power density utilizing high efficiency LED lighting technology and retrofit products throughout the building. The new LED lighting will result in a reduced lighting power density and potential for high savings. All of the typical 32W T8 fluorescent lighting in the building could be replaced with LED retrofit products. The existing lighting power density of the building is estimated to be 0.43 W/ft^2. The resulting lighting power density of the entire facility is estimated to be in the range of 0.31 W/ft.^{2} after a complete retrofit.

6.03.2 EEM 2 – Lighting Controls Upgrades

This measure investigates the energy reduction associated with installing occupancy lighting control sensors. This building currently has no form of automatic lighting controls installed. The occupancy sensors would automatically turn lights on and off depending on whether the space is occupied. This measure will prevent lights from staying on for extended periods of time while the spaces are not being used. Note that savings for this measure is based on EEM 1 being implemented.

6.03.3 EEM 3 – Hot Water Piping Insulation

As the majority of hot water piping in the basement is uninsulated, this measure estimates the energy reduction and cost savings associated with installing standard 1" pipe insulation on all of the accessible piping.

6.03.4 EEM 4 – Heating Night Setback

This measure assesses the energy reduction and cost savings associated with implementing a night setback heating setpoint for the boiler. All of the existing dial Honeywell thermostats could be replaced with programmable thermostats that have the ability to adjust heating setpoints based on a predetermined occupied and unoccupied schedule. Lowering the heating setpoint will reduce boiler run time and reduce the overall EUI of the building.

Figure 36. Typical Honeywell programmable thermostat

Long Term EEM's

6.03.5 EEM 5 – Heating Plant Upgrades: High Efficiency Gas-Fired Hot Water Boiler

This project would eliminate the existing standard efficiency gas-fired boiler at the building and install a new high efficiency, condensing boiler for heating. We estimate that the boiler efficiency of the existing heating plant is approximately 81%. Current best achievable hot water boiler efficiency is in the range of 90% – 91%.

7.0 Ambulance Corps Garage

7.01 Existing Conditions

Hastings-on-Hudson Ambulance Corps garage is a 1-story, 3,600 square foot volunteer ambulance garage located at 47 Main Street in Hastings-on-Hudson, NY and was constructed in 1979. The first floor contains the main garage, kitchen/lounge area, bathroom, and boiler room for the garage. Photos 64 and 65 show an aerial and exterior view of the building.

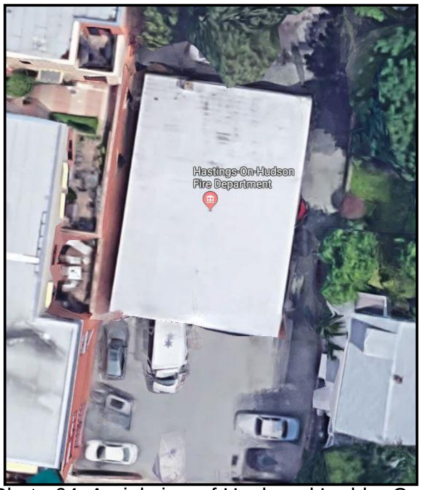

Photo 64. Aerial view of Hook and Ladder Co.


Photo 65. Ambulance Garage exterior

As the ambulance garage is considered a volunteer ambulatory service, there are no permanent occupants at the building. Based on observations made during the survey, it appears the building is typically occupied by one or two volunteers during the day and unoccupied at night. Volunteers likely only occupy the building in the case of an emergency call during night hours. It was noted that no volunteers were present at the building during the site survey.

7.01.1 Existing Heating Systems

Heating for the building is provided by one (1) gas-fired hot water boiler manufactured by Bunrham (Photo 16). The size of the boiler plant was unable to be verified, as the boiler did not have any nameplate data and OLA was unable to open the front panel of the boiler. Hot water generated by the heating plant is distributed to various perimeter radiators located in the main garage (Photo 67). There appears to be no form of heating for the kitchen and lounge area. A summary of the heating plant is shown below in Table 24.

Table 24. Ambulance Garage Heating Plant Summary

Manufacturer	Type	Capacity (MBH)	Fuel Source	Quantity	Year Installed	Typical Boiler Operating Time
Burnham	Hot Water		Natural Gas	1		

Photo 66. HW boiler serving Ambulance Garage

Photo 67. Typical hot water radiator

Heating for the building is controlled by a local wall-mounted thermostat, which controls all of the perimeter radiators in the main garage (Photo 68). It was noted that the thermostat is enclosed in a plastic casing, and appears to be left at a constant temperature between 75 – 80°F.

Photo 68. Thermostat serving Ambulance Garage

7.01.2 Existing Cooling Systems

Cooling for the building is provided by three (3) Friedrich window AC units, which serve the main garage and lounge area respectively (Photos 69 and 70). Each window AC unit has an approximate capacity of 1 – 1.5 tons (12-18 MBH) of cooling, and is remotely controlled. A summary of the window AC units serving the building is shown below in Table 25.

Table 25. Ambulance Garage Cooling Plant Summary

Type	Manufacturer	Total Capacity (Tons)	Estimated Total Quantity
Window AC unit	Friedrich	1 – 1.5	3

Photo 69. Typical window AC unit serving lounge area

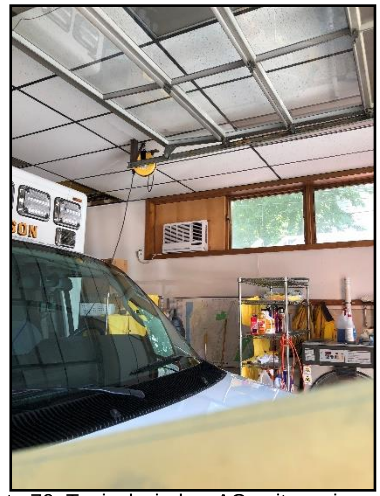

Photo 70. Typical window AC unit serving main garage

7.01.3 Existing Ventilation Systems

There is no mechanical ventilation system serving the Ambulance Garage. Ventilation is primarily provided by opening windows and the garage doors. It was noted that there is a vent located in the main garage that could provide ventilation for the space, but its purpose could not be confirmed (Photo 71).

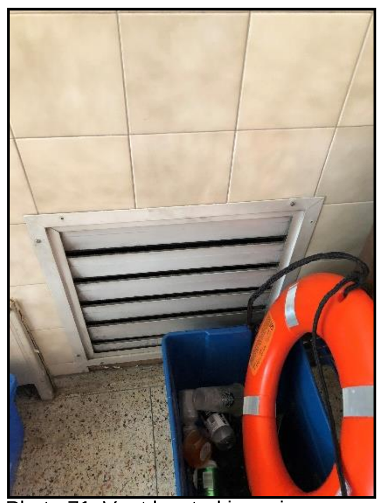

Photo 71. Vent located in main garage

7.01.4 Existing Domestic Water Systems

Domestic hot water (DHW) is generated by a combination gas-fired Bradford White DHW heater and storage tank, which is located in the boiler room (Photo 72). The DHW heater has a total capacity of 40,000 Btu/hr and storage capacity of 40 gallons. A summary of the DHW system is shown below in Table 26.

Table 26. Ambulance Garage DHW System Summary

Manufacturer	Fuel Source	Heating Capacity (MBH)	Storage Capacity (Gal)	Quantity	Year Installed
Bradford White	Natural Gas	40	40	1	2014

Photo 72. Bradford White DHW heater

7.01.5 Existing Lighting System

Interior lighting primarily consists of 2 and 3-bulb T8 fluorescent light fixtures containing Sylvania 32W T8 fluorescent lamps. These fixtures are found throughout the main garage and lounge area (Photos 73 and 74).

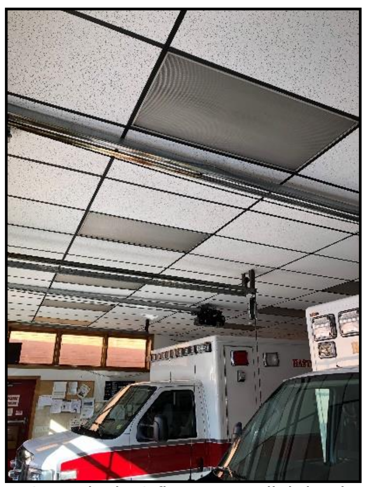
Photo 73. Typical T8 fluorescent lighting in main garage


Photo 74. Typical T8 fluorescent lighting in lounge area

Exterior lighting is minimal and typically features round ceiling mounted fixtures, which appear to contain fluorescent bulbs (Photo 75).

Photo 75. Typical exterior lighting

7.01.6 Existing Lighting Controls

All interior lighting is controlled manually by toggle switches (Photo 76). Exterior lighting appears to be controlled by timers, but this could not be verified (Photo 77).


Photo 76. Typical manual light switches


Photo 77. Timers appear to be for exterior lighting

7.02 Ambulance Corps Garage Analysis of Present Energy Use

A historical energy use analysis was performed for the energy sources at the Ambulance Corps garage. The following data was analyzed based on yearly energy consumption and costs. Based on the utility bills provided, OLA was able to calculate a combined site EUI for the building. Note that OLA was only provided with invoices for gas bills, and actual usage for this building was inferred based on monthly $/therm rates calculated from Hook and Ladder Co. gas bills. The building used approximately 68.3 kBtu/ft² site energy and had a total energy cost of $4,937 based on 2017-2018 data. OLA could not calculate an average EUI over multiple years due to the limited amount of utility bills provided. Table 27 below provides a summary of the annual energy usage and costs for 2017-2018.

Table 27. 2017-2018 Annual Overall Site Energy

	Energy Usage	kBtu	Cost ($)	Cost ($) per ft²	Site EUI (kBtu/ft²)	CO_2 Emissions (lb/year)
Electric (kWh)	12,121	43,713	$3,227	$1.34	17.2	7,722
Natural Gas (therm)	1,225	122,479	$1,710	$0.71	51.0	14,341
Total		163,836	$4,937	$2.06	68.3	22,062
Gross Area (ft²)		2,400				

* Inferred based on monthly $/therm unit prices from Hook and Ladder Co.

Figure 37 provides the site EUI per energy type based on analysis of the utility bills for 2017-2018. Figure 38 provides the energy cost summary by energy type from the same year. Natural gas for heating is the dominant energy source for this building, and is projected to account for 75% of the overall energy consumption of the building, and 35% of the total cost. Figure 39 provides the annual CO_2 emissions breakdown by energy type.

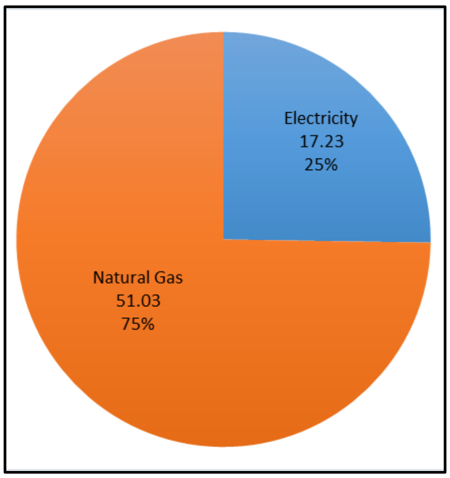

Figure 37. Existing Annual Fuel Type Site EUI Breakdown in kBtu/ft.²

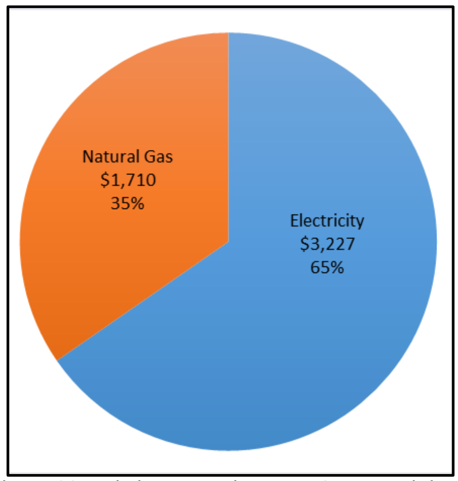

Figure 38. Existing Annual Energy Cost Breakdown

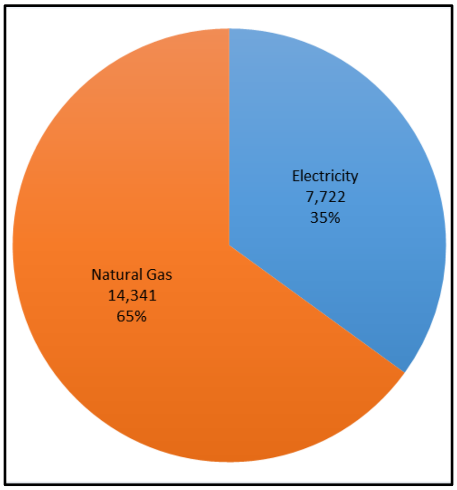

Figure 39. Existing Annual CO_2 Emissions Breakdown in lb/year

7.02.1 Electrical Usage

The historical electric usage for the Ambulance Corps garage is shown in Figure 40. Peak electricity usage typically occurs during the summer months (May – September), likely due to the need to run the window AC units in order to cool the building. The highest monthly usage recorded during this time was 2,026 kWh during July 2016.

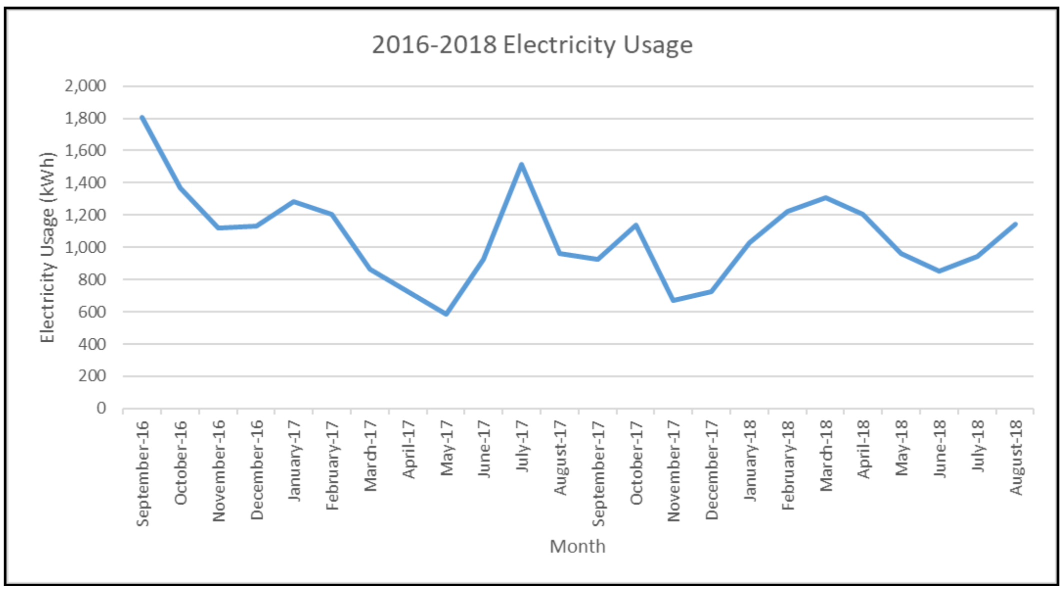

Figure 40. 2016 – 2018 Historical Electricity Use

OLA was provided with complete electric utility bills for this analysis, and determined an electricity rate of 0.266 $/kWh based on the bills provided. For the purposes of this study, this calculated rate was used to estimate energy cost savings.

7.02.2 Natural Gas Usage

Figure 41 below shows the historical 2017-2018 natural gas usage for the building. As OLA was only provided with invoices from monthly gas bills, the actual usage has been inferred based on monthly $/therm unit prices calculated from the Hook and Ladder Co. gas bills. A peak usage of 186 therms was recorded in December 2017.

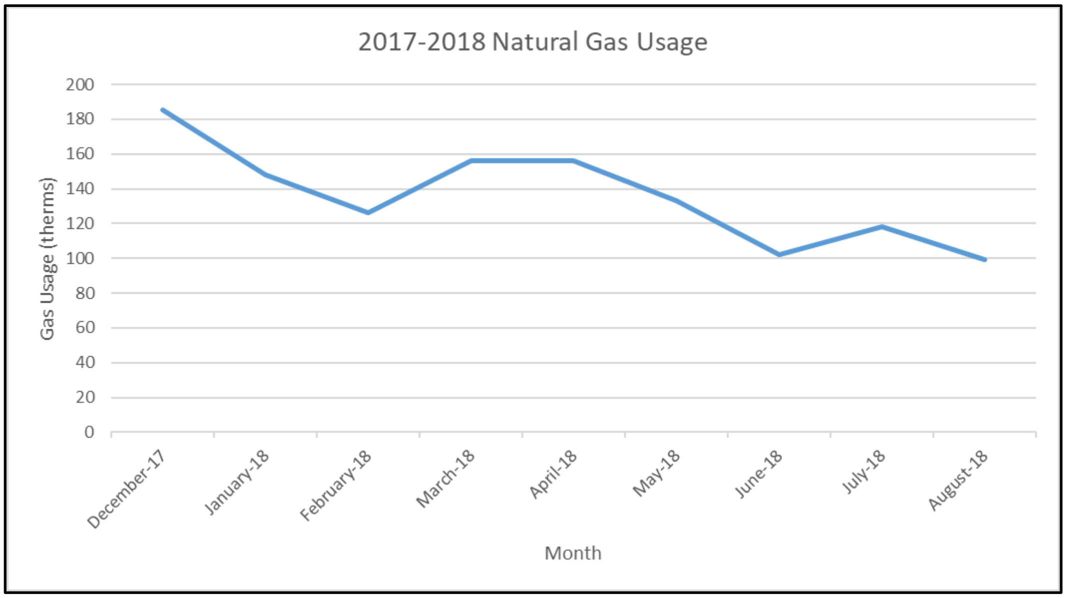

Figure 41. 2017-2018 Historical Natural Gas Usage

OLA was not provided with complete utility bills for this analysis and could not determine an actual natural gas rate. Invoices for natural gas bills were provided for the months December 2017 – August 2018. The total cost from these months was used as the annual gas utility cost for this building. For the purposes of this study, an estimated natural gas rate of $1.40/therm was calculated based on the inferred gas usage (determined by monthly $/therm rates from Hook and Ladder Co.) and the annual gas utility cost based on the invoices provided. This calculated rate was used to estimate energy cost savings.

7.02.3 Utility Rates and Costs

The Ambulance Corps garage is served by one (1) electric meter and one (1) gas meter. Estimated electric and gas rates for the building were determined based on monthly usage and monthly charges. For the purposes of this study, all energy cost savings were based on 2017/18 utility rates. Table 28 below shows a breakdown of the utility rates for each fuel source.

Table 28. Utility Rates

Utility	Unit	2016/17	2017/18
Electric	$/kWh	$0.249	$0.266
Natural Gas	$/therm	-	$1.40

7.02.4 Energy Utilization

Figure 42 below shows the breakdown of energy intensity (kBtu/ft^2) by end use type. The results confirm that fuel consumed to run the heating plant accounts for the largest portion of the site energy use and cost.

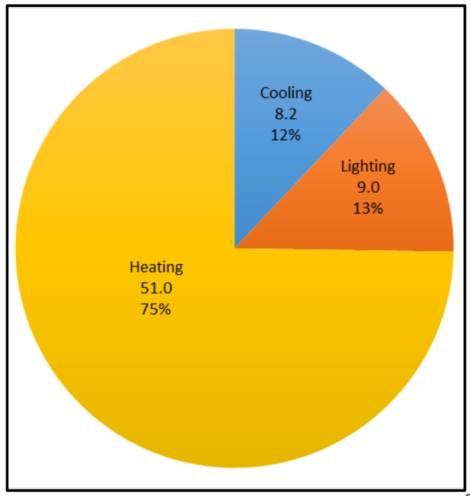

Figure 42. Energy End Use Breakdown in kBtu/ft.^{2}

7.03 Energy Efficiency Measures (EEMs)

Short Term EEM's

7.03.1 EEM 1 – LED Lighting Retrofits

This measure investigates the impact on energy consumption of reduced lighting power density utilizing high efficiency LED lighting technology and retrofit products throughout the building. The new LED lighting will result in a reduced lighting power density and potential for high savings. All of the typical 34W T8 fluorescent lighting in the building could be replaced with LED retrofit products. The existing lighting power density of the building is estimated to be 0.72 W/ft^2. The resulting lighting power density of the entire facility is estimated to be in the range of 0.49 W/ft.^{2} after a complete retrofit.

7.03.2 EEM 2 – Night Setback Heating

This measure assesses the energy reduction and cost savings associated with implementing a night setback heating setpoint for the boiler. The existing Honeywell thermostat could be replaced with a programmable thermostat that has the ability to adjust heating setpoint based on a predetermined occupied and unoccupied schedule. Lowering the heating setpoint will reduce boiler run time and reduce the overall EUI of the building.

8.0 Chemka Pool Building

8.01 Existing Conditions

The Chemka pool building is a 1-story, 4,200 square foot pool building and locker room facility located at Hillside Avenue in Hastings-on-Hudson, NY. The building contains a lifeguard staff work and lounge area, as well as male and female locker rooms. There is also a lower level that contains mechanical and filtration equipment for the pool complex. Photos 78 and 79 show an aerial and exterior view of the building.

Photo 78. Aerial view of Chemka pool

Photo 79. Chemka pool building exterior

Hours for the pool building vary throughout the summer of 2018. The pool is typically occupied from 12:00pm – 8:00pm on weekdays 10:00am – 8:00pm on weekends during the summer. A detailed breakdown of the occupancy hours at the Chemka Pool is shown below in Table 29. The pool opened on May 23 and closed on September 9, 2018. The pool building is unoccupied during the offseason.

Table 29. Chemka Pool Building Operating Hours

Date	**Time**	**Monday**	**Tuesday**	**Wednesday**	**Thursday**	**Friday**	**Weekend**
5/23 – 6/23 & 8/20 – 9/2	12:00pm	Building opens	Building opens	Building opens	Building opens	Building opens	Building open 10:00am – 8:00pm
	8:00pm	Building closes	Building closes	Building closes	Building closes	Building closes	
6/24 – 8/19	12:30pm	Building opens	Building opens	Building opens	Building opens	Building opens	Building open 10:00am – 8:00pm
	8:00pm	Building closes	Building closes	Building closes	Building closes	Building closes	
9/3 – 9/9	3:00pm	Building opens	Building opens	Building opens	Building opens	Building opens	Building open 11:00am – 7:00pm
	7:00pm	Building closes	Building closes	Building closes	Building closes	Building closes	

8.01.1 Existing Pool Filtration Systems

The Chemka Pool complex features three (3) different pools: the main pool, training pool, and wading pool. Each pool contains its own dedicated feature pump and chemical monitoring system (Photos 80 and 81). The main and training pools also have their own dedicated filtration tanks, which collect and filter the pool water before it is pumped to its respective pool.


Photo 80. Main pool feature pump


Photo 81. Typical pool chemical monitoring system

8.01.2 Existing Heating Systems

As the pool building is used seasonally, there is no heating plant serving the locker rooms and staff area. The locker room and staff areas are winterized during the off season. The pool equipment room is heated by a wall-mounted electric resistance heater to protect that equipment.

8.01.3 Existing Cooling Systems

There is no form of mechanical cooling at the pool building. The only conditioning for the locker rooms and staff office is provided by natural airflow through doorways.

8.01.4 Existing Ventilation Systems

There is no mechanical ventilation system serving the pool building. Ventilation is provided only by natural airflow through the locker rooms and staff office as noted above.

8.01.5 Existing Domestic Water Systems

Domestic hot water (DHW) is generated by two (2) combination electric Rheem DHW heaters and storage tanks located in the building (Photo 82). Each DHW heater has a total input capacity of 9 kW and storage capacity of 120 gallons. A summary of the DHW system is shown below in Table 30.

Table 30. Chemka Pool Building DHW System Summary

Manufacturer	**Fuel Source**	**Heating Capacity**	**Storage Capacity (Gal)**	**Quantity**	**Year Installed**
Rheem	Electric	9 kW (each) 30.7 MBH (each)	120 (each)	2	2004

Photo 82. Rheem electric DHW heater

8.01.6 Existing Lighting System

Interior lighting for the locker rooms and staff office primarily consists of round ceiling mounted fixtures, which contain a mixture of LED and fluorescent bulbs (Photos 83 and 84).

Photo 83. Typical locker room lighting

Photo 84. Typical staff office lighting

Exterior lighting primarily consists of wall and ceiling mounted fixtures containing fluorescent lamps (Photo 85). There are two (2) exterior light towers that provide light for the entire pool complex. Each tower contains approximately sixteen (16) bulbs (Photo 86). The wattage of these bulbs could not be verified during the site visit.

Photo 85. Typical exterior lighting

Photo 86. Typical exterior lighting tower

8.01.7 Existing Lighting Controls

All interior lighting is controlled manually by toggle switches. The exterior light towers are controlled by timers; the control panels for which are located in the pool equipment room.

8.02 Chemka Pool Building Analysis of Present Energy Use

A historical energy use analysis was performed for the energy sources at the Chemka Pool building. The following data was analyzed based on yearly energy consumption and costs. Based on the utility bills provided, OLA was able to calculate a combined site EUI for the building. The building used approximately 89.1 kBtu/ft^2 site energy and had a total energy cost of $26,347 based on 2016-2018 data. Table 31 below provides a summary of the annual energy usage and costs for 2016-2018.

Table 31. 2016-2018 Annual Overall Site Energy

	Energy Usage	kBtu	Cost ($)	Cost ($) per ft^2	Site EUI (kBtu/ft^2)	CO_2 Emissions (lb/year)
Electric (kWh)	109,680	374,228	$26,347	$6.57	89.1	69,872
Total		374,228	$26,347	$6.57	89.1	69,872
Gross Area (ft^2)		4,200				

8.02.1 Electrical Usage

The historical electric usage for the Chemka Pool building is shown in Figure 43. Peak electricity usage occurs during the summer months (May – September), due to the continuous operation of the pool equipment. The highest monthly usage recorded during this time was 20,240 kWh during June 2017.

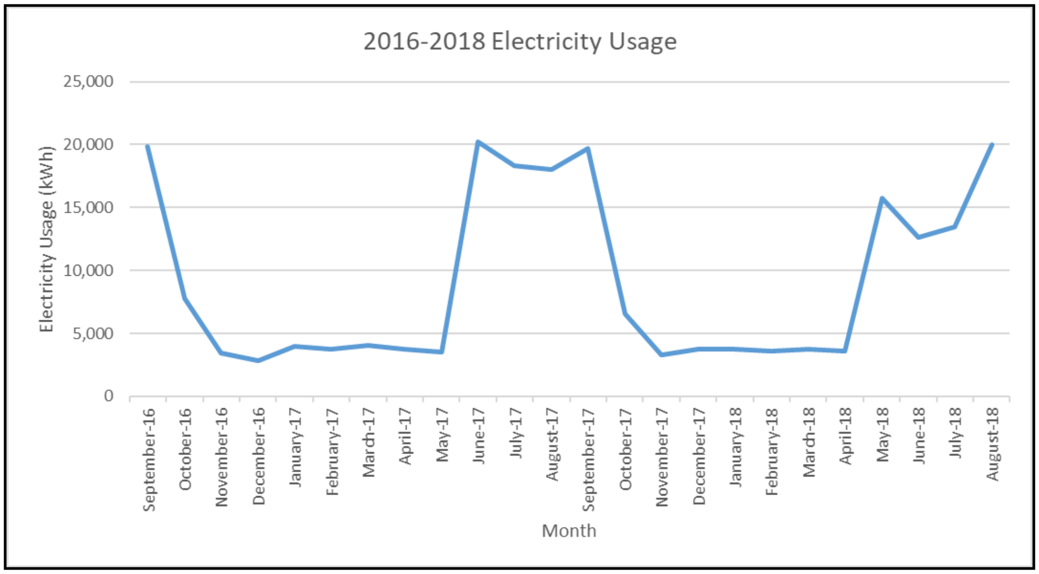

Figure 43. 2016 – 2018 Historical Electricity Use

The historical electric demand is shown in Figure 44. Similar to the historical electricity usage above, the building's peak demand occurs between May and September. The highest recorded demand of 107.2 kW occurred in August 2018.

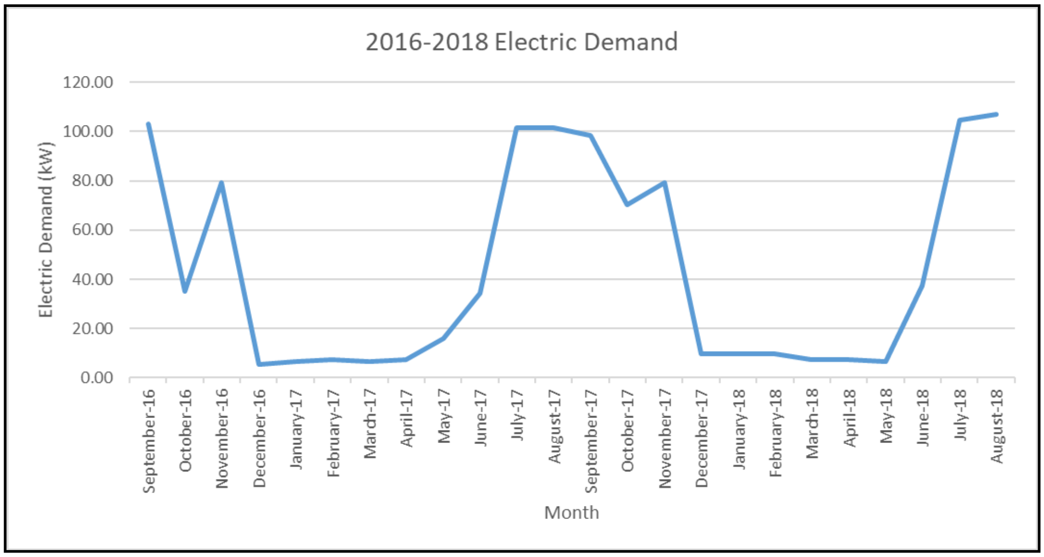

Figure 44. 2016 – 2018 Historical Electric Demand

OLA was provided with complete electric utility bills for this analysis, and determined an average blended electricity rate of 0.240 $/kWh based on the bills provided.

8.02.2 Utility Rates and Costs

The Chemka Pool building is served by one (1) electric meter. Estimated demand, energy, and total blended electric rates for the building were determined based on monthly usage and monthly charges. For the purposes of this study, electricity energy cost savings were based on average demand and energy charges. Table 32 below shows a breakdown of the utility rates for each fuel source.

Table 32. Utility Rates

Utility	Unit	2016/17	2017/18	Average
Electric	$/kW	$33.21	$36.04	$34.62
	$/kWh	$0.077	$0.072	$0.074
	$/kWh (Blended)	$0.229	$0.251	$0.240

8.02.3 Energy Utilization

Figure 45 below shows the breakdown of energy intensity (kBtu/ft^2) by end use type. The pumping energy for the pool filtration system accounts for 64% of the total electricity usage.

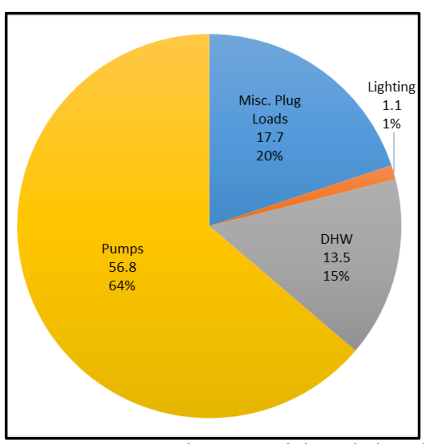

Figure 45. Energy End Use Breakdown in kBtu/ft.^{2}

8.03 Energy Efficiency Measures (EEMs)

Short Term EEM's

8.03.1 EEM 1 – Complete LED Lighting Retrofit

Although much of the space has already been converted to LED lighting, this measure investigates the impact of a complete LED retrofit and energy consumption of reduced lighting power density. The new LED lighting will result in a reduced lighting power density and potential for high savings. All of the typical 23W fluorescent and 32W T8 fluorescent lighting in the building could be replaced with LED retrofit products. The existing lighting power density of the building is estimated to be 0.33 W/ft^2. The resulting lighting power density of the entire facility is estimated to be in the range of 0.19 W/ft.^{2} after a complete retrofit.

8.03.1 EEM 2 – Variable Speed Pumps and High Efficiency Motors

This measure assesses the impact of installing variable frequency drives (VFD's) and high efficiency motors on the pumps serving the three (3) different pools on site. Allowing the pool pumps to modulate to lower speeds during unoccupied hours would result in a significant energy and cost reduction.

8.03.2 EEM 3 – Air Source VRF Heat Pump for Pool Equipment Room

This measure assesses the energy reduction associated with installing a single-zone air source heat pump to heat and cool the pool equipment room. Air source heat pumps typically offer high heating and cooling efficiencies, which could result in an overall EUI reduction and cost savings. Indoor units would be installed where appropriate, providing heating and cooling to the spaces they serve.

Figure 46. Single-zone Mitsubishi air-source heat pump

8.03.3 EEM 4 – Domestic Hot Water Heat Pumps

Replacing the existing electric resistance domestic hot water heaters with a commercial grade electric heat pump system should be considered in the future. It is possible to utilize the existing storage tanks. Providing the building with a new high efficient electric heat pump water heater would reduce the source EUI of the building.

Figure 47. Colmac DHW heat pump

Long Term EEM's

8.03.4 EEM 5 – Solar Tube Skylight

This measure assess the impact of installing skylights on the roof of the building that utilize natural daylight for lighting in the pool building locker rooms. Solar tube technology harnesses and transfers natural sunlight into the space with reflective material within the tubing. This would offset a portion of the energy usage and costs associated with lighting, thereby reducing greenhouse gas emissions.

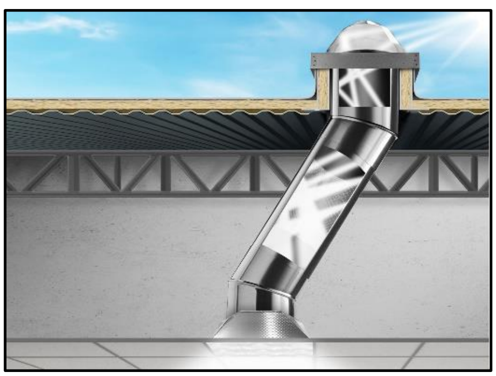

Figure 48. Typical skylight diagram

Figure 49. "Solatube" skylight installed in locker room

9.0 Department of Public Works (DPW) Garage

9.01 Existing Conditions

The Department of Public Works (DPW) garage is a 1-story, 12,000 square foot garage located at 69 Southside Avenue in Hastings-on-Hudson, NY and was constructed in approximately 1985. The building acts as a storage and maintenance facility for the vehicles and associated equipment used for public service in the town. One half of the garage is used as a repair shop, and contains offices, restrooms, and a lounge for the mechanics. The other half is used as storage for the vehicles. Photos 87 and 88 show an aerial and exterior view of the building.

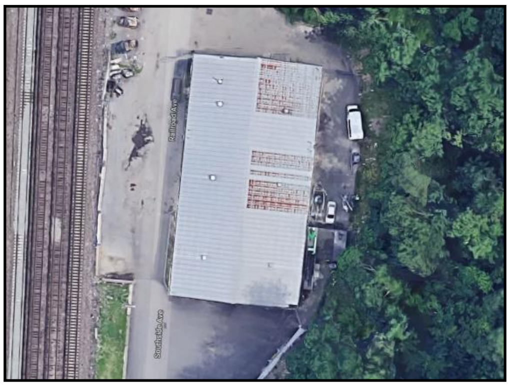

Photo 87. Aerial view of DPW garage

Photo 88. DPW Garage exterior

Typical building hours for the garage range from 7:00am – 3:30pm Monday through Friday, and 8:00am – 12:00pm on Saturdays. The garage is closed on Sundays. A breakdown of the building operating hours is shown below in Table 33.

Table 33. DPW Garage Operating Hours

Time	Monday	Tuesday	Wednesday	Thursday	Friday	Weekend
7:00am	Building opens	Building opens	Building opens	Building opens	Building opens	Saturday: 8:00am – 12:00pm Sunday: Building closed
3:30pm	Building closes	Building closes	Building closes	Building closes	Building closes	

9.01.1 Existing Heating Systems

Heating for the garage is provided by a combination of an American Standard condensing gas-fired furnace serving the repair shop (Photo 89), and Reznor gas-fired unit heaters serving the remainder of the garage (Photo 90). A summary table of the heating systems at the DPW garage is located in Table 34 below.

Table 34. DPW Garage Heating Plant Summary

Manufacturer	Type	Capacity (MBH)	Fuel Source	Quantity	Year Installed	Typical Operating Time
American Standard	Furnace	-	Natural Gas	1		7:00am – 3:30pm
Reznor	Unit Heater	75* (each)	Natural Gas	2		7:00am – 3:30pm

*Based on existing drawings

Photo 89. Gas-fired furnace serving repair shop

Photo 90. Typical gas-fired unit heater serving garage

The gas-fired furnace is located on an elevated platform and serves the open areas of the repair shop only. The offices, restrooms, and lounge area are all considered enclosed spaces and are not adequately heated by the furnace. Heating for these spaces is provided only by plug-in heaters and radiators (Photo 91). There is an additional office that is served by electric baseboard and controlled be a wall-mounted Lux thermostat (Photo 92). It was noted that only two (2) of the unit heaters serving the garage have been replaced and are currently functioning (Photo 93). The remaining unit heaters have been dysfunctional for several years according to staff and are abandoned in place.

Photo 90. Typical plug-in space heater

Photo 92. Thermostat controlling electric baseboard

Photo 93. Typical gas-fired unit heater abandoned in place

Heating for the repair shop is controlled by a wall-mounted programmable Honeywell thermostat located outside one of the offices (Photo 94). It was noted that staff typically set the thermostat for approximately 68°F during occupied hours, and will automatically reduce the temperature setpoint to approximately 62°F during unoccupied hours. Heating for the garage is also controlled by similar wall-mounted Honeywell thermostats (Photo 95). Each thermostat typically controls one of the Reznor unit heaters.

Photo 94. Thermostat controlling gas-fired furnace

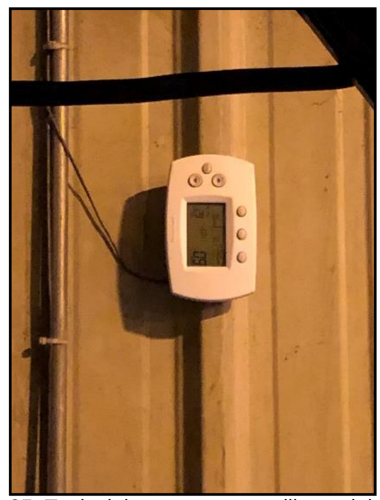

Photo 95. Typical thermostat controlling unit heater

9.01.2 Existing Cooling Systems

Cooling is provided by a combination of window AC units serving the offices and lounge within the repair shop, and ceiling fans in the garage. There are four (4) Friedrich window AC units that serve the offices and lounge. Each window AC unit has an approximate capacity of 1 – 1.5 tons (12-18 MBH) of cooling, and is controlled manually A summary of the window AC units serving the building is shown below in Table 35.

Table 35. DPW Garage Cooling Plant Summary

Type	Manufacturer	Total Capacity (Tons)	Estimated Total Quantity
Window AC unit	Friedrich	1 – 1.5	4

9.01.3 Existing Ventilation Systems

There is no mechanical ventilation system serving the garage. Ventilation is provided only by opening the garage doors.

9.01.4 Existing Domestic Water Systems

Domestic hot water (DHW) is generated by one (1) combination gas-fired Rheem DHW heater and storage tank located in the repair shop (Photo 96). The DHW heater has a total input capacity of 38 MBH and storage capacity of 40 gallons. A summary of the DHW system is shown below in Table 36.

Table 36. DPW Garage DHW System Summary

Manufacturer	Fuel Source	Heating Capacity (MBH)	Storage Capacity (Gal)	Quantity	Year Installed
Rheem	Natural Gas	30	40	1	2003

Photo 82. Rheem DHW heater

9.01.5 Existing Lighting System

Interior lighting primarily consists of T8 fluorescent light fixtures in offices, restrooms, and the lounge area, ceiling hung metal halide fixtures in the repair shop, and ceiling hung high pressure sodium (HPS) fixtures in the remainder of the garage (Photos 97 – 99).

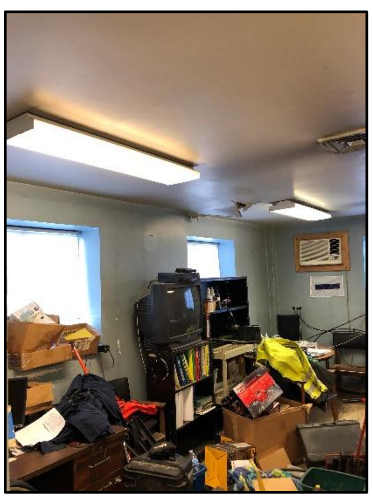

Photo 97. Typical T8 fluorescent light fixtures

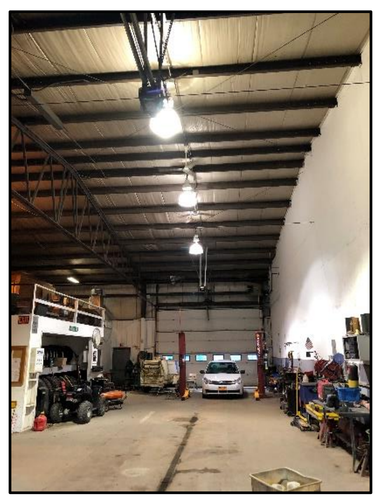

Photo 98. Typical metal halide light fixtures

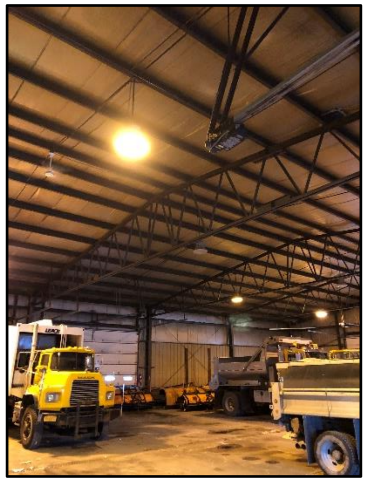

Photo 99. Typical HPS light fixtures

9.01.6 Existing Lighting Controls

All interior lighting is manually controlled by toggle switches.

9.02 DPW Garage Analysis of Present Energy Use

A historical energy use analysis was performed for the energy sources at the DPW Garage. The following data was analyzed based on yearly energy consumption and costs. Based on the utility bills provided, OLA was able to calculate a combined site EUI for the building. The building used approximately 66.3 kBtu/ft^2 site energy and had a total energy cost of $13,053 based on 2016-2018 data. Table 37 below provides a summary of the annual energy usage and costs for 2016-2018.

Table 37. 2016-2018 Annual Overall Site Energy

	Energy Usage	kBtu	Cost ($)	Cost ($) per ft^2	Site EUI (kBtu/ft^2)	CO_2 Emissions (lb/year)
Electric (kWh)	35,091	122,494	$5,792	$0.48	10.2	22,871
Natural Gas (therm)	6,728	672,800	$7,262	$0.61	56.1	78,776
Total		795,294	$13,053	$1.09	66.3	101,647
Gross Area (ft^2)		12,000				

Figure 50 provides the annual site EUI per energy type based on analysis of the utility bills for 2016-2018. Figure 51 provides the annual energy cost summary by energy type from the same year. Natural gas for heating is the dominant energy source for this building, and accounts for 85% of the overall energy consumption of the building. However, natural gas only accounts for 56% of the cost, due to the higher cost of electricity. Figure 52 provides the annual CO_2 emissions breakdown by energy type.

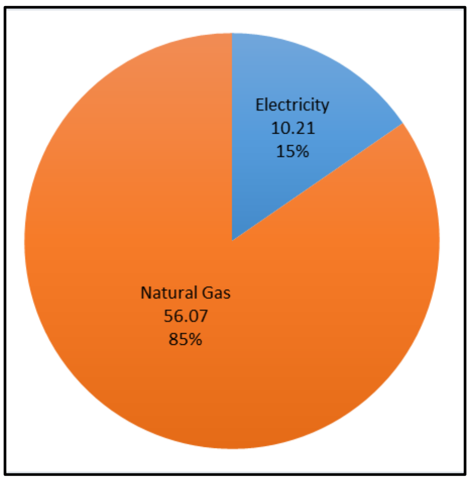

Figure 50. Existing Annual Fuel Type Site EUI Breakdown in kBtu/ft.^{2}

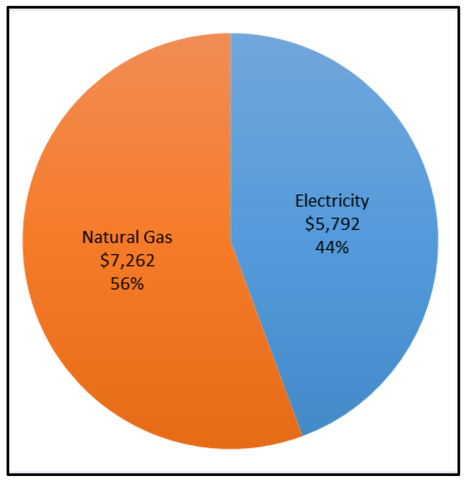

Figure 51. Existing Annual Energy Cost Breakdown

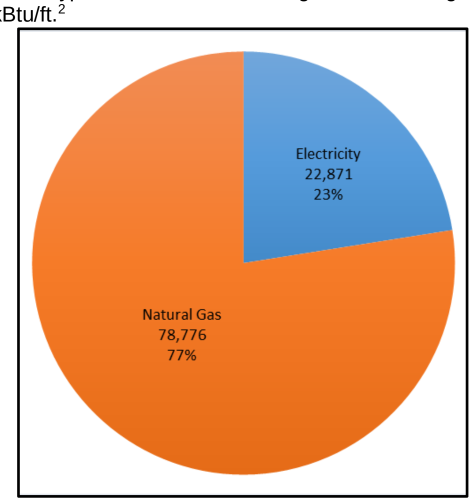

Figure 52. Existing Annual CO_2 Emissions Breakdown in lb/year

9.02.1 Electrical Usage

The historical electric usage for the DPW Garage is shown in Figure 53. Peak electricity usage typically occurs during the winter months for this building, likely due to electric heaters, and because there is no form of cooling at the facility. The highest monthly usage recorded during this time was 5,310 kWh during January 2018.

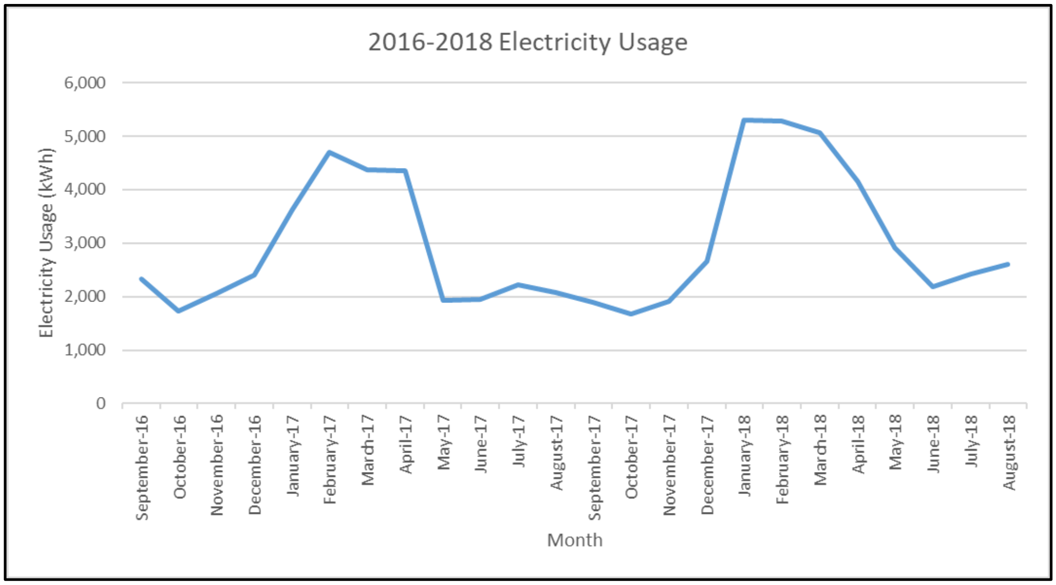

Figure 53. 2016 – 2018 Historical Electricity Use

The historical electric demand is shown in Figure 54. Similar to the historical electricity usage above, the building's peak demand typically occurs during the winter months. The highest recorded demand of 14.6 kW occurred in February 2018.

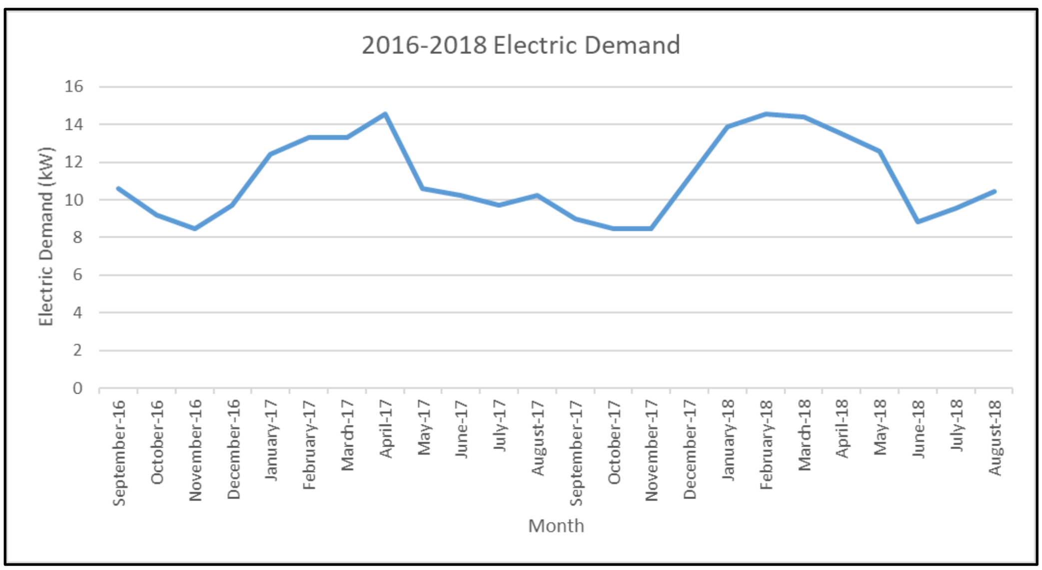

Figure 54. 2016 – 2018 Historical Electric Demand

OLA was provided with complete electric utility bills for this analysis, and determined an average blended electricity rate of 0.161 $/kWh based on the bills provided.

9.02.2 Natural Gas Usage

Figure 55 below shows the historical 2016-2018 natural gas usage for the building. Since gas in this building is used for heating only, usage is found to be highest during the winter months. A peak usage of 2,374 therms was recorded in February 2017.

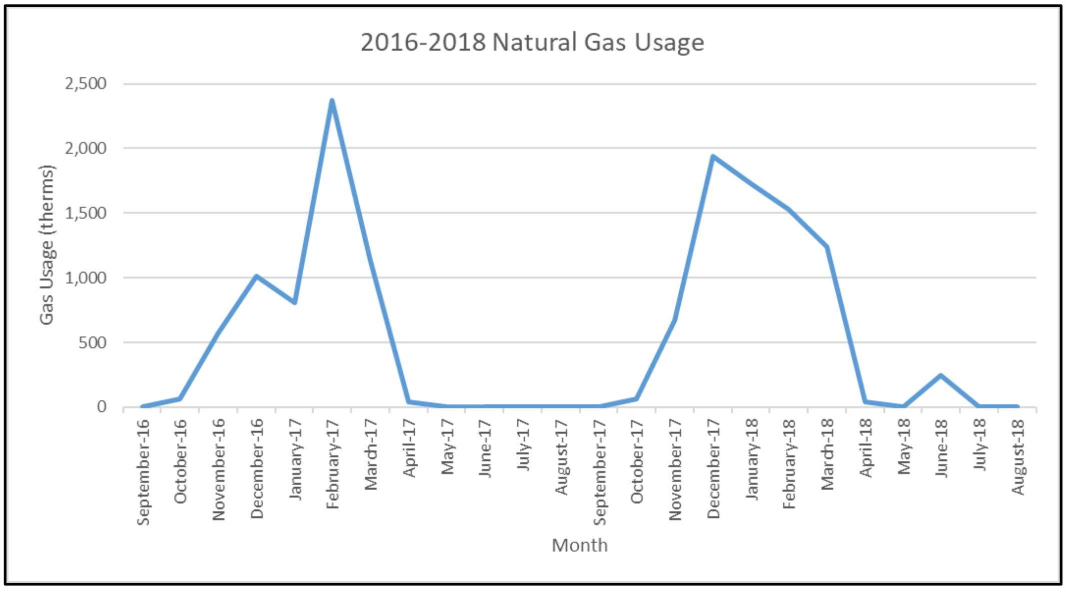

Figure 55. 2016-2018 Historical Natural Gas Usage

OLA was provided with complete utility bills for this analysis and determined a natural gas of 1.08 $/therm based on the bills provided. For the purposes of this study, this calculated rate was used to estimate energy cost savings.

9.02.3 Utility Rates and Costs

The DPW garage is served by one (1) electric meter and one (1) gas meter. Estimated demand, energy, and blended electric and gas rates for the building were determined based on monthly usage and monthly charges. For the purposes of this study, all energy cost savings were based on calculated average utility rates. Electricity energy cost savings were based on average demand and energy charges. Table 38 below shows a breakdown of the utility rates for each fuel source.

Table 38. Utility Rates

Utility	Unit	2016/17	2017/18	Average
Electric	$/kW	$25.21	$27.33	$26.27
	$/kWh	$0.061	$0.065	$0.063
	$/kWh (Blended)	$0.160	$0.162	$0.161
Natural Gas	$/therm	$1.06	$1.10	$1.08

9.02.4 Energy Utilization

Figure 56 below shows the breakdown of energy intensity (kBtu/ft^2) by end use type. The results confirm that fuel consumed to run the heating plant accounts for the largest portion of the site energy use and cost.

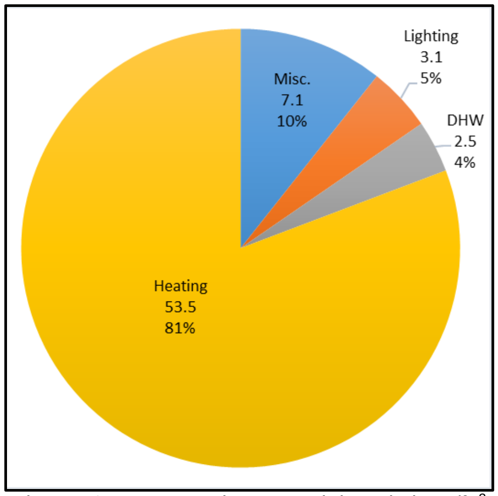

Figure 56. Energy End Use Breakdown in kBtu/ft.^{2}

9.03 Energy Efficiency Measures (EEMs)

Short Term EEM's

9.03.1 EEM 1 – LED Lighting Retrofits

This measure investigates the impact on energy consumption of reduced lighting power density utilizing high efficiency LED lighting technology and retrofit products throughout the building. The new LED lighting will result in a reduced lighting power density and potential for high savings. All of the typical 32W T8 fluorescent lighting and HPS / metal halide flood lighting in the building could be replaced with LED retrofit products. The existing lighting power density of the building is estimated to be 0.33 W/ft^2. The resulting lighting power density of the entire facility is estimated to be in the range of 0.16 W/ft.^{2} after a complete retrofit.

Long Term EEM's

9.03.2 EEM 2 – Air Source VRF Heat Pump for Repair Shop

This measure assesses the energy reduction associated with installing a multi-zone air source heat pump with variable refrigerant flow (VRF) to heat the repair shop and adjacent office spaces. Air source heat pumps typically offer high heating and cooling efficiencies, which could result in an overall EUI reduction and cost savings. Indoor units would be installed where appropriate, providing heating and cooling to the spaces they serve.

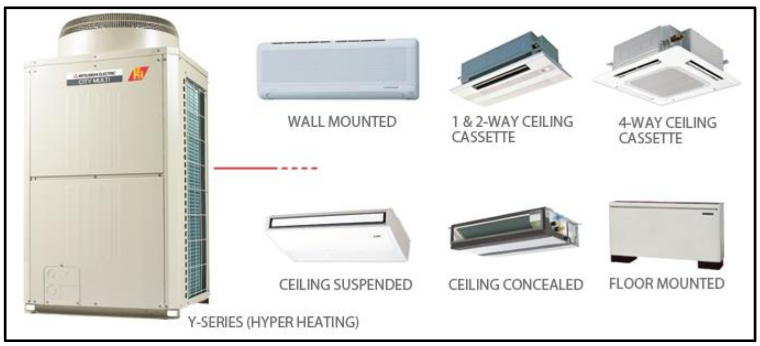

Figure 57. City-Multi VRF heat pump units

10.0 Energy Efficiency Measure (EEM) Summary

Table 39 summarizes the results of the energy analysis for the EEMs investigated.

Participant's Name and Address:
Village of Hastings-on-Hudson
7 Maple Avenue
Hastings-on-Hudson, NY

ENERGY EFFICIENCY MEASURE SUMMARY

	Measure Description	Measure Status (See Notes)	Building Electricity Usage (kWh)	Building Oil Usage (gallons)	Building Gas Usage (therms)	Building Energy Use (kBtu/ft^2)	Electricity Saved (kWh)	Natural Gas Saved (therms)	Site Energy Saved (kBtu/ft^2)	Demand Saved (kW)	CO_2 Emissions Saved (lb/year)	Annual Utility Cost ($/year)	Annual Electric Energy Cost Saved ($/yr)	Annual Gas Energy Cost Saved ($/yr)	Total Annual Energy Cost Saved ($/yr)	Estimated Cost for Implementation ($)	Simple Payback (Total Cost Basis)
Village Hall and Library																	
Existing Building (Combined 2017-2018 Usage)			252,360	2,621	12,107	102.4	-	-	-	-	-	$58,494	-	-	-	-	-
Existing Building (Adjusted Baseline Usage - Gas Only)			252,360	0	16,027	103.4	-	-	-	-	-	$56,601	-	-	-	-	-
EEM 1	Village Hall LED Lighting Retrofit and Lighting Controls Upgrade	R	244,039	0	16,027	102.2	8,321	0	1.2	2.7	5,301	$55,994	$608	$0	$608	$16,000	26.3
EEM 2	Library Lighting Controls and Daylighting Upgrade	R	241,260	0	16,027	101.9	2,780	0	0.4	0	1,771	$55,808	$185	$0	$185	$10,000	53.9
EEM 3	Building Envelope Upgrades - New Windows	R	241,260	0	14,917	97.2	0	1,110	4.7	0	12,995	$54,569	$0	$1,239	$1,239	$362,000	292.2
EEM 4	Building Envelope Upgrades - Wall Insulation and Air Barrier	R	241,260	0	13,702	92.1	0	1,215	5.1	0	14,227	$53,213	$0	$1,356	$1,356	$160,000	118.0
EEM 5	Steam Boiler Replacement	R	241,260	0	13,225	90.1	0	476	2.0	0	5,577	$52,681	$0	$532	$532	$165,000	310.3
EEM 5A	Condensing Gas-Fired Hot Water Boilers	R	241,260	0	12,197	85.8	0	1,505	6.3	0	17,621	$51,533	$0	$1,680	$1,680	$593,000	353.0
EEM 5B	Geothermal Heat Pumps for VH	RS	273,494	0	7,842	72.1	-32,235	5,860	20.0	-25.0	48,078	$50,431	-$3,759	$6,541	$2,782	$1,100,000	395.4
EEM 5C	Air Source VRF Heat Pumps for VH	R	280,701	0	7,842	73.1	-39,441	5,860	19.0	-28.4	43,487	$52,457	-$5,785	$6,541	$756	$256,000	338.6
EEM 5D	Air Source VRF Heat Pumps for VH + Condensing Gas-Fired Hot Water Boiler for Library	R	280,701	0	7,052	69.8	-39,441	6,650	22.3	-28.4	52,738	$51,575	-$5,785	$7,423	$1,638	$490,000	299.1
EEM 6	Library Roof-Mounted Solar PV System	RS	199,289	0	13,702	86.1	41,971	0	6.0	0	26,738	$50,292	$2,921	$0	$2,921	$145,000	49.6
EEM 7	Library AHU Replacement	R	225,321	0	13,702	89.8	15,939	0	2.3	0	10,154	$52,191	$1,022	$0	$1,022	$324,000	316.9
EEM 8	Village Hall / Library Plug Load Management and Reduction	R	234,020	0	13,702	91.1	7,240	0	1.0	0	4,612	$52,749	$464	$0	$464	$47,000	101.2
James Harmon Community Center																	
Existing Building (Adjusted Baseline Usage)			209,400	0	11,691	110.8	-	-	-	-	-	$43,027	-	-	-	-	-
EEM 1	LED Lighting Retrofits	R	203,315	0	11,691	109.6	6,085	0	1.2	2.4	3,877	$42,578	$449	$0	$449	$16,000	35.6
EEM 2	Rescheduling of RTU's	R	196,770	0	11,691	108.3	6,545	0	1.3	0	4,169	$42,161	$417	$0	$417	$1,200	2.9
EEM 3	Variable Frequency Drives (VFD's) on RT-3 and RT-4	R	182,057	0	11,691	105.3	14,713	0	3.0	0	9,373	$41,223	$937	$0	$937	$36,000	38.4
EEM 4	Condensing Gas-Fired Hot Water Boiler	RS	182,057	0	10,311	97.2	0	1,380	8.1	0	16,164	$39,705	$0	$1,518	$1,518	$191,000	125.9
EEM 5	Supplemental Domestic Hot Water Heat Pump	RS	183,468	0	10,154	96.6	-1,411	157	0.6	-1.5	935	$39,662	-$128	$172	$44	$20,000	456

Measure Status: Recommended (R); Further Study Recommended (RS)
Notes:
1.) Energy and cost savings for all EEM's are considered incremental. Savings for a particular measure is calculated assuming the preceding measure has been implemented.
2.) Village Hall - Library EEM's 5 - 7 are designated as long term. Savings for long term EEM's are based on EEM 4, and are not incremental (i.e. EEM 7 is not incremental to EEM 6).
3.) Village Hall - Library EEM 8 savings is based on EEM 4 and is not incremental to long term EEM's 5 - 7.

Hook and Ladder Company																	
Existing Building (Adjusted Baseline Usage)			8,646	0	6,362	74.0	-	-	-	-	-	$7,419	-	-	-	-	-
EEM 1	LED Lighting Retrofit	R	6,828	0	6,362	73.3	1,818	0	0.7	1.1	1,158	$7,267	$152	$0	$152	$6,000	39.5
EEM 2	Lighting Controls Upgrade	R	6,354	0	6,362	73.1	474	0	0.2	0	302	$7,227	$40	$0	$40	$6,000	151.4
EEM 3	Hot Water Piping Insulation	R	6,354	0	5,997	69.0	0	365	4.1	0	4,274	$6,827	$0	$400	$400	$3,300	8.2
EEM 4	Heating Night Setback	R	6,354	0	4,668	54.3	0	1,329	14.8	0	15,562	$5,369	$0	$1,458	$1,458	$7,000	4.8
EEM 5	Condensing Gas-Fired Hot Water Boiler	RS	6,354	0	4,195	49.0	0	473	5.3	0	5,542	$4,850	$0	$519	$519	$80,000	154.1
Ambulance Corps Garage																	
Existing Building (Adjusted Baseline Usage)			12,121	0	1,978	99.7	-	-	-	-	-	$4,937	-	-	-	-	-
EEM 1	LED Lighting Retrofit	R	10,069	0	1,978	96.7	2,052	0	2.9	0.8	1,307	$4,391	$546	$0	$546	$7,000	12.8
EEM 2	Heating Night Setback	R	10,069	0	1,479	75.9	0	499	20.8	0	5,847	$3,694	$0	$697	$697	$2,000	2.9
Chemka Pool Building																	
Existing Building			109,680	0	0	89.1	-	-	-	-	-	$26,347	-	-	-	-	-
EEM 1	Complete LED Lighting Retrofit	R	109,138	0	0	88.7	542	0	0.4	0.6	346	$26,287	$60	$0	$60	$3,000	50.3
EEM 2	Variable Speed Pumps and High Efficiency Motors	R	68,797	0	0	55.9	40,340	0	32.8	0	25,699	$23,310	$2,977	$0	$2,977	$83,000	27.9
EEM 3	Air Source VRF Heat Pump for Pool Equipment Room	R	67,148	0	0	54.6	1,649	0	1.3	6.7	1,050	$23,235	$75	$0	$75	$12,000	159.8
EEM 4	Domestic Hot Water Heat Pumps	RS	63,386	0	0	51.5	3,762	0	3.1	7.5	2,397	$22,696	$539	$0	$539	$56,000	103.9
EEM 5	Solar Tube Skylight	R	62,852	0	0	51.1	534	0	0.4	0	340	$22,568	$128	$0	$128	$44,000	342.8
DPW Garage																	
Existing Building (Adjusted Baseline Usage)			35,901	0	8,077	77.5	-	-	-	-	-	$13,053	-	-	-	-	-
EEM 1	LED Lighting Retrofit	R	30,101	0	8,077	75.9	5,800	0	1.6	2.1	3,695	$12,631	$422	$0	$422	$11,000	26.0
EEM 2	Air Source VRF Heat Pumps for Repair Shop	RS	54,151	0	4,894	56.2	-24,051	3,183	19.7	-17.0	37,272	$13,401	-$4,199	$3,429	-$770	$130,000	

Measure Status: Recommended (R); Further Study Recommended (RS)

Notes:

1.) Energy and cost savings for all EEM's are considered incremental. Savings for a particular measure is calculated assuming the preceding measure has been implemented.

2.) Village Hall - Library EEM's 5 - 7 are designated as long term. Savings for long term EEM's are based on EEM 4, and are not incremental (i.e. EEM 7 is not incremental to EEM 6).

3.) Village Hall - Library EEM 8 savings is based on EEM 4 and is not incremental to long term EEM's 5 - 7.

11.0 Recommendations for Strategic Implementation

This section is provided to clarify the sequence and scope of our recommendations and implementation and provide commentary on the recommended measures. This section will be update after a review discussion with the Village of Hastings to develop a prioritization of EEMs. Please note that costs are preliminary and should be further explored, designed and bid to establish reliable costs for implementation. These costs are for “order of magnitude” only and should be understood to be preliminary and not for budgeting purposes.

Table 40. Recommended Sequence for Implementation

Time Period (Implementation)	Building Key	EEM		CO_2 Emissions Saved (lb/year)	Annual Energy Cost Saved ($/yr)	Implementation Costs	Simple Payback (years)
Short Term Low Cost EEM's	HL	EEM 4	Hook and Ladder - Heating Night Setback	15,562	$1,458	$7,000	5
	AC	EEM 2	Ambulance Corps - Heating Night Setback	5,847	$697	$2,000	3
	HL	EEM 3	Hook and Ladder - Hot Water Piping Insulation	4,274	$400	$3,300	8
	CC	EEM 2	Community Center - Rescheduling of RTU's	4,169	$417	$1,200	3
	AC	EEM 1	Ambulance Corps - LED Lighting Retrofit	1,307	$546	$7,000	13
	CP	EEM 1	Chemka Pool Building - Complete LED Lighting Retrofit	346	$60	$3,000	50
Remaining Short Term EEM's	HL	EEM 1	Hook and Ladder - LED Lighting Retrofit	1,158	$152	$6,000	39
	HL	EEM 2	Hook and Ladder - Lighting Controls Upgrade	302	$40	$6,000	151
	DPW	EEM 1	DPW Garage - LED Lighting Retrofit	3,695	$422	$11,000	26
	LI	EEM 2	Library - Lighting Controls and Daylighting Upgrade	1,771	$185	$10,000	54
	VH	EEM 1	Village Hall - LED Lighting Retrofit and Lighting Controls Upgrade	5,301	$608	$16,000	26
	VH / LI	EEM 8	Village Hall / Library Plug Load Management and Reduction	4,612	$464	$47,000	101
	CC	EEM 1	Community Center - LED Lighting Retrofits	3,877	$449	$16,000	36
	CP	EEM 2	Chemka Pool Building - Variable Speed Pumps and High Efficiency Motors	25,699	$2,977	$83,000	28
	CC	EEM 3	Community Center - Variable Frequency Drives (VFD's) on RT-3 and RT-4	9,373	$937	$36,000	38
	CP	EEM 4	Chemka Pool Building - Domestic Hot Water Heat Pumps	2,397	$539	$56,000	104
	CP	EEM 3	Chemka Pool Building - Air Source VRF Heat Pump for Pool Equipment Room	1,050	$75	$12,000	160
Long Term EEM's	DPW	EEM 2	DPW Garage - Air Source VRF Heat Pumps for Repair Shop	37,272	-$770	$130,000	-
	VH	EEM 4	Village Hall - Building Envelope Upgrades: Wall Insulation and Air Barrier	14,227	$1,356	$160,000	118
	VH	EEM 3	Village Hall - Building Envelope Upgrades: New Windows	12,995	$1,239	$362,000	292
	VH / LI	EEM 5, 5A, 5B, 5C, 5D	Village Hall / Library - Steam Boiler Replacement	5,577	$532	$165,000	310
			Village Hall / Library - Condensing Gas-Fired Hot Water Boilers	17,621	$1,680	$593,000	353
			Village Hall - Geothermal Heat Pumps	48,078	$2,782	$1,096,750	394
			Village Hall - Air Source VRF Heat Pumps	43,487	$756	$256,000	339
			Village Hall / Library - Air Source VRF Heat Pumps and Condensing Gas-Fired Hot Water Boiler	52,738	$1,638	$490,000	299
	LI	EEM 6	Library - Roof-Mounted Solar PV System	26,738	$2,921	$145,000	50
	LI	EEM 7	Library - AHU Replacement	10,154	$1,022	$324,000	317
	CP	EEM 5	Chemka Pool Building - Solar Tube Skylight	340	$128	$44,000	343
	CC	EEM 4	Community Center - Condensing Gas-Fired Hot Water Boiler	16,164	$1,518	$191,000	126
	HL	EEM 5	Hook and Ladder - Condensing Gas-Fired Hot Water Boiler	5,542	$519	$80,000	154
	CC	EEM 5	Community Center - Supplemental Domestic Hot Water Heat Pump	935	$44	$20,000	456

Building Key
AC - Ambulance Corps Garage
CC - James Harmon Community Center
CP - Chemka Pool Building
DPW - DPW Garage
HL - Hook and Ladder Company
LI - Library
VH - Village Hall

1. Low-cost measures

Several buildings can benefit from simple low-cost measures like programmable set-back thermostats, pipe insulation, proper scheduling of equipment, and simple LED retrofits. Regarding scheduling and thermostats, occupants of the buildings should be educated that the goal is operate at a high efficiency without energy waste, and on how to mitigate unnecessary energy use by using the night setback.

Simple screw-in and swap-in retrofits for LED lights in the Pool building and Ambulance corps can also be prioritized.

2. LED Lighting and Lighting Controls

Additional LED lighting retrofits and lighting controls are cost effective measures that should also be prioritized. Some buildings may require more elaborate retrofit kits or fixture replacements such as in the Community Center, but many can use T8 retrofit products. The lighting controls recommended for various buildings include occupancy sensors and daylight sensing in various locations. These are fairly easy to implement and can be preferably all be done as part of a larger lighting upgrade project Village wide.

Continuing to trend energy costs and consumption to try to approach high performance operation will emphasize the importance of optimizing the building operation.

3. Variable Speed Drives for RTUs and Pool pumps

Some HVAC can benefit from the use of variable speed drives to save energy. These measures have the potential to save considerable energy and associated GHG emissions for the Community Center RTU's and the Pool pump motors. The measures have a reasonable payback and make sense to prioritize after the lower cost measures.

4. Air-source heat pumps (Space Heat)

Several measures look at using cold-climate air-source heat pumps in lieu of electric resistance heat or in the case of the DPW garage, gas fired heat. In the case of the Pool building, a small heat pump to heat the mechanical room is preferable to electric resistance heat and can cut GHGs. For the DPW Garage, it appeared that an air-source heat pump system could provide additional benefits of providing cooling as well as heat to the office spaces, some of which only have space heaters that provide poor or no temperature control, and only have window units for cooling. Heat pump systems have the ability to reduce GHGs significantly.

5. Village Hall Envelope Improvements

Several measures looked at improving the envelope (windows and walls) of the Village Hall. Given the age of the building, these measures would obviously be capital intensive, but do have the benefit of reducing building loads, reducing GHGs significantly, and likely improving occupant comfort. These may be considered longer term measures. We would recommend considering these measures before investing in the heating system however, in order to optimize any future heating plant, and reduce equipment sizing requirements.

6. Village Hall / Library Heating System

The Village Hall and Library heating system is currently shared. This study looked at several options to improve the energy performance and reduce GHGs for both buildings. Both geothermal and air-source heat pump systems were considered as a replacement heating system for the Village Hall. The geothermal option does have the potential to save more energy than an air-source heat pump, however it comes with significantly higher capital cost. We also determined that a geothermal system likely cannot serve both Village Hall and Library due to lack of available land area.

Recent improvements in cold-climate air-source heat pumps would make it possible to heat the Village Hall building and avoid using the boiler. The boiler could be retained to heat just the Library, and eventually replaced in the future with a condensing gas boiler to heat the Library. This is a cost effective approach since the Library already has a hydronic heating system. At the request of HEWG, OLA reviewed the possibility of installing air source heat pumps solely for the Police Station. It is estimated that this project would cost in the range of $80,000 - $90,000, and could serve as the first initial phase of EEM's 5C / 5D if these measures are implemented. The Police Station operates 24/7 and therefore is likely to provide the greatest savings benefit for the building overall. Note that the existing emergency power capacity would need to be reviewed as part of this design effort.

7. Library AHU Replacement

The Library main air-handling unit (HV-1) is original to the building, past its expected useful life and should be planned for eventual replacement. The existing system use constant speed fans, but a future modern system would use variable speed fans for energy savings. This is capital intensive project, but should be considered for the future.

8. Community Center and Hook & Ladder Condensing Boilers

These buildings all have existing hydronic heating systems with boilers that are not too old. Eventually the equipment may need to be replaced, and the current best available boiler technology would be condensing boilers to improve efficiency and reduce emission.

9. Heat Pump Domestic Hot Water Heaters

Several buildings can benefit from using heat-pump water heaters, particularly the Pool building which likely has more of a hot water load and uses electric resistance heaters. The Community Center water heater is not at the end of its useful life yet, but eventually could be replaced with a heat-pump water heater.

12.0 Appendices

Appendix A:

Energy Star Target Finder Results

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]
Ambulance Corps

N/A

ENERGY STAR® Design Score[2]

Primary Property Type: Fire Station
Gross Floor Area (ft²): 2,400
Estimated Date of Certification of Occupancy: __________

Date Generated: March 04, 2019

1. This form is required when applying for Designed to Earn the ENERGY STAR recognition. It was generated from ENERGY STAR Portfolio Manager.
2. The ENERGY STAR 1 – 100 Score is based on total annual Source Energy. To be eligible for Designed to Earn the ENERGY STAR recognition you must score at least 75.

Property & Contact Information for Design Project

Property Address	Project Architect	Owner Contact
Ambulance Corps 47 Main Street Hastings-on-Hudson, New York 10706	____ ________ , (____)____-______ __________________	____ ________ , (____)____-______ __________________
Property ID: 6664032	**Architect Of Record** __________________ __________________ ___________, ____ ______ (____)____-______	**Property Owner** __________________ , (____)____-______

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Electric - Grid	12,121 kWh (thousand Watt-hours)	$ 0.27/kWh (thousand Watt-hours)
Natural Gas	1,225 therms	$ 1.40/therms

Estimated Design Use Details

This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

Fire Station	
Weekly Operating Hours	168
Number of Workers on Main Shift	5
Number of Computers	4
Gross Floor Area	2,400 Sq. Ft.

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**N/A**	50	N/A
Energy Reduction (from Median)(%)	**-18.4**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**101**	124	23
Site Energy Use Intensity (kBtu/ft²/yr)	**68**	83	15
Source Energy Use (kBtu/yr)	**244,424**	299,681	55,257
Site Energy Use (kBtu/yr)	**163,856**	200,900	37,044
Energy Costs ($)	**4,939**	6,055	1,116
Total GHG Emissions (Metric Tons CO2e)	**10**	12	2

Designed to Earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does your property type match the function or use of a property that's eligibility to receive an ENERGY STAR design score? ☐ **Yes** ☐ **No/Not Sure**

If you are not sure your project is eligible for an ENERGY STAR design score, please describe the property's major functions or use:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property currently unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) applying for ENERGY STAR partnership? ☐ **Yes** ☐ **No**

6) Was the design record created in the owner's Portfolio Manager account? ☐ **Yes** ☐ **No**

7) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: ____________________________

Professional Verification

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _______________________Date: ___________

Verifying Professional

____ ________
,
(____)____-______
____

Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

I agree to adhere to the ENERGY STAR Identity Guidelines when using the Designed to Earn the ENERGY STAR recognition graphic in association with this project.

Architect of Record Acknowledgement

As the Architect of Record representative, I confirm that the information on this SEDI is true and accurate to the best of my knowledge. It is our best estimate for all energy use of specified systems and processes but does not guarantee the operational performance of this building. Instead, this project has been specified to achieve Designed to Earn the ENERGY STAR recognition in an effort to assist the Owner/Developer in meeting their operational performance goal for the building to earn ENERGY STAR certification.

Signature: _______________________

Date: __________________________

Building Owner/Developer Acknowledgement

As the Building Owner/Developer representative, I concur that this project be nominated for Designed to Earn the ENERGY STAR recognition. Our organization understands the importance of measuring actual energy use in Portfolio Manager after receiving the Certificate of Occupancy to verify that this property is performing as intended. We understand that once the building earns an ENERGY STAR score of 75 or higher, it may be eligible for ENERGY STAR certification.

Signature: _______________________

Date: __________________________

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]
Chemka Pool Building

LEARN MORE AT energystar.gov

N/A

ENERGY STAR®
Design Score[2]

Primary Property Type: Other - Entertainment/Public Assembly
Gross Floor Area (ft²): 4,200
Estimated Date of Certification of Occupancy: __________

Date Generated: March 04, 2019

1. This form is required when applying for Designed to Earn the ENERGY STAR recognition. It was generated from ENERGY STAR Portfolio Manager.
2. The ENERGY STAR 1 – 100 Score is based on total annual Source Energy. To be eligible for Designed to Earn the ENERGY STAR recognition you must score at least 75.

Property & Contact Information for Design Project

Property Address	Project Architect	Owner Contact
Chemka Pool Building Hillside Avenue Hastings-on-Hudson, New York 10706	____ ________ , (____)____-______ __________________	____ ________ , (____)____-______ __________________
Property ID: 6664188	**Architect Of Record** __________________ __________________ ___________, ____ ______ (____)____-______	**Property Owner** __________________ , (____)____-______

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Electric - Grid	109,680 kWh (thousand Watt-hours)	$ 0.24/kWh (thousand Watt-hours)

Estimated Design Use Details

☆ This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

Other - Entertainment/Public Assembly	
Weekly Operating Hours	60
Number of Workers on Main Shift	10
Number of Computers	2
★ Gross Floor Area	4,200 Sq. Ft.

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**N/A**	50	N/A
Energy Reduction (from Median)(%)	**122.7**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**249**	112	-137
Site Energy Use Intensity (kBtu/ft²/yr)	**89**	40	-49
Source Energy Use (kBtu/yr)	**1,047,839**	470,430	-577,409
Site Energy Use (kBtu/yr)	**374,228**	168,011	-206,217
Energy Costs ($)	**26,323**	11,817	-14,506
Total GHG Emissions (Metric Tons CO2e)	**31**	14	-17

Designed to Earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does your property type match the function or use of a property that's eligibility to receive an ENERGY STAR design score? ☐ **Yes** ☐ **No/Not Sure**

If you are not sure your project is eligible for an ENERGY STAR design score, please describe the property's major functions or use:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property currently unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) applying for ENERGY STAR partnership? ☐ **Yes** ☐ **No**

6) Was the design record created in the owner's Portfolio Manager account? ☐ **Yes** ☐ **No**

7) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: ____________________________

Professional Verification

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _______________________Date: ___________

Verifying Professional

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(____)____-______
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Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

I agree to adhere to the ENERGY STAR Identity Guidelines when using the Designed to Earn the ENERGY STAR recognition graphic in association with this project.

Architect of Record Acknowledgement

As the Architect of Record representative, I confirm that the information on this SEDI is true and accurate to the best of my knowledge. It is our best estimate for all energy use of specified systems and processes but does not guarantee the operational performance of this building. Instead, this project has been specified to achieve Designed to Earn the ENERGY STAR recognition in an effort to assist the Owner/Developer in meeting their operational performance goal for the building to earn ENERGY STAR certification.

Signature: _______________________

Date: __________________________

Building Owner/Developer Acknowledgement

As the Building Owner/Developer representative, I concur that this project be nominated for Designed to Earn the ENERGY STAR recognition. Our organization understands the importance of measuring actual energy use in Portfolio Manager after receiving the Certificate of Occupancy to verify that this property is performing as intended. We understand that once the building earns an ENERGY STAR score of 75 or higher, it may be eligible for ENERGY STAR certification.

Signature: _______________________

Date: __________________________

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]

James Harmon Community Center

N/A

ENERGY STAR®
Design Score[2]

Primary Property Type: Mixed Use Property
Gross Floor Area (ft²): 17,000
Estimated Date of Certification of Occupancy: __________

Date Generated: March 04, 2019

1. This form is required when applying for Designed to Earn the ENERGY STAR recognition. It was generated from ENERGY STAR Portfolio Manager.
2. The ENERGY STAR 1 – 100 Score is based on total annual Source Energy. To be eligible for Designed to Earn the ENERGY STAR recognition you must score at least 75.

Property & Contact Information for Design Project

Property Address	Project Architect	Owner Contact
James Harmon Community Center 44 Main Street Hastings-on-Hudson, New York 10706	____ ________ , (____)____-______ __________________	____ ________ , (____)____-______ __________________
Property ID: 6664076	**Architect Of Record** __________________ __________________ ___________, ____ ______ (____)____-______	**Property Owner** __________________ , (____)____-______

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Natural Gas	11,213 therms	$ 1.10/therms
Electric - Grid	209,400 kWh (thousand Watt-hours)	$ 0.15/kWh (thousand Watt-hours)

Estimated Design Use Details

☆ This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

Social/Meeting Hall		Other - Recreation	
Weekly Operating Hours	40	Weekly Operating Hours	40
Number of Workers on Main Shift	20	Number of Workers on Main Shift	5
Number of Computers	0	Number of Computers	15
★ Gross Floor Area	3,000 Sq. Ft.	★ Gross Floor Area	4,000 Sq. Ft.

Office	
★ Weekly Operating Hours	40
★ Number of Workers on Main Shift	10
★ Percent That Can Be Cooled	50 % or more
★ Number of Computers	10
Percent That Can Be Heated	50 % or more
★ Gross Floor Area	10,000 Sq. Ft.

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**N/A**	50	N/A
Energy Reduction (from Median)(%)	**60.6**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**186**	116	-70
Site Energy Use Intensity (kBtu/ft²/yr)	**108**	67	-41
Source Energy Use (kBtu/yr)	**3,177,889**	1,978,295	-1,199,594
Site Energy Use (kBtu/yr)	**1,835,773**	1,142,803	-692,970
Energy Costs ($)	**43,116**	26,840	-16,276
Total GHG Emissions (Metric Tons CO2e)	**120**	74	-46

Designed to Earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does your property type match the function or use of a property that's eligibility to receive an ENERGY STAR design score? ☐ **Yes** ☐ **No/Not Sure**

If you are not sure your project is eligible for an ENERGY STAR design score, please describe the property's major functions or use:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property currently unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) applying for ENERGY STAR partnership? ☐ **Yes** ☐ **No**

6) Was the design record created in the owner's Portfolio Manager account? ☐ **Yes** ☐ **No**

7) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: ____________________________

Professional Verification

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _______________________Date: ___________

Verifying Professional

____ ________
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(____)____-______
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Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

I agree to adhere to the ENERGY STAR Identity Guidelines when using the Designed to Earn the ENERGY STAR recognition graphic in association with this project.

Architect of Record Acknowledgement

As the Architect of Record representative, I confirm that the information on this SEDI is true and accurate to the best of my knowledge. It is our best estimate for all energy use of specified systems and processes but does not guarantee the operational performance of this building. Instead, this project has been specified to achieve Designed to Earn the ENERGY STAR recognition in an effort to assist the Owner/Developer in meeting their operational performance goal for the building to earn ENERGY STAR certification.

Signature: _______________________

Date: __________________________

Building Owner/Developer Acknowledgement

As the Building Owner/Developer representative, I concur that this project be nominated for Designed to Earn the ENERGY STAR recognition. Our organization understands the importance of measuring actual energy use in Portfolio Manager after receiving the Certificate of Occupancy to verify that this property is performing as intended. We understand that once the building earns an ENERGY STAR score of 75 or higher, it may be eligible for ENERGY STAR certification.

Signature: _______________________

Date: __________________________

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]

Department of Public Works Garage

48

ENERGY STAR®
Design Score[2]

Primary Property Type: Non-Refrigerated Warehouse
Gross Floor Area (ft²): 12,000
Estimated Date of Certification of Occupancy: __________

Date Generated: March 04, 2019

1. This form is required when applying for Designed to Earn the ENERGY STAR recognition. It was generated from ENERGY STAR Portfolio Manager.
2. The ENERGY STAR 1 – 100 Score is based on total annual Source Energy. To be eligible for Designed to Earn the ENERGY STAR recognition you must score at least 75.

Property & Contact Information for Design Project

Property Address	Project Architect	Owner Contact
Department of Public Works Garage 69 Southside Avenue Hastings-on-Hudson, New York 10706	____ ________ , (____)____-______ __________________	____ ________ , (____)____-______ __________________
Property ID: 6664054	**Architect Of Record** __________________ __________________ ___________, ____ ______ (____)____-______	**Property Owner** __________________ , (____)____-______

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Electric - Grid	35,901 kWh (thousand Watt-hours)	$ 0.16/kWh (thousand Watt-hours)
Natural Gas	6,728 therms	$ 1.08/therms

Estimated Design Use Details

☆ This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

Non-Refrigerated Warehouse	
★ Weekly Operating Hours	60
★ Number of Workers on Main Shift	5
★ Percent Used for Cold Storage	0
★ Percent That Can Be Cooled	All of it - 100%
★ Percent That Can Be Heated	All of it - 100%
★ Gross Floor Area	12,000 Sq. Ft.
Number of Walk-in Refrigeration/Freezer Units	0

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**48**	50	N/A
Energy Reduction (from Median)(%)	**2.3**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**87**	85	-2
Site Energy Use Intensity (kBtu/ft²/yr)	**66**	64	-2
Source Energy Use (kBtu/yr)	**1,049,423**	1,025,620	-23,803
Site Energy Use (kBtu/yr)	**795,294**	777,254	-18,040
Energy Costs ($)	**13,046**	12,750	-296
Total GHG Emissions (Metric Tons CO2e)	**46**	45	-1

Designed to Earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does your property type match the function or use of a property that's eligibility to receive an ENERGY STAR design score? ☐ **Yes** ☐ **No/Not Sure**

If you are not sure your project is eligible for an ENERGY STAR design score, please describe the property's major functions or use:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property currently unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) applying for ENERGY STAR partnership? ☐ **Yes** ☐ **No**

6) Was the design record created in the owner's Portfolio Manager account? ☐ **Yes** ☐ **No**

7) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: ____________________________

Professional Verification

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _______________________Date: ___________

Verifying Professional

____ ________
,
(____)____-______
____

Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

I agree to adhere to the ENERGY STAR Identity Guidelines when using the Designed to Earn the ENERGY STAR recognition graphic in association with this project.

Architect of Record Acknowledgement

As the Architect of Record representative, I confirm that the information on this SEDI is true and accurate to the best of my knowledge. It is our best estimate for all energy use of specified systems and processes but does not guarantee the operational performance of this building. Instead, this project has been specified to achieve Designed to Earn the ENERGY STAR recognition in an effort to assist the Owner/Developer in meeting their operational performance goal for the building to earn ENERGY STAR certification.

Signature: _______________________

Date: __________________________

Building Owner/Developer Acknowledgement

As the Building Owner/Developer representative, I concur that this project be nominated for Designed to Earn the ENERGY STAR recognition. Our organization understands the importance of measuring actual energy use in Portfolio Manager after receiving the Certificate of Occupancy to verify that this property is performing as intended. We understand that once the building earns an ENERGY STAR score of 75 or higher, it may be eligible for ENERGY STAR certification.

Signature: _______________________

Date: __________________________

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]

Hook and Ladder Fire Company

LEARN MORE AT energystar.gov

N/A

ENERGY STAR®
Design Score[2]

Primary Property Type: Fire Station
Gross Floor Area (ft²): 9,000
Estimated Date of Certification of Occupancy: __________

Date Generated: March 04, 2019

1. This form is required when applying for Designed to Earn the ENERGY STAR recognition. It was generated from ENERGY STAR Portfolio Manager.
2. The ENERGY STAR 1 – 100 Score is based on total annual Source Energy. To be eligible for Designed to Earn the ENERGY STAR recognition you must score at least 75.

Property & Contact Information for Design Project

Property Address	Project Architect	Owner Contact
Hook and Ladder Fire Company 50 Main Street Hastings-on-Hudson, New York 10706	____ ________ , (____)____-______ _________________	____ ________ , (____)____-______ _________________
Property ID: 6664038	**Architect Of Record** _________________ _________________ ___________, ____ ______ (____)____-______	**Property Owner** _________________ , (____)____-______

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Electric - Grid	8,646 kWh (thousand Watt-hours)	$ 0.08/kWh (thousand Watt-hours)
Natural Gas	6,105 therms	$ 1.10/therms

Estimated Design Use Details

☆ This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

Fire Station	
Weekly Operating Hours	168
Number of Workers on Main Shift	5
Number of Computers	5
★ Gross Floor Area	9,000 Sq. Ft.

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**N/A**	50	N/A
Energy Reduction (from Median)(%)	**-35.6**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**80**	124	44
Site Energy Use Intensity (kBtu/ft²/yr)	**71**	110	39
Source Energy Use (kBtu/yr)	**723,625**	1,123,806	400,181
Site Energy Use (kBtu/yr)	**640,000**	993,934	353,934
Energy Costs ($)	**7,441**	11,557	4,116
Total GHG Emissions (Metric Tons CO2e)	**34**	54	20

Designed to Earn the ENERGY STAR: Application Checklist

This section is only required if you are using this document to apply for Designed to Earn the ENERGY STAR. All design projects that achieve an EPA energy performance score of 75 or higher are eligible for this certification.

1) Does your property type match the function or use of a property that's eligibility to receive an ENERGY STAR design score? ☐ **Yes** ☐ **No/Not Sure**

If you are not sure your project is eligible for an ENERGY STAR design score, please describe the property's major functions or use:

2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property currently unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) applying for ENERGY STAR partnership? ☐ **Yes** ☐ **No**

6) Was the design record created in the owner's Portfolio Manager account? ☐ **Yes** ☐ **No**

7) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: ____________________________

Professional Verification

I ________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: ______________________Date: ___________

Verifying Professional

____ ________
,
(____)____-______
____

Note: When applying for the ENERGY STAR Designed to Earn, the signature of the Verifying Professional must match the stamp.

Verifying Professional Stamp (if applicable)

I agree to adhere to the ENERGY STAR Identity Guidelines when using the Designed to Earn the ENERGY STAR recognition graphic in association with this project.

Architect of Record Acknowledgement

As the Architect of Record representative, I confirm that the information on this SEDI is true and accurate to the best of my knowledge. It is our best estimate for all energy use of specified systems and processes but does not guarantee the operational performance of this building. Instead, this project has been specified to achieve Designed to Earn the ENERGY STAR recognition in an effort to assist the Owner/Developer in meeting their operational performance goal for the building to earn ENERGY STAR certification.

Signature: ______________________

Date: __________________________

Building Owner/Developer Acknowledgement

As the Building Owner/Developer representative, I concur that this project be nominated for Designed to Earn the ENERGY STAR recognition. Our organization understands the importance of measuring actual energy use in Portfolio Manager after receiving the Certificate of Occupancy to verify that this property is performing as intended. We understand that once the building earns an ENERGY STAR score of 75 or higher, it may be eligible for ENERGY STAR certification.

Signature: ______________________

Date: __________________________

ENERGY STAR® Statement of Energy Design Intent (SEDI)[1]

Village Hall / Library

N/A

ENERGY STAR®
Design Score[2]

Primary Property Type: Social/Meeting Hall
Gross Floor Area (ft²): 23,820
Estimated Date of Certification of Occupancy: __________

Date Generated: March 04, 2019

1. This form is required when applying for Designed to Earn the ENERGY STAR recognition. It was generated from ENERGY STAR Portfolio Manager.
2. The ENERGY STAR 1 – 100 Score is based on total annual Source Energy. To be eligible for Designed to Earn the ENERGY STAR recognition you must score at least 75.

Property & Contact Information for Design Project

Property Address	**Project Architect**	**Owner Contact**
Village Hall / Library 7 Maple Avenue Hastings-on-Hudson, New York 10706	____ ________ , (____)____-______ __________________	____ ________ , (____)____-______ __________________
Property ID: 6664014	**Architect Of Record**	**Property Owner**
	__________________ __________________ ___________, ____ ______ (____)____-______	__________________ , (____)____-______

Estimated Design Energy

Fuel Type	Usage	Energy Rate ($/Unit)
Natural Gas	12,107 therms	$ 1.12/therms
Electric - Grid	252,360 kWh (thousand Watt-hours)	$ 0.15/kWh (thousand Watt-hours)
Fuel Oil (No. 2)	2,621 Gallons	$ 2.39/Gallons

Estimated Design Use Details

☆ This Use Detail is used to calculate the 1-100 ENERGY STAR Score.

Library		**Office**	
Weekly Operating Hours	60	★ Weekly Operating Hours	60
Number of Workers on Main Shift	10	★ Number of Workers on Main Shift	30
Number of Computers	20	★ Percent That Can Be Cooled	50 % or more
★ Gross Floor Area	13,225 Sq. Ft.	★ Number of Computers	30
		Percent That Can Be Heated	50 % or more
		★ Gross Floor Area	8,595 Sq. Ft.

Police Station	
Weekly Operating Hours	168
Number of Workers on Main Shift	10
Number of Computers	8
★ Gross Floor Area	2,000 Sq. Ft.

Design Energy and Emission Results

Metric	Design Project	Median Property	Estimated Savings
ENERGY STAR Score (1-100)	**N/A**	50	N/A
Energy Reduction (from Median)(%)	**18.3**	0	N/A
Source Energy Use Intensity (kBtu/ft²/yr)	**169**	143	-26
Site Energy Use Intensity (kBtu/ft²/yr)	**102**	86	-16
Source Energy Use (kBtu/yr)	**4,047,495**	3,421,313	-626,182
Site Energy Use (kBtu/yr)	**2,433,450**	2,056,974	-376,476
Energy Costs ($)	**58,435**	49,394	-9,041
Total GHG Emissions (Metric Tons CO2e)	**164**	138	-26

Designed to Earn the ENERGY STAR: Application Checklist

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2) Is the design project at least 95% complete with construction documents? ☐ **Yes** ☐ **No**

If no, please explain:

3) Is the property currently unoccupied and not yet generating energy bills? ☐ **Yes** ☐ **No**

4) Do energy calculations account for the whole building intended operations and all energy sources? ☐ **Yes** ☐ **No**

5) Is the Architect of Record (AOR) applying for ENERGY STAR partnership? ☐ **Yes** ☐ **No**

6) Was the design record created in the owner's Portfolio Manager account? ☐ **Yes** ☐ **No**

7) Are you seeking other qualifications for this design project? ☐ **Yes** ☐ **No**

If so, please select all that apply:

- ☐ AIA 2030 Commitment
- ☐ Architecture 2030 Challenge
- ☐ Federal, State or Local Disclosure Ordinance
- ☐ Green Globes
- ☐ LEED
- ☐ Other, please indicate: ____________________________

Professional Verification

I _________________ (Name) verify that the above information is true and correct to the best of my knowledge.

Signature: _______________________Date: ___________

Verifying Professional

____ ________
,
(____)____-______
____

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Date: __________________________

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Signature: _______________________

Date: __________________________

Appendix B:

Utility Bill Summaries

Ambulance Corps Utility Info - 47 Main Street

Gas

From	To	Days	Month	therms	Cost	$/therm
1/0/00			January-15			
1/0/00			February-15			
1/0/00			March-15			
1/0/00			April-15			
1/0/00			May-15			
1/0/00			June-15			
1/0/00			July-15			
1/0/00			August-15			
1/0/00			September-15			
1/0/00			October-15			
1/0/00			November-15			
1/0/00			December-15			
1/0/00			January-16			
1/0/00			February-16			
1/0/00			March-16			
1/0/00			April-16			
1/0/00			May-16			
1/0/00			June-16			
1/0/00			July-16			
1/0/00			August-16			
1/0/00			September-16			
1/0/00			October-16			
1/0/00			November-16			
1/0/00			December-16			
1/0/00			January-17			
1/0/00			February-17			
1/0/00			March-17			
1/0/00			April-17			
1/0/00			May-17			
1/0/00			June-17			
1/0/00			July-17			
1/0/00			August-17			
1/0/00			September-17			
1/0/00			October-17			
1/0/00			November-17			
1/0/00			December-17	186	$164	$0.88
1/0/00			January-18	148	$164	$1.11
1/0/00			February-18	126	$164	$1.30
1/0/00			March-18	156	$203	$1.30
1/0/00			April-18	156	$203	$1.30
1/0/00			May-18	133	$203	$1.53
1/0/00			June-18	102	$203	$1.99
1/0/00			July-18	118	$203	$1.71
1/0/00			August-18	99	$203	$2.05
Running Annual (September 2016)				**0**	**$0**	**#DIV/0!**
Running Annual (September 2017)				**1,225**	**$1,710**	**$1.40**
Average				612	$855	#DIV/0!

Oil

From	To	Days	Month	Gallons	Cost	$/gal
			January-15			
			February-15			
			March-15			
			April-15			
			May-15			
			June-15			
			July-15			
			August-15			
			September-15			
			October-15			
			November-15			
			December-15			
			January-16			
			February-16			
			March-16			
			April-16			
			May-16			
			June-16			
			July-16			
			August-16			
			September-16			
			October-16			
			November-16			
			December-16			
			January-17			
			February-17			
			March-17			
			April-17			
			May-17			
			June-17			
			July-17			
			August-17			
			September-17			
			October-17			
			November-17			
			December-17			
			January-18			
			February-18			
			March-18			
			April-18			
			May-18			
			June-18			
			July-18			
			August-18			
				0	**$0**	
				0	**$0**	
				0	$0	

Electricity

From	To	Days	Month	kWh	kW	Production Cost	Delivery Cost	Total Cost	$/kWh
			January-15						
			February-15						
			March-15						
			April-15						
			May-15						
1/0/00			June-15						
1/0/00			July-15						
1/0/00			August-15						
1/0/00			September-15						
1/0/00			October-15						
1/0/00			November-15						
1/0/00			December-15						
1/0/00			January-16						
1/0/00			February-16						
1/0/00			March-16						
1/0/00			April-16						
1/0/00			May-16	899		$14.21	$176.55	$190.76	$0.212
1/0/00			June-16	1,410		$50.52	$268.58	$319.10	$0.226
1/0/00			July-16	2,026		$89.40	$403.28	$492.68	$0.243
1/0/00			August-16	1,970		$79.39	$372.15	$451.54	$0.229
1/0/00			September-16	1,807		$92.95	$353.85	$446.80	$0.247
1/0/00			October-16	1,369		$68.32	$258.69	$327.01	$0.239
1/0/00			November-16	1,118		$33.80	$232.28	$266.08	$0.238
1/0/00			December-16	1,131		$42.70	$246.12	$288.82	$0.255
1/0/00			January-17	1,287		$44.34	$267.71	$312.05	$0.242
1/0/00			February-17	1,206		$56.57	$235.27	$291.84	$0.242
1/0/00			March-17	867		$40.53	$188.16	$228.69	$0.264
1/0/00			April-17	727		$27.41	$137.56	$164.97	$0.227
1/0/00			May-17	587		$26.72	$110.94	$137.66	$0.235
1/0/00			June-17	928		$46.27	$181.80	$228.07	$0.246
1/0/00			July-17	1,512		$100.40	$312.26	$412.66	$0.273
1/0/00			August-17	963		$55.77	$196.84	$252.61	$0.262
1/0/00			September-17	923		$55.94	$193.73	$249.67	$0.270
1/0/00			October-17	1,141		$58.89	$228.22	$287.11	$0.252
1/0/00			November-17	673		$31.03	$147.44	$178.47	$0.265
1/0/00			December-17	724		$36.59	$169.18	$205.77	$0.284
1/0/00			January-18	1,027		$43.74	$228.48	$272.22	$0.265
1/0/00			February-18	1,221		$73.62	$247.79	$321.41	$0.263
1/0/00			March-18	1,311		$118.21	$282.18	$400.39	$0.305
1/0/00			April-18	1,206		$43.27	$236.19	$279.46	$0.232
1/0/00			May-18	960		$38.94	$189.76	$228.70	$0.238
1/0/00			June-18	850		$45.37	$175.74	$221.11	$0.260
1/0/00			July-18	941		$56.42	$206.32	$262.74	$0.279
1/0/00			August-18	1,144		$80.36	$240.01	$320.37	$0.280
				13,502	**0**			**$3,357**	$0.249
				12,121	**0**			**$3,227**	$0.266
				12,812	0			$ 3,292	$ 0.257

Total Energy

Month	Gas (kBtu/ft²)	Oil (kBtu/ft²)	Electricity (kBtu/ft²)	Total (kBtu/ft²)	Total Site Heating (kBtu/ft²)	Total Source Heating (kBtu/ft²)	Total Cost	Total Cost ($/ft²)
January-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
June-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
July-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
August-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
September-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
October-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
November-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
December-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
January-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-16	0.0	0	1.3	1.3	0.0	0.0	$14	0.005921
June-16	0.0	0	2.0	2.0	0.0	0.0	$51	0.02105
July-16	0.0	0	2.9	2.9	0.0	0.0	$89	0.03725
August-16	0.0	0	2.8	2.8	0.0	0.0	$79	0.033079
September-16	0.0	0	2.6	2.6	0.0	0.0	$93	0.038729
October-16	0.0	0	1.9	1.9	0.0	0.0	$68	0.028467
November-16	0.0	0	1.6	1.6	0.0	0.0	$34	0.014083
December-16	0.0	0	1.6	1.6	0.0	0.0	$43	0.017792
January-17	0.0	0	1.8	1.8	0.0	0.0	$44	0.018475
February-17	0.0	0	1.7	1.7	0.0	0.0	$57	0.023571
March-17	0.0	0	1.2	1.2	0.0	0.0	$41	0.016888
April-17	0.0	0	1.0	1.0	0.0	0.0	$27	0.011421
May-17	0.0	0	0.8	0.8	0.0	0.0	$27	0.011133
June-17	0.0	0	1.3	1.3	0.0	0.0	$46	0.019279
July-17	0.0	0	2.1	2.1	0.0	0.0	$100	0.041833
August-17	0.0	0	1.4	1.4	0.0	0.0	$56	0.023238
September-17	0.0	0	1.3	1.3	0.0	0.0	$56	0.023308
October-17	0.0	0	1.6	1.6	0.0	0.0	$59	0.024538
November-17	0.0	0	1.0	1.0	0.0	0.0	$31	0.012929
December-17	7.7	0	1.0	8.8	7.7	8.1	$201	0.083579
January-18	6.2	0	1.5	7.6	6.2	6.5	$208	0.086558
February-18	5.3	0	1.7	7.0	5.3	5.5	$238	0.099008
March-18	6.5	0	1.9	8.4	6.5	6.8	$321	0.133838
April-18	6.5	0	1.7	8.2	6.5	6.8	$246	0.102613
May-18	5.5	0	1.4	6.9	5.5	5.8	$242	0.100808
June-18	4.2	0	1.2	5.5	4.2	4.5	$248	0.103488
July-18	4.9	0	1.3	6.3	4.9	5.2	$259	0.108092
August-18	4.1	0	1.6	5.8	4.1	4.3	$283	0.118067
	0.00	**0.0**	**19.2**	**19.20**	**0.00**	**0.00**	$3,357	1.3989
	51.03	**0.0**	**17.2**	**68.26**	**51.03**	**53.58**	$4,937	2.057258
				43.73	25.52	26.79	$4,147	

Chemka Pool - Hillside Avenue

Gas

From	To	Days	Month	therms	Cost	$/therm
1/0/00			January-15			
1/0/00			February-15			
1/0/00			March-15			
1/0/00			April-15			
1/0/00			May-15			
1/0/00			June-15			
1/0/00			July-15			
1/0/00			August-15			
1/0/00			September-15			
1/0/00			October-15			
1/0/00			November-15			
1/0/00			December-15			
1/0/00			January-16			
1/0/00			February-16			
1/0/00			March-16			
1/0/00			April-16			
1/0/00			May-16			
1/0/00			June-16			
1/0/00			July-16			
1/0/00			August-16			
1/0/00			September-16			
1/0/00			October-16			
1/0/00			November-16			
1/0/00			December-16			
1/0/00			January-17			
1/0/00			February-17			
1/0/00			March-17			
1/0/00			April-17			
1/0/00			May-17			
1/0/00			June-17			
1/0/00			July-17			
1/0/00			August-17			
1/0/00			September-17			
1/0/00			October-17			
1/0/00			November-17			
1/0/00			December-17			
1/0/00			January-18			
1/0/00			February-18			
1/0/00			March-18			
1/0/00			April-18			
1/0/00			May-18			
1/0/00			June-18			
1/0/00			July-18			
1/0/00			August-18			
Running Annual (September 2016)				**0**	**$0**	**#DIV/0!**
Running Annual (September 2017)				**0**	**$0**	**#DIV/0!**
Average				0	$0	#DIV/0!

Oil

From	To	Days	Month	Gallons	Cost	$/gal
			January-15			
			February-15			
			March-15			
			April-15			
			May-15			
			June-15			
			July-15			
			August-15			
			September-15			
			October-15			
			November-15			
			December-15			
			January-16			
			February-16			
			March-16			
			April-16			
			May-16			
			June-16			
			July-16			
			August-16			
			September-16			
			October-16			
			November-16			
			December-16			
			January-17			
			February-17			
			March-17			
			April-17			
			May-17			
			June-17			
			July-17			
			August-17			
			September-17			
			October-17			
			November-17			
			December-17			
			January-18			
			February-18			
			March-18			
			April-18			
			May-18			
			June-18			
			July-18			
			August-18			
				0	**$0**	
				0	**$0**	
				0	$0	

Electricity

From	To	Days	Month	kWh	kW	$/kW	Energy Production Cost	Delivery (Demand) Cost	Total Cost	$/kWh	Energy Cost $/kWh
			January-15								
			February-15								
			March-15								
			April-15								
			May-15								
1/0/00			June-15								
1/0/00			July-15								
1/0/00			August-15								
1/0/00			September-15								
1/0/00			October-15								
1/0/00			November-15								
1/0/00			December-15								
1/0/00			January-16								
1/0/00			February-16								
1/0/00			March-16								
1/0/00			April-16								
1/0/00			May-16	6,320	16.80	$21.93	$266.16	$986.01	$1,252.17	$0.198	$0.042
1/0/00			June-16	16,480	93.60	$22.69	$890.17	$2,178.86	$3,069.03	$0.186	$0.054
1/0/00			July-16	20,720	101.60	$24.20	$1,272.36	$2,507.68	$3,780.04	$0.182	$0.061
1/0/00			August-16	21,200	103.20	$21.93	$1,219.74	$2,377.74	$3,597.48	$0.170	$0.058
1/0/00			September-16	19,840	103.20	$22.69	$1,370.26	$1,453.10	$2,823.36	$0.142	$0.069
1/0/00			October-16	7,760	35.20	$21.93	$567.33	$987.30	$1,554.63	$0.200	$0.073
1/0/00			November-16	3,440	79.20	$23.45	$236.35	$1,961.28	$2,197.63	$0.639	$0.069
1/0/00			December-16	2,800	5.60	$24.20	$228.57	$1,113.06	$1,341.63	$0.479	$0.082
1/0/00			January-17	4,000	6.40	$24.20	$319.66	$1,058.84	$1,378.50	$0.345	$0.080
1/0/00			February-17	3,760	7.20	$23.19	$356.26	$996.21	$1,352.47	$0.360	$0.095
1/0/00			March-17	4,080	6.40	$25.98	$373.26	$1,096.89	$1,470.15	$0.360	$0.091
1/0/00			April-17	3,760	7.20	$23.55	$321.68	$963.83	$1,285.51	$0.342	$0.086
1/0/00			May-17	3,520	16.00	$22.74	$338.20	$943.85	$1,282.05	$0.364	$0.096
1/0/00			June-17	20,240	34.40	$24.36	$1,322.69	$1,003.93	$2,326.62	$0.115	$0.065
1/0/00			July-17	18,320	101.60	$25.98	$1,561.11	$2,669.70	$4,230.81	$0.231	$0.085
1/0/00			August-17	18,000	101.60	$23.55	$1,384.63	$2,489.61	$3,874.24	$0.215	$0.077
1/0/00			September-17	19,680	98.40	$24.36	$1,542.12	$2,490.48	$4,032.60	$0.205	$0.078
1/0/00			October-17	6,560	70.40	$23.55	$538.90	$1,747.98	$2,286.88	$0.349	$0.082
1/0/00			November-17	3,280	79.20	$25.17	$330.77	$2,073.69	$2,404.46	$0.733	$0.101
1/0/00			December-17	3,760	9.60	$25.98	$367.64	$1,168.22	$1,535.86	$0.408	$0.098
1/0/00			January-18	3,760	9.60	$26.45	$239.11	$1,167.01	$1,406.12	$0.374	$0.064
1/0/00			February-18	3,600	9.60	$25.91	$295.42	$1,081.10	$1,376.52	$0.382	$0.082
1/0/00			March-18	3,760	7.20	$27.64	$417.97	$1,125.72	$1,543.69	$0.411	$0.111
1/0/00			April-18	3,600	7.20	$25.05	$207.47	$1,023.02	$1,230.49	$0.342	$0.058
1/0/00			May-18	15,760	6.40	$25.05	$605.62	$1,025.56	$1,631.18	$0.104	$0.038
1/0/00			June-18	12,640	37.60	$25.91	$788.92	$1,065.91	$1,854.83	$0.147	$0.062
1/0/00			July-18	13,440	104.80	$27.64	$947.38	$2,944.49	$3,891.87	$0.290	$0.070
1/0/00			August-18	20,000	107.20	$25.05	$1,574.44	$2,807.39	$4,381.83	$0.219	$0.079
				109,520	**103.20**	**$33.21**	**$8,380**	**$16,738**	**$25,118**	$0.229	$0.077
				109,840	**107.20**	**$36.04**	**$7,856**	**$19,721**	**$27,576**	$0.251	$0.072
				109,680	105.20	$ 34.62	$ 8,118	$ 18,229	$ 26,347	$ 0.240	$ 0.074

Total Energy

Month	Gas ($kBtu/ft^2$)	Oil ($kBtu/ft^2$)	Electricity ($kBtu/ft^2$)	Total ($kBtu/ft^2$)	Total Site Heating ($kBtu/ft^2$)	Total Source Heating ($kBtu/ft^2$)	Total Cost	Total Cost ($\$/ft^2$)
January-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
June-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
July-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
August-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
September-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
October-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
November-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
December-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
January-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-16	0.0	0	5.1	5.1	0.0	0.0	$266	0.063371
June-16	0.0	0	13.4	13.4	0.0	0.0	$890	0.211945
July-16	0.0	0	16.8	16.8	0.0	0.0	$1,272	0.302943
August-16	0.0	0	17.2	17.2	0.0	0.0	$1,220	0.290414
September-16	0.0	0	16.1	16.1	0.0	0.0	$1,370	0.326252
October-16	0.0	0	6.3	6.3	0.0	0.0	$567	0.135079
November-16	0.0	0	2.8	2.8	0.0	0.0	$236	0.056274
December-16	0.0	0	2.3	2.3	0.0	0.0	$229	0.054421
January-17	0.0	0	3.2	3.2	0.0	0.0	$320	0.07611
February-17	0.0	0	3.1	3.1	0.0	0.0	$356	0.084824
March-17	0.0	0	3.3	3.3	0.0	0.0	$373	0.088871
April-17	0.0	0	3.1	3.1	0.0	0.0	$322	0.07659
May-17	0.0	0	2.9	2.9	0.0	0.0	$338	0.080524
June-17	0.0	0	16.4	16.4	0.0	0.0	$1,323	0.314926
July-17	0.0	0	14.9	14.9	0.0	0.0	$1,561	0.371693
August-17	0.0	0	14.6	14.6	0.0	0.0	$1,385	0.329674
September-17	0.0	0	16.0	16.0	0.0	0.0	$1,542	0.367171
October-17	0.0	0	5.3	5.3	0.0	0.0	$539	0.12831
November-17	0.0	0	2.7	2.7	0.0	0.0	$331	0.078755
December-17	0.0	0	3.1	3.1	0.0	0.0	$368	0.087533
January-18	0.0	0	3.1	3.1	0.0	0.0	$239	0.056931
February-18	0.0	0	2.9	2.9	0.0	0.0	$295	0.070338
March-18	0.0	0	3.1	3.1	0.0	0.0	$418	0.099517
April-18	0.0	0	2.9	2.9	0.0	0.0	$207	0.049398
May-18	0.0	0	12.8	12.8	0.0	0.0	$606	0.144195
June-18	0.0	0	10.3	10.3	0.0	0.0	$789	0.187838
July-18	0.0	0	10.9	10.9	0.0	0.0	$947	0.225567
August-18	0.0	0	16.2	16.2	0.0	0.0	$1,574	0.374867
	0.00	**0.0**	**89.0**	**88.97**	**0.00**	**0.00**	$25,118	5.9804
	0.00	**0.0**	**89.2**	**89.23**	**0.00**	**0.00**	$27,576	6.565793
				89.10	0.00	0.00	$26,347	

James Harmon Community Center - 44 Main Street

Gas

From	To	Days	Month	therms	Cost	$/therm
1/0/00			January-15			
1/0/00			February-15			
1/0/00			March-15			
1/0/00			April-15			
1/0/00			May-15			
1/0/00			June-15			
1/0/00			July-15			
1/0/00			August-15			
1/0/00			September-15			
1/0/00			October-15			
1/0/00			November-15			
1/0/00			December-15			
1/0/00			January-16			
1/0/00			February-16			
1/0/00			March-16			
1/0/00			April-16			
1/0/00			May-16			
1/0/00			June-16			
1/0/00			July-16			
1/0/00			August-16	10	$42	$4.23
1/0/00			September-16	37	$69	$1.86
1/0/00			October-16	728	$661	$0.91
1/0/00			November-16	1,517	$1,317	$0.87
1/0/00			December-16	2,469	$2,170	$0.88
1/0/00			January-17	2,023	$2,384	$1.18
1/0/00			February-17	1,805	$2,169	$1.20
1/0/00			March-17	1,666	$1,714	$1.03
1/0/00			April-17	520	$673	$1.29
1/0/00			May-17	294	$367	$1.25
1/0/00			June-17	9	$46	$5.11
1/0/00			July-17	8	$41	$5.11
1/0/00			August-17	9	$43	$4.81
1/0/00			September-17	20	$56	$2.78
1/0/00			October-17	416	$591	$1.42
1/0/00			November-17	1,922	$1,947	$1.01
1/0/00			December-17	2,726	$2,532	$0.93
1/0/00			January-18	2,201	$2,568	$1.17
1/0/00			February-18	1,711	$2,344	$1.37
1/0/00			March-18	1,632	$1,838	$1.13
1/0/00			April-18	563	$773	$1.37
1/0/00			May-18	123	$216	$1.76
1/0/00			June-18	10	$49	$4.86
1/0/00			July-18	8	$43	$5.35
1/0/00			August-18	8	$44	$5.44
Running Annual (September 2016)				**11,085**	**$11,653**	**$1.05**
Running Annual (September 2017)				**11,340**	**$13,000**	**$1.15**
Average				11,213	$12,327	$1.10

Oil

From	To	Days	Month	Gallons	Cost	$/gal
			January-15			
			February-15			
			March-15			
			April-15			
			May-15			
			June-15			
			July-15			
			August-15			
			September-15			
			October-15			
			November-15			
			December-15			
			January-16			
			February-16			
			March-16			
			April-16			
			May-16			
			June-16			
			July-16			
			August-16			
			September-16			
			October-16			
			November-16			
			December-16			
			January-17			
			February-17			
			March-17			
			April-17			
			May-17			
			June-17			
			July-17			
			August-17			
			September-17			
			October-17			
			November-17			
			December-17			
			January-18			
			February-18			
			March-18			
			April-18			
			May-18			
			June-18			
			July-18			
			August-18			
Running Annual (September 2016)				**0**	**$0**	
Running Annual (September 2017)				**0**	**$0**	
Average				0	$0	

Electricity

From	To	Days	Month	kWh	kW	$/kW	Energy Production Cost	Delivery (Demand) Cost	Total Cost	$/kWh	Energy Cost $/kWh
			January-15								
			February-15								
			March-15								
			April-15								
			May-15								
1/0/00			June-15								
1/0/00			July-15								
1/0/00			August-15								
1/0/00			September-15								
1/0/00			October-15								
1/0/00			November-15								
1/0/00			December-15								
1/0/00			January-16								
1/0/00			February-16								
1/0/00			March-16								
1/0/00			April-16								
1/0/00			May-16	13,520	40.00	$21.93	$432.12	$952.81	$1,384.93	$0.102	$0.032
1/0/00			June-16	15,360	54.40	$22.69	$791.24	$1,286.24	$2,077.48	$0.135	$0.052
1/0/00			July-16	19,200	74.40	$24.20	$1,155.91	$1,846.38	$3,002.29	$0.156	$0.060
1/0/00			August-16	19,760	75.20	$21.93	$1,112.34	$1,758.36	$2,870.70	$0.145	$0.056
1/0/00			September-16	19,680	81.60	$22.69	$1,334.91	$1,960.30	$3,295.21	$0.167	$0.068
1/0/00			October-16	15,440	64.00	$21.92	$1,023.51	$1,484.68	$2,508.19	$0.162	$0.066
1/0/00			November-16	15,200	46.40	$23.45	$706.51	$1,192.56	$1,899.07	$0.125	$0.046
1/0/00			December-16	16,400	36.80	$24.20	$879.95	$1,015.99	$1,895.94	$0.116	$0.054
1/0/00			January-17	19,280	40.00	$24.20	$938.87	$1,054.71	$1,993.58	$0.103	$0.049
1/0/00			February-17	16,160	40.00	$23.19	$1,007.25	$989.43	$1,996.68	$0.124	$0.062
1/0/00			March-17	17,520	38.40	$25.98	$1,079.44	$1,056.97	$2,136.41	$0.122	$0.062
1/0/00			April-17	15,520	41.60	$23.56	$829.24	$999.55	$1,828.79	$0.118	$0.053
1/0/00			May-17	14,960	51.20	$22.74	$920.57	$1,198.73	$2,119.30	$0.142	$0.062
1/0/00			June-17	15,600	70.40	$24.36	$1,040.20	$1,744.59	$2,784.79	$0.179	$0.067
1/0/00			July-17	20,800	71.20	$25.98	$1,687.23	$1,882.48	$3,569.71	$0.172	$0.081
1/0/00			August-17	18,320	67.20	$23.55	$1,339.37	$1,694.72	$3,034.09	$0.166	$0.073
1/0/00			September-17	16,480	69.60	$24.36	$1,266.67	$1,802.51	$3,069.18	$0.186	$0.077
1/0/00			October-17	15,120	64.00	$23.55	$1,026.64	$1,622.02	$2,648.66	$0.175	$0.068
1/0/00			November-17	16,160	50.40	$25.17	$979.60	$1,368.11	$2,347.71	$0.145	$0.061
1/0/00			December-17	19,200	40.80	$25.98	$1,229.33	$1,207.64	$2,436.97	$0.127	$0.064
1/0/00			January-18	19,280	44.00	$26.45	$942.73	$1,287.90	$2,230.63	$0.116	$0.049
1/0/00			February-18	18,480	74.40	$25.91	$1,250.39	$1,976.86	$3,227.25	$0.175	$0.068
1/0/00			March-18	17,040	41.60	$27.64	$1,651.03	$1,194.44	$2,845.47	$0.167	$0.097
1/0/00			April-18	16,080	39.20	$25.04	$687.66	$1,028.34	$1,716.00	$0.107	$0.043
1/0/00			May-18	15,520	60.80	$25.05	$742.32	$1,572.88	$2,315.20	$0.149	$0.048
1/0/00			June-18	18,800	56.00	$25.91	$1,125.21	$1,508.85	$2,634.06	$0.140	$0.060
1/0/00			July-18	20,080	68.00	$27.64	$1,341.03	$1,938.66	$3,279.69	$0.163	$0.067
1/0/00			August-18	21,680	70.40	$25.05	$1,668.22	$1,919.45	$3,587.67	$0.165	$0.077
Running Annual (September 2016)				**204,880**	**81.60**	**$25.08**	**$12,787**	**$16,275**	**$29,062**	$0.142	$0.062
Running Annual (September 2017)				**213,920**	**74.40**	**$27.13**	**$13,911**	**$18,428**	**$32,338**	$0.151	$0.065
Average				209,400	78.00	$ 26.11	$ 13,349	$ 17,351	$ 30,700	$ 0.147	$ 0.064

Total Energy

Month	Gas $(kBtu/ft^2)$	Oil $(kBtu/ft^2)$	Electricity $(kBtu/ft^2)$	Total $(kBtu/ft^2)$	Total Site Heating $(kBtu/ft^2)$	Total Source Heating $(kBtu/ft^2)$	Total Cost	Total Cost $(\$/ft^2)$
January-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
June-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
July-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
August-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
September-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
October-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
November-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
December-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
January-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-16	0.0	0	2.7	2.7	0.0	0.0	$432	0.025419
June-16	0.0	0	3.1	3.1	0.0	0.0	$791	0.046544
July-16	0.0	0	3.9	3.9	0.0	0.0	$1,156	0.067995
August-16	0.1	0	4.0	4.0	0.1	0.1	$1,155	0.067921
September-16	0.2	0	3.9	4.2	0.2	0.2	$1,404	0.082582
October-16	4.3	0	3.1	7.4	4.3	4.5	$1,685	0.099094
November-16	8.9	0	3.1	12.0	8.9	9.4	$2,024	0.119033
December-16	14.5	0	3.3	17.8	14.5	15.2	$3,050	0.179382
January-17	11.9	0	3.9	15.8	11.9	12.5	$3,323	0.195451
February-17	10.6	0	3.2	13.9	10.6	11.1	$3,176	0.186812
March-17	9.8	0	3.5	13.3	9.8	10.3	$2,794	0.164341
April-17	3.1	0	3.1	6.2	3.1	3.2	$1,502	0.088363
May-17	0.8	0	3.0	3.8	0.8	0.9	$1,110	0.065276
June-17	0.2	0	3.1	3.4	0.2	0.3	$1,123	0.066031
July-17	0.1	0	4.2	4.3	0.1	0.1	$1,741	0.102399
August-17	0.4	0	3.7	4.1	0.4	0.5	$1,454	0.085535
September-17	0.5	0	3.3	3.8	0.5	0.6	$1,400	0.082339
October-17	1.6	0	3.0	4.6	1.6	1.6	$1,396	0.082105
November-17	5.8	0	3.2	9.0	5.8	6.0	$1,929	0.113444
December-17	8.0	0	3.9	11.9	8.0	8.4	$2,437	0.143342
January-18	6.8	0	3.9	10.7	6.8	7.2	$2,225	0.130898
February-18	5.7	0	3.7	9.4	5.7	6.0	$2,503	0.147228
March-18	9.6	0	3.4	13.0	9.6	10.1	$3,489	0.205254
April-18	3.3	0	3.2	6.5	3.3	3.5	$1,461	0.085921
May-18	0.7	0	3.1	3.8	0.7	0.8	$959	0.056393
June-18	0.1	0	3.8	3.8	0.1	0.1	$1,174	0.06905
July-18	0.0	0	4.0	4.1	0.0	0.0	$1,384	0.081402
August-18	0.0	0	4.4	4.4	0.0	0.0	$1,712	0.100692
Running Annual (September 2016)	**65.21**	**0.0**	**41.1**	**106.33**	**65.21**	**68.47**	$40,715	2.3950
Running Annual (September 2017)	**66.71**	**0.0**	**42.9**	**109.64**	**66.71**	**70.04**	$45,339	2.666988
Average				107.98	65.96	69.25	$43,027	

DPW Garage - 69 Southside Avenue

Gas

From	To	Days	Month	therms	Cost	$/therm
1/0/00			January-15			#DIV/0!
1/0/00			February-15			#DIV/0!
1/0/00			March-15			#DIV/0!
1/0/00			April-15			#DIV/0!
1/0/00			May-15			#DIV/0!
1/0/00			June-15			#DIV/0!
1/0/00			July-15			#DIV/0!
1/0/00			August-15			#DIV/0!
1/0/00			September-15			#DIV/0!
1/0/00			October-15			#DIV/0!
1/0/00			November-15			#DIV/0!
1/0/00			December-15			#DIV/0!
1/0/00			January-16			#DIV/0!
1/0/00			February-16			#DIV/0!
1/0/00			March-16			#DIV/0!
1/0/00			April-16			#DIV/0!
1/0/00			May-16			#DIV/0!
1/0/00			June-16			#DIV/0!
1/0/00			July-16			#DIV/0!
1/0/00			August-16			#DIV/0!
1/0/00			September-16	0	$32	#DIV/0!
1/0/00			October-16	61	$91	$1.49
1/0/00			November-16	576	$498	$0.86
1/0/00			December-16	1,011	$865	$0.86
1/0/00			January-17	806	$914	$1.13
1/0/00			February-17	2,374	$2,640	$1.11
1/0/00			March-17	1,134	$1,102	$0.97
1/0/00			April-17	39	$80	$2.04
1/0/00			May-17	5	$32	$6.39
1/0/00			June-17	0	$32	#DIV/0!
1/0/00			July-17	0	$32	#DIV/0!
1/0/00			August-17	0	$32	#DIV/0!
1/0/00			September-17	1	$31	$31.39
1/0/00			October-17	61	$117	$1.92
1/0/00			November-17	668	$664	$0.99
1/0/00			December-17	1,940	$1,693	$0.87
1/0/00			January-18	1,728	$1,888	$1.09
1/0/00			February-18	1,526	$1,952	$1.28
1/0/00			March-18	1,238	$1,310	$1.06
1/0/00			April-18	40	$85	$2.13
1/0/00			May-18	5	$37	$7.40
1/0/00			June-18	243	$334	$1.37
1/0/00			July-18	0	$31	#DIV/0!
1/0/00			August-18	0	$32	#DIV/0!
Running Annual (September 2016)				**6,006**	**$6,349**	**$1.06**
Running Annual (September 2017)				**7,450**	**$8,175**	**$1.10**
Average				6,728	$7,262	$1.08

Oil

From	To	Days	Month	Gallons	Cost	$/gal
			January-15			
			February-15			
			March-15			
			April-15			
			May-15			
			June-15			
			July-15			
			August-15			
			September-15			
			October-15			
			November-15			
			December-15			
			January-16			
			February-16			
			March-16			
			April-16			
			May-16			
			June-16			
			July-16			
			August-16			
			September-16			
			October-16			
			November-16			
			December-16			
			January-17			
			February-17			
			March-17			
			April-17			
			May-17			
			June-17			
			July-17			
			August-17			
			September-17			
			October-17			
			November-17			
			December-17			
			January-18			
			February-18			
			March-18			
			April-18			
			May-18			
			June-18			
			July-18			
			August-18			
Running Annual (September 2016)				**0**	**$0**	
Running Annual (September 2017)				**0**	**$0**	
Average				0	$0	

Electricity

From	To	Days	Month	kWh	kW	$/kW	Production Cost	Delivery Cost	Total Cost	$/kWh	Energy Cost $/kWh
			January-15								
			February-15								
			March-15								
			April-15								
			May-15								
1/0/00			June-15								
1/0/00			July-15								
1/0/00			August-15								
1/0/00			September-15								
1/0/00			October-15								
1/0/00			November-15								
1/0/00			December-15								
1/0/00			January-16								
1/0/00			February-16								
1/0/00			March-16								
1/0/00			April-16								
1/0/00			May-16	1,872	10.80	$21.93	$63.82	$254.16	$317.98	$0.170	$0.034
1/0/00			June-16	1,818	8.82	$22.69	$98.75	$211.74	$310.49	$0.171	$0.054
1/0/00			July-16	1,908	9.72	$24.20	$118.86	$245.19	$364.05	$0.191	$0.062
1/0/00			August-16	2,322	10.44	$21.93	$133.01	$253.30	$386.31	$0.166	$0.057
1/0/00			September-16	2,322	10.62	$22.69	$158.88	$264.54	$423.42	$0.182	$0.068
1/0/00			October-16	1,728	9.18	$21.93	$118.81	$218.66	$337.47	$0.195	$0.069
1/0/00			November-16	2,052	8.46	$23.45	$98.35	$220.50	$318.85	$0.155	$0.048
1/0/00			December-16	2,412	9.72	$24.20	$131.53	$261.87	$393.40	$0.163	$0.055
1/0/00			January-17	3,618	12.42	$24.20	$177.98	$318.89	$496.87	$0.137	$0.049
1/0/00			February-17	4,698	13.32	$23.19	$284.19	$321.97	$606.16	$0.129	$0.060
1/0/00			March-17	4,374	13.32	$25.98	$265.71	$358.48	$624.19	$0.143	$0.061
1/0/00			April-17	4,356	14.58	$23.55	$227.74	$347.64	$575.38	$0.132	$0.052
1/0/00			May-17	1,926	10.62	$22.71	$124.43	$248.64	$373.07	$0.194	$0.065
1/0/00			June-17	1,944	10.26	$24.36	$133.81	$255.89	$389.70	$0.200	$0.069
1/0/00			July-17	2,214	9.72	$25.98	$186.08	$259.04	$445.12	$0.201	$0.084
1/0/00			August-17	2,070	10.26	$23.55	$157.79	$264.25	$422.04	$0.204	$0.076
1/0/00			September-17	1,890	9.00	$24.44	$150.97	$240.81	$391.78	$0.207	$0.080
1/0/00			October-17	1,674	8.46	$23.55	$121.11	$222.63	$343.74	$0.205	$0.072
1/0/00			November-17	1,908	8.46	$25.17	$124.60	$233.33	$357.93	$0.188	$0.065
1/0/00			December-17	2,664	11.16	$25.98	$177.81	$320.20	$498.01	$0.187	$0.067
1/0/00			January-18	5,310	13.86	$26.45	$258.92	$391.93	$650.85	$0.123	$0.049
1/0/00			February-18	5,292	14.58	$25.91	$352.42	$387.84	$740.26	$0.140	$0.067
1/0/00			March-18	5,058	14.40	$27.64	$488.26	$407.43	$895.69	$0.177	$0.097
1/0/00			April-18	4,158	13.50	$25.05	$177.03	$347.55	$524.58	$0.126	$0.043
1/0/00			May-18	2,916	12.60	$25.05	$140.46	$325.55	$466.01	$0.160	$0.048
1/0/00			June-18	2,178	8.82	$25.91	$134.10	$239.92	$374.02	$0.172	$0.062
1/0/00			July-18	2,430	9.54	$27.64	$164.56	$275.27	$439.83	$0.181	$0.068
1/0/00			August-18	2,610	10.44	$25.05	$202.90	$291.99	$494.89	$0.190	$0.078
Running Annual (September 2016)				**33,714**	**14.58**	$25.21	**$2,065**	**$3,340**	**$5,406**	$0.160	$0.061
Running Annual (September 2017)				**38,088**	**14.58**	$27.33	**$2,493**	**$3,684**	**$6,178**	$0.162	$0.065
Average				35,901	14.58	$ 26.27	$ 2,279	$ 3,512	$ 5,792	$ 0.161	$ 0.063

Total Energy

Month	Gas (kBtu/ft^2)	Oil (kBtu/ft^2)	Electricity (kBtu/ft^2)	Total (kBtu/ft^2)	Total Site Heating (kBtu/ft^2)	Total Source Heating (kBtu/ft^2)	Total Cost	Total Cost ($/ft^2)
January-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
June-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
July-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
August-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
September-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
October-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
November-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
December-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
January-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-16	0.0	0	0.5	0.5	0.0	0.0	$64	0.005318
June-16	0.0	0	0.5	0.5	0.0	0.0	$99	0.008229
July-16	0.0	0	0.5	0.5	0.0	0.0	$119	0.009905
August-16	0.0	0	0.7	0.7	0.0	0.0	$133	0.011084
September-16	0.0	0	0.7	0.7	0.0	0.0	$191	0.015907
October-16	0.5	0	0.5	1.0	0.5	0.5	$210	0.01747
November-16	4.8	0	0.6	5.4	4.8	5.0	$596	0.049673
December-16	8.4	0	0.7	9.1	8.4	8.8	$997	0.083068
January-17	6.7	0	1.0	7.7	6.7	7.1	$1,092	0.090973
February-17	19.8	0	1.3	21.1	19.8	20.8	$2,924	0.24367
March-17	9.5	0	1.2	10.7	9.5	9.9	$1,368	0.113961
April-17	0.3	0	1.2	1.6	0.3	0.3	$307	0.025618
May-17	0.0	0	0.5	0.6	0.0	0.0	$156	0.013033
June-17	0.0	0	0.6	0.6	0.0	0.0	$166	0.013815
July-17	0.0	0	0.6	0.6	0.0	0.0	$218	0.018171
August-17	0.0	0	0.6	0.6	0.0	0.0	$190	0.015813
September-17	0.0	0	0.5	0.5	0.0	0.0	$182	0.015197
October-17	0.5	0	0.5	1.0	0.5	0.5	$238	0.019838
November-17	5.6	0	0.5	6.1	5.6	5.8	$789	0.065713
December-17	16.2	0	0.8	16.9	16.2	17.0	$1,871	0.155911
January-18	14.4	0	1.5	15.9	14.4	15.1	$2,147	0.178926
February-18	12.7	0	1.5	14.2	12.7	13.4	$2,305	0.192064
March-18	10.3	0	1.4	11.8	10.3	10.8	$1,798	0.149866
April-18	0.3	0	1.2	1.5	0.3	0.4	$262	0.021838
May-18	0.0	0	0.8	0.9	0.0	0.0	$177	0.014787
June-18	2.0	0	0.6	2.6	2.0	2.1	$468	0.038971
July-18	0.0	0	0.7	0.7	0.0	0.0	$196	0.016296
August-18	0.0	0	0.7	0.7	0.0	0.0	$235	0.019573
Running Annual (September 2016)	**50.05**	**0.0**	**9.6**	**59.64**	**50.05**	**52.55**	$11,754	0.9795
Running Annual (September 2017)	**62.08**	**0.0**	**10.8**	**72.91**	**62.08**	**65.19**	$14,352	1.196016
Average				66.27	56.07	58.87	$13,053	

Hook and Ladder Co. #1 Utility Info - 50 Main Street

Gas

From	To	Days	Month	therms	Cost	$/therm
1/0/00			January-15			#DIV/0!
1/0/00			February-15			#DIV/0!
1/0/00			March-15			#DIV/0!
1/0/00			April-15			#DIV/0!
1/0/00			May-15			#DIV/0!
1/0/00			June-15			#DIV/0!
1/0/00			July-15			#DIV/0!
1/0/00			August-15			#DIV/0!
1/0/00			September-15			#DIV/0!
1/0/00			October-15			#DIV/0!
1/0/00			November-15			#DIV/0!
1/0/00			December-15			#DIV/0!
1/0/00			January-16			#DIV/0!
1/0/00			February-16			#DIV/0!
1/0/00			March-16			#DIV/0!
1/0/00			April-16			#DIV/0!
1/0/00			May-16			#DIV/0!
1/0/00			June-16			#DIV/0!
1/0/00			July-16			#DIV/0!
1/0/00			August-16	20	$49	$2.44
1/0/00			September-16	31	$59	$1.89
1/0/00			October-16	359	$329	$0.92
1/0/00			November-16	744	$628	$0.84
1/0/00			December-16	1,217	$1,022	$0.84
1/0/00			January-17	993	$1,114	$1.12
1/0/00			February-17	1,024	$1,168	$1.14
1/0/00			March-17	844	$832	$0.99
1/0/00			April-17	258	$334	$1.29
1/0/00			May-17	141	$189	$1.34
1/0/00			June-17	41	$82	$2.01
1/0/00			July-17	21	$54	$2.55
1/0/00			August-17	73	$115	$1.57
1/0/00			September-17	92	$133	$1.45
1/0/00			October-17	265	$369	$1.39
1/0/00			November-17	979	$949	$0.97
1/0/00			December-17	1,366	$1,207	$0.88
1/0/00			January-18	1,159	$1,283	$1.11
1/0/00			February-18	964	$1,252	$1.30
1/0/00			March-18	643	$835	$1.30
1/0/00			April-18	643	$835	$1.30
1/0/00			May-18	171	$261	$1.53
1/0/00			June-18	51	$102	$1.99
1/0/00			July-18	88	$151	$1.71
1/0/00			August-18	43	$88	$2.05
Running Annual (September 2016-2017)				**5,746**	**$5,926**	**$1.03**
Running Annual (September 2017-2018)				**6,463**	**$7,466**	**$1.16**
Average				6,105	$6,696	**$1.10**

Oil

From	To	Days	Month	Gallons	Cost	$/gal
			January-15			
			February-15			
			March-15			
			April-15			
			May-15			
			June-15			
			July-15			
			August-15			
			September-15			
			October-15			
			November-15			
			December-15			
			January-16			
			February-16			
			March-16			
			April-16			
			May-16			
			June-16			
			July-16			
			August-16			
			September-16			
			October-16			
			November-16			
			December-16			
			January-17			
			February-17			
			March-17			
			April-17			
			May-17			
			June-17			
			July-17			
			August-17			
			September-17			
			October-17			
			November-17			
			December-17			
			January-18			
			February-18			
			March-18			
			April-18			
			May-18			
			June-18			
			July-18			
			August-18			
				0	**$0**	
				0	**$0**	
				0	$0	

Electricity

From	To	Days	Month	kWh	kW	$/kW	Production Cost	Delivery Cost	Total Cost	$/kWh
			January-15							
			February-15							
			March-15							
			April-15							
			May-15							
1/0/00			June-15							
1/0/00			July-15							
1/0/00			August-15	48	3.24	$23.45	$7.71	$76.07	$83.78	$1.745
1/0/00			September-15	504	3.24	$22.69	$34.06	$73.62	$107.68	$0.214
1/0/00			October-15	492	2.88	$21.93	$31.87	$63.26	$95.13	$0.193
1/0/00			November-15	504	1.08	$21.94	$29.29	$23.72	$53.01	$0.105
1/0/00			December-15	528	5.40	$25.71	$34.77	$139.05	$173.82	$0.329
1/0/00			January-16	864	3.12	$24.20	$41.31	$75.61	$116.92	$0.135
1/0/00			February-16	1,200	3.36	$22.69	$46.84	$76.34	$123.18	$0.103
1/0/00			March-16	288	3.00	$22.69	$17.33	$68.16	$85.49	$0.297
1/0/00			April-16	288	2.88	$23.45	$13.97	$67.62	$81.59	$0.283
1/0/00			May-16	552	2.76	$21.93	$19.84	$60.62	$80.46	$0.146
1/0/00			June-16	636	3.48	$22.69	$34.87	$79.07	$113.94	$0.179
1/0/00			July-16	696	3.60	$24.20	$43.48	$87.25	$130.73	$0.188
1/0/00			August-16	564	2.64	$21.93	$33.98	$57.98	$91.96	$0.163
1/0/00			September-16	408	2.52	$22.69	$30.44	$57.26	$87.70	$0.215
1/0/00			October-16	540	3.12	$21.93	$37.92	$73.76	$111.68	$0.207
1/0/00			November-16	600	3.00	$23.45	$29.80	$77.58	$107.38	$0.179
1/0/00			December-16	660	3.48	$24.20	$37.27	$93.55	$130.82	$0.198
1/0/00			January-17	1,068			$50.68	$6.40	$57.08	$0.053
1/0/00			February-17	804			$49.45	$5.12	$54.57	$0.068
1/0/00			March-17	864			$52.62	$4.88	$57.50	$0.067
1/0/00			April-17	708			$37.65	$1.56	$39.21	$0.055
1/0/00			May-17	624			$38.68	$2.75	$41.43	$0.066
1/0/00			June-17	708			$46.25	$2.26	$48.51	$0.069
1/0/00			July-17	624			$51.71	$2.42	$54.13	$0.087
1/0/00			August-17	576			$43.08	$8.74	$51.82	$0.090
1/0/00			September-17	936			$69.36	$8.27	$77.63	$0.083
1/0/00			October-17	684			$45.89	$2.05	$47.94	$0.070
1/0/00			November-17	636			$39.54	$1.43	$40.97	$0.064
1/0/00			December-17	564			$38.13	$1.46	$39.59	$0.070
1/0/00			January-18	756			$35.21	$0.00	$35.21	$0.047
1/0/00			February-18	684			$43.97	$0.00	$43.97	$0.064
1/0/00			March-18	696			$65.53	$0.00	$65.53	$0.094
1/0/00			April-18	432			$17.22	$0.00	$17.22	$0.040
1/0/00			May-18	504			$22.45	$0.00	$22.45	$0.045
1/0/00			June-18	744			$42.67	$0.00	$42.67	$0.057
1/0/00			July-18	1,152			$73.66	$0.00	$73.66	$0.064
1/0/00			August-18	1,320			$97.97	$0.00	$97.97	$0.074
				8,184	**3.60**				**$842**	$0.103
				9,108					**$605**	$0.066
				8,646	3.60				**$ 723**	$0.084

Total Energy

Month	Gas (kBtu/ft²)	Oil (kBtu/ft²)	Electricity (kBtu/ft²)	Total (kBtu/ft²)	Total Site Heating (kBtu/ft²)	Total Source Heating (kBtu/ft²)	Total Cost	Total Cost ($/ft²)
January-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
February-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
March-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
April-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
May-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
June-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
July-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
August-15	0.0	0	0.0	0.0	0.0	0.0	$8	0.000857
September-15	0.0	0	0.2	0.2	0.0	0.0	$34	0.003784
October-15	0.0	0	0.2	0.2	0.0	0.0	$32	0.003541
November-15	0.0	0	0.2	0.2	0.0	0.0	$29	0.003254
December-15	0.0	0	0.2	0.2	0.0	0.0	$35	0.003863
January-16	0.0	0	0.3	0.3	0.0	0.0	$41	0.00459
February-16	0.0	0	0.5	0.5	0.0	0.0	$47	0.005204
March-16	0.0	0	0.1	0.1	0.0	0.0	$17	0.001926
April-16	0.0	0	0.1	0.1	0.0	0.0	$14	0.001552
May-16	0.0	0	0.2	0.2	0.0	0.0	$20	0.002204
June-16	0.0	0	0.2	0.2	0.0	0.0	$35	0.003874
July-16	0.0	0	0.3	0.3	0.0	0.0	$43	0.004831
August-16	0.2	0	0.2	0.4	0.2	0.2	$83	0.009203
September-16	0.3	0	0.2	0.5	0.3	0.4	$89	0.009887
October-16	4.0	0	0.2	4.2	4.0	4.2	$367	0.040763
November-16	8.3	0	0.2	8.5	8.3	8.7	$658	0.073072
December-16	13.5	0	0.3	13.8	13.5	14.2	$1,059	0.117709
January-17	11.0	0	0.4	11.4	11.0	11.6	$1,165	0.129457
February-17	11.4	0	0.3	11.7	11.4	11.9	$1,218	0.135296
March-17	9.4	0	0.3	9.7	9.4	9.8	$885	0.0983
April-17	2.9	0	0.3	3.1	2.9	3.0	$372	0.04128
May-17	1.6	0	0.2	1.8	1.6	1.6	$228	0.025311
June-17	0.5	0	0.3	0.7	0.5	0.5	$129	0.014286
July-17	0.2	0	0.2	0.5	0.2	0.2	$105	0.011696
August-17	0.8	0	0.2	1.0	0.8	0.9	$158	0.017534
September-17	1.0	0	0.4	1.4	1.0	1.1	$202	0.022494
October-17	2.9	0	0.3	3.2	2.9	3.1	$415	0.046116
November-17	10.9	0	0.2	11.1	10.9	11.4	$988	0.109832
December-17	15.2	0	0.2	15.4	15.2	15.9	$1,246	0.138402
January-18	12.9	0	0.3	13.2	12.9	13.5	$1,318	0.146416
February-18	10.7	0	0.3	11.0	10.7	11.2	$1,296	0.14405
March-18	7.1	0	0.3	7.4	7.1	7.5	$901	0.100087
April-18	7.1	0	0.2	7.3	7.1	7.5	$852	0.094719
May-18	1.9	0	0.2	2.1	1.9	2.0	$284	0.031503
June-18	0.6	0	0.3	0.8	0.6	0.6	$144	0.016022
July-18	1.0	0	0.4	1.4	1.0	1.0	$224	0.024939
August-18	0.5	0	0.5	1.0	0.5	0.5	$186	0.02067
	63.84	**0.0**	**3.1**	**66.95**	**63.84**	**67.04**	$6,768	0.7520
	71.81	**0.0**	**3.5**	**75.26**	**71.81**	**75.40**	$8,070	0.896718
				71.11	67.83	71.22	$7,419	

VOH Library - 7 Maple Avenue

Gas

From	To	Days	Month	therms	Cost	$/therm
1/0/00			January-15			
1/0/00			February-15			
1/0/00			March-15			
1/0/00			April-15			
1/0/00			May-15			
1/0/00			June-15			
1/0/00			July-15			
1/0/00			August-15			
1/0/00			September-15			
1/0/00			October-15			
1/0/00			November-15			
1/0/00			December-15			
1/0/00			January-16			
1/0/00			February-16			
1/0/00			March-16			
1/0/00			April-16			
1/0/00			May-16			
1/0/00			June-16			
1/0/00			July-16	5	$34	$6.89
1/0/00			August-16			#DIV/0!
1/0/00			September-16	3	$32	$10.62
1/0/00			October-16	4	$35	$8.71
1/0/00			November-16	6	$38	$6.29
1/0/00			December-16	12	$74	$6.18
1/0/00			January-17		$38	#DIV/0!
1/0/00			February-17	2,872	$3,183	$1.11
1/0/00			March-17	2,242	$2,132	$0.95
1/0/00			April-17	146	$209	$1.43
1/0/00			May-17	6	$37	$6.19
1/0/00			June-17	4	$37	$9.17
1/0/00			July-17	6	$55	$9.17
1/0/00			August-17	3	$33	$11.11
1/0/00			September-17	3	$32	$10.78
1/0/00			October-17	3	$35	$11.71
1/0/00			November-17	3	$35	$11.76
1/0/00			December-17	1,420	$1,253	$0.88
1/0/00			January-18	3,715	$3,879	$1.04
1/0/00			February-18	3,490	$4,348	$1.25
1/0/00			March-18	2,594	$2,693	$1.04
1/0/00			April-18	798	$1,001	$1.25
1/0/00			May-18	72	$134	$1.87
1/0/00			June-18	4	$37	$9.28
1/0/00			July-18	2	$32	$16.11
1/0/00			August-18	3	$34	$11.26
Running Annual (September 2016)				**5,304**	**$5,903**	**$1.11**
Running Annual (September 2017)				**12,107**	**$13,515**	**$1.12**
Average				8,706	$9,709	$1.11

Oil

From	To	Days	Month	Gallons	Cost	$/gal
			January-15			
			February-15			
			March-15			
			April-15			
			May-15			
			June-15			
			July-15			
			August-15			
			September-15			
			October-15			
			November-15			
			December-15			
			January-16			
			February-16			
			March-16			
			April-16			
			May-16			
			June-16			
			July-16			
			August-16			
			September-16			
			October-16			
			November-16			
			December-16			
			January-17			
			February-17			
			March-17			
			April-17			
			May-17			
			June-17			
			July-17			
			August-17			
			September-17			
			October-17			
			November-17	1293	$3,092	$2.39
			December-17	1328	$3,176	$2.39
			January-18			
			February-18			
			March-18			
			April-18			
			May-18			
			June-18			
			July-18			
			August-18			
Running Annual (September 2016)						
Running Annual (September 2017)				**2,621**	**$6,268**	$2.39
Average				2,621	$6,268	

Electricity

From	To	Days	Month	kWh	kW	$/kW	Energy Production Cost	Delivery (Demand) Cost	Total Cost	$/kWh	Energy Cost $/kWh
			January-15								
			February-15								
			March-15								
			April-15								
			May-15								
1/0/00			June-15								
1/0/00			July-15								
1/0/00			August-15								
1/0/00			September-15								
1/0/00			October-15								
1/0/00			November-15								
1/0/00			December-15								
1/0/00			January-16								
1/0/00			February-16								
1/0/00			March-16								
1/0/00			April-16								
1/0/00			May-16	10,400	28.80	$21.93	$341.89	$699.58	$1,041.47	$0.100	$0.033
1/0/00			June-16	13,360	47.20	$22.69	$690.43	$1,117.26	$1,807.69	$0.135	$0.052
1/0/00			July-16	17,440	53.60	$24.20	$1,033.59	$1,336.29	$2,369.88	$0.136	$0.059
1/0/00			August-16	18,240	60.00	$21.93	$1,015.76	$1,410.87	$2,426.63	$0.133	$0.056
1/0/00			September-16	18,640	64.00	$22.69	$1,248.83	$1,545.20	$2,794.03	$0.150	$0.067
1/0/00			October-16	14,240	54.40	$21.93	$938.55	$1,260.77	$2,199.32	$0.154	$0.066
1/0/00			November-16	12,240	43.20	$23.45	$567.43	$1,100.66	$1,668.09	$0.136	$0.046
1/0/00			December-16	11,440	31.20	$24.20	$620.03	$860.79	$1,480.82	$0.129	$0.054
1/0/00			January-17	13,200	33.60	$24.20	$654.56	$885.63	$1,540.19	$0.117	$0.050
1/0/00			February-17	12,400	38.40	$23.19	$774.89	$940.83	$1,715.72	$0.138	$0.062
1/0/00			March-17	11,360	29.60	$25.98	$715.96	$817.23	$1,533.19	$0.135	$0.063
1/0/00			April-17	9,920	31.20	$23.55	$547.18	$750.83	$1,298.01	$0.131	$0.055
1/0/00			May-17	8,640	33.60	$22.74	$556.09	$791.87	$1,347.96	$0.156	$0.064
1/0/00			June-17	11,760	47.20	$24.36	$774.37	$1,173.53	$1,947.90	$0.166	$0.066
1/0/00			July-17	12,640	53.60	$25.98	$1,045.26	$1,418.74	$2,464.00	$0.195	$0.083
1/0/00			August-17	11,360	52.80	$23.55	$852.00	$1,331.69	$2,183.69	$0.192	$0.075
1/0/00			September-17	12,880	52.00	$24.36	$985.34	$1,350.72	$2,336.06	$0.181	$0.077
1/0/00			October-17	11,760	50.40	$23.55	$799.71	$1,277.57	$2,077.28	$0.177	$0.068
1/0/00			November-17	10,800	52.00	$25.17	$686.16	$1,387.52	$2,073.68	$0.192	$0.064
1/0/00			December-17	8,960	30.40	$25.98	$603.18	$904.84	$1,508.02	$0.168	$0.067
1/0/00			January-18	10,160	31.20	$26.45	$506.93	$923.10	$1,430.03	$0.141	$0.050
1/0/00			February-18	9,920	29.60	$25.91	$671.43	$804.50	$1,475.93	$0.149	$0.068
1/0/00			March-18	8,720	26.40	$27.64	$854.67	$764.01	$1,618.68	$0.186	$0.098
1/0/00			April-18	9,040	28.80	$25.05	$394.02	$754.90	$1,148.92	$0.127	$0.044
1/0/00			May-18	8,160	26.40	$25.05	$397.22	$696.21	$1,093.43	$0.134	$0.049
1/0/00			June-18	8,400	46.40	$25.91	$520.70	$1,243.69	$1,764.39	$0.210	$0.062
1/0/00			July-18	13,680	59.20	$27.64	$924.43	$1,677.66	$2,602.09	$0.190	$0.068
1/0/00			August-18	14,240	60.00	$25.05	$1,107.28	$1,610.99	$2,718.27	$0.191	$0.078
Running Annual (September 2016)				**147,840**	**64.00**	$25.11	**$9,295**	**$12,878**	**$22,173**	$0.150	$0.063
Running Annual (September 2017)				**126,720**	**60.00**	$27.18	**$8,451**	**$13,396**	**$21,847**	$0.172	$0.067
Average				137,280	62.00	$ 26.15		$ 13,137		$ 0.161	$ 0.065

Total Energy

Month	Gas ($kBtu/ft^2$)	Oil ($kBtu/ft^2$)	Electricity ($kBtu/ft^2$)	Total ($kBtu/ft^2$)	Total Site Heating ($kBtu/ft^2$)	Total Source Heating ($kBtu/ft^2$)	Total Cost	Total Cost ($\$/ft^2$)
January-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
February-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
March-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
April-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
May-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
June-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
July-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
August-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
September-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
October-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
November-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
December-15	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
January-16	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
February-16	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
March-16	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
April-16	0.0	0.0	0.0	0.0	0.0	0.0	$0	0
May-16	0.0	0.0	2.7	2.7	0.0	0.0	$342	0.014353
June-16	0.0	0.0	3.4	3.4	0.0	0.0	$690	0.028985
July-16	0.0	0.0	4.5	4.5	0.0	0.0	$1,068	0.044837
August-16	0.0	0.0	4.7	4.7	0.0	0.0	$1,016	0.042643
September-16	0.0	0.0	4.8	4.8	0.0	0.0	$1,281	0.053766
October-16	0.0	0.0	3.7	3.7	0.0	0.0	$973	0.040865
November-16	0.0	0.0	3.2	3.2	0.0	0.0	$605	0.025407
December-16	0.1	0.0	3.0	3.0	0.1	0.1	$694	0.029144
January-17	0.0	0.0	3.4	3.4	0.0	0.0	$693	0.029089
February-17	12.1	0.0	3.2	15.3	12.1	12.7	$3,958	0.166146
March-17	9.4	0.0	2.9	12.3	9.4	9.9	$2,848	0.119576
April-17	0.6	0.0	2.6	3.2	0.6	0.6	$756	0.031733
May-17	0.0	0.0	2.2	2.3	0.0	0.0	$593	0.024906
June-17	0.0	0.0	3.0	3.1	0.0	0.0	$811	0.03405
July-17	0.0	0.0	3.3	3.3	0.0	0.0	$1,100	0.046191
August-17	0.0	0.0	2.9	2.9	0.0	0.0	$885	0.037168
September-17	0.0	0.0	3.3	3.3	0.0	0.0	$1,018	0.042723
October-17	0.0	0.0	3.0	3.0	0.0	0.0	$835	0.035047
November-17	0.0	7.5	2.8	10.3	7.5	7.6	$3,814	0.160101
December-17	6.0	7.7	2.3	16.0	13.7	14.1	$5,032	0.211271
January-18	15.6	0.0	2.6	18.2	15.6	16.4	$4,386	0.184141
February-18	14.7	0.0	2.6	17.2	14.7	15.4	$5,019	0.21072
March-18	10.9	0.0	2.2	13.1	10.9	11.4	$3,548	0.148952
April-18	3.4	0.0	2.3	5.7	3.4	3.5	$1,395	0.058551
May-18	0.3	0.0	2.1	2.4	0.3	0.3	$532	0.022316
June-18	0.0	0.0	2.2	2.2	0.0	0.0	$558	0.023417
July-18	0.0	0.0	3.5	3.5	0.0	0.0	$957	0.040161
August-18	0.0	0.0	3.7	3.7	0.0	0.0	$1,141	0.047904
Running Annual (September 2016)	**22.27**	**0.0**	**38.1**	**60.41**	**22.27**	**23.38**	$28,076	1.1787
Running Annual (September 2017)	**50.83**	**15.2**	**32.7**	**98.76**	**66.07**	**68.76**	$41,630	1.747677
Average				79.58	44.17	46.07	$34,853	

VOH Village Hall - 7 Maple Avenue																																		
Gas							Oil							Electricity												Total Energy								
From	To	Days	Month	therms	Cost	$/therm	From	To	Days	Month	Gallons	Cost	$/gal	From	To	Days	Month	kWh	kW	$/kW	Energy Production Cost	Delivery (Demand) Cost	Total Cost	$/kWh	Energy Cost $/kWh	Month	Gas (kBtu/ft^2)	Oil (kBtu/ft^2)	Electricity (kBtu/ft^2)	Total (kBtu/ft^2)	Total Site Heating (kBtu/ft^2)	Total Source Heating (kBtu/ft^2)	Total Cost	Total Cost ($/ft^2)
1/0/00			January-15							January-15							January-15									January-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			February-15							February-15							February-15									February-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			March-15							March-15							March-15									March-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			April-15							April-15							April-15									April-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			May-15							May-15							May-15									May-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			June-15							June-15				1/0/00			June-15									June-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			July-15							July-15				1/0/00			July-15									July-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			August-15							August-15				1/0/00			August-15									August-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			September-15							September-15				1/0/00			September-15									September-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			October-15							October-15				1/0/00			October-15									October-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			November-15							November-15				1/0/00			November-15									November-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			December-15							December-15				1/0/00			December-15									December-15	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			January-16							January-16				1/0/00			January-16									January-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			February-16							February-16				1/0/00			February-16									February-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			March-16							March-16				1/0/00			March-16									March-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			April-16							April-16				1/0/00			April-16									April-16	0.0	0	0.0	0.0	0.0	0.0	$0	0
1/0/00			May-16							May-16				1/0/00			May-16	10,360	22.40	$21.93	$317.29	$535.29	$852.58	$0.082	$0.031	May-16	0.0	0	3.3	3.3	0.0	0.0	$317	0.01332
1/0/00			June-16							June-16				1/0/00			June-16	9,960	30.80	$22.69	$507.85	$728.42	$1,236.27	$0.124	$0.051	June-16	0.0	0	3.2	3.2	0.0	0.0	$508	0.02132
1/0/00			July-16	5	$34	$6.89				July-16				1/0/00			July-16	11,520	32.00	$24.20	$678.76	$799.96	$1,478.72	$0.128	$0.059	July-16	0.0	0	3.7	3.7	0.0	0.0	$713	0.029941
1/0/00			August-16			#DIV/0!				August-16				1/0/00			August-16	11,760	38.40	$21.93	$654.57	$903.80	$1,558.37	$0.133	$0.056	August-16	0.0	0	3.8	3.8	0.0	0.0	$655	0.02748
1/0/00			September-16	3	$32	$10.62				September-16				1/0/00			September-16	12,880	32.40	$22.69	$849.10	$794.32	$1,643.42	$0.128	$0.066	September-16	0.0	0	4.1	4.2	0.0	0.0	$881	0.036984
1/0/00			October-16	4	$35	$8.71				October-16				1/0/00			October-16	10,240	31.60	$21.93	$666.12	$736.86	$1,402.98	$0.137	$0.065	October-16	0.0	0	3.3	3.3	0.0	0.0	$701	0.029428
1/0/00			November-16	6	$38	$6.29				November-16				1/0/00			November-16	11,520	29.60	$23.45	$515.82	$749.31	$1,265.13	$0.110	$0.045	November-16	0.0	0	3.7	3.7	0.0	0.0	$554	0.02324
1/0/00			December-16	12	$74	$6.18				December-16				1/0/00			December-16	11,040	28.80	$23.53	$577.86	$743.17	$1,321.03	$0.120	$0.052	December-16	0.1	0	3.6	3.6	0.1	0.1	$652	0.027373
1/0/00			January-17	6	$38	$6.39				January-17				1/0/00			January-17	11,400	24.80	$24.20	$540.88	$646.44	$1,187.32	$0.104	$0.047	January-17	0.0	0	3.7	3.7	0.0	0.0	$579	0.024316
1/0/00			February-17	2,872	$3,183	$1.11				February-17				1/0/00			February-17	11,280	22.80	$23.19	$676.20	$562.17	$1,238.37	$0.110	$0.060	February-17	12.1	0	3.6	15.7	12.1	12.7	$3,859	0.162003
1/0/00			March-17	2,242	$2,132	$0.95				March-17				1/0/00			March-17	10,560	20.80	$25.97	$635.00	$572.50	$1,207.50	$0.114	$0.060	March-17	9.4	0	3.4	12.8	9.4	9.9	$2,767	0.116178
1/0/00			April-17	146	$209	$1.43				April-17				1/0/00			April-17	9,920	26.40	$23.55	$510.12	$632.61	$1,142.73	$0.115	$0.051	April-17	0.6	0	3.2	3.8	0.6	0.6	$719	0.030177
1/0/00			May-17	6	$37	$6.19				May-17				1/0/00			May-17	9,040	21.60	$22.74	$540.49	$509.68	$1,050.17	$0.116	$0.060	May-17	0.0	0	2.9	2.9	0.0	0.0	$578	0.024251
1/0/00			June-17	4	$37	$9.17				June-17				1/0/00			June-17	9,760	31.60	$24.36	$626.77	$785.50	$1,412.27	$0.145	$0.064	June-17	0.0	0	3.1	3.2	0.0	0.0	$663	0.027853
1/0/00			July-17	6	$55	$9.17				July-17				1/0/00			July-17	11,960	34.00	$25.98	$956.76	$900.44	$1,857.20	$0.155	$0.080	July-17	0.0	0	3.9	3.9	0.0	0.0	$1,012	0.042477
1/0/00			August-17	3	$33	$11.11				August-17				1/0/00			August-17	11,160	34.40	$23.55	$803.29	$868.01	$1,671.30	$0.150	$0.072	August-17	0.0	0	3.6	3.6	0.0	0.0	$837	0.035123
1/0/00			September-17	3	$32	$10.78				September-17				1/0/00			September-17	10,480	30.40	$24.36	$778.75	$796.15	$1,574.90	$0.150	$0.074	September-17	0.0	0	3.4	3.4	0.0	0.0	$811	0.03405
1/0/00			October-17	3	$35	$11.71				October-17				1/0/00			October-17	9,360	29.20	$23.55	$615.43	$747.43	$1,362.86	$0.146	$0.066	October-17	0.0	0	3.0	3.0	0.0	0.0	$651	0.027311
1/0/00			November-17	3	$35	$11.76				November-17	1293	$3,092	$2.39	1/0/00			November-17	9,480	26.00	$25.17	$564.38	$706.90	$1,271.28	$0.134	$0.060	November-17	0.0	7.5	3.1	10.6	7.5	7.6	$3,692	0.154989
1/0/00			December-17	1,420	$1,253	$0.88				December-17	1328	$3,176	$2.39	1/0/00			December-17	10,000	21.20	$25.98	$636.39	$628.07	$1,264.46	$0.126	$0.064	December-17	6.0	7.7	3.2	16.9	13.7	14.1	$5,066	0.212665
1/0/00			January-18	3,715	$3,879	$1.04				January-18				1/0/00			January-18	11,120	25.60	$26.45	$539.54	$741.16	$1,280.70	$0.115	$0.049	January-18	15.6	0	3.6	19.2	15.6	16.4	$4,419	0.18551
1/0/00			February-18	3,490	$4,348	$1.25				February-18				1/0/00			February-18	10,440	23.60	$25.91	$692.76	$635.72	$1,328.48	$0.127	$0.066	February-18	14.7	0	3.4	18.0	14.7	15.4	$5,041	0.211615
1/0/00			March-18	2,594	$2,693	$1.04				March-18				1/0/00			March-18	10,800	22.40	$27.64	$1,038.39	$641.51	$1,679.90	$0.156	$0.096	March-18	10.9	0	3.5	14.4	10.9	11.4	$3,732	0.156665
1/0/00			April-18	798	$1,001	$1.25				April-18				1/0/00			April-18	10,280	22.80	$25.05	$431.33	$593.34	$1,024.67	$0.100	$0.042	April-18	3.4	0	3.3	6.7	3.4	3.5	$1,432	0.060117
1/0/00			May-18	72	$134	$1.87				May-18				1/0/00			May-18	9,800	26.00	$25.05	$458.33	$674.90	$1,133.23	$0.116	$0.047	May-18	0.3	0	3.2	3.5	0.3	0.3	$593	0.024881
1/0/00			June-18	4	$37	$9.28				June-18				1/0/00			June-18	10,000	26.00	$25.91	$595.34	$701.00	$1,296.34	$0.130	$0.060	June-18	0.0	0	3.2	3.2	0.0	0.0	$632	0.026551
1/0/00			July-18	2	$32	$16.11				July-18				1/0/00			July-18	11,880	36.80	$27.64	$790.51	$1,045.26	$1,835.77	$0.155	$0.067	July-18	0.0	0	3.8	3.8	0.0	0.0	$823	0.034539
1/0/00			August-18	3	$34	$11.26				August-18				1/0/00			August-18	12,000	32.80	$25.05	$918.19	$893.96	$1,812.15	$0.151	$0.077	August-18	0.0	0	3.9	3.9	0.0	0.0	$952	0.039966
Running Annual (September 2016)				**5,310**	**$5,903**	**$1.11**												**130,760**	**34.40**	$25.09	**$7,898**	**$8,501**	**$16,399**	$0.125	$0.060		**22.29**	**0.0**	**42.1**	**64.40**	**22.29**	**23.41**	$22,302	$0.94
Running Annual (September 2017)				**12,107**	**$13,515**	**$1.12**					**2,621**	**$6,268**	$2.39					**125,640**	**36.80**	$27.28	**$8,059**	**$8,805**	**$16,865**	$0.134	$0.064		**50.83**	**15.2**	**40.5**	**106.53**	**66.07**	**68.76**	$36,648	$1.54
Average																		128,200	35.60	$26.18		$8,653	$16,632	$ 0.130	$ 0.062					85.46	44.18	46.08	$29,475	$1.24

Appendix C:

Equipment Cut Sheets

Chemka Pool Building

SOLATUBE®

Model: Solatube 750 DS-O Open Ceiling
(21 in./530 mm Daylighting System)

Project: ______________________________

Location: ______________________________

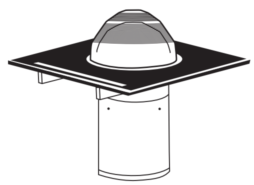
Type: ______________________________

Product Specifications Appear in CSI Division 08, Section 08 62 23.   For budgeting and quotations use only. Qty: ________

Model		Capture Zone					Transfer Zone			Delivery Zone				
S750DS-O	–			–			–			–		–		–
1		2	2a		3	3a		4	4a		5		5a	6

1 Model

750 DS-O SolaMaster® Solatube 750 DS-O (21 in./530 mm Daylighting System) Open Ceiling



Capture Zone

2 Dome

DA Acrylic Dome
DAI Acrylic Outer Dome + Acrylic Inner Dome
DPI Acrylic Outer Dome + Polycarbonate Inner Dome (Required for High Velocity Hurricane Zones, FM, and FEMA)
MIL Acrylic Dual Dome (Required for UFC-ATFP)

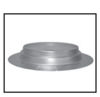
2a Dome Options (Leave blank if not desired)

B Security Bar
SK Dome Security Kit**
PB Dome Edge Protection Band (Required for FM)*+
PBC Dome Edge Protection Band Curb Cap (Required for FM)*+

**Inner dome required for Dome Security Kit

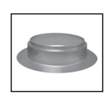
3 Flashings

F4 4-inch/100mm Self Mounted

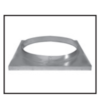


F8 8-inch/200mm Self Mounted (FM Approved*+)

F11 11-inch/275mm Self Mounted (FM Approved*+)

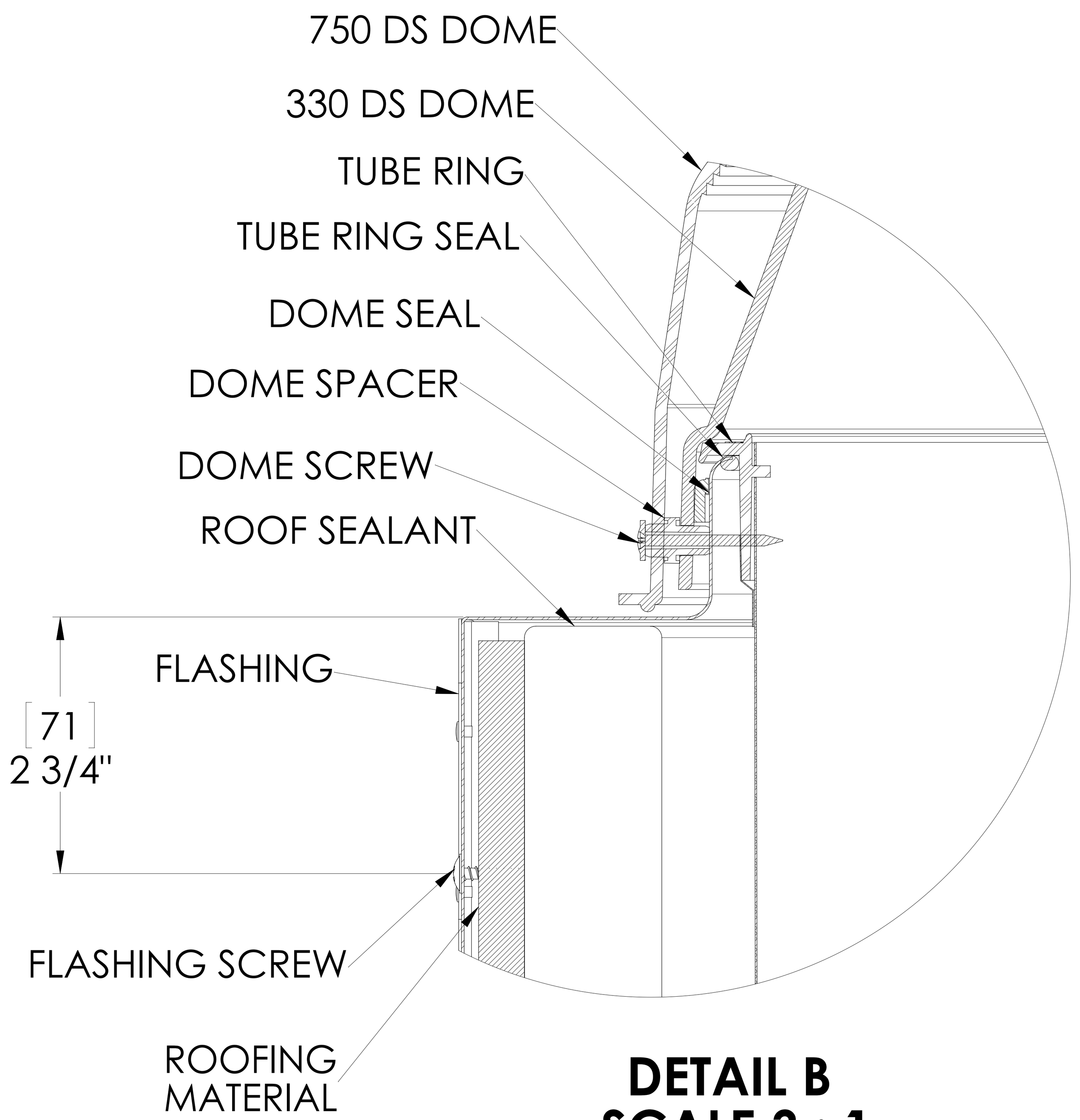


FC Curb Cap (Curb by Others) (FM Approved*+) (Required for FEMA)

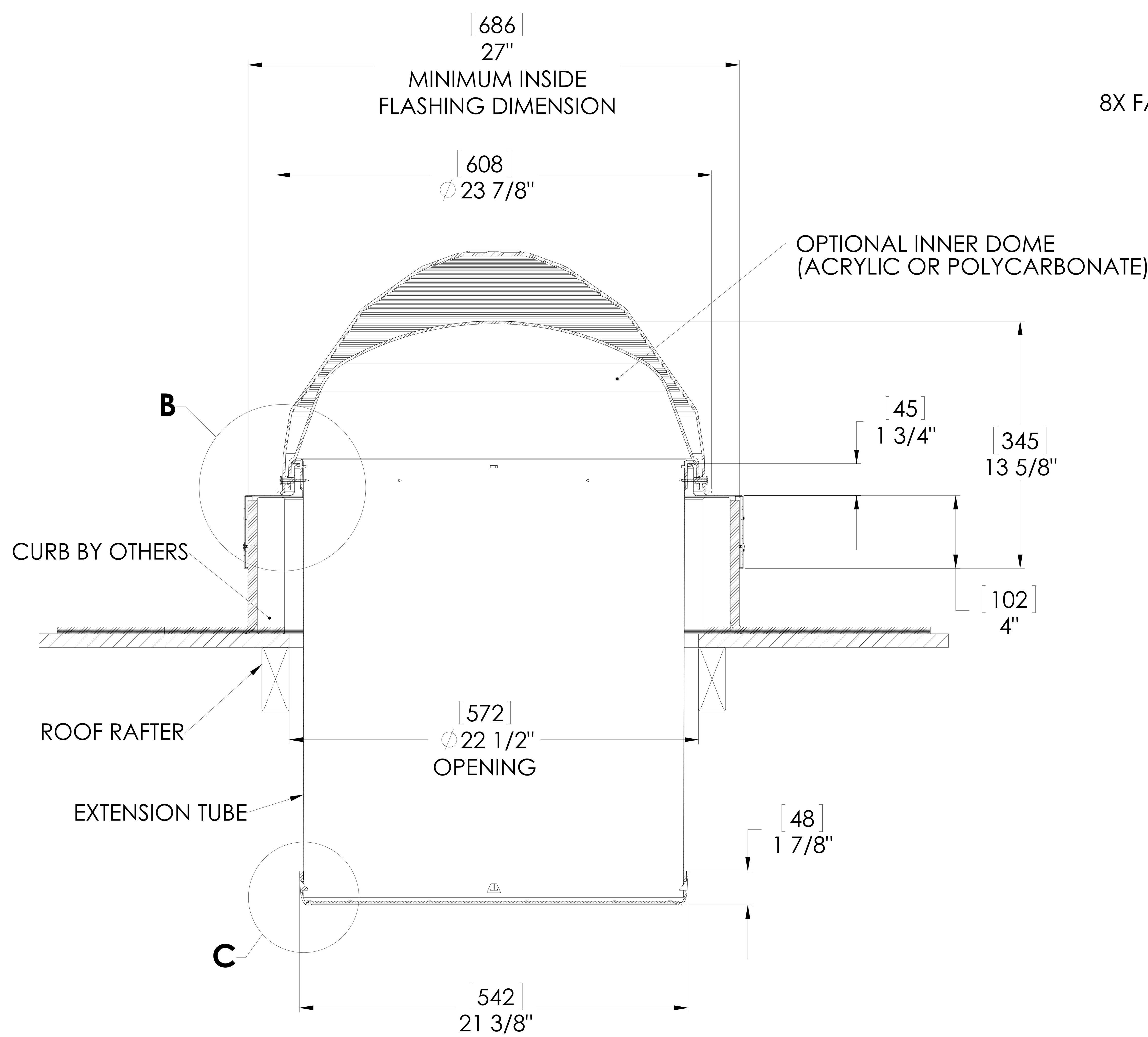


FSM Metal Roof Flashing

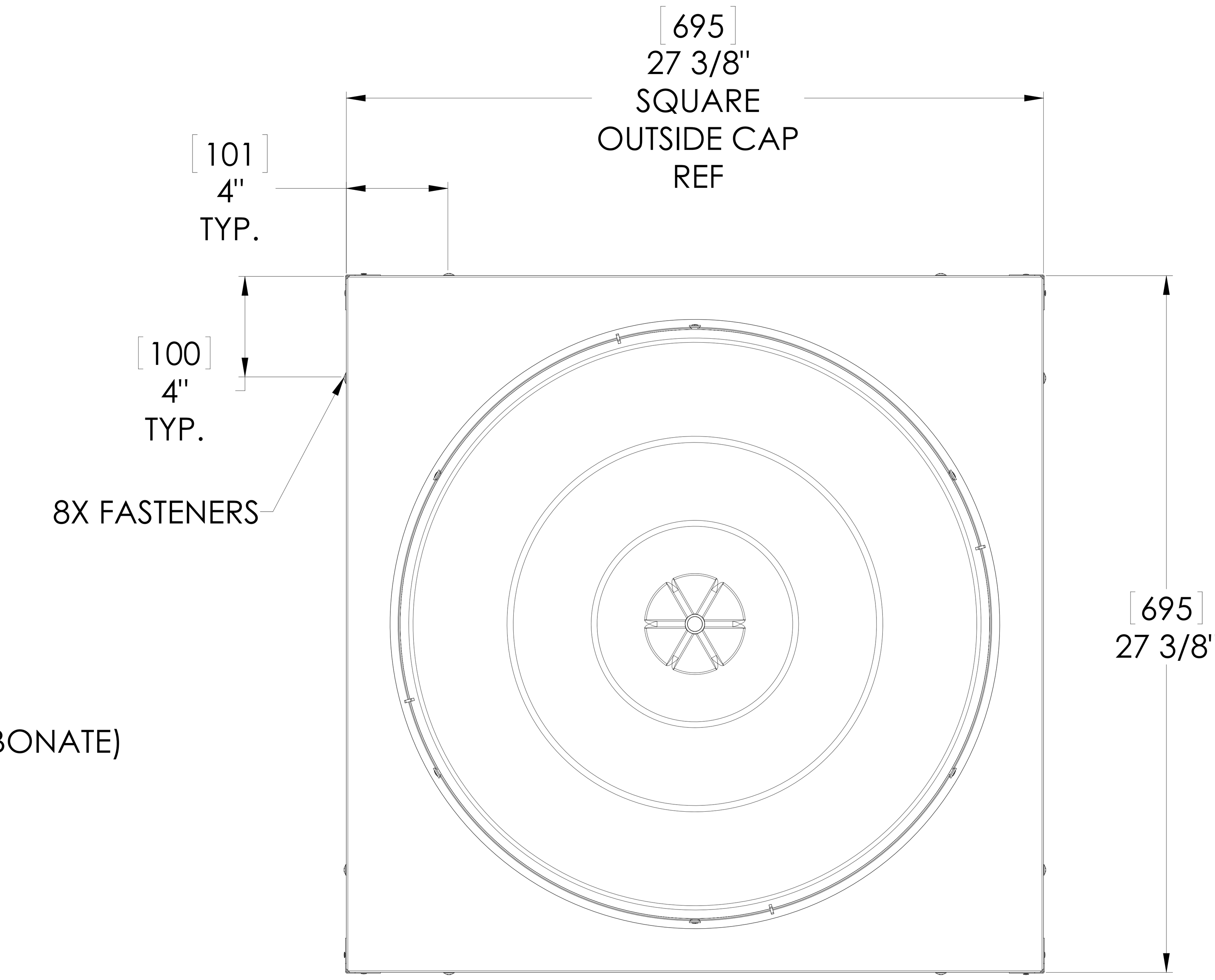
SOLATUBE 750 DS-O
(21 IN/530 MM)
CURB CAP OPEN CEILING - NO ANGLE ADAPTER



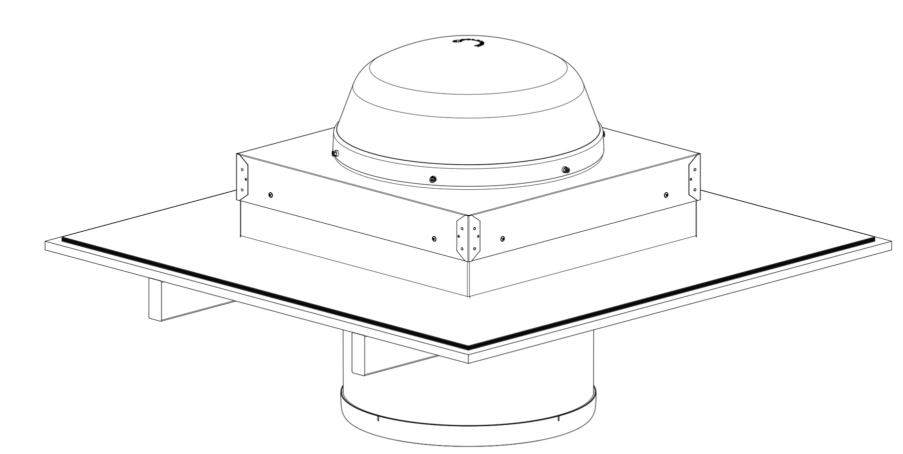
DETAIL B
SCALE 3 : 1

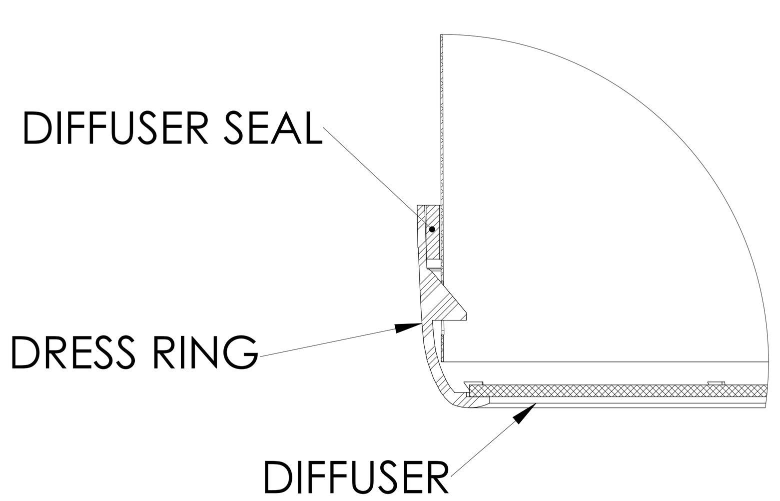


FULL SECTION
SCALE 1:1



TOP VIEW
SCALE 1:1





DETAIL C
SCALE 3 : 1

NOTES:

1. STRUCTURAL ELEMENTS (PLYWOOD, RAFTERS, DRYWALL ETC.) BY OTHERS & SHOWN FOR REFERENCE ONLY.
2. ALL TUBE JOINTS & SEAMS TAPED WITH 2" FOIL TAPE (NOT SHOWN).
3. DIMENSIONS IN BRACKETS ARE METRIC UNLESS OTHERWISE SPECIFIED.
4. 6" MIN CLEARANCE SHOULD BE MAINTAINED FROM ALL SOLATUBE COMPONENTS AND OTHER PLENUM COMPONENTS.

UNLESS OTHERWISE SPECIFIED:
DIMENSION TOLERANCE
FRACTIONS ± 1/4"
INCH .X ± .1, .XX ± .06 | MILLIMETER [.X] ± 2.5, [.XX] ± 1.5

MATERIAL: --
FINISH: --
DO NOT SCALE DRAWING

WWW.SOLATUBE.COM

DRAWN BY: STEVENS | DATE: 3/2/09
CHECKED BY: -- | DATE: --
APPROVED BY: -- | DATE: --

SOLATUBE
2210 OAK RIDGE WAY
VISTA, CALIFORNIA 92081-8341
PH (760) 597-4400

TITLE: 750 DS-O (21") CURB CAP OPEN CEILING
SIZE | DWG. NO. WEB-750-CF-OC-NA | REV 2
SCALE: 1:1 | SHEET 1 OF 1

3a Flashing Options (Leave blank if not desired)

T12* Roof Flashing Turret Extension 12 in./300 mm
T24* Roof Flashing Turret Extension 24 in./600 mm
T36* Roof Flashing Turret Extension 36 in./900 mm
T48* Roof Flashing Turret Extension 48 in./1200 mm

MCF Membrane Counter Flashing (use with F8 or F11)
FI Flashing Insulator
CI Curb Insulator
CCI Curb Cap Insulation (Required for FEMA)

* Specify additional extension tubes in #4

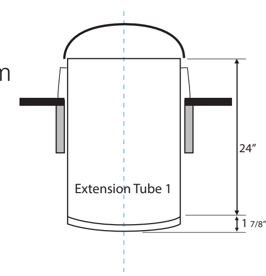
*+ Only product that is FM approved. Must use Dome Polycarbonate (DP). It is required that a dome Edge Protection Band (PB) is used with FM approved flashings and (F8 & F11). The Dome Edge Protection Band for the Curb Cap (PBC) must be used with FM approved Curb Cap (FC).

Transfer Zone

4 Extension Tubes Required*

Run measured from top of flashing to diffuser along centerline of tubing using 24”/600mm lengths. See 4a for optional 48”/1200mm length.

Assuming 8-inch/200mm self flashing***



E1** One Extension Tube – Max Run = 24”/600mm
E2** Two Extension Tubes – Max Run = 46”/1170mm
E3** Three Extension Tubes – Max Run = 68”/1730mm
E4** Four Extension Tubes – Max Run = 90”/2285mm
E5** Five Extension Tubes – Max Run = 112”/2845mm
E6** Six Extension Tubes – Max Run = 134”3400mm
E7** Seven Extension Tubes – Max Run = 156”/3960mm
E8** Eight Extension Tubes – Max Run = 178”/4520mm
E9** Nine Extension Tubes – Max Run = 200”/5080mm
E10** Ten Extension Tubes – Max Run = 222”/5640mm
EXX** Total Run Length to be Determined by Bidding Contractor

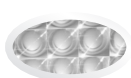
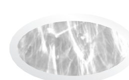
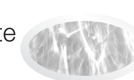
*At least one 24”/600mm or 48”/1200mm extension tube required for diffuser
**Compatible with dome ring to be used as a top tube or extension tube
***Total tube run will vary depending on flashing used

4a Product Options (Leave blank if not desired)

A1 One 0-90 Degree Extension Tube (Angle Adapter)
A2 Two 0-90 Degree Extension Tubes (Angle Adapter)
E Wire Suspension Kit (50 ft./15m) (Required for FEMA)
EL Optional 48”/1200mm Extension Tube (Substitute one 48”/1200mm for two 24”/600mm above)
AK 16”/400mm Top Tube Angle Adapter and 16”/400mm Bottom Tube Angle Adapter
TA 16”/400mm Top Tube Angle Adapter
BA 16”/400mm Bottom Tube Angle Adapter
TIP Thermal Insulation Panel
R Trim Ring

Delivery Zone

5 Diffuser Lens

L1 OptiView® Diffuser 
L2 Prismatic Diffuser 
L2P Prismatic Diffuser Polycarbonate (Required for FEMA) 

5a Options (Leave blank if not desired)

D Daylight Dimmer™
D1 0-10V Daylight Dimmer™

6 Measurement Standard

M Metric
I Imperial

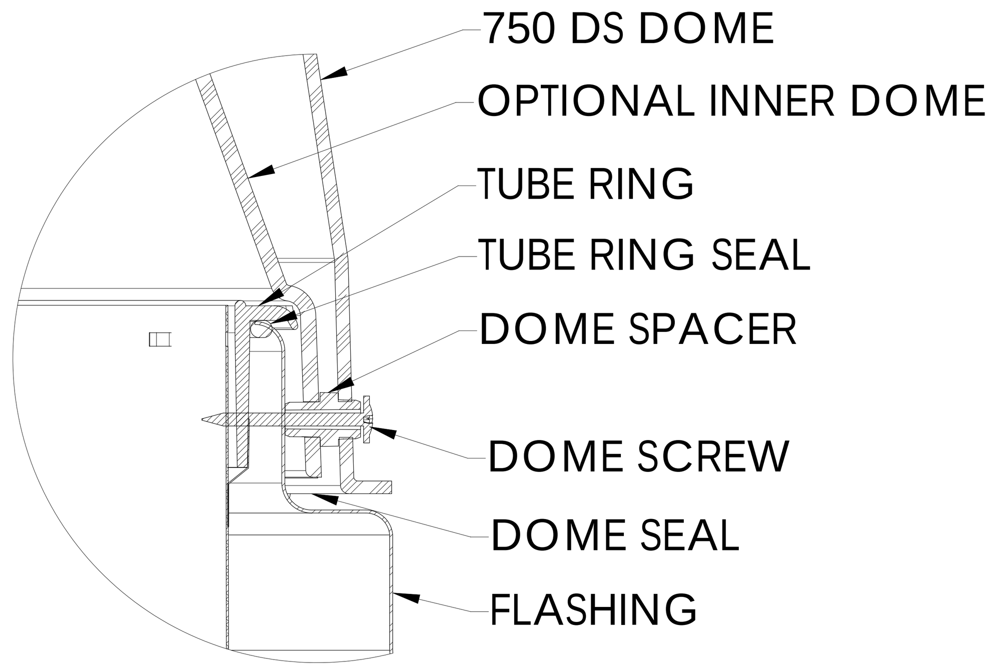
Accessories (Order separately)

SW Low voltage switch (white) required to operate Solatube Daylight Dimmers. Note: Only one switch is required per ten (10) synchronously controlled dimmers. (For ‘D’ only)
S1 Low voltage 0-10V switch (white) required to operate Solatube 0-10V Daylight Dimmers. Only one switch is required per forty-eight (48) synchronously controlled dimmers. (For ‘D1’ only) Note: For use when no controls have been specified and customer is looking for an off-the-shelf solution. If different controls have been specified please source those from others.
CA Two Conductor/22 AWG Low Voltage Cable 500 ft./150m (For ‘D’ only)
TR20 UL Listed Class 2 Transformer 24 VAC, Rated 20 VA (For ‘D1’ only)
TR96 UL Listed Class 2 Transformer 24 VAC, Rated 96 VA (For ‘D1’ only)

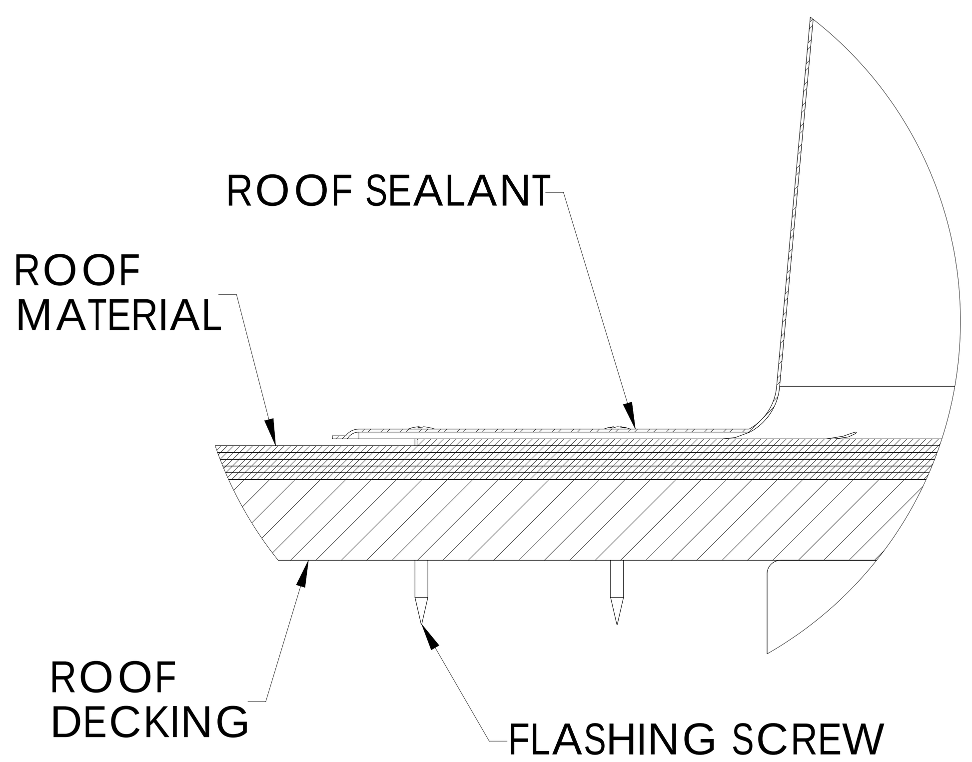
Example

S750 DS-O-DPI-F8-E2-L1-M
SolaMaster Series® 750 DS-O (21 in./530 mm Daylighting System), Acrylic Outer Dome + Polycarbonate Inner Dome, 8-inch/200mm High Self Mounted Flashing, Two Extension Tubes and OptiView® Diffuser. For metric installations.

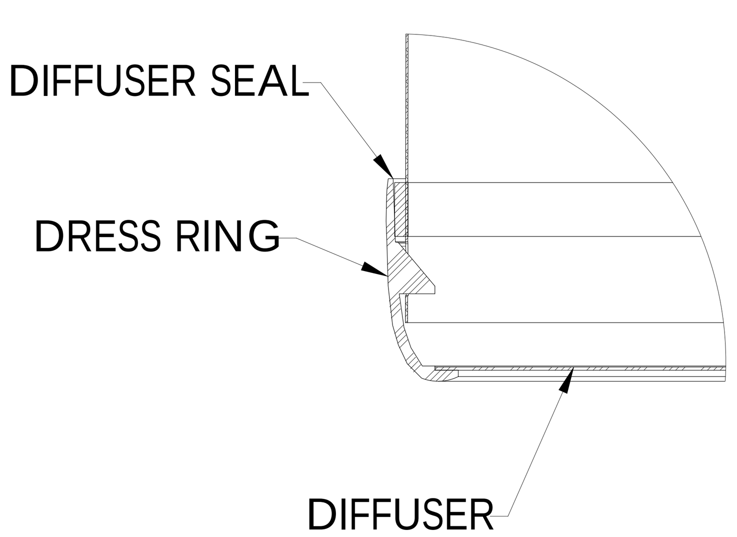
SOLATUBE 750 DS-O
(21 IN/530 MM)
11" SELF FLASHING OPEN CEILING - NO ANGLE ADAPTER
WITH OPTIONAL INNER DOME



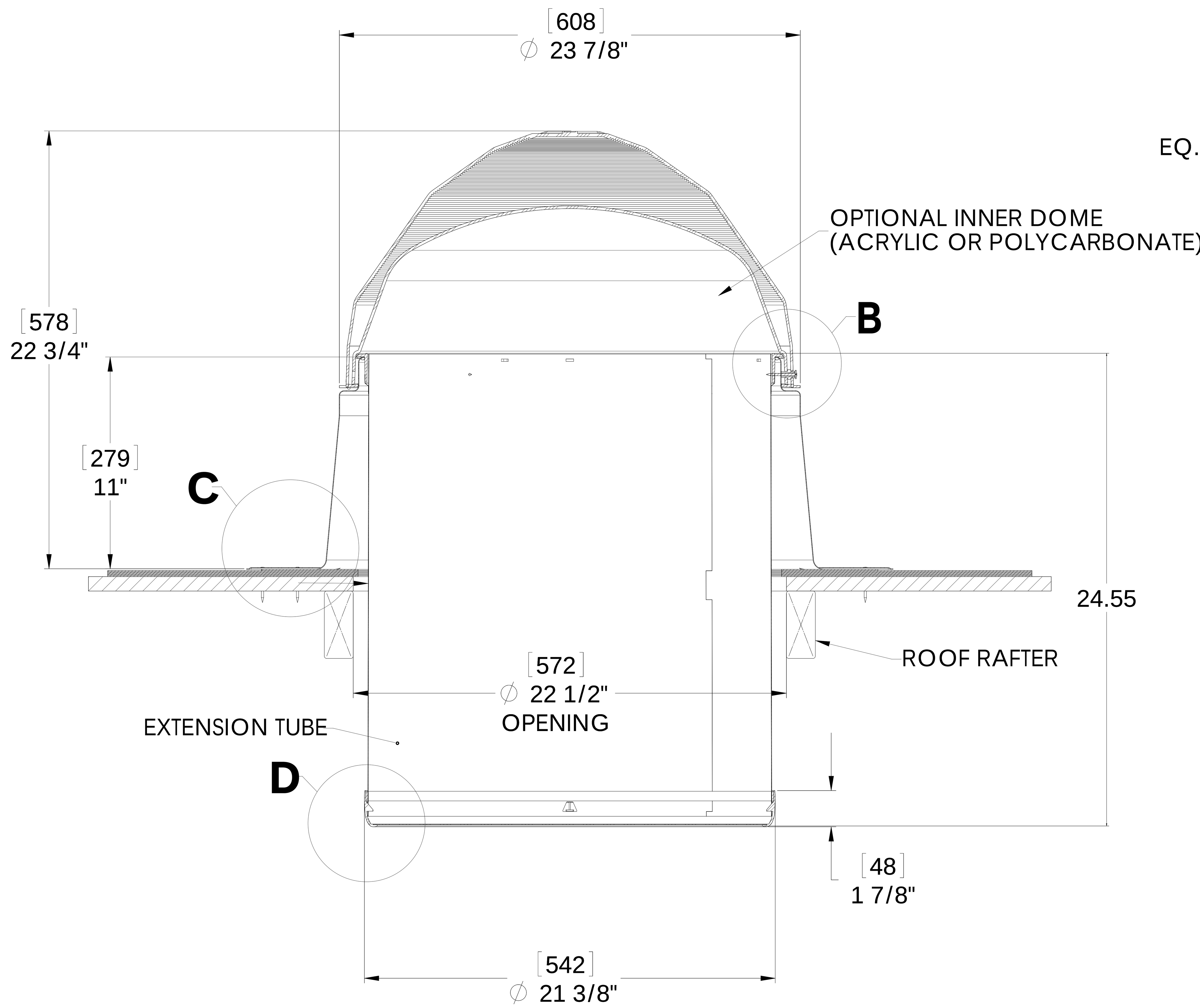
DETAIL B
SCALE 3 : 1



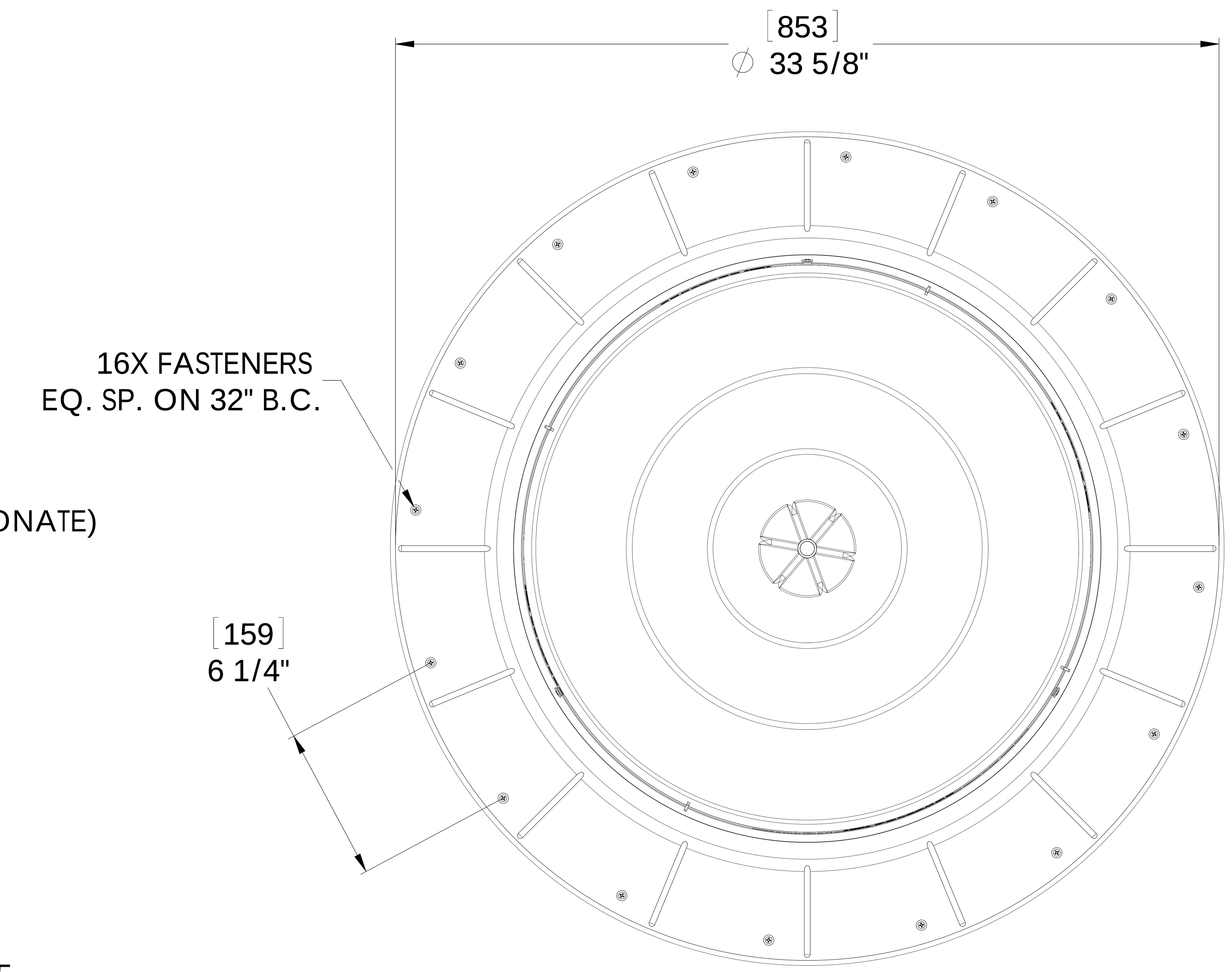
DETAIL C
SCALE 3 : 1



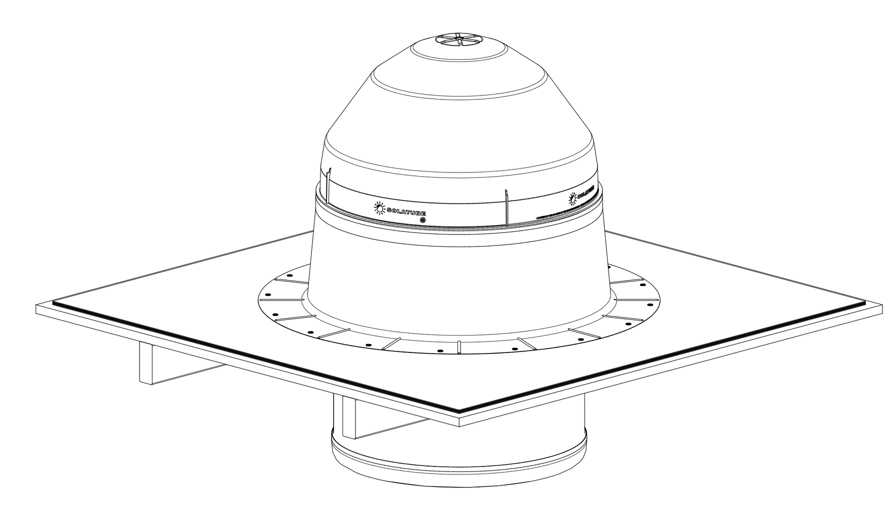
DETAIL D
SCALE 3 : 1



FULL SECTION
SCALE 1:1



TOP VIEW
SCALE 1 : 2



NOTES:

1. STRUCTURAL ELEMENTS (PLYWOOD, RAFTERS, DRYWALL ETC.) BY OTHERS & SHOWN FOR REFERENCE ONLY.
2. ALL TUBE JOINTS & SEAMS TAPED WITH 2" FOIL TAPE (NOT SHOWN).
3. DIMENSIONS IN BRACKETS ARE METRIC UNLESS OTHERWISE SPECIFIED.
4. 6" MIN CLEARANCE SHOULD BE MAINTAINED FROM ALL SOLATUBE COMPONENTS AND OTHER PLENUM COMPONENTS.

UNLESS OTHERWISE SPECIFIED:
DIMENSIONS ARE IN INCHES
TOLERANCES:
ANGULAR: Ñ0.5Á
.X Ñ .1
.XX Ñ .02
.XXX Ñ .005

MATERIAL: --
FINISH: --
DO NOT SCALE DRAWING

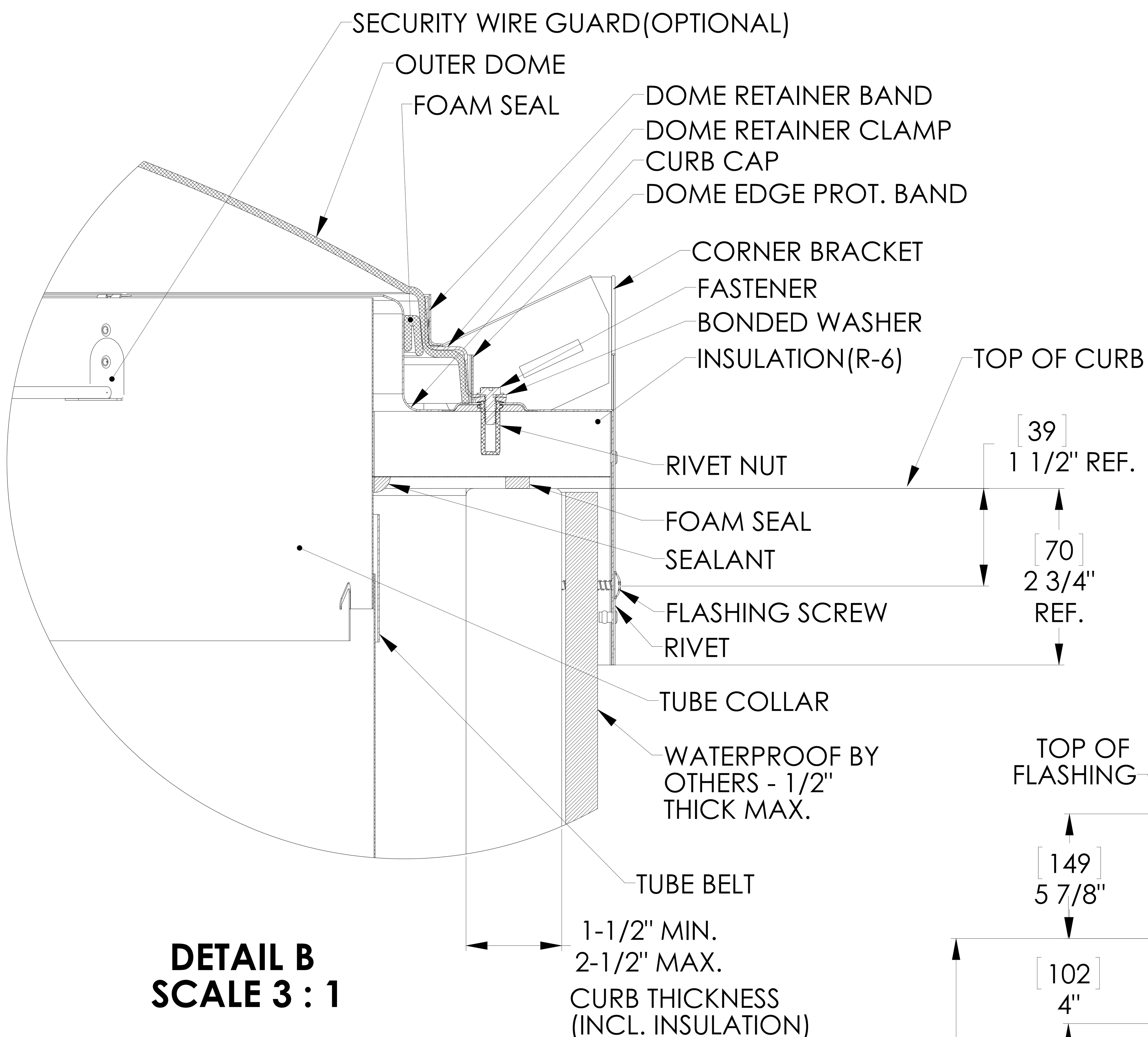
WWW.SOLATUBE.COM

DRAWN BY: STEVENS — DATE: 3/2/09
CHECKED BY: -- — DATE: --
APPROVED BY: -- — DATE: --

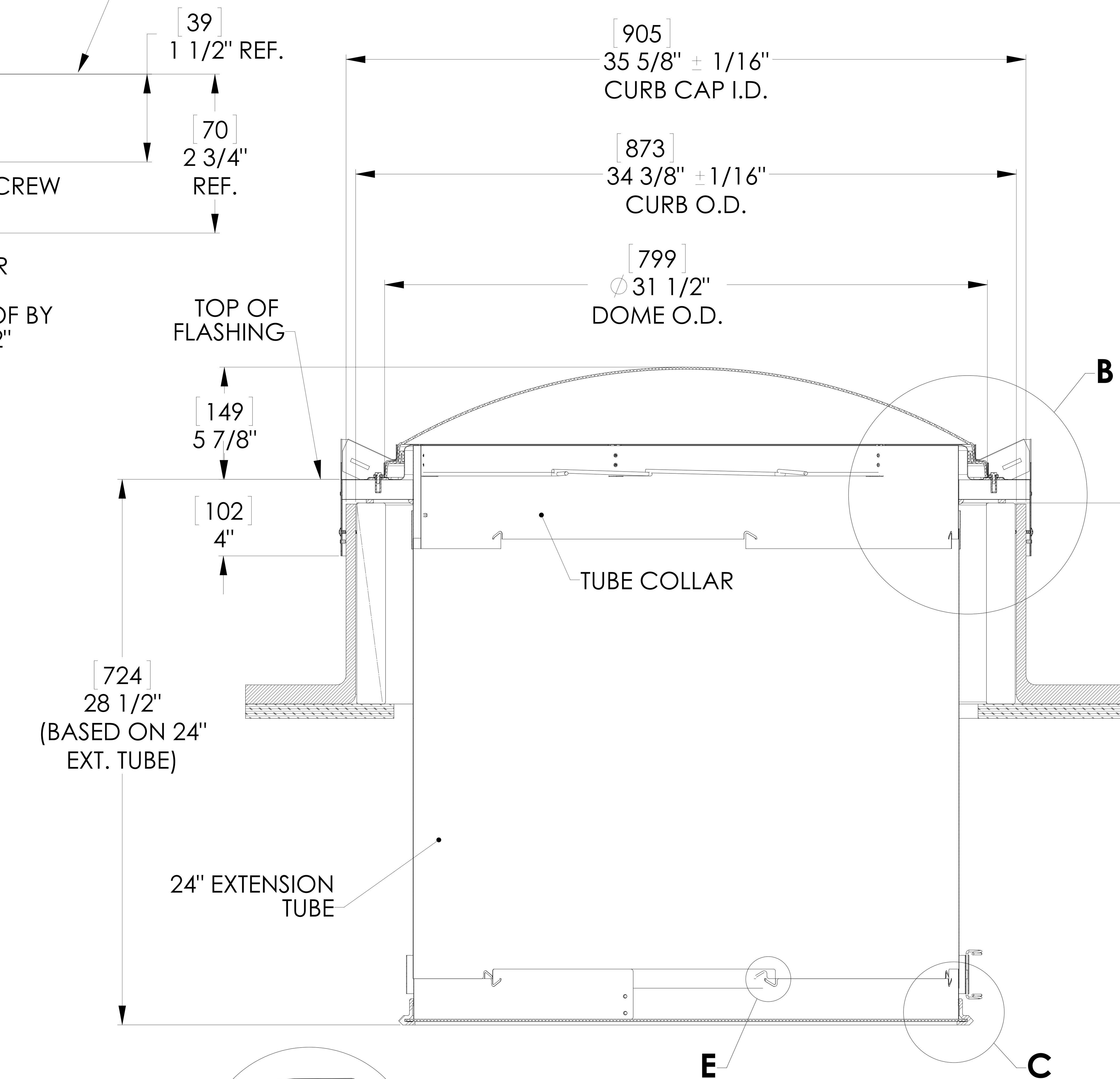
SOLATUBE
2210 OAK RIDGE WAY
VISTA, CALIFORNIA 92081-8341
PH (760) 597-4400

TITLE: 750 DS (21") SELF-FLASHING OPEN CEILING
SIZE: DWG. NO. WEB-750-SF11-OC-NA — REV 1
SCALE: 1:1 — SHEET 1 OF 1

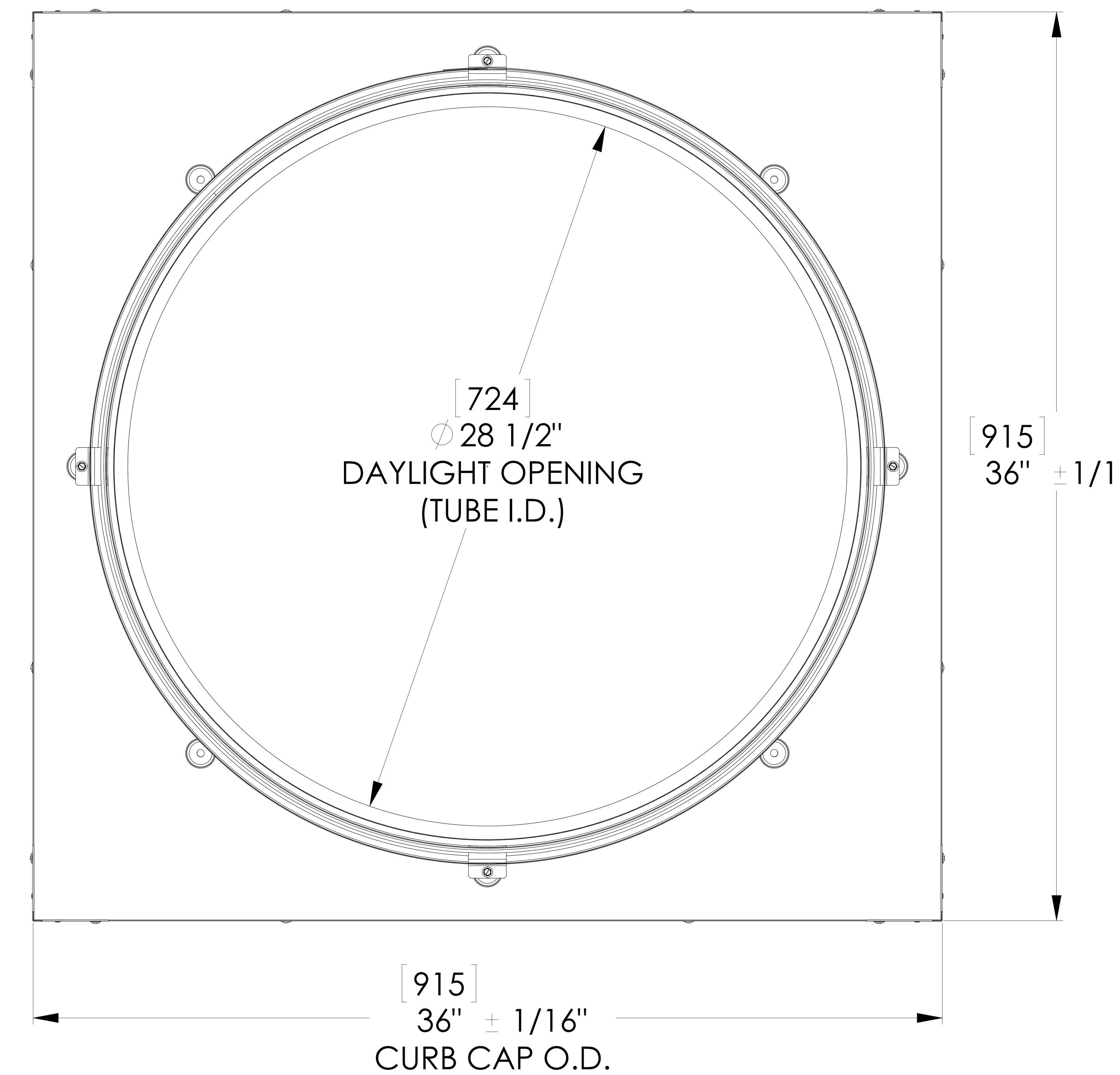
SOLATUBE M74 DS-O-DP-B (29 IN / 740 MM) CURB CAP OPEN CEILING

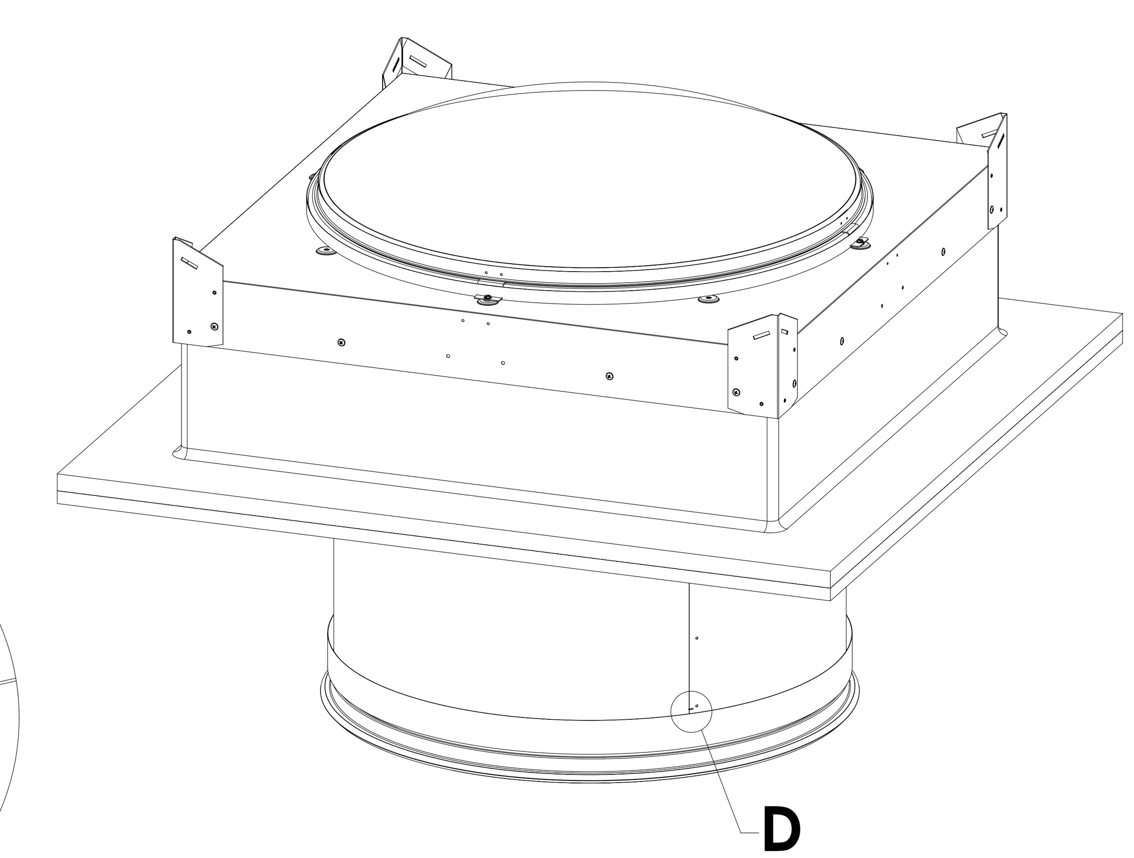


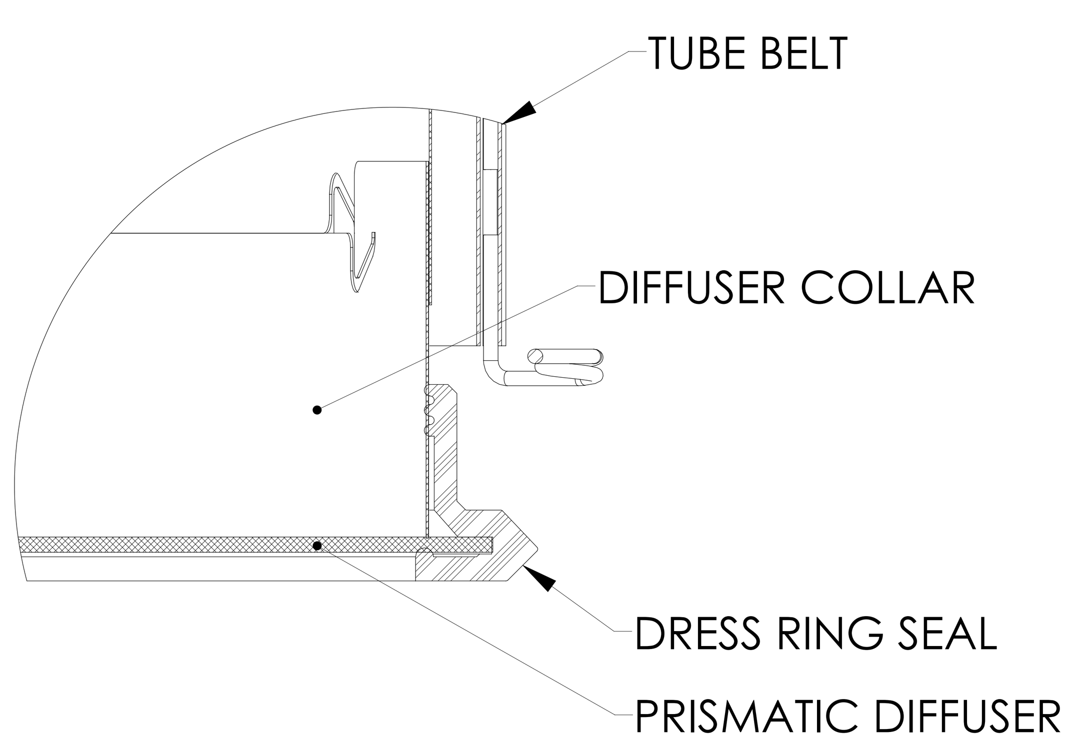
DETAIL B SCALE 3 : 1



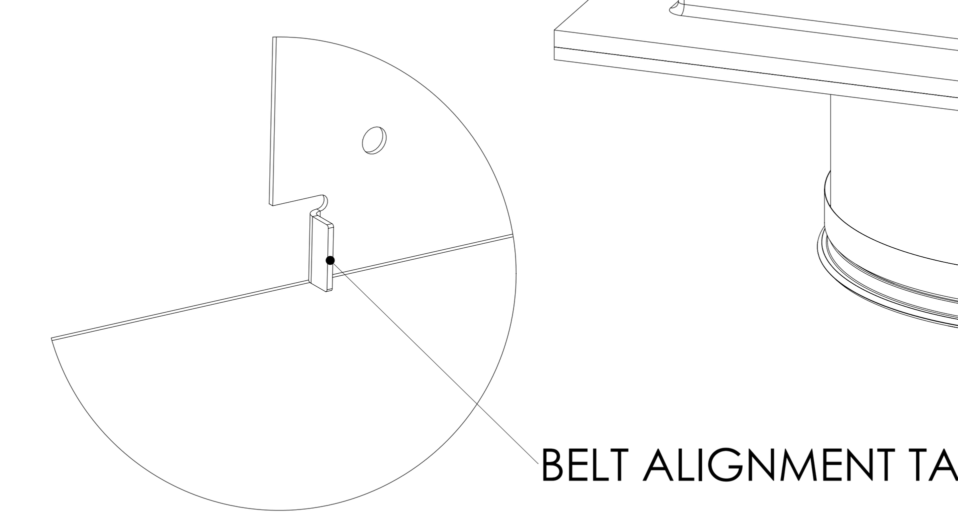
SECTION A-A



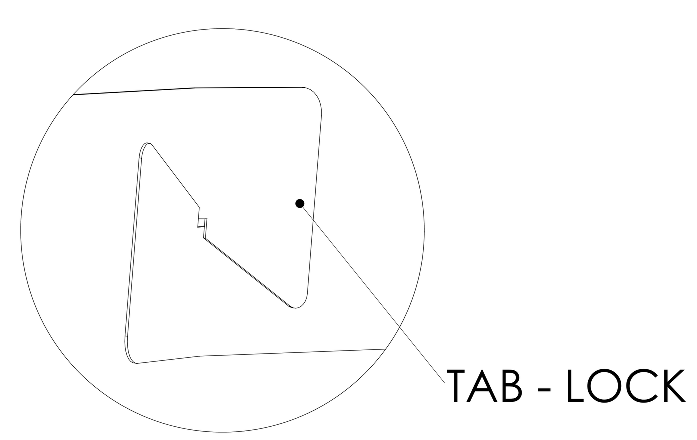




DETAIL C SCALE 4 : 1



DETAIL D SCALE 8 : 1



DETAIL E SCALE 8 : 1

NOTES:

1. STRUCTURAL ELEMENTS (PLYWOOD, RAFTERS, DRYWALL ETC.) BY OTHERS & SHOWN FOR REFERENCE ONLY.
2. DIMENSIONS IN BRACKETS ARE METRIC UNLESS OTHERWISE SPECIFIED.
3. 6" MIN CLEARANCE SHOULD BE MAINTAINED FROM ALL SOLATUBE COMPONENTS AND OTHER PLENUM COMPONENTS.
4. CURB CORNER TO CORNER MEASUREMENT SHALL BE EQUIVALENT TO WITHIN 3/32".

UNLESS OTHERWISE SPECIFIED:
DIMENSION TOLERANCE
FRACTIONS ± 1/4"
INCH .X ± .1 .XX ± .06
MILLIMETER [.X] ± 2.5 [.XX] ± 1.5

MATERIAL --
FINISH --
DO NOT SCALE DRAWING

DRAWN BY	STEVENS	DATE	20 MAY 13
CHECKED BY	--	DATE	--
APPROVED BY	--	DATE	--

SOLATUBE
2210 OAK RIDGE WAY
VISTA, CALIFORNIA 92081-8341
PH (760) 597-4400

TITLE: M74 DS CURB MOUNT OPEN CEILING

SIZE: D
DWG. NO. SM74DS-O-DP-B-FC-OC
REV: 2
SCALE: 1:1
SHEET 1 OF 1

M-SERIES

SUBMITTAL DATA: MSZ-GL12NA & MUZ-GL12NA
12,000 BTU/H WALL-MOUNTED HEAT PUMP SYSTEM

MITSUBISHI ELECTRIC

Job Name:	
System Reference:	Date:

Indoor Unit: MSZ-GL12NA	Outdoor Unit: MUZ-GL12NA	Wireless Remote Controller
		

GENERAL FEATURES
- Slim wall-mounted indoor units provide zone comfort control
- The outdoor unit powers the indoor unit, and should a power outage occur, the system is automatically restarted when power returns
- INVERTER-driven compressor and LEV provide high efficiency and comfort while using only the energy needed to maintain maximum performance
- Multiple fan speed options: Quiet, Low, Medium, High, Super-high, Auto
- Multiple control options available:
  - Hand-held Remote Controller (provided with unit)
  - kumo cloud® smart device app for remote access
  - Third-party interface options
  - Wired or wireless controllers
- Hot-Start Technology: no cold air rush at equipment startup or when restarting after Defrost Cycle
- Quiet operation
- Smart Set: recalls a preferred preset temperature setting at the touch of a button
- Blue Fin anti-corrosion treatment applied to the outdoor unit heat exchanger for increased coil protection and longer life

Specifications are subject to change without notice.

SPECIFICATIONS: MSZ-GL12NA & MUZ-GL12NA

Cooling[1]	Maximum Capacity	Btu/h	13,600
	Rated Capacity	Btu/h	12,000
	Minimum Capacity	Btu/h	1,500
	Maximum Power Input	W	1,300
	Rated Power Input	W	920
	Moisture Removal	Pints/h	2.5
	Sensible Heat Factor		0.77
	Power Factor	%	95 / 95
Heating at 47°F[2]	Maximum Capacity	Btu/h	18,100
	Rated Capacity	Btu/h	14,400
	Minimum Capacity	Btu/h	2,000
	Maximum Power Input	W	1,620
	Rated Power Input	W	1,100
	Power Factor	%	96 / 96
Heating at 17°F[3]	Maximum Capacity	Btu/h	12,000
	Rated Capacity	Btu/h	9,200
	Maximum Power Input	W	1,240
	Rated Power Input	W	870
Heating at 5°F[4]	Maximum Capacity	Btu/h	9,790
	Maximum Power Input	W	1,020
Heating at -4°F[5]	Maximum Capacity	Btu/h	7,920
Efficiency	SEER		23.1
	EER[1]		13.0
	HSPF (IV)		12.5
	COP at 47°F[2]		3.84
	COP at 17°F in Maximum Capacity[3]		2.84
	COP at 5°F in Maximum Capacity[4]		2.81
	ENERGY STAR® Certified (ENERGY STAR products are third-party certified by an EPA-recognized Certification Body.)		YES
Electrical	Voltage, Phase, Frequency		208/230V, 1 phase, 60Hz
	Guaranteed Voltage Range	V AC	187 - 253
	Voltage: Indoor - Outdoor, S1-S2	V AC	208 / 230
	Voltage: Indoor - Outdoor, S2-S3	V DC	24
	Voltage: Indoor - Remote Controller		Wireless Type
	Recommended Fuse/Breaker Size	A	15
	Recommended Wire Size (Indoor - Outdoor)	AWG	14
Indoor Unit	MCA	A	1
	MOCP	A	15
	Blower Motor Full Load Amperage	A	0.76
	Blower Motor Output	W	30
	Airflow Rate at Cooling, Dry	CFM	399-321-237-170-145

Specifications are subject to change without notice.

SPECIFICATIONS: MSZ-GL12NA & MUZ-GL12NA

	Airflow Rate at Cooling, Wet	CFM	364-286-201-134-109
	Airflow Rate at Heating, Dry	CFM	406-321-237-170-145
	Sound Pressure Level (Cooling)	dB(A)	45-37-30-22-19
	Sound Pressure Level (Heating)	dB(A)	43-37-30-22-19
	Drain Pipe Size	In. (mm)	5/8 (15.88)
	Heat Exchanger Type		Plate fin coil
	External Finish Color		Munsell 1.0Y 9.2/0.2
	Unit Dimensions	W: In. (mm)	31-7/16 (798)
		D: In. (mm)	9-1/8 (232)
		H: In. (mm)	11-5/8 (295)
	Package Dimensions	W: In. (mm)	33-1/2 (850)
		D: In. (mm)	12 (300)
		H: In. (mm)	14 (350)
	Unit Weight	Lbs. (kg)	22 (10)
	Package Weight	Lbs. (kg)	26 (11.5)
Indoor Unit Operating Temperature Range	Cooling Intake Air Temp (Maximum / Minimum)*	°F	90 DB, 73 WB / 67 DB, 57 WB
	Heating Intake Air Temp (Maximum / Minimum)	°F	80 DB / 70 DB
Outdoor Unit	MCA	A	9
	MOCP	A	15
	Fan Motor Full Load Amperage	A	0.5
	Fan Motor Output	W	55
	Airflow Rate	CFM	1,229 / 1,172
	Refrigerant Control		LEV
	Defrost Method		Reverse cycle
	Heat Exchanger Type		Plate fin coil
	Sound Pressure Level, Cooling[1]	dB(A)	49
	Sound Pressure Level, Heating[2]	dB(A)	51
	Compressor Type		DC INVERTER-driven
	Compressor Model		SNB092FQAMT
	Compressor Rated Load Amps	A	6.6
	Compressor Locked Rotor Amps	A	8.2
	Compressor Oil Type // Charge	oz.	FV50S // 11.8
	External Finish Color		Munsell 3Y 7.8/1/1
	Base Pan Heater		Optional
	Unit Dimensions	W: In. (mm)	31-1/3 (800)
		D: In. (mm)	11-1/5 (285)
		H: In. (mm)	21-5/9 (550)
	Package Dimensions	W: In. (mm)	37 (940)
		D: In. (mm)	14-15/16 (380)
		H: In. (mm)	24-13/16 (630)
	Unit Weight	Lbs. (kg)	81 (37)

Specifications are subject to change without notice.

SPECIFICATIONS: MSZ-GL12NA & MUZ-GL12NA

	Package Weight	Lbs. (kg)	89 (40)
Outdoor Unit Operating Temperature Range	Cooling Air Temp (Maximum / Minimum)*	°F	115 / 14
	Cooling Thermal Lock-out / Re-start Temperatures**	°F	-1 / 3
	Heating Air Temp (Maximum / Minimum)	°F	75 / -4
	Heating Thermal Lock-out / Re-start Temperatures**	°F	-9 / -4
Refrigerant	Type		R410A
	Charge	Lbs, oz	2, 9
Piping	Gas Pipe Size O.D. (Flared)	In. (mm)	3/8 (9.52)
	Liquid Pipe Size O.D. (Flared)	In. (mm)	1/4 (6.35)
	Maximum Piping Length	Ft. (m)	65 (20)
	Maximum Height Difference	Ft. (m)	40 (12)
	Maximum Number of Bends		10

Notes

AHRI Rated Conditions (Rated data is determined at a fixed compressor speed)	[1]Cooling (Indoor // Outdoor)	°F	80 DB, 67 WB // 95 DB, 75 WB
	[2]Heating at 47°F (Indoor // Outdoor)	°F	70 DB, 60 WB // 47 DB, 43 WB
	[3]Heating at 17°F (Indoor // Outdoor)	°F	70 DB, 60 WB // 17 DB, 15 WB
Conditions	[4]Heating at 5°F (Indoor // Outdoor)	°F	70 DB, 60 WB // -4 DB, -5 WB
	[5]Heating at -4°F (Indoor // Outdoor)	°F	70 DB, 60 WB // -4 DB, -5 WB

*Applications should be restricted to comfort cooling only; equipment cooling applications are not recommended for low ambient temperature conditions.
**System cuts out in heating mode to avoid thermistor error and automatically restarts at these temperatures.

ACCESSORIES: MSZ-GL12NA

Anti-allergy Enzyme Filter	□ MAC-408FT-E
Backlit, Wall-mounted, Wireless Controller	□ MHK1
Portable Central Controller	□ MCCH1
Wired MA Controller[1]	□ PAR-33MAA
Simple MA Controller[1]	□ PAC-YT53CRAU
Touch MA Controller[1]	□ PAR-CT01MAU-SB
Wired Remote Sensor	□ M21-EAA-307
Wireless Temperature and Humidity Sensor	□ PAC-USWHS003-TH-1
Outside Air Sensor for MHK1	□ MOS1
System Control Interface[2]	□ MAC-333IF-E
Wireless Interface	□ PAC-USWHS002-WF-1
Thermostat Interface	□ PAC-US444CN-1
kumo station®	□ PAC-WHS01HC-E
USNAP Interface	□ PAC-WHS01UP-E
IT Extender	□ PAC-WHS01IE-E
BACnet® and MODBUS® Interface	□ PAC-UKPRC001-CN-1
Lockdown Bracket for Hand-held Remote Controllers	□ RCMKP1CB
Blue Diamond Sensor Extension Cable — 15 Ft.	□ C13-103
Blue Diamond Alarm Extension Cable — 6.5 Ft.	□ C13-192
Blue Diamond MultiTank — collection tank for use with multiple pumps	□ C21-014
Blue Diamond Rubber Foot Pads	□ F10-010
Mini Condensate Pump — 230 volt application	□ SI30-230
MegaBlue Advanced Blue Diamond Condensate Pump w/ Reservoir & Sensor	□ X87-835 - 110 to 250V
MaxiBlue Advanced Blue Diamond Mini Condensate Pump w/ Reservoir & Sensor (110V) up to 48,000 Btu/h [recommended]	□ X87-711 - 110V
Advanced Blue Diamond Mini Condensate Pump w/ Reservoir & Sensor (208/230V) [recommended]	□ X87-721 - 208/230V
MicroBlue Blue Diamond Mini Condensate Pump (110/208/230V) up to 18,000 Btu/h	□ X85-003
Fascia Kit for MicroBlue Pump – mounts the MicroBlue and sensor directly beneath the indoor unit	□ T18-016
Drain Pan Level Sensor	□ DPLS2
(30A/600V/UL) [fits 2" X 4" utility box] - Black	□ TAZ-MS303
(30A/600V/UL) [fits 2" X 4" utility box] - White	□ TAZ-MS303W

[1] Requires MAC-333IF-E

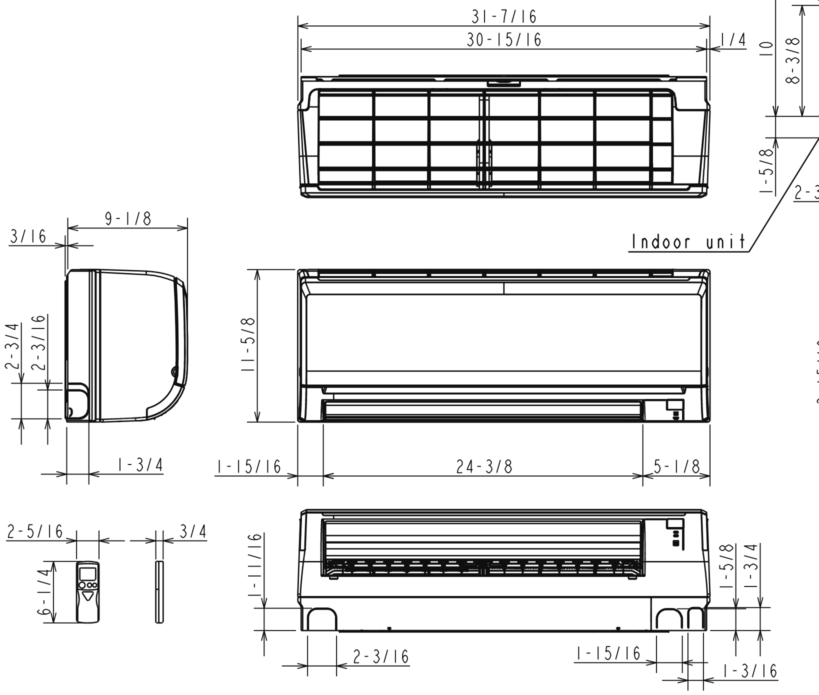
[2] Allows indoor units to connect to an MA Controller

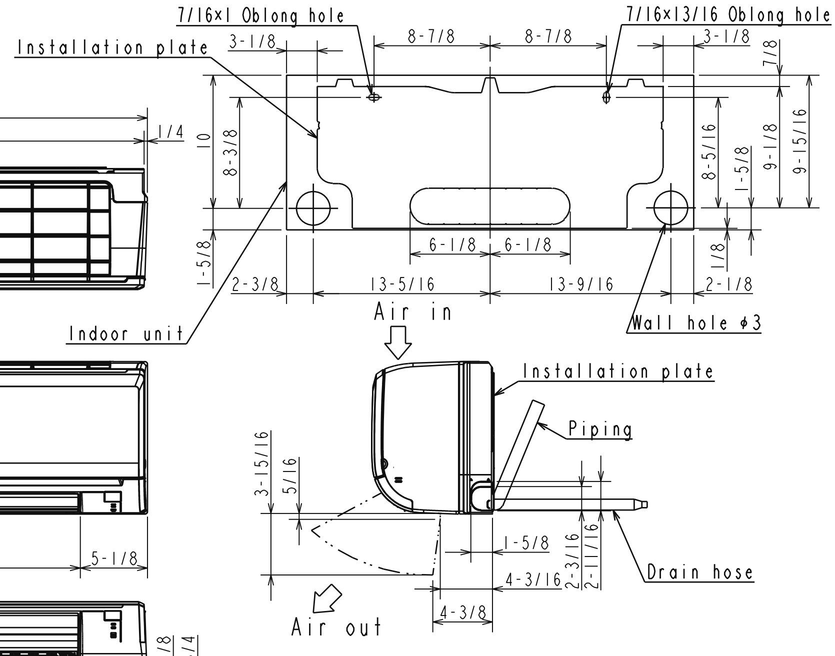
ACCESSORIES: MUZ-GL12NA

Air Outlet Guide	□ MAC-881SG
Drain Socket	□ MAC-860DS
Optional Defrost Heater	□ MAC-640BH-U
Hail Guard	□ HG-B4
Outdoor Unit 3-1/4 inch Mounting Base (Pair) - Plastic	□ DSD-400P
Condensing Unit Mounting Pad 16" x 36" x 3"	□ ULTRILITE1
Outdoor Unit Stand — 12" High	□ QSMS1201M
Outdoor Unit Stand — 18" High	□ QSMS1801M
Outdoor Unit Stand — 24" High	□ QSMS2401M
Heavy Duty Wall Mounting Bracket— Coated Steel	□ QSWB2000M-1
Heavy Duty Wall Mounting Bracket — 316 Series Stainless Steel	□ QSWBSS
15' x 1/4" x 15' / 3/8" Lineset (Twin-Tube Insulation)	□ MLS143812T-15
30' x 1/4" x 30' / 3/8" Lineset (Twin-Tube Insulation)	□ MLS143812T-30
50' x 1/4" x 50' / 3/8" Lineset (Twin-Tube Insulation)	□ MLS143812T-50
65' x 1/4" x 65' / 3/8" Lineset (Twin-Tube Insulation)	□ MLS143812T-65

DIMENSIONS: MSZ-GL12NA

Unit: inch



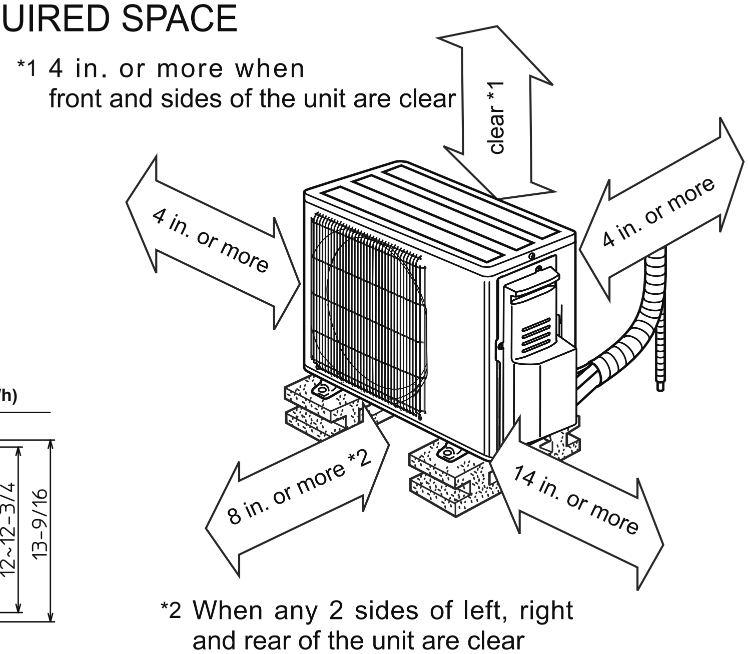


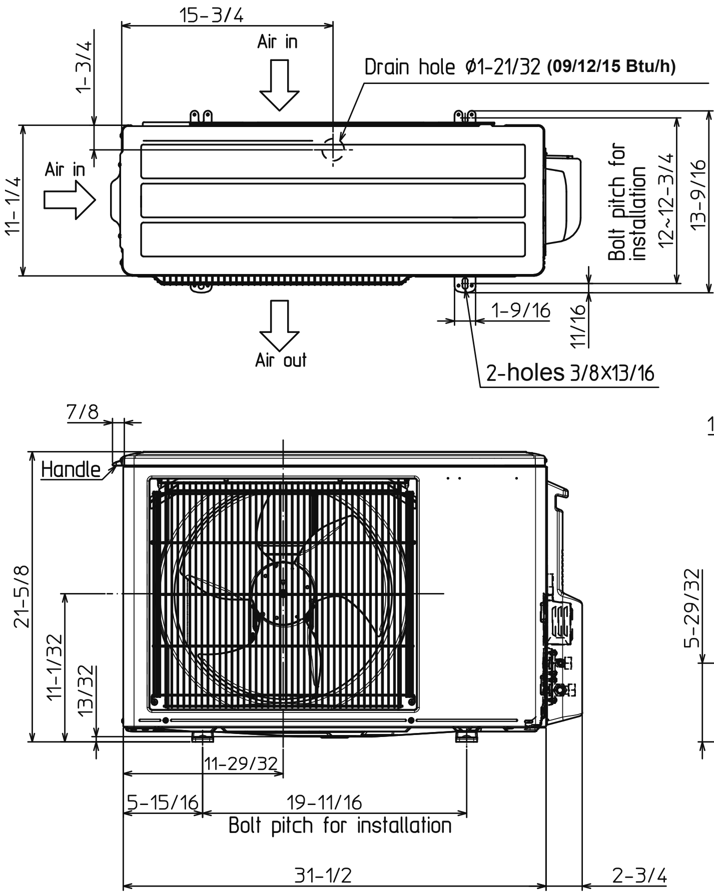
Piping	Insulation	ø1 - 3/8 O.D
	Liquid line	ø1/4 19 - 11/16 (Flared connection ø1/4)
	Gas line	ø3/8 16 - 15/16 (Flared connection: ø3/8 (**GL06/09/12NA**), ø1/2 (**GL15NA**))
Drain hose		Insulation ø1-1/8 O.D Connected part ø5/8 O.D

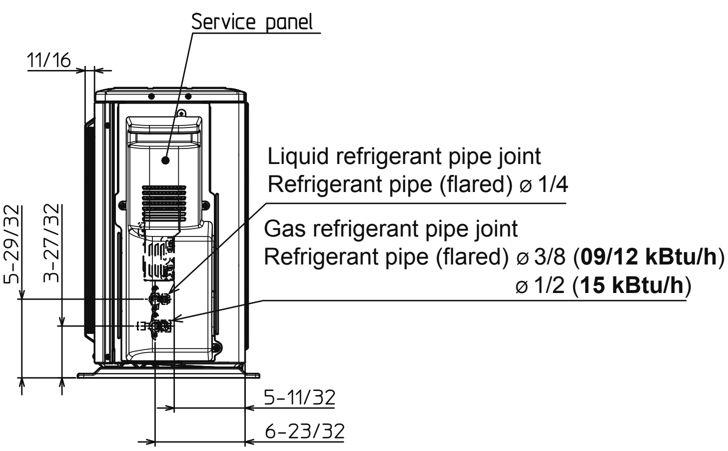
DIMENSIONS: MUZ-GL12NA

Unit: inch

REQUIRED SPACE







MITSUBISHI ELECTRIC
COOLING & HEATING

1340 Satellite Boulevard, Suwanee, GA 30024
Toll Free: 800-433-4822 www.mehvac.com

FORM# MSZ-GL12NA / MUZ-GL12NA - 201902

Specifications are subject to change without notice.

CITY MULTI® **Model: PKFY-P12NHMU-E** MITSUBISHI ELECTRIC

Job Name: ______________________ Location: ______________________

Drawing Reference: ______________________ Schedule No. ______________________

System No.: ______________________ Date: ______________________

GENERAL FEATURES

- R410A refrigerant
- Seven sizes from 6,000 to 30,000 Btu/h
- Powerful airflow (CFM)
- Compact, lightweight, shiny-white, flat-panel design
- Quiet operation
- Multiple fan-speed settings
- Intake grille filter is easily removed for cleaning
- Built-in receiver is standard

SPECIFICATIONS

Capacity*
Cooling……………………………………………….12,000 Btu/h
Heating……………………………………………….13,500 Btu/h

Power
Power Source…………………..........208 / 230V, 1-phase, 60Hz
Power Consumption
Cooling……………………………………………………0.03 kW
Heating……………………………………………………0.03 kW
Current
Cooling……...……………0.30 A
Heating……...……………0.30 A
Minimum Circuit Ampacity (MCA)……………….…...……...0.38 A
Maximum Overcurrent Protection (MOCP) Fuse...….........…..15 A

External Finish……………....…..………Munsell No. 1.0Y 9.2 / 0.2

External Dimensions
Inches………………………..11-5/8 H x 35-3/8 W x 9-13/16 D
mm………………………………………295 H x 898 W x 249 D

Net Weight
Unit……………….....…...……………..................29 lbs. / 13 kg

Coil Type………………...…Cross Fin
(Aluminum Plate Fin and Copper Tube)

Fan
Type x Quantity……………….....…………...Line Flow Fan x 1
Airflow Rate (Low-Mid-High)...……..……...320 - 355 - 390 CFM
Motor
Type……….....……....………...………...Direct-drive DC Motor
Output……….....……....………...……….....………...…0.030 kW

Air Filter...……………………………..Polypropylene Honeycomb

Refrigerant Piping Dimensions
Liquid (High Pressure)……................…1/4" / 6.35 mm (Flare)
Gas (Low Pressure)………………..….1/2" / 12.7 mm (Flare)

Drainpipe Dimension……............……...…….I.D. 5/8" / 16 mm

Sound Pressure Levels
Low-Mid-High…..…………..………….34 - 38 - 42 dB(A)

OPTIONS

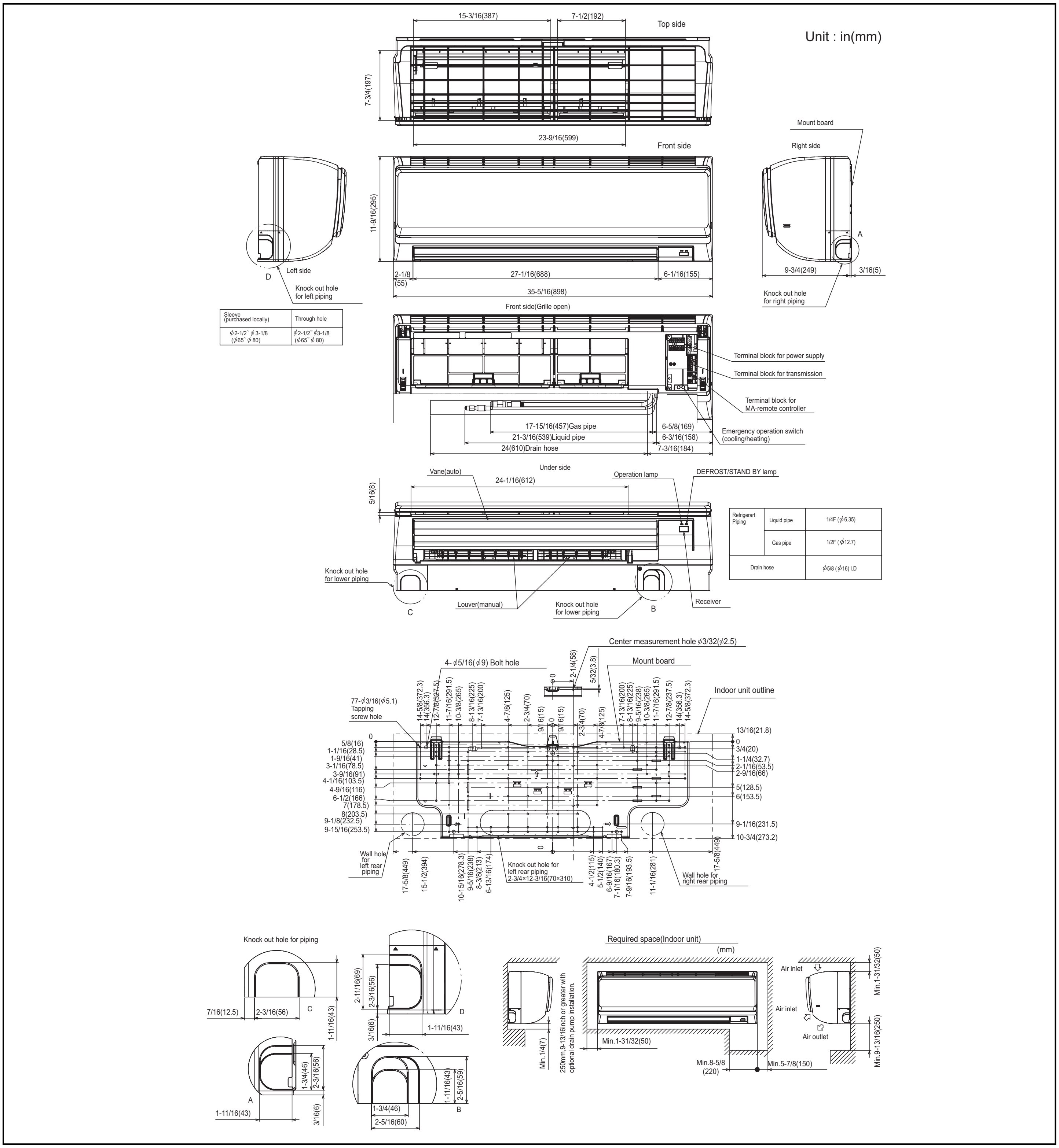
- ☐ Condensate Pump……………………………….SI3100-230
- ☐ External Heat Adapter……………………………PAC-725AD
- ☐ CN24 Relay Kit…………………………CN24RELAY-KIT-CM

* Cooling / Heating capacity indicated at the maximum value at operation under the following conditions:
Cooling: Indoor 80°F (27°C) DB / 67°F (19°C) WB, Outdoor 95°F (35°C) DB
Heating: Indoor 70°F (21°C) DB, Outdoor 47°F (8°C) DB / 43°F (6°C) WB

Note: Ventilation air: Providing sufficient ventilation air is an important part of every building design. ASHRAE Standard 62 provides the minimum ventilation air requirement. Also, check local codes.

R410A

Model: PKFY-P12NHMU-E – DIMENSIONS



Sleeve (purchased locally)	Through hole
ϕ2-1/2"~ϕ3-1/8 (ϕ65"~ϕ80)	ϕ2-1/2"~ϕ3-1/8 (ϕ65"~ϕ80)

Refrigerant Piping	Liquid pipe	1/4F (ϕ6.35)
	Gas pipe	1/2F (ϕ12.7)
Drain hose		ϕ5/8 (ϕ16) I.D

Certificate Number FM33568

Mitsubishi Electric Air Conditioning & Refrigeration Systems Works acquired ISO 9001 certification under Series 9000 of the International Standard Organization (ISO) based on a review of quality warranties for the production of refrigeration and air conditioning equipment.

ISO Authorization System
The ISO 9000 series is a plant authorization system relating to quality warranties as stipulated by the ISO. ISO 9001 certifies quality warranties based on the "design, development, production, installation and auxiliary services" for products built at an authorized plant.

Mitsubishi Electric Air Conditioning & Refrigeration Systems Works acquired environmental management system standard ISO 14001 certification.

The ISO 14000 series is a set of standards applying to environmental protection set by the International Standard Organization (ISO).

Certificate Number EC97J1227

HVAC Advanced Products Division
Mitsubishi Electric & Electronics USA, Inc.
3400 Lawrenceville Suwanee Rd.
Suwanee, GA 30024
Tele: 678-376-2900 • Fax: 800-889-9904
Toll Free: 800-433-4822 (#4)
www.mehvac.com

Specifications are subject to change without notice.

DATA SHEET

Pool Building EEM - High Efficiency Motors

Three Phase Induction Motor - Squirrel Cage

Customer	:
Product line	: General NEMA Premium Efficiency Three-Phase
Product code :	10702566

Frame	: E143/5T	Locked rotor time	: 27s (cold) 15s (hot)
Output	: 2 HP (1.5 kW)	Temperature rise	: 80 K
Poles	: 4	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 208-230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 6.41-5.80/2.90 A	Protection degree	: IP21
L. R. Amperes	: 52.6-47.6/23.8 A	Cooling method	: IC01 - ODP
LRC	: 8.2x(Code L)	Mounting	: F-3
No load current	: 3.54-3.20/1.60 A	Rotation[1]	: Both (CW and CCW)
Rated speed	: 1730 rpm	Noise level[2]	: 52.0 dB(A)
Slip	: 3.89 %	Starting method	: Direct On Line
Rated torque	: 0.828 kgfm	Approx. weight[3]	: 19.8 kg
Locked rotor torque	: 350 %		
Breakdown torque	: 330 %		
Insulation class	: F		
Service factor	: 1.15		
Moment of inertia (J)	: 0.0067 kgm²		
Design	: B		

Output	25%	50%	75%	100%
Efficiency (%)	81.2	82.5	85.5	86.5
Power Factor	0.34	0.58	0.70	0.78

Foundation loads

Max. traction	: 68 kgf
Max. compression	: 88 kgf

		Drive end	Non drive end
Bearing type	:	6205 ZZ	6204 ZZ
Sealing	:	Without Bearing Seal	Without Bearing Seal
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date

Performed by		Page	Revision
Checked by			
Date	12/03/2019	1 / 1	

DATA SHEET

Three Phase Induction Motor - Squirrel Cage

Customer	:

Product line	: W22 Super Premium Efficiency Three-Phase	Product code :	12604363
		Catalog # :	00736EG3E213T-W22

Frame	: 213/5T	Locked rotor time	: 66s (cold) 37s (hot)
Output	: 7.5 HP (5.5 kW)	Temperature rise	: 80 K
Poles	: 2	Duty cycle	: Cont.(S1)
Frequency	: 60 Hz	Ambient temperature	: -20°C to +40°C
Rated voltage	: 230/460 V	Altitude	: 1000 m.a.s.l.
Rated current	: 17.6/8.82 A	Protection degree	: IP55
L. R. Amperes	: 134/67.0 A	Cooling method	: IC411 - TEFC
LRC	: 7.6x(Code J)	Mounting	: F-1
No load current	: 6.20/3.10 A	Rotation¹	: Both (CW and CCW)
Rated speed	: 3530 rpm	Noise level²	: 68.0 dB(A)
Slip	: 1.94 %	Starting method	: Direct On Line
Rated torque	: 1.52 kgfm	Approx. weight³	: 73.3 kg
Locked rotor torque	: 229 %		
Breakdown torque	: 330 %		
Insulation class	: F		
Service factor	: 1.25		
Moment of inertia (J)	: 0.0234 kgm²		
Design	: A		

Output	50%	75%	100%
Efficiency (%)	87.5	89.5	91.0
Power Factor	0.73	0.82	0.86

Foundation loads	
Max. traction	: 70 kgf
Max. compression	: 143 kgf

		Drive end	Non drive end
Bearing type	:	6308 ZZ	6207 ZZ
Sealing	:	V'Ring	V'Ring
Lubrication interval	:	-	-
Lubricant amount	:	-	-
Lubricant type	:	Mobil Polyrex EM	

Notes

This revision replaces and cancel the previous one, which must be eliminated.
(1) Looking the motor from the shaft end.
(2) Measured at 1m and with tolerance of +3dB(A).
(3) Approximate weight subject to changes after manufacturing process.
(4) At 100% of full load.

These are average values based on tests with sinusoidal power supply, subject to the tolerances stipulated in NEMA MG-1.

Rev.	Changes Summary	Performed	Checked	Date

Performed by				
Checked by			Page	Revision
Date	12/03/2019		1 / 1	

Community Center

Reo Semi Recessed Decor

SPI LIGHTING

PROJECT DETAILS

AIW10373 40 in

JOB NAME:

TYPE:

NOTES:

DESCRIPTION

Reo can be partially recessed into the wall cavity, accent the space with side illumination, and provide a sense of depth in a low profile, ADA compliant package. Reo's unique light source orientation illuminates in front of and behind the decorative translucent panel, intensifying a 3D effect. The ability to complement any style comes standard.

ADA | EMR

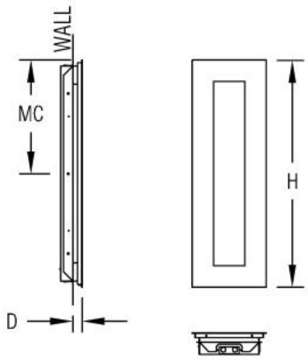
FEATURES & BENEFITS

- Add texture to a space with architectural panels (standard panels are available with other panels available upon request)
- Optional durable wood laminate faceplate option adds a warm, natural texture to a space
- Optional embossed stainless steel-linear and crosshatch face plate option adds a unique, metal accent and texture to a space
- Compliant with Americans with Disabilities Act (ADA) requirements
- Handcrafted in USA

SPECIFICATIONS

- **LIGHT SOURCE:** White LED light engine
- **LUMEN MAINTENANCE:** L70 life = 50,000+ hours
- **CCT**: 3000K, 3500K, or 4000K
- **DRIVER:** Integral Class II power supply standard
- **DIMMING:** 0-10V controls standard to 1% on LED light engines
- **EMERGENCY:** Emergency battery remote optional
- **CONSTRUCTION:** Formed metal construction provides durable protection for internal components and is recyclable
- **FINISH:** Choose from more than 30 thermoset polyester powder coat paint colors or brushed aluminum finish. RAL®, Pantone®, or custom finishes available upon request.
- **MODIFICATIONS:** Consult factory for all modification requests
- **APPROVALS:** ETL listed to UL standards (US & Canada) for use in damp locations; not recommended for exterior applications

DIMENSIONS



W	H	D	MC
13 in 33 cm	39.8 in 101.1 cm	1.7 in 4.3 cm	19.5 in 49.5 cm

Mounting Weight
Approximate: 25 lb (12 kg)

CONFIGURATOR

To configure your spec sheet online, go to www.spilighting.com/AIW10373. Not all options are available in all configurations; consult factory for details.

Required Field *

Catalog	Light Source:	Primary Finish:	Voltage:	Mounting:	Lamp Options:	Diffuser:	Faceplate Options:
	A		B	C	D	E	F

A - LIGHT SOURCE *

To ensure color consistency, SPI uses precise bin selection and strict quality processes to maintain a 3-step (MacAdam) SDCM on all white LED lampings. Published LED luminaire wattages are calculated using a typical power supply efficiency of 88%; exact wattages may vary based on application. Alternative wattages available upon request.

- ☐ **L36W** | White 36W LED Light Engine| Delivered Lumens: 1,467
- ☐ **L72W** | White 72W LED Light Engine| Delivered Lumens: 2,933

See last page for finish options

B - VOLTAGE

- ☐ **120-277V** | Universal Voltage

C - MOUNTING

Requires recessed mounting. Additional mounting structure and hardware required (by others).

- ☐ **DF_SMR** | Semi-recessed Wall Mount (default)

D - LAMP OPTIONS

Delivered lumens shown are at 4000K CCT; apply multiplier for delivered lumens at other CCT.

- ☐ **3000K** [1] **|** 3000K CCT
- ☐ **3500K** [2] **|** 3500K CCT
- ☐ **4000K |** 4000K CCT

[1] Apply .95 multiplier for delivered lumens

[2] Apply .97 multiplier for delivered lumens

E - DIFFUSER *

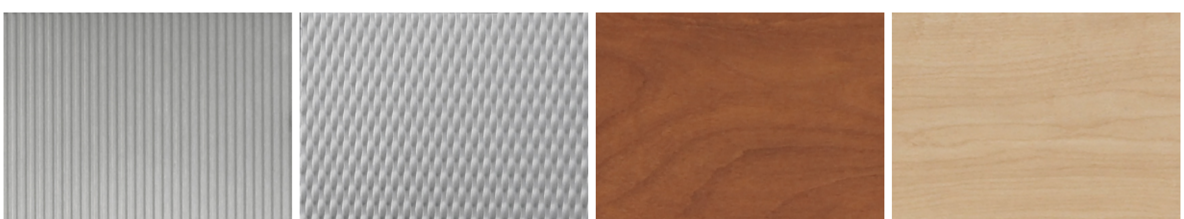
Other styles available upon request. Contact factory to customize an architectural panel that coordinates with your application.

- ☐ **HP01 |** Silver Hand Painted Acrylic Lens
- ☐ **HP02 |** Beige Hand Painted Acrylic Lens
- ☐ **HP03 |** Amber Hand Painted Acrylic Lens
- ☐ **TP01 |** Translucent Panel, Bear Grass, Vertical

HP01 | HP02 | HP03 | TP01

F - FACEPLATE OPTIONS

- ☐ **ES1 |** Embossed Stainless Steel-Linear Pattern
- ☐ **ES2 |** Embossed Stainless Steel-Cross Hatch Pattern
- ☐ **WF1 |** Cherry Laminate
- ☐ **WF2 |** Maple Laminate



ES1 | ES2 | WF1 | WF2

Available Finishes

Not all finishes are available in all configurations; consult factory for details.

Brushed Aluminum

BAL	Brushed Aluminum

Paint Colors

PT01	Super White
PT02	White
PT03	Morning Light
PT04	Warm White
PT05	Putty
PT06	Warm Beige
PT07	Light Taupe
PT08	Medium Taupe
PT09	Medium Grey
PT10	Dark Grey
PT11	Black
PT12	Dark Chocolate
PT13	Warm Grey
PT14	Light Grey
PT15	Sage
PT16	Spruce
PT17	Red
PT18	Deep Red
PT19	Blue
PT20	Dark Green
PT21	Pearl White (Metallic)
PT22	Platinum (Metallic)
PT27	Deep Copper (Metallic)
PT28	Dark Stainless (Metallic)
PT29	Red Brass (Metallic)
PT31	Medium Bronze (Metallic)
PT32	Dark Bronze (Metallic)
PT33	Dark Blue
PT40	Yellow
PT41	Orange
PT42	Sky Blue
PT43	Teal
PT44	Green
PT45	Purple
PT46	Aluminum (Metallic)
PT47	Deep Red Brass (Metallic)
PT48	Brass (Metallic)
PT49	Bronze (Metallic)
PT51	Matte White

CITYMULTI®

Outdoor Unit: 16-TON PUHY-P192TSLMU-A (-BS)

(Consists of One PUHY-P120TLMU-A (-BS), One PUHY-P72TLMU-A (-BS), and One CMY-Y100CBK3 Twinning Kit)

MITSUBISHI ELECTRIC

Job Name:	
System Reference:	Date:

DPW Garage

OUTDOOR VRF HEAT PUMP SYSTEM

UNIT OPTION

- □ Standard Model..PUHY-P192TSLMU-A
- □ Seacoast (BS) Model...................................PUHY-P192TSLMU-A-BS

ACCESSORIES

- ■ Twinning Kit (required)..CMY-Y100CBK3
- □ Joint Kit............................for details see Pipe Accessories Submittal
- □ Low Ambient Kit ....for details see Low Ambient Kit Submittal
- □ Snow/Hail Guards Kit.........for details see Snow/Hail Guards Kit Submittal
- □ Base Pan Heater Kit............for details see Base Pan Heater Kit Submittal

Specifications		System	Module 1	Module 2
Unit Type		PUHY-P192TSLMU-A (-BS)	PUHY-P120TLMU-A (-BS)	PUHY-P72TLMU-A (-BS)
Nominal Cooling Capacity (208/230V)	Btu/h	192,000	120,000	72,000
Nominal Heating Capacity (208/230V)	Btu/h	215,000	135,000	80,000
Operating Temperature Range *1	Cooling (Outdoor) *2	Refer to Module Data	23~126° F (-5~52° C) DB	
	Heating (Outdoor)		-13~60° F (-25~15.5° C) WB	
External Dimensions (H x W x D)	In. (mm)	Refer to Module Data	64-31/32 x 68-29/32 x 29-5/32 (1,650 x 1,750 x 740)	64-31/32 x 36-1/4 x 29-5/32 (1,650 x 920 x 740)
Net Weight	Lbs. (kg)	1,106 (501)	671 (304)	435 (197)
External Finish		Refer to Module Data	Pre-coated galvanized steel sheet	
Electrical Power Requirements	Voltage, Phase, Hertz	Refer to Module Data**	208 / 230V, 3-Phase, 60Hz	
Minimum Circuit Ampacity (MCA)	A	Refer to Module Data**	42 / 39	24 / 22
Maximum Overcurrent Protection (MOP)	A	Refer to Module Data**	60 / 60	35 / 35
Piping Diameter (Brazed)				
From Twinning Kit to First Joint or Header (In. / mm)	Liquid (High Pressure)	5/8 (15.88)	Refer to System Data	
	Gas (Low Pressure)	1-1/8 (28.58)		
Max. Total Refrigerant Line Length	Ft.	3,280	Refer to System Data	
Max. Refrigerant Line Length (Between ODU & IDU)	Ft.	541		
Max. Control Wiring Length	Ft.	1,640		
Indoor Unit	Total Capacity	50~130% of outdoor unit capacity	Refer to System Data	
	Model / Quantity	P06~P96/1~41	Refer to System Data	
Sound Pressure Level	dB(A)	62.5	Refer to System Data	
Fan				
Type x Quantity		Refer to Module Data	Propeller fan x 2	Propeller fan x 1
Airflow Rate	CFM		11,300	6,200
External Static Pressure	In. WG	Refer to Module Data	Selectable; 0, 0.12 or 0.24"WG; factory set to 0"W.G.	
Compressor Operating Range		5% to 100%	Refer to System Data	
Compressor Type x Quantity		Refer to Module Data	Inverter-driven Scroll Hermetic x 1	Inverter-driven Scroll Hermetic x 1
Refrigerant		Refer to Module Data	R410A; 26 lbs. + 1 oz. (11.8 kg)	R410A; 16 lbs. + 9 oz. (7.5 kg)
Protection Devices	High Pressure	Refer to Module Data	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)
	Inverter Circuit (Comp. / Fan)		Over-current protection	Over-current protection
AHRI Ratings (Ducted/Non-Ducted)	EER	12.4 / 13.5	Refer to System Data	
	IEER	21.1 / 24.5		
	COP	3.61 / 3.70		

NOTES:

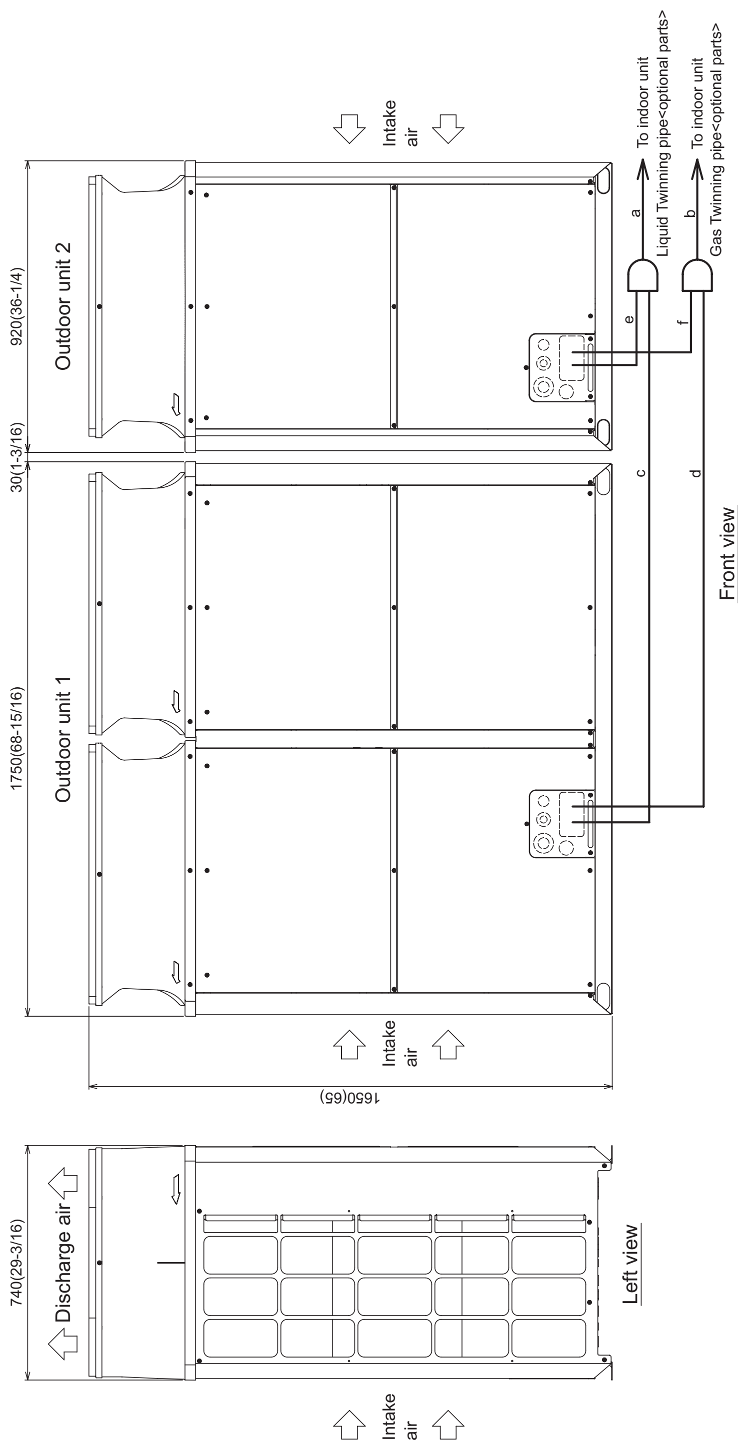
*1. When applying product below -4° F, consult your design engineer for cold climate application best practices, including the use of a backup source for heating.

*2. For details on extended cooling operation range down to -10° F DB, see Low Ambient Kit Submittal.

** Each individual module requires a separate electrical connection. Refer to electrical data for each individual module.

Outdoor Unit: PUHY-P192TSLMU-A (-BS) – DIMENSIONS

Unit : mm (in.)



Twinning pipe connection size

Package unit name			PUHY-P192TSLMU-A(-BS)
Component unit name	Outdoor unit 1		PUHY-P120TLMU-A(-BS)
	Outdoor unit 2		PUHY-P72TLMU-A(-BS)
Outdoor Twinning Kit(optional parts)			CMY-Y100CBK3
Indoor unit~Twinning pipe	Liquid	a	ø15.88(5/8)
	Gas	b	ø28.58(1-1/8)

	Unit model	Liquid	Gas
		c or e	d or f
Twinning pipe~Outdoor unit	P72	ø9.52(3/8)	ø22.2(7/8)
	P120	ø12.7(1/2)	ø28.58(1-1/8)

Note 1.Connect the pipes as shown in the figure above. Refer to the table above for the pipe size.
2.Twinning pipes should not be tilted more than 15 degrees from the horizontal plane.
Be sure to see the Installation Manual for details of Twinning pipe installation.
3.The pipe section before the Twinning pipe (sections "a" and "b" in the figure) must have at least 500mm(19-11/16) of straight section
(*including the straight pipe that is supplied with the Twinning pipe).
4.Only use the Twinning pipe by Mitsubishi (optional parts).

NOTES:
SEACOAST PROTECTION

- Anti-corrosion Protection: A coating treatment is applied to condenser coil for protection from air contaminants.
- Standard: Salt Spray Test Method - no unusual rust development to 480 hours.
- Sea Coast (BS): Salt Spray Test Method (JRA 9002) - no unusual rust development to 960 hours.

Model: PUHY-P120TLMU-A (-BS) – DIMENSIONS

Unit : mm (in.)

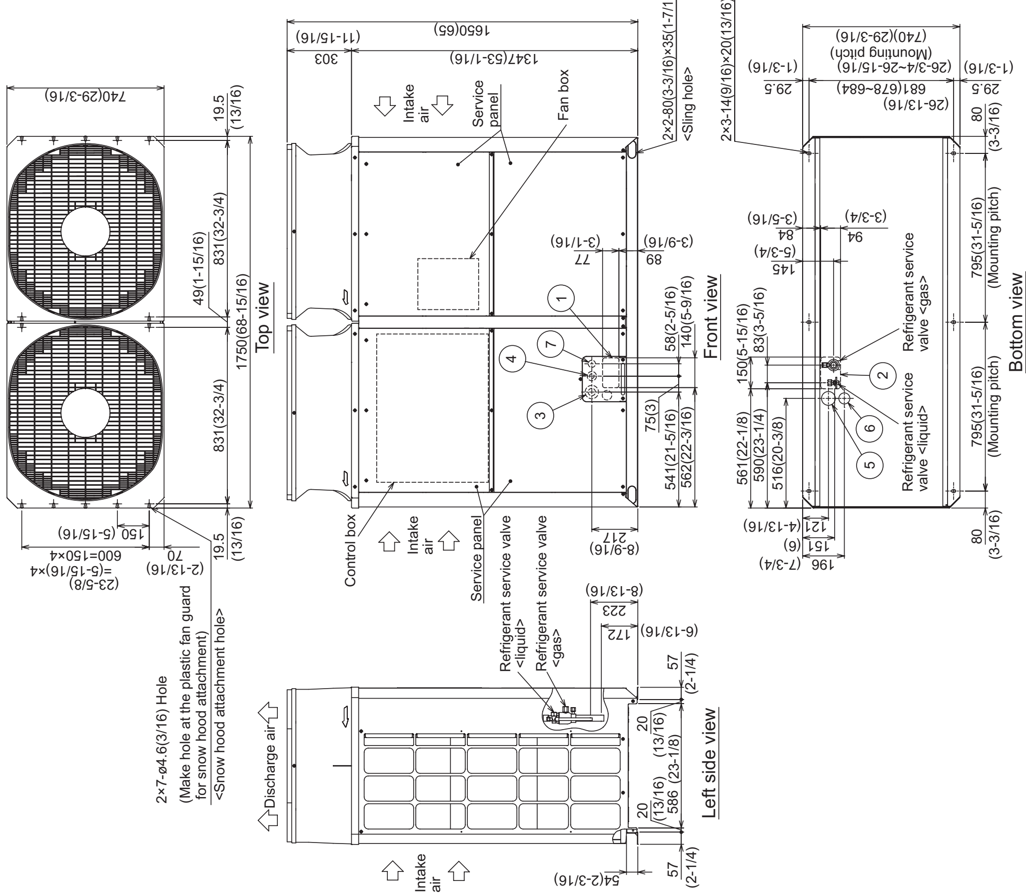
Note1.Please refer to the engineering manual for information regarding necessary spacing around the unit and foundation work. Outdoor unit must be mounted at least 12" off the ground or 12" above the highest average snow depth, whichever is greater.
2.At brazing of pipes,wrap the refrigerant service valve with wet cloth and keep the temperature of refrigerant service valve under 120°C(248 °F).

Connecting pipe specifications

Model	Diameter			
	Refrigerant pipe		Service valve	
	Liquid	Gas	Liquid	Gas
PUHY-P120TLMU	ø9.52 Brazed (3/8)*2 (ø12.7 Brazed) (1/2)*1 *3 *4	ø28.58 Brazed (1-1/8)*1	ø12.7 (1/2)	ø28.58 (1-1/8)
PUHY-P144TLMU	ø12.7 Brazed (1/2)*1			
PUHY-P168TLMU	ø15.88 Brazed (5/8)*2			

*1 Expand the on-site piping and connect to the refrigerant service valve piping.
*2 Use the pipe joint(field supply) and connect to the refrigerant service valve piping.
*3 Indicates dimensions and connection specifications in the case the unit is used in combination with other outdoor units.
*4 Furthest piping length (OU from IU)≥40m(131ft)

NO.	Usage		Specifications
1	For pipes	Front through hole	140 × 77 Knockout hole (5-9/16) (3-1/16)
2	For pipes	Bottom through hole	150 × 94 Knockout hole (5-15/16)(3-3/4)
3	For wires	Front through hole	ø62.7 or ø34.5 Knockout hole (2-1/2) (1-3/8)
4	For wires	Front through hole	ø43.7 or ø22.2 Knockout hole (1-3/4) (7/8)
5	For wires	Bottom through hole	ø65 Knockout hole (2-9/16)
6	For wires	Bottom through hole	ø52 Knockout hole (2-1/16)
7	For transmission cables	Front through hole	ø34 Knockout hole (1-3/8)



NOTES:
SEACOAST PROTECTION
- Anti-corrosion Protection: A coating treatment is applied to condenser coil for protection from air contaminants.
- Standard: Salt Spray Test Method - no unusual rust development to 480 hours.
- Sea Coast (BS): Salt Spray Test Method (JRA 9002) - no unusual rust development to 960 hours.

Model: PUHY-P72TLMU-A (-BS) – DIMENSIONS

Unit : mm (in.)

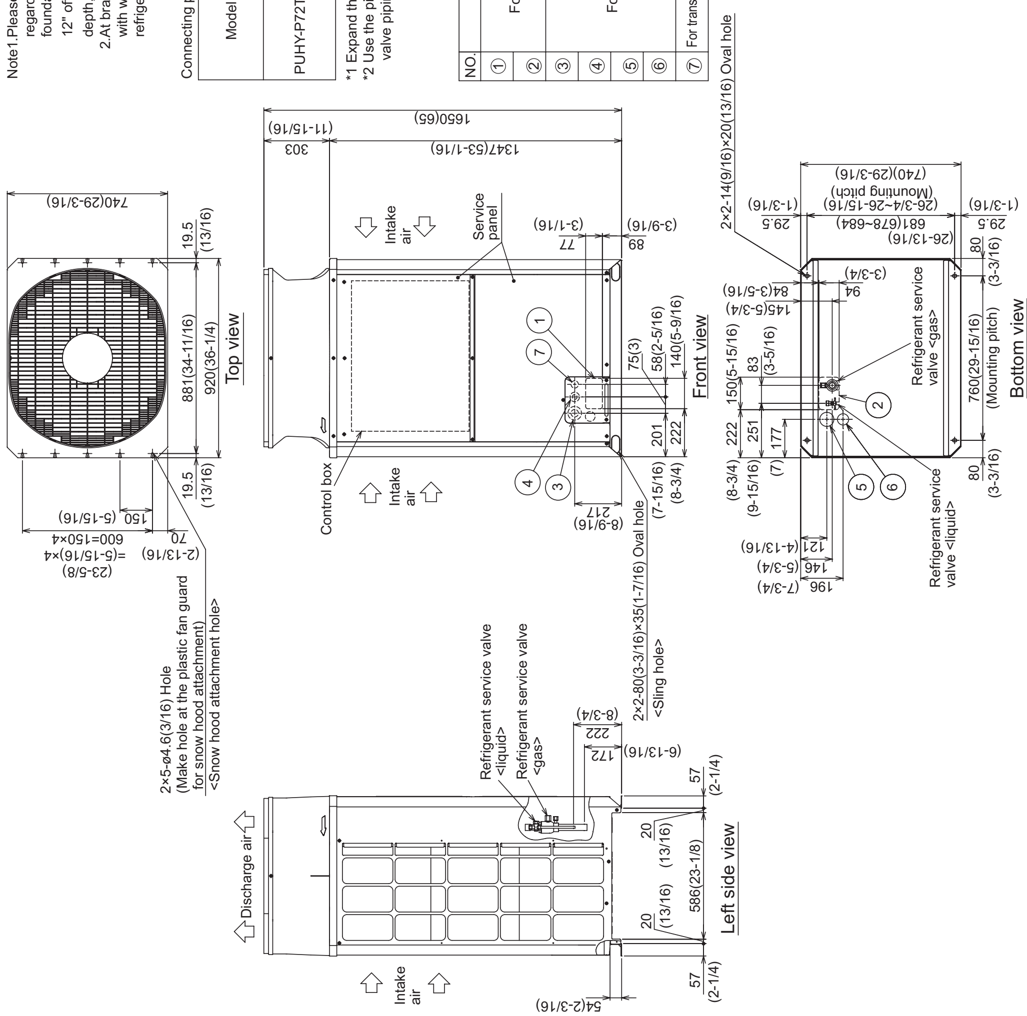
Note1.Please refer to the engineering manual for information regarding necessary spacing around the unit and foundation work. Outdoor unit must be mounted at least 12" off the ground or 12" above the highest average snow depth, whichever is greater.
2.At brazing of pipes,wrap the refrigerant service valve with wet cloth and keep the temperature of refrigerant service valve under 120°C(248 °F).

Connecting pipe specifications

Model	Diameter: Refrigerant pipe Liquid	Refrigerant pipe Gas	Service valve Liquid	Service valve Gas
PUHY-P72TLMU	ø9.52 Brazed (3/8)*1	ø22.2 Brazed (7/8) *2	ø9.52 (3/8)	ø28.58 (1-1/8)

*1 Expand the on-site piping and connect to the refrigerant service valve piping.
*2 Use the pipe joint(field supply) and connect to the refrigerant service valve piping.

NO.	Usage		Specifications
①	For pipes	Front through hole	140 × 77 Knockout hole (5-9/16) (3-1/16)
②	For pipes	Bottom through hole	150 × 94 Knockout hole (5-15/16)(3-3/4)
③	For wires	Front through hole	ø62.7 or ø34.5 Knockout hole (2-1/2) (1-3/8)
④	For wires	Front through hole	ø43.7 or ø22.2 Knockout hole (1-3/4) (7/8)
⑤	For wires	Bottom through hole	ø65 Knockout hole (2-9/16)
⑥	For wires	Bottom through hole	ø52 Knockout hole (2-1/16)
⑦	For transmission cables	Front through hole	ø34 Knockout hole (1-3/8)



NOTES:
SEACOAST PROTECTION

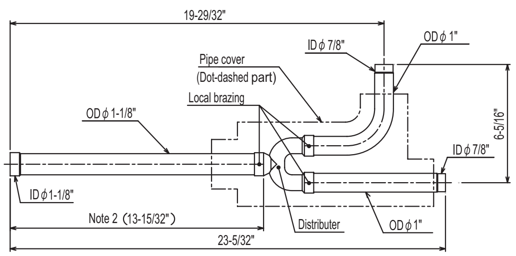
- Anti-corrosion Protection: A coating treatment is applied to condenser coil for protection from air contaminants.
- Standard: Salt Spray Test Method - no unusual rust development to 480 hours.
- Sea Coast (BS): Salt Spray Test Method (JRA 9002) - no unusual rust development to 960 hours.

Twinning Kit: CMY-Y100CBK3

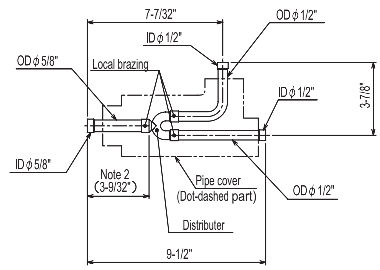
CMY-Y100CBK3

Ref.: CMY_Y100VBK2_EXD_EUDB_SI
in.

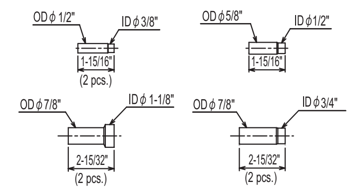
For Gas pipe:



For Liquid pipe:

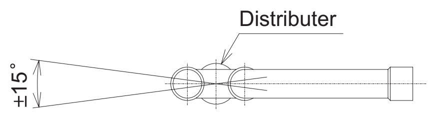


<Reducer(Accessory)>



ID: Inner Diameter   OD: Outer Diameter

Note 1. Reference the attitude angle of the branch pipe below the fig.



The angle of the branch pipe for hign pressure is within±15˚ against the horizontal plane.

2. Use the attached pipe to braze the port-opening of the distributer.
3. Pipe diameter is indicated by inside diameter.
4. Only use the Twinning pipe by Mitsubishi (optional parts) .

MITSUBISHI ELECTRIC
COOLING & HEATING
1340 Satellite Boulevard. Suwanee, GA 30024
Toll Free: 800-433-4822 www.mehvac.com

Outdoor Unit: 16-TON PUHY-P192TSLMU-A (-BS)

(Consists of One PUHY-P120TLMU-A (-BS), One PUHY-P72TLMU-A (-BS), and One CMY-Y100CBK3 Twinning Kit)

MITSUBISHI ELECTRIC

Job Name:	
System Reference:	Date:

Village Hall

OUTDOOR VRF HEAT PUMP SYSTEM

UNIT OPTION

- ☐ Standard Model..PUHY-P192TSLMU-A
- ☐ Seacoast (BS) Model..................................PUHY-P192TSLMU-A-BS

ACCESSORIES

- ■ Twinning Kit (required)..CMY-Y100CBK3
- ☐ Joint Kit.............................for details see Pipe Accessories Submittal
- ☐ Low Ambient Kit ....for details see Low Ambient Kit Submittal
- ☐ Snow/Hail Guards Kit.........for details see Snow/Hail Guards Kit Submittal
- ☐ Base Pan Heater Kit............for details see Base Pan Heater Kit Submittal

Specifications		System	Module 1	Module 2
Unit Type		PUHY-P192TSLMU-A (-BS)	PUHY-P120TLMU-A (-BS)	PUHY-P72TLMU-A (-BS)
Nominal Cooling Capacity (208/230V)	Btu/h	192,000	120,000	72,000
Nominal Heating Capacity (208/230V)	Btu/h	215,000	135,000	80,000
Operating Temperature Range *1	Cooling (Outdoor) *2	Refer to Module Data	23~126° F (-5~52° C) DB	
	Heating (Outdoor)		-13~60° F (-25~15.5° C) WB	
External Dimensions (H x W x D)	In. (mm)	Refer to Module Data	64-31/32 x 68-29/32 x 29-5/32 (1,650 x 1,750 x 740)	64-31/32 x 36-1/4 x 29-5/32 (1,650 x 920 x 740)
Net Weight	Lbs. (kg)	1,106 (501)	671 (304)	435 (197)
External Finish		Refer to Module Data	Pre-coated galvanized steel sheet	
Electrical Power Requirements	Voltage, Phase, Hertz	Refer to Module Data**	208 / 230V, 3-Phase, 60Hz	
Minimum Circuit Ampacity (MCA)	A	Refer to Module Data**	42 / 39	24 / 22
Maximum Overcurrent Protection (MOP)	A	Refer to Module Data**	60 / 60	35 / 35
Piping Diameter (Brazed)				
From Twinning Kit to First Joint or Header (In. / mm)	Liquid (High Pressure)	5/8 (15.88)	Refer to System Data	
	Gas (Low Pressure)	1-1/8 (28.58)		
Max. Total Refrigerant Line Length	Ft.	3,280	Refer to System Data	
Max. Refrigerant Line Length (Between ODU & IDU)	Ft.	541		
Max. Control Wiring Length	Ft.	1,640		
Indoor Unit	Total Capacity	50~130% of outdoor unit capacity	Refer to System Data	
	Model / Quantity	P06~P96/1~41	Refer to System Data	
Sound Pressure Level	dB(A)	62.5	Refer to System Data	
Fan				
Type x Quantity		Refer to Module Data	Propeller fan x 2	Propeller fan x 1
Airflow Rate	CFM		11,300	6,200
External Static Pressure	In. WG	Refer to Module Data	Selectable; 0, 0.12 or 0.24"WG; factory set to 0"W.G.	
Compressor Operating Range		5% to 100%	Refer to System Data	
Compressor Type x Quantity		Refer to Module Data	Inverter-driven Scroll Hermetic x 1	Inverter-driven Scroll Hermetic x 1
Refrigerant		Refer to Module Data	R410A; 26 lbs. + 1 oz. (11.8 kg)	R410A; 16 lbs. + 9 oz. (7.5 kg)
Protection Devices	High Pressure	Refer to Module Data	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)	High pressure sensor, High pressure switch at 4.15 MPa (601 psi)
	Inverter Circuit (Comp. / Fan)		Over-current protection	Over-current protection
AHRI Ratings (Ducted/Non-Ducted)	EER	12.4 / 13.5	Refer to System Data	
	IEER	21.1 / 24.5		
	COP	3.61 / 3.70		

NOTES:

*1. When applying product below -4° F, consult your design engineer for cold climate application best practices, including the use of a backup source for heating.

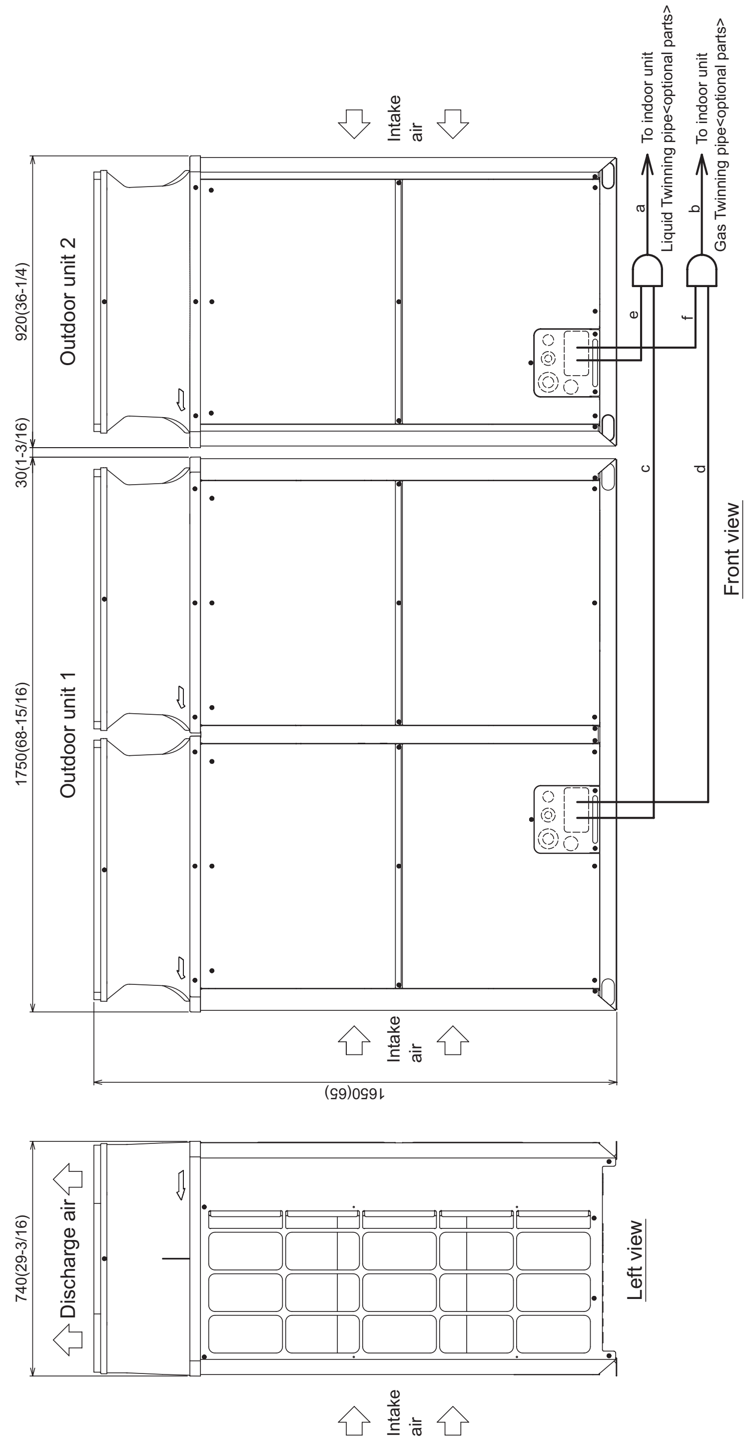
*2. For details on extended cooling operation range down to -10° F DB, see Low Ambient Kit Submittal.

** Each individual module requires a separate electrical connection. Refer to electrical data for each individual module.

Specifications are subject to change without notice.

Outdoor Unit: PUHY-P192TSLMU-A (-BS) – DIMENSIONS

Unit : mm (in.)



Twinning pipe connection size

Package unit name			PUHY-P192TSLMU-A(-BS)
Component unit name	Outdoor unit 1		PUHY-P120TLMU-A(-BS)
	Outdoor unit 2		PUHY-P72TLMU-A(-BS)
Outdoor Twinning Kit(optional parts)			CMY-Y100CBK3
Indoor unit~Twinning pipe	Liquid	a	ø15.88(5/8)
	Gas	b	ø28.58(1-1/8)

Twinning pipe~Outdoor unit	Liquid	Gas
Unit model	c or e	d or f
P72	ø9.52(3/8)	ø22.2(7/8)
P120	ø12.7(1/2)	ø28.58(1-1/8)

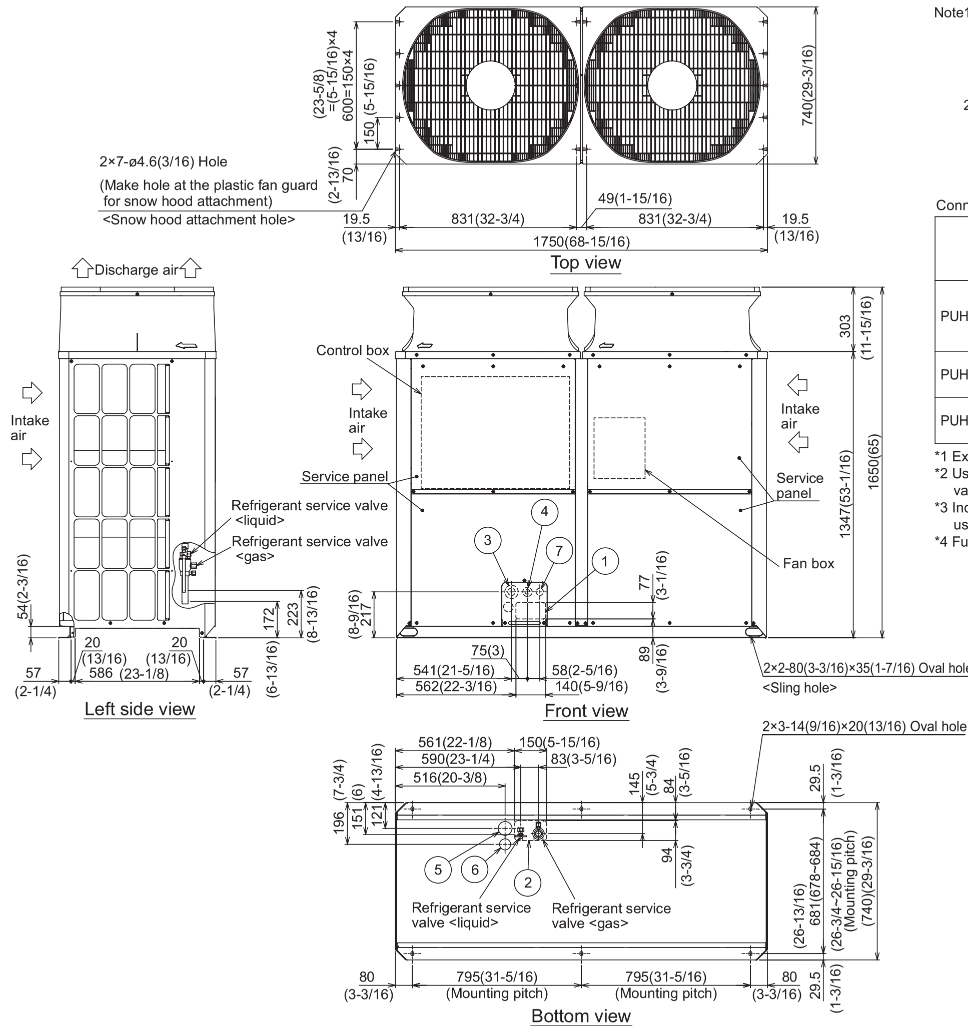
Note 1.Connect the pipes as shown in the figure above. Refer to the table above for the pipe size.
2.Twinning pipes should not be tilted more than 15 degrees from the horizontal plane.
Be sure to see the Installation Manual for details of Twinning pipe installation.
3.The pipe section before the Twinning pipe (sections "a" and "b" in the figure) must have at least 500mm(19-11/16) of straight section
(*including the straight pipe that is supplied with the Twinning pipe).
4.Only use the Twinning pipe by Mitsubishi (optional parts).

NOTES:
SEACOAST PROTECTION

- Anti-corrosion Protection: A coating treatment is applied to condenser coil for protection from air contaminants.
- Standard: Salt Spray Test Method - no unusual rust development to 480 hours.
- Sea Coast (BS): Salt Spray Test Method (JRA 9002) - no unusual rust development to 960 hours.

Model: PUHY-P120TLMU-A (-BS) – DIMENSIONS

Unit : mm (in.)



Note1.Please refer to the engineering manual for information regarding necessary spacing around the unit and foundation work. Outdoor unit must be mounted at least 12" off the ground or 12" above the highest average snow depth, whichever is greater.

2.At brazing of pipes,wrap the refrigerant service valve with wet cloth and keep the temperature of refrigerant service valve under 120°C(248 °F).

Connecting pipe specifications

Model	Diameter			
	Refrigerant pipe		Service valve	
	Liquid	Gas	Liquid	Gas
PUHY-P120TLMU	ø9.52 Brazed (3/8)*2 (ø12.7 Brazed) (1/2)*1 *3 *4	ø28.58 Brazed (1-1/8)*1	ø12.7 (1/2)	ø28.58 (1-1/8)
PUHY-P144TLMU	ø12.7 Brazed (1/2)*1			
PUHY-P168TLMU	ø15.88 Brazed (5/8)*2			

*1 Expand the on-site piping and connect to the refrigerant service valve piping.
*2 Use the pipe joint(field supply) and connect to the refrigerant service valve piping.
*3 Indicates dimensions and connection specifications in the case the unit is used in combination with other outdoor units.
*4 Furthest piping length (OU from IU)≥40m(131ft)

NO.	Usage		Specifications
①	For pipes	Front through hole	140 × 77 Knockout hole (5-9/16) (3-1/16)
②		Bottom through hole	150 × 94 Knockout hole (5-15/16)(3-3/4)
③	For wires	Front through hole	ø62.7 or ø34.5 Knockout hole (2-1/2) (1-3/8)
④		Front through hole	ø43.7 or ø22.2 Knockout hole (1-3/4) (7/8)
⑤		Bottom through hole	ø65 Knockout hole (2-9/16)
⑥		Bottom through hole	ø52 Knockout hole (2-1/16)
⑦	For transmission cables	Front through hole	ø34 Knockout hole (1-3/8)

NOTES:
SEACOAST PROTECTION

- Anti-corrosion Protection: A coating treatment is applied to condenser coil for protection from air contaminants.
- Standard: Salt Spray Test Method - no unusual rust development to 480 hours.
- Sea Coast (BS): Salt Spray Test Method (JRA 9002) - no unusual rust development to 960 hours.

Model: PUHY-P72TLMU-A (-BS) – DIMENSIONS

Unit : mm (in.)

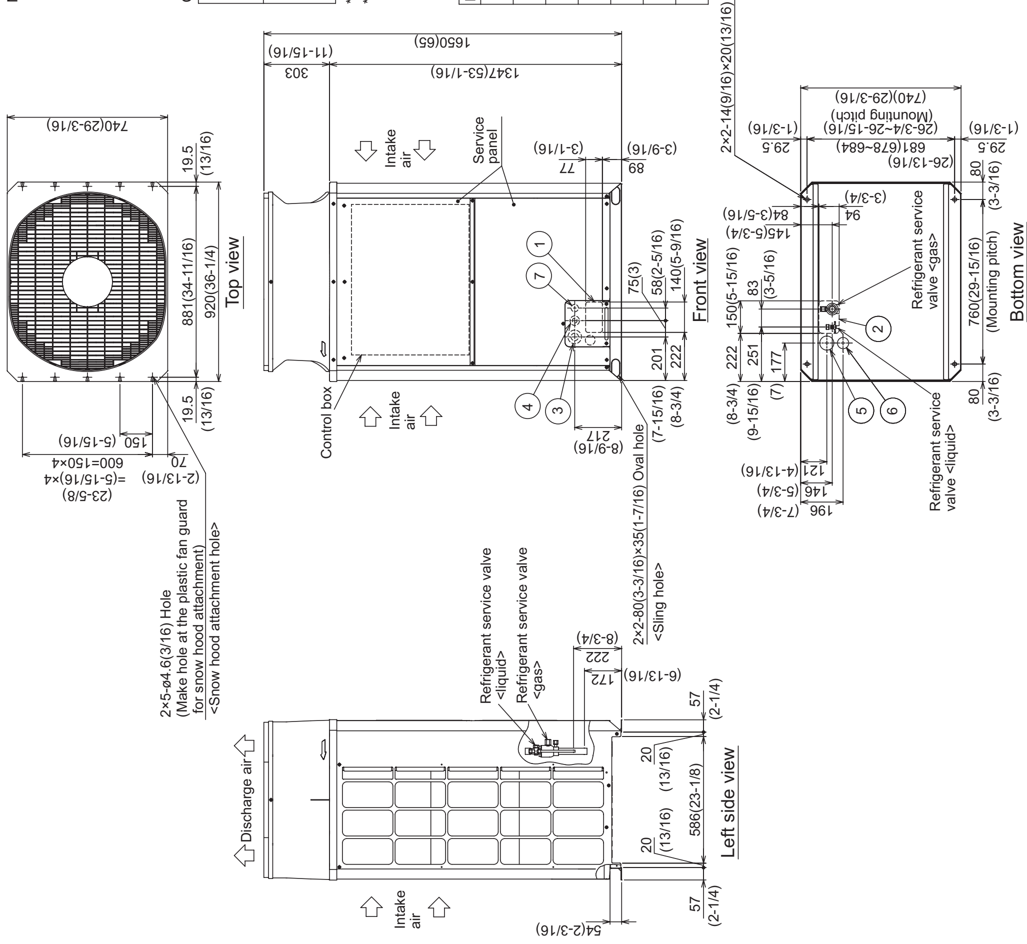
Note1.Please refer to the engineering manual for information regarding necessary spacing around the unit and foundation work. Outdoor unit must be mounted at least 12" off the ground or 12" above the highest average snow depth, whichever is greater.
2.At brazing of pipes,wrap the refrigerant service valve with wet cloth and keep the temperature of refrigerant service valve under 120°C(248 °F).

Connecting pipe specifications

Model	Diameter: Refrigerant pipe: Liquid	Diameter: Refrigerant pipe: Gas	Diameter: Service valve: Liquid	Diameter: Service valve: Gas
PUHY-P72TLMU	ø9.52 Brazed (3/8)*1	ø22.2 Brazed (7/8) *2	ø9.52 (3/8)	ø28.58 (1-1/8)

*1 Expand the on-site piping and connect to the refrigerant service valve piping.
*2 Use the pipe joint(field supply) and connect to the refrigerant service valve piping.

NO.	Usage		Specifications
①	For pipes	Front through hole	140 × 77 Knockout hole (5-9/16) (3-1/16)
②	For pipes	Bottom through hole	150 × 94 Knockout hole (5-15/16) (3-3/4)
③	For wires	Front through hole	ø62.7 or ø34.5 Knockout hole (2-1/2) (1-3/8)
④	For wires	Front through hole	ø43.7 or ø22.2 Knockout hole (1-3/4) (7/8)
⑤	For wires	Bottom through hole	ø65 Knockout hole (2-9/16)
⑥	For wires	Bottom through hole	ø52 Knockout hole (2-1/16)
⑦	For transmission cables	Front through hole	ø34 Knockout hole (1-3/8)



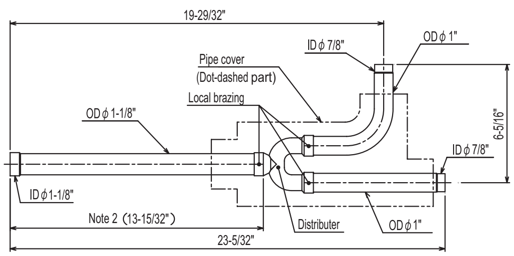
NOTES:
SEACOAST PROTECTION

- Anti-corrosion Protection: A coating treatment is applied to condenser coil for protection from air contaminants.
- Standard: Salt Spray Test Method - no unusual rust development to 480 hours.
- Sea Coast (BS): Salt Spray Test Method (JRA 9002) - no unusual rust development to 960 hours.

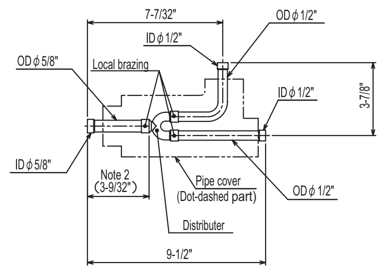
CMY-Y100CBK3

Ref.: CMY_Y100VBK2_EXD_EUDB_SI
in.

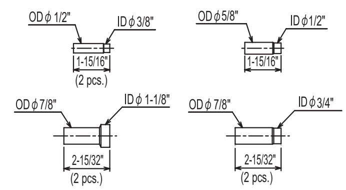
For Gas pipe:



For Liquid pipe:

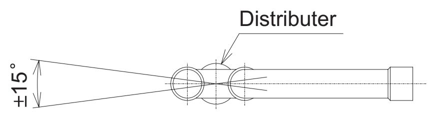


<Reducer(Accessory)>



ID: Inner Diameter OD: Outer Diameter

Note 1. Reference the attitude angle of the branch pipe below the fig.



The angle of the branch pipe for hign pressure is within±15° against the horizontal plane.

2. Use the attached pipe to braze the port-opening of the distributer.
3. Pipe diameter is indicated by inside diameter.
4. Only use the Twinning pipe by Mitsubishi (optional parts) .

MITSUBISHI ELECTRIC
COOLING & HEATING

1340 Satellite Boulevard. Suwanee, GA 30024
Toll Free: 800-433-4822 www.mehvac.com

FORM# PUHY-P192TSLMU-A (-BS) - 201605

88™ Series 2 Commercial Boiler
Weil-McLain®

88™
SERIES 2 BOILER

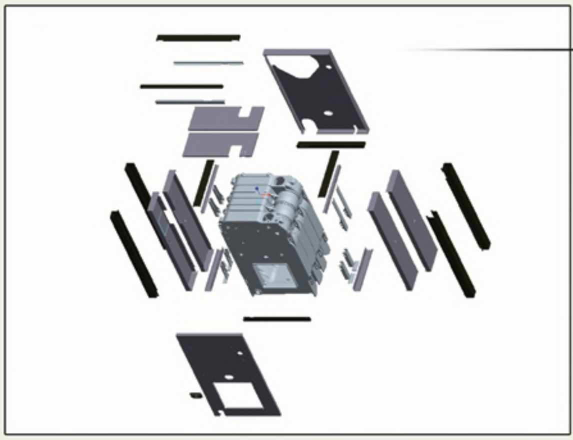
Gas, Oil & Gas/Oil
Water or Steam
MBH: 996-5,845
Combustion Eff.: Up to 87.5%

- Up to 85.7% Thermal Efficiency
- Water or Steam
- Gas, Oil or Gas/Oil
- Complies to LEED
- Packaged or Knock-down

WEIL-McLAIN®
www.weil-mclain.com

MADE IN THE USA

RECYCLED CAST IRON



NEW Jacket design:

- Modular jacketing and toolless jacket panels for easy access
- 3 inches of insulation to minimize jacket losses, maximizing thermal efficiencies
- Modular side panels for ease of assembly
- High temperature site glass grommets
- Part number labels on all components for easy assembly

NEW Efficiencies!

- 85.7% Thermal Efficiencies (see ratings)
- HXT-bars optimize heat transfer

NEW clean-out plates:

- ¼ inch thick solid steel plates
- Coated Woven Fiberglass reusable gasket
- Reusable - cleaning after cleaning

Backwards Compatible:

- Can use up to 50% Series 2 iron on a Series 1 block without consulting Weil-McLain® – no need to stock both!

Standard Equipment

All Boilers:

- ASME 80 PSI rated cast iron sections
- Insulated steel jacket
- Power burner for light oil, gas or gas/light oil (except H-XX88)
- Burner mounting plate with refractory (except H-XX88)
- Cast iron flue collar with built-in breaching damper
- Observation ports on front and back sections
- Cleanout plates with reusable gaskets
- Flue brush
- HXT-bars
- 3 inches of insulation (except front panel)

Water Boilers

- 30 PSI ASME relief valve
- Combination high limit and low limit with manual reset control
- Combination pressure/temperature gauge
- Nipple and 5" x 6" reducing coupling (1288 – 1888 boilers only)
- Built-in air eliminator

Steam Boilers

- 15 PSI ASME safety valve side outlet
- Low limit and high limit pressure controls
- Steam pressure gauge siphon
- Gauge cocks, glass and guards

Optional Equipment

- Factory assembled sections
- Burner mounting plate with refractory for "H" units
- Intermediates with tankless heater opening
- Tankless heaters for domestic hot water (water or steam boilers)
- Tankless heater opening cover plates
- Low water cutoffs
- Barometric dampers
- Side inspection tappings with plugs – 2 per section
- Dual-range manometer
- Optional burners and burner controls

Ratings

Model	I=B=R			I=B=R Net Rating				Flue Outlet (Dia)	Combustion Efficiency		Thermal Efficiency	
	Oil Input GPH	Gas Input MBH	Gross Output MBH	Steam MBH	Steam Sq. Ft.	Water MBH	Boiler H.P.		OIL	GAS	OIL	GAS
488R®	6.9	996	827	620	2,583	719	24.7	10 in.	87.5	84.8	85.6	83.1
488®	7.0	1,010	839	629	2,621	730	25.1	10 in.	87.5	84.8	85.6	83.1
588®	9.4	1,356	1,126	845	3,521	979	33.6	10 in.	87.0	84.4	85.6	83.1
688®	11.8	1,701	1,413	1,072	4,469	1,229	42.2	10 in.	86.7	84.1	85.6	83.1
788®	14.2	2,046	1,700	1,311	5,463	1,478	50.8	12 in.	86.5	83.9	85.6	83.1
888®	16.6	2,382	1,987	1,543	6,427	1,728	59.4	12 in.	86.3	83.7	85.6	83.1
988R®	17.2	2,482	2,062	1,601	6,671	1,793	61.6	14 in.	86.2	83.7	85.6	83.1
988®	18.8	2,737	2,274	1,766	7,358	1,977	67.9	14 in.	86.2	83.7	85.6	83.1
1088R®	20.0	2,887	2,399	1,863	7,763	2,086	71.7	14 in.	86.2	83.6	85.6	83.1
1088®	21.5	3,082	2,561	1,988	8,283	2,227	76.5	14 in.	86.2	83.6	85.6	83.1
1188®	23.5	3,428	2,848	2,211	9,213	2,477	85.1	14 in.	86.1	83.5	85.7	83.1
1288®	26.0	3,773	3,135	2,434	10,147	2,726	93.7	14 in.	86.0	83.5	85.7	83.1
1388®	28.5	4,119	3,422	2,657	11,071	2,976	102.2	14 in.	86.0	84.4	85.7	83.1
1488®	31.0	4,464	3,709	2,880	12,000	3,225	110.8	16 in.	86.0	83.4	85.7	83.1
1588	33.0	4,809	3,996	3,102	12,925	3,475	119.4	16 in.	85.9	83.3	85.7	83.1
1688R	34.5	4,979	4,137	3,212	13,383	3,597	123.6	16 in.	85.9	83.3	85.7	83.1
1688®	35.5	5,155	4,283	3,325	13,854	3,724	127.9	16 in.	85.9	83.3	85.7	83.1
1788®	38.0	5,494	4,570	3,548	14,783	3,974	136.5	18 in.*	85.9	83.3	85.7	83.1
1888®	40.5	5,845	4,857	3,771	15,713	4,123	145.1	18 in.*	85.9	83.3	85.7	83.1

- Burner input based on maximum of 2.000 ft. altitude - for higher altitudes consult Weil-McLain® representative.
- No.2 Fuel oil - Commercial Standard Spec. CS75-56. Heat value of oil - 140.000 BTU/G.
- Stack gas volume at outlet temperature
- With 0.10" WC positive pressure at flue collar.
- Consult Burner Specification Sheets for gas pressure required.
- Gross I=B=R ratings have been determined under the I=B=R provision governing forced draft boiler-burner units
- Net I-B-Rratings are based on net installed radiation of sufficient quantity for the requirements of the building and nothing need be added for normal piping and pick.up. Water ratings are based on a piping and pick-up allowance of 1.15. Steam ratings are based on the following allowances: 488 and 588 - 1.333; 688 - 1.323; 788 - 1.300; 888 - 1.289; and 988 through 1888 - 1.288. An additional allowance should be made for gravity hot water systems or for unusual piping and pick.up loads. Consult Weil-McLain® representative.

*Flue collar connection is oval, 16 1/8" x 19 7/8"

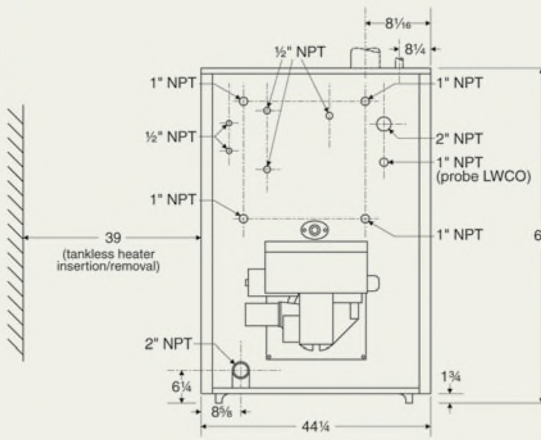
Dimensions

Dimensions (inches)								
Model	A	B	C	D	E	L	W	H
488®	23	–	–	10	54 ¾	34 ¾	30	23 3/8
588®	31	–	–	10	54 ¾	42 ¾	38	31 3/8
688®	39	–	–	10	54 ¾	50 ¾	46	39 3/8
788®	47	–	–	12	53 ¾	58 ¾	54	47 3/8
888®	55	–	–	12	53 ¾	66 ¾	62	55 3/8
988®	63	–	–	14	52 ¾	74 ¾	70	63 3/8
1088®	71	–	–	14	52 ¾	82 ¾	78	71 3/8
1188®	79	–	–	14	52 ¾	90 ¾	86	79 3/8
1288®	87	39 ½	–	14	52 ¾	98 ¾	94	87 3/8
1388®	95	47 ½	–	14	52 ¾	106 ¾	102	95 3/8
1488®	103	55 ½	–	16	51 ¾	114 ¾	110	103 3/8
1588®	111	63 ½	–	16	51 ¾	122 ¾	118	111 3/8
1688®	119	47 ½	–	16	51 ¾	130 ¾	126	119 3/8
1788®	127	31 ½	79 ½	18†	51 ¾	138 ¾	134	127 3/8
1888®	135	39 ½	87 ½	18†	51 ¾	146 ¾	142	135 3/8

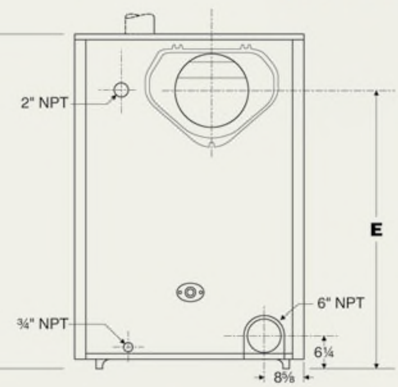
†For 18" diameter breaching, flue collar is oval (19 1/8 x 16 1/16")

	Supply & return tappings				Dimension F
	Supply tappings (No. & size)*		Return tappings (No. & size)*		
Model	Steam	Water	Steam	Water	
488R®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	See Burner Specification & Data Sheets
488®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
588®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
688®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
788®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
888®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
988R®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
988®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
1088R®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
1088®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
1188®	2 – 5"	2 – 5"	1 – 6"	1 – 6"	
1288®	3 – 5"	2 – 5"	1 – 6"	1 – 6"	
1388®	3 – 5"	2 – 5"	1 – 6"	1 – 6"	
1488®	3 – 5"	2 – 5"	1 – 6"	1 – 6"	
1588®	3 – 5"	2 – 5"	1 – 6"	1 – 6"	
1688R®	3 – 5"	2 – 5"	1 – 6"	1 – 6"	
1688®	3 – 5"	2 – 5"	1 – 6"	1 – 6"	
1788®	4 – 5"	2 – 5"	1 – 6"	1 – 6"	
1888®	4 – 5"	2 – 5"	1 – 6"	1 – 6"	

*Use recommended piping connections.
†For 18" diameter breaching, flue collar is oval (19 1/8 x 16 1/16")

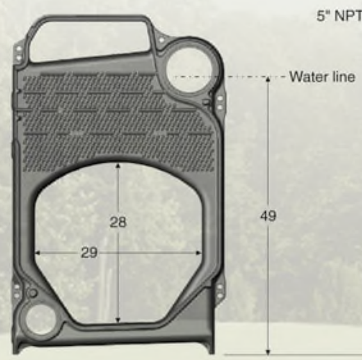


FRONT

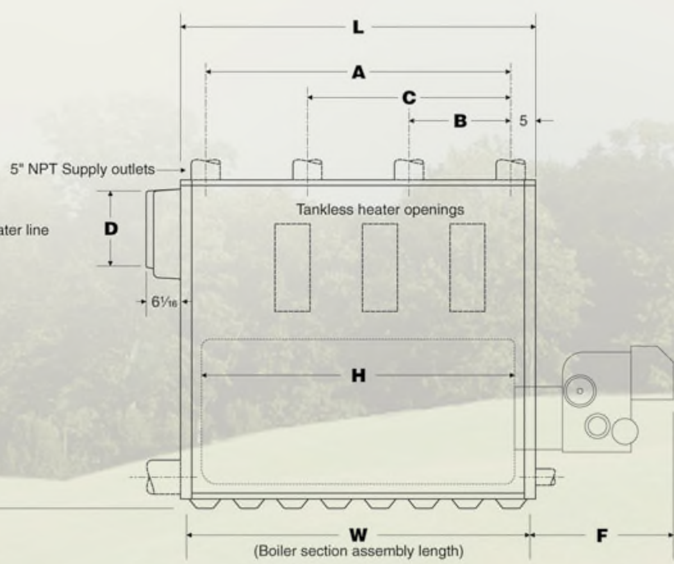


REAR

Model	I=B=R Vent or Liner Dia (in) Forced Draft	Balanced Draft	Boiler Flue Collar Dimensions (in)
488®	10	12	10 round
588®	10	15	10 round
688®	12	15	10 round
788®	12	18	12 round
888®	14	18	12 round
988®	14	18	14 round
1088®	14	21	14 round
1188®	16	21	14 round
1288®	16	21	14 round
1388®	16	24	14 round
1488®	18	24	16 round
1588®	18	24	16 round
1688®	18	24	16 round
1788®	18	24	16 1/8 x 19 7/8 oval
1888®	20	27	16 1/8 x 19 7/8 oval



INTERMEDIATE SECTION



LEFT SIDE

8864

C-645 (0913)

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Technical Data Sheet

Benchmark 750-6000 Boilers

The AERCO Benchmark (BMK) Water Boiler is designed for condensing application in any closed loop hydronic system. It delivers unmatched burner modulation to match energy input directly to fluctuating system loads to yield the highest possible seasonal efficiencies. And no other product packs as much capacity into such a small footprint.

Energy Efficient

To minimize emissions, the BMK Series is fitted with a low NOx burner whose emissions will meet the most stringent NOx and CO requirements. The fully modulating burner also maintains AERCO standards for energy efficiency, longevity, reliability and construction quality.

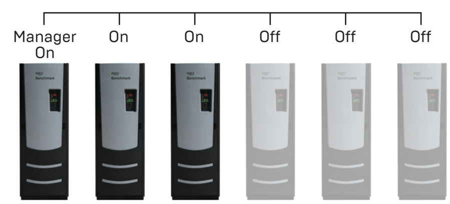
The BMK Series comes standard with AERCO's Patent Pending, Oxygen Level (O_2) monitoring system. This monitoring system, designed to display the O_2 level directly on the unit in real time, can also be remotely monitored via Modbus giving the customer the ability to measure the emissions level and fuel economy of the boiler without traditional combustion calibration devices.

GAS-FIRED c UL LISTED

AHRI CERTIFIED www.ahridirectory.org Commercial Boilers AHRI Standard BTS-2000

Application and Plant Design

The BMK boilers can be used as an individual unit or in modular arrangements and offers selectable modes of operation. In addition to controlling the boiler according to a constant set point, indoor/outdoor reset schedule or 4-20mA signal, one or more units can be integrated via Modbus communications protocol. For boiler plants ranging from 2-8 boilers, AERCO'S built-in Boiler Sequencing Technology (BST)* can be utilized. For heating plants greater than 8 boilers, AERCO's ACS (AERCO Control System) provides the right solution. Likewise, Benchmark systems can be easily integrated with a facility-wide Energy Management or Building Automation System.



*See BST System technical data sheet for additional system details and capabilities

Features

- Natural Gas, Propane, or Dual Fuel (model dependent)
- 20:1 Turndown Ratio (5%) depending on capacity
- Oxygen Level (O_2) Monitoring Standard
- Stainless Steel Fire Tube heat exchanger
- Capable of variable primary flow Installations
- NOx Emissions capable of 9PPM or less @ all firing rates *depending on capacity
- Compact Footprint
- Precise Temperature Control
- On-board Boiler Sequencing Technology (BST)
- Ducted Combustion Air Capable
- Easy Open Access for Service
- Acceptable vent materials AL29-4C, Polypropylene, PVC, cPVC (model dependent)
- Reliable Quiet Operation
- Controls Options: Constant Setpoint, Indoor/Outdoor Reset, Remote Setpoint, 4-20mA signal or ModBus

Specifications

	BMK Standard							
	750	1000	1500	2000	2500	3000	5000	6000
Boiler Category	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV
Gas Connections (NPT)	1″	1″	2″	2″	2″	2″	2 / 3″	2 / 3″
Max. Gas Pressure	14″	14″	14″	14″	14″	14″	2psi/10″*	2psi/10″*
Min. Gas Pressure [1]	4″	4″	4″	4″	4″	4″	14 / 4″*	14 / 4″*
Max. Allowed Working Pressure	160 PSIG	160 PSIG	160 PSIG	160 PSIG	160 PSIG	160 PSIG	80PSIG/ 150 PSIG Optional	80 PSIG/ 150 PSIG Optional
Electrical Req. 120V/1PH/60Hz [2]	13 FLA	13 FLA	16 FLA	16 FLA	N/A	N/A	N/A	N/A
Electrical Req. 208V/3PH/60Hz [2]	N/A	N/A	N/A	N/A	10 FLA	10 FLA	19 FLA	19 FLA
Electrical Req. 460V/3PH/60Hz [2]	N/A	N/A	N/A	N/A	5 FLA	5 FLA	9 FLA	9 FLA
Electrical Req. 575V/3PH/60Hz [2]	N/A	N/A	N/A	N/A	N/A	N/A	7 FLA	7 FLA
Water Connect. (Flanged)	3″	3″	4″	4″	4″	4″	6″	6″
Min. Water Flow (GPM)	12	12	25	25	25	25	75	75
Max. Water Flow (GPM)	175	175	250	350	350	350	700	700
Water Volume Gallons	16.25	14.25	44	40	58	55	110	110
Water Pressure Drop	3.0 PSIG @100 GPM	3.0 PSIG @100 GPM	3.0 PSIG @170 GPM	3.0 PSIG @170 GPM	3.0 PSIG @218 GPM	3.0 PSIG @261 GPM	4.0 PSIG @500 GPM	4.0 PSIG @500 GPM
Turndown Ratio	15:1 (7%)	20:1 (5%)	20:1 (5%)	20:1 (5%)	15:1 (7%)	15:1 (7%)	12:1 (8%)	15:1 (7%)
Vent/Air Intake Connections	6 Inch	6 Inch	6 Inch	8 Inch	8 Inch	8 Inch	14 Inch Optional/ 12 Inch Flue Venting	14 Inch Optional/ 12 Inch Flue Venting
Vent Materials	AL29-4C Polypro, CPVC, PVC	AL29-4C Polypro, CPVC, PVC	AL29-4C Polypro	AL29-4C Polypro	AL29-4C Polypro	AL29-4C Polypro	AL29-4C Polypro	AL29-4C Polypro
Type of Gas	Natural Gas, Propane	Natural Gas, Propane	Natural Gas, Propane, Dual Fuel	Natural Gas, Propane, Dual Fuel	Natural Gas, Propane, Dual Fuel	Natural Gas, Propane, Dual Fuel	Natural Gas, Dual Fuel	Natural Gas, Dual Fuel
NOx Emissions <9ppm Capability	✓	✓	✓	✓	N/A (<20 ppm)	N/A (<20ppm)	✓[3]	✓[3]
Temp. Control Range	50°F to 190°F							
Ambient Temp. Range	0°F to 130°F							
Standard Listings & Approvals	UL, CUL, CSD-1, ASME							
Gas Train Operations	FM Compliant or Factory Installed DBB (IRI)						FM Compliant	
Sound Rating dbA	65	65	70	70	72	72	79	79
Weight (dry) lbs.	669	700	1406	1500	2,000	2,170	3,000	3,000
Shipping Weight lbs.	862	900	1606	1700	2,200	2,370	3,800	3,800

*BMK5000/6000 low gas pressure option is available as a different style number. It operates between 4″ and 10″ of gas pressure. BMK5000/6000 with natural gas can be ordered with VPS (Valve-Proving System) for additional operation safety.

1. Values are for natural gas FM compliant gas trains only. See Benchmark Gas Components & Supply Design Guide GF-2030 for propane, DBB & dual fuel gas train minimum gas pressure requirements.
2. See Benchmark Electrical Power Guide GF-2060 for service disconnect switch amperage requirements.
3. BMK5000/6000 operating at standard gas pressure (>14″ W.C.) can achieve 9 ppm NOx.

Ratings

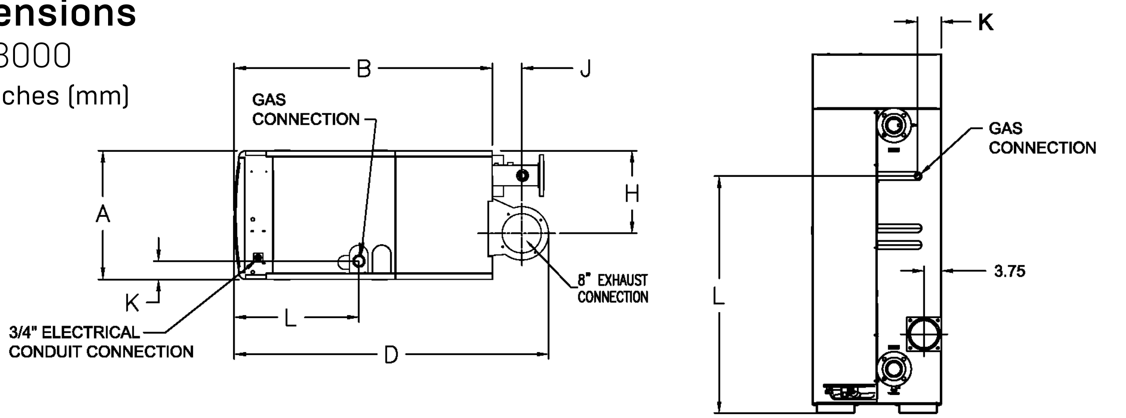
BMK Models	Min Input MBH	Max Input MBH	Max Output* MBH	Efficiency Range	Efficiency 80° to 180°F
750	50	750	653-720	87%-98%	95.50%
1000	50	1000	870-960	87%-98%	96.80%
1500	75	1500	1305-1425	87%-98%	94.60%
2000	100	2000	1740-1900	87%-98%	94.60%
2500	167	2500	2175-2360	87%-98%	93.50%
3000	200	3000	2610-2880	87%-98%	93.50%
5000	400	5000	4350-4800	87%-98%	93.90%
6000	400	6000	5220-5670	87%-98%	94.50%

*Max output dependent upon application – see efficiency curves

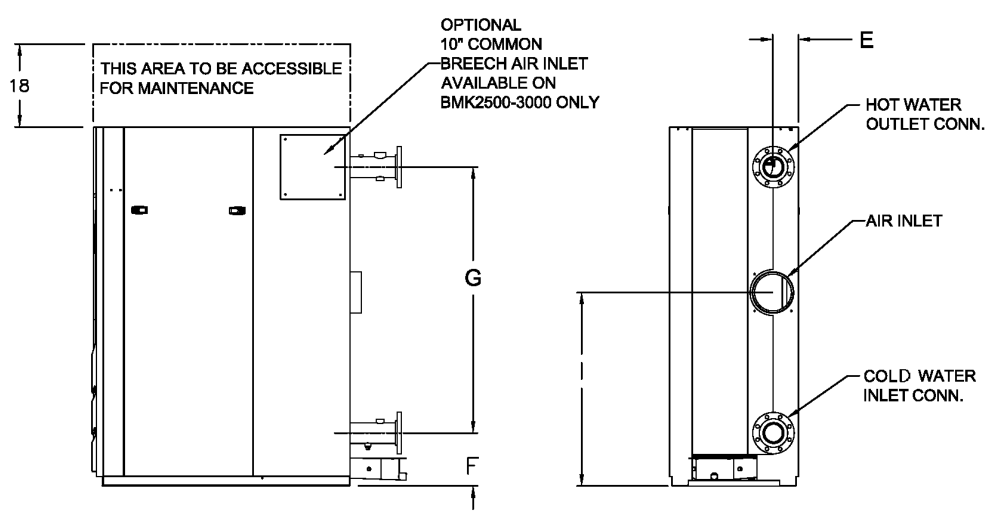
Dimensions

750-3000

Dim: Inches (mm)



BMK750-1000

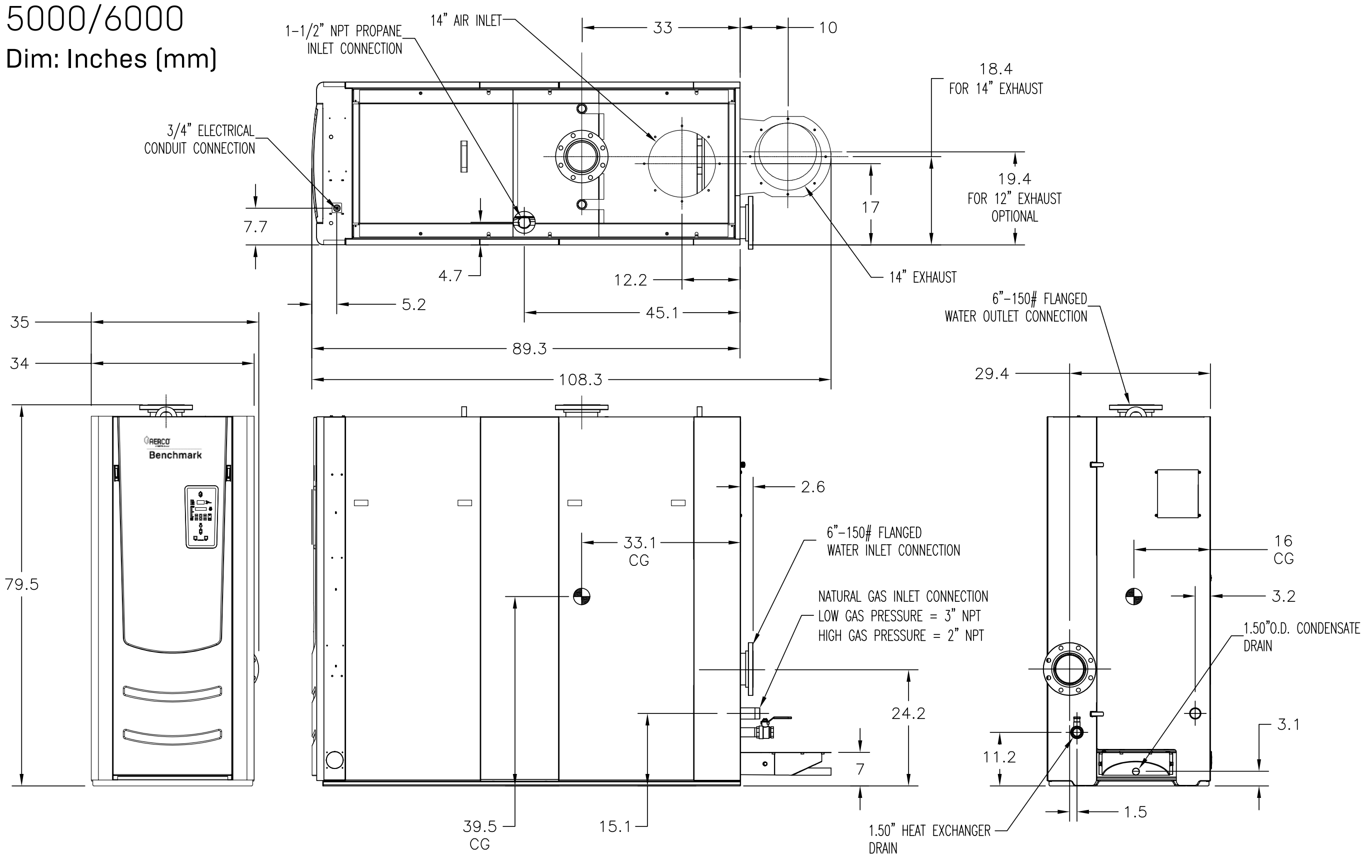


BMK Models	(Width) A	(Depth) B	(Height) C	D	E	F	G	H	I	J	K	L
BMK 750	28″	25″	78″	34″	10″	10″	53″	21″	17″	4″	5″	51.8″
BMK 1000	28″	25″	78″	34″	10″	10″	53″	21″	17″	4″	5″	51.8″
BMK 1500	28″	43.6″	78″	58.4″	7″	11.5″	57.8″	18″	42″	8.9″	4.7″	19.5″
BMK 2000	28″	43.6″	78″	58.4″	7″	11.5″	57.8″	18″	42″	8.9″	4.7″	19.5″
BMK 2500	28″	56″	78″	68.4″	5.4″	11.5″	57.8″	18″	42″	6.4″	3.6″	26″
BMK 3000	28″	56″	78″	68.4″	5.4″	11.5″	57.8″	18″	42″	6.4″	3.6″	26″

Dimensions

5000/6000

Dim: Inches (mm)



BMK Models	(Width) A	(Depth) B	(Height) C
5000	35″	89.3″	79.8″
6000	35″	89.3″	79.8″

Product Catalog

Water Source Heat Pump Axiom™ Rooftop - GWS*

3 to 20 Tons - 60 Hz

February 2019

WSHP-PRC028C-EN

Performance Data

Table 6. ANSI/AHRI/ASHRAE/ISO 13256-1 WLHP, GWHP and GLHP performance - 3.5 to 20 tons

Size	Rated GPM	Rated CFM	Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
			Cooling 86°F		Heating 68°F		Cooling 59°F		Heating 50°F		Cooling 77°F		Heating 32°F	
			Capacity Btuh	EER	Capacity Btuh	COP	Capacity Btuh	EER	Capacity Btuh	COP	Capacity Btuh	EER	Capacity Btuh	COP
GWSC036H	9.0	1200	40,900	14.95	46,700	4.62	46,200	23.29	38,800	4.12	42,700	17.31	30,000	3.41
GWSC048H	12.0	1600	52,700	16.56	60,100	5.14	59,700	25.72	50,000	4.56	55,100	19.28	39,000	3.77
GWSC060H	15.0	2000	60,200	14.83	74,800	4.86	68,300	22.57	61,900	4.33	63,000	17.22	47,800	3.59
GWSC072H	18.0	2400	75,200	14.20	91,100	4.80	84,800	20.10	75,000	4.30	78,600	16.00	58,600	3.60
GWSC092H	22.5	3000	91,700	14.30	113,800	4.70	100,300	20.70	92,200	4.20	95,700	16.50	70,800	3.40
GWSC120H	30.0	4000	122,000	15.70	145,000	4.90	138,200	23.40	118,100	4.40	127,300	18.10	91,900	3.40
GWS*150E	38.8	4750	160,300	15.90	181,500	5.10	178,700	22.70	150,800	4.50	166,800	18.00	118,800	3.70
GWS*180E	46.5	5700	184,400	14.20	201,000	4.60	204,200	19.70	162,900	4.00	192,500	15.90	123,200	3.20
GWS*240E	62.0	7600	261,600	13.20	313,100	4.40	290,500	17.70	265,900	4.00	273,500	14.80	210,000	3.50

Notes:

1. Rated in accordance ANSI/AHRI/ASHRAE/ISO13256-1. Certified conditions are 80.6°F DB/66.2°F WB EAT in cooling and 68°F DB/59°F WB EAT in heating.
2. Models with capacities greater than 135,000 Btuh are not included in the ANSI/AHRI/ASHRAE/ISO13256-1 certification program.
3. * stands for both downflow and horizontal units.

ENVISION™

Console 0.75 to 1.5 Ton

Water Source/Geothermal Heat Pump

WaterFurnace®

Smarter from the Ground Up™

ENVISION

The Envision Series Console provides cutting edge technology in heating and cooling for commercial applications, using the latest in component and design technology. Single speed, R-410A LG rotary compressors are the heart of the system. Also included are oversized coaxial water-to-refrigerant heat exchangers and durable all-aluminum air coils for high efficiencies at low face velocities. Envision Console units are capable of operating at extreme loop temperatures and have the options and flexibility for any application. The cabinet footprint is designed to match "legacy" consoles for easy retrofitting.

As a leader in the industry, WaterFurnace International is dedicated to innovation, quality and customer satisfaction. Our team of engineers, customer support and skilled assembly technicians are dedicated to providing the highest quality products with the most extensive support network in the industry. By specifying WaterFurnace 0.75-1.5 ton Envision Series Consoles, you can rest assured your customers are investing in a product with superior quality and performance.

KEY FEATURES

COMPRESSOR: Single speed rotary compressors. Available in commercial single phase voltages.

WATER LINES: 1/2˝ Copper FPT waterline connections protrude out the end of the chassis for ease of installation.

COAXIAL HEAT EXCHANGER: Oversized and convoluted with copper inner tube (optional cupronickel) and steel outer tube, designed for maximum heat transfer at normal and low water flow rates to minimize pressure drop.

ALUMINUM AIR COIL: An aluminum air coil is featured in all Envision Console units to provide exceptional durability and high efficiencies. Added protection is also available with an optional AlumiSeal™ coating.

MOTORIZED OUTSIDE AIR DAMPER: Optional field installed motorized outside air damper allows for the introduction of 25% outside (fresh) air into the conditioned space. Powered on by a 24V signal to the damper motor and spring-closed upon a loss of signal.

ELECTRIC HEAT: Internally mounted Nickel-Cadmium (Ni-Cad) electric heat elements with ceramic insulators and thermal switches. Available in 1 kW or 2 kW for NC09-12 and 3 kW for NC15-18.

ELECTRICAL DISCONNECT: Optional, field installed fused or non-fused electrical disconnect available. Fused sizes available in 10, 12, 15, 20 and 25 amp fuses.

CABINET: Constructed of heavy gauge environmentally-responsible galvanized steel for maximum corrosion resistance. All cabinets finished with beige textured epoxy powder coating on both sides for added protection. Fits "legacy" console footprints.

REFRIGERANT CIRCUIT: Units utilize R-410A refrigerant in sealed circuits. Metering accomplished with thermostatic expansion valve to deliver optimum refrigerant flow over a wide range of conditions without troublesome check valves. Four-way solenoid activated reversing valve faults to heating, and is “cool brazed” at the factory.

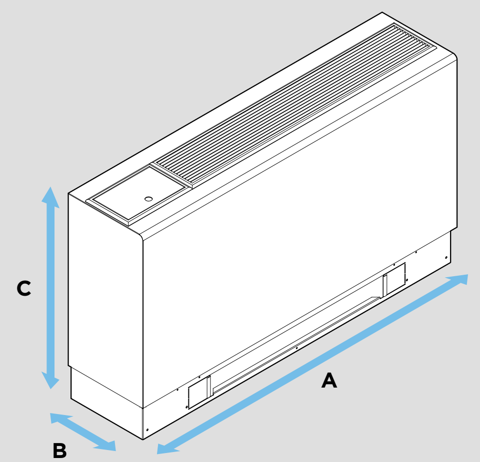
CONTROLS: The Compressor Control Module (CCM) comes standard or an optional Versatec Microprocessor Control is also available. The optional FX10 Control adds N2, Modbus, LON & BACnet compatibility along with unit or wall mounted sensors or wall mounted thermostat options (thermostat/sensors sold separately).

FAN MOTOR: High efficiency 3-speed ECM blower motors come standard.

ADDITIONAL OPTIONS:

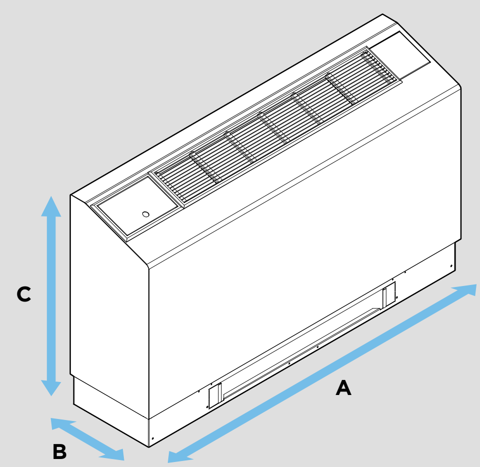
- EXTENDED RANGE COAXIAL HEAT EXCHANGER AND PIPING INSULATION.
- CABINETS AVAILABLE IN FLAT, SLOPE TOP, OR EXTENDED SLOPE TOP.
- LEFT OR RIGHT CONTROLS
- 115V OPTION ON NC09-12

ENVISION SERIES CONSOLES 0.75 - 1.5 Ton



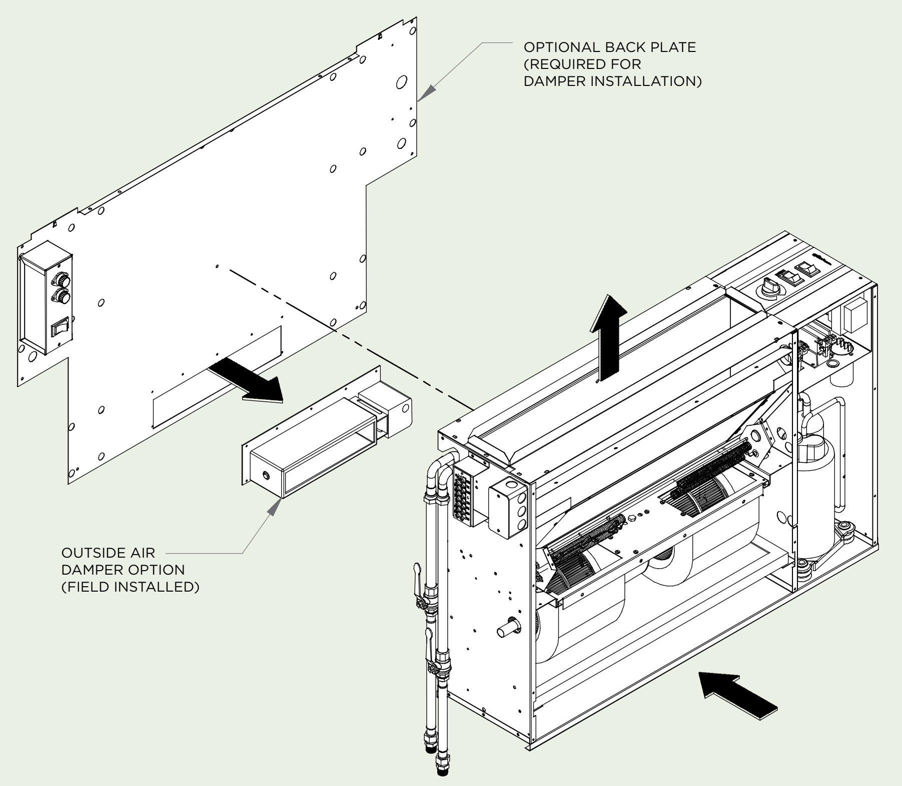
Flat Top

Model	A	B	C
09 - 12	45.0˝	10.8˝	25.7"
015 - 018	50.0˝	12.3˝	25.7"



Slope Top

Model	A	B	C
09 - 12	50.0˝	12.6˝	29.1"
015 - 018	55.0˝	12.6˝	29.1"



Inside the Envision Series Console

ARI/ISO 13256-1 PERFORMANCE RATINGS

ECM Motors

ARI/ASHRAE/ISO 13256-1
English (IP) Units

Model	Flow Rate		Water Loop Heat Pump				Ground Water Heat Pump				Ground Loop Heat Pump			
			Cooling EWT 86°F		Heating EWT 68°F		Cooling EWT 59°F		Heating EWT 50°F		Cooling EWT 77°F		Heating EWT 32°F	
	gpm	cfm	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP	Capacity Btuh	EER Btuh/W	Capacity Btuh	COP
09	2.5	300	8,500	13.4	10,500	4.4	10,200	22.5	8,700	3.8	9,000	16.0	6,700	3.1
12	3.5	350	10,500	12.3	14,400	4.3	12,400	19.5	11,800	3.7	11,000	14.2	9,500	3.5
15	4.5	450	13,500	13.6	17,000	4.9	16,200	22.0	14,000	4.1	14,200	15.9	10,500	3.4
18	5.5	500	16,200	12.5	21,000	4.4	19,000	19.6	17,000	3.7	16,600	15.1	13,300	3.1

12/09/09

Cooling capacities based upon 80.6°F DB, 66.2°F WB entering air temperature
Heating capacities based upon 68°F DB, 59°F WB entering air temperature
All ratings based upon 208V operation

BR1010CN 03/15

EEM - LED Lighting Retrofit fixtures

PHILIPS

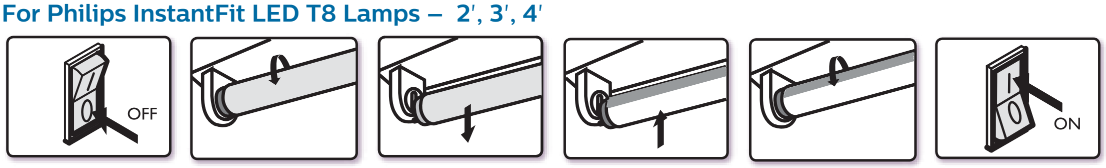
Installation Guide

InstantFit T8

The Installation Guide contains important information and notes regarding the installation and operation of the InstantFit T8 lamps. Please note the important points below:

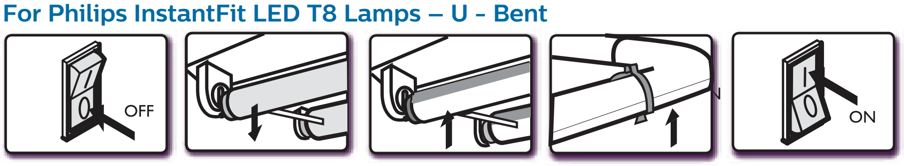
- Product is not dimmable
- Not compatible with luminaires that use a remote starter.
- Modifications to the product void the warranty.
- Suitable to replace T8 fluorescent lamps as specified on the product label.
- Operates on instant-start and certain programmed-start ballasts only. Please refer to www.philips.com/instantfit for latest ballast compatibility guide.

For Philips InstantFit LED T8 Lamps – 2', 3', 4'



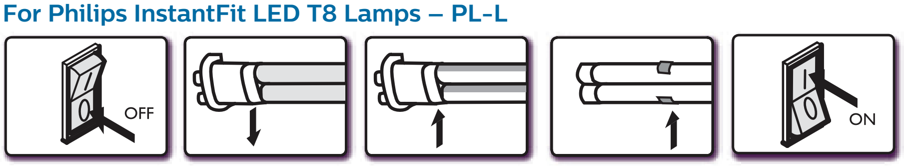
1 2 Fluorescent 3 Fluorescent 4 LED T8 InstantFit 5 LED T8 InstantFit 6

For Philips InstantFit LED T8 Lamps – U - Bent



1 2-3 Fluorescent 4 InstantFit LED T8 5 InstantFit LED T8 6

For Philips InstantFit LED T8 Lamps – PL-L



1 2-3 Fluorescent 4 InstantFit LED T8 5 InstantFit LED T8 6

C US LISTED

See reverse side for installation instructions.

Philips InstantFit LED T8 Lamps

Instructions

1. Switch-off power to the luminaire
2. Remove diffuser (if provided)
3. Remove the existing fluorescent lamps from the luminaire.
   - Note: Verify the fluorescent tube type is listed on the label of Philips InstantFit LED T8 lamp.

4-5. Install the Philips InstantFit LED T8 lamp (one for each fluorescent lamp removed, ensure pins are firmly seated in the lamp holders).
   - For U-Bent & PL-L, please ensure that the lamp is secured by the clip.
   - Replace diffuser (if removed in step 2).

6. Switch on power to the luminaire.

CAUTION – IF THE LAMP OR LUMINAIRE EXHIBITS UNDESIRABLE OPERATION (BUZZING, FLICKERING, ETC.), IMMEDIATELY TURN OFF POWER, REMOVE LAMP FROM LUMINAIRE AND CONTACT THE MANUFACTURER

CAUTION – RISK OF FIRE. DO NOT INSTALL IN A PRE-HEAT LUMINAIRE

THIS LAMP ONLY OPERATES ON ELECTRONIC BALLASTS. IF LAMP DOES NOT LIGHT WHEN THE LUMINAIRE IS ENERGIZED, REMOVE LAMP FROM LUMINAIRE AND CONTACT LAMP MANUFACTURER OR QUALIFIED ELECTRICIAN

CAUTION – RISK OF FIRE. PERFORM A VISUAL INSPECTION TO ENSURE LAMPHOLDERS ARE NOT DAMAGED OR LOOSE. IF DAMAGED, CORRODED, CHARRED, BLACKENED, OR LOOSE, CONTACT A QUALIFIED ELECTRICIAN FOR PROPER REPLACEMENT.

THIS PRODUCT MAY CAUSE INTERFERENCE TO RADIO EQUIPMENT AND SHOULD NOT BE INSTALLED NEAR MARITIME SAFETY COMMUNICATIONS EQUIPMENT OR OTHER CRITICAL NAVIGATION OR COMMUNICATION EQUIPMENT OPERATING BETWEEN 0.45 – 30MHZ.

LAMPS MUST BE OPERATED WITHIN AN AMBIENT FIXTURE TEMPERATURE OF -4F (-20C) AND 113F (45C) TO ENSURE UL COMPLIANCE.

Instructions

1. Couper l'alimentation du luminaire.
2. Retirer le diffuseur (si inclus).
3. Retirer les lampes fluorescentes du luminaire.
   - Vous assurer que le ballast dans le luminaire est un ballast à allumage instantané (généralement situé dans le canal du ballast).

4-5. Installer la lampe DEL T8 InstantFit de Philips (remplacer chaque lampe fluorescente retiree, vous assurer que les broches sont bien insérées dans les culots).
   - Pour les lampes en U et PL-L, vous assurer de bien rattacher la lampe avec l'attache.
   - Remplacer le diffuseur (s'il a été retiré à l'étape 2).

6. Allumer l'interrupteur du luminaire.

ATTENTION - SI LA LAMPE OU LE LUMINAIRE MONTRE DES SIGNES D'OPERATION INDESIRABLE (BRUIT, VIBRATION, CLIGNOTEMENT, ETC.), ALORS COUPER IMMÉDIATEMENT LE COURANT ET ENLÈVER LA LAMPE DE L'APPAREIL D'ÉCLAIRAGE ENTRER EN CONTACT AVEC LE FABRICANT

ATTENTION - RISQUE DE FEU. N'INSTALLEZ PAS CETTE LAMPE DANS UN APPAREIL D'ÉCLAIRAGE DE PRÉCHAUFFAGE

CETTE LAMPE OPERE SEULEMENT AVEC LE BALLAST ELECTRONIQUE. SI LA LAMPE NE S'ALLUME PAS QUAND L'APPAREIL D'ECLAIRAGE ACTIVE, ENLEVEZ LA LAMPE DE L'APPAREIL D'ECLAIRAGE ET CONTACTEZ LE FABRICANT DE LAMPE OU UN ELECTRICIEN QUALIFIE

ATTENTION – RISQUE D'INCENDIE. INSPECTEZ VISUELLEMENT POUR VOUS ASSURER QUE LES CULOTS NE SONT PAS ENDOMMAGÉS OU DESSERRÉS. SI LES CULOTS SONT ENDOMMAGÉS, CORRODÉS, BRÛLÉS, NOIRCIS OU DESSERRÉS, VEUILLEZ CONTACTER UN ÉLECTRICIEN QUALITÉ POUR EFFECTUER UN REMPLACEMENT ADÉQUAT.

CE PRODUIT EST SUSCEPTIBLE DE CAUSER DE L'INTERFÉRENCE AVEC LES ÉQUIPEMENTS RADIO ET NE DEVRAIT PAS ÊTRE INSTALLÉ PRÈS DES APPAREILS DE COMMUNICATION DE SÉCURITÉ MARITIME OU TOUT AUTRE ÉQUIPEMENT DE COMMUNICATION OU DE LA NAVIGATION QUI FONCTIONNE À UNE BANDE ENTRE 0,45 ET 30 MHZ.

AFIN D'ASSURER L'HOMOLOGATION UL, L'EXPLOITATION DES DOIT ÊTRE EFFECTUÉE À UNE TEMPÉRATURE AMBIANTE DU LUMINAIRE ENTRE -20C (-4F) ET 45C (113F).

03/15 philips.com

Philips Lighting, North America Corporation
200 Franklin Square Drive, Somerset, NJ 08873
Tel. 855-486-2216

Imported by: Philips Lighting,
A division of Philips Electronics Ltd.
281 Hillmount Rd, Markham, ON, Canada L6C 2S3
Tel. 800-668-9008

Appendix D:

Energy Audit Forms

Building Characteristics

Building ID: Ambulance Corps Garage

Date of Audit:

City: Hastings-on-Hudson State: NY Zip: 10706

Gross Floor Area: 1,200 ft^2

Number of Conditioned Floors: Above Grade: 1 Below Grade:

Year of Construction:

Primary Building Function: ~~School~~

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

From Utility Bills:

Utility Company: Account Number: Energy Type:

Utility Company: Account Number: Energy Type:

Utility Company: Account Number: Energy Type:

Electricity (kBtu/ft^2/yr):

Gas (kBtu/ft^2/yr):

Oil (kBtu/ft^2/yr):

EUI (kBtu/ft^2/yr): 36.4*

Cost Index ($/$ft^2$/yr):

Brief Building Description:

Site Plan (meter locations)

OLA Consulting Engineers
I:\Projects\VOH\NVOH0001.00\Docs\Site Visit Forms\Ambulance Corps

Building Envelope

OLA CONSULTING ENGINEERS

Construction Types (check all that apply)

Walls: Insulated?

________	Wood	________
________	Masonry	________
________	Concrete (above grade)	________
________	Concrete (below grade)	________
________	Metal	________
________	Stone	________
________	Glass	________
________	Other (describe if other)	________

Doors:

________	Solid Wood	________
________	Hollow Wood	________
________	Uninsulated Metal	________
________	Glass (<85%)	________
________	Other (describe if other)	________
________	Weatherstripping	

Roofs Insulated?

________	Concrete Deck	________
________	Wood Deck	________
________	Metal Deck	________
________	Other (describe if other)	________

Windows (Metal Framed)

________	Single Glazing	________
________	Double Glazing	________

Windows (Wood Framed)

________	Single Glazing	________
________	Double Glazing	________

Additional Notes: ____

Building Use Schedule

Average Hours/Week: Average Weeks/Year:

After Hours Cleaning (Y/N):

- volunteers on call 24/7

Schedule for the months of (i.e. School Year Sept - June):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of (i.e. Summer Months July - Aug):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Building HVAC System Summary

Check all major systems that apply

Primary Cooling:

- ______ Centrifugal Chiller
- ______ Reciprocating Chiller
- ______ Screw Chiller
- ______ Absorption Chiller
- ______ Packaged DX
- ______ Split DX
- ______ Air-Cooled Heat Rejection
- ______ Water-Cooled Heat Rejection
- ______ Ground-Source Heat Pump
- ______ Air-Source Heat Pump
- ______ Recirculating Water-Source Heat Pump
- ______ Variable Refrigerant Flow

Primary Heating:

- ______ Cast Iron Hot Water Boiler
- ______ Condensing Boiler
- ______ Steam Boiler
- ______ Furnace
- ______ Ground-Source Heat Pump
- ______ Air-Source Heat Pump
- ______ Recirculating Water-Source Heat Pump

AHU/Terminal Systems:

- ______ Single Zone
- ______ Multi Zone
- ______ Dual Duct
- ______ Variable Air Volume
- ______ Reheat
- ______ Fan Coil Units
- ______ Unit Ventilators
- ______ Packaged Terminal Air Conditioners
- ______ Steam/Hot Water Radiators/Convectors
- ______ Above Systems with Economizer

Exhaust Systems:

- ______ Fume Hoods, Constant Volume
- ______ Fume Hoods, VAV
- ______ Kitchen Hoods
- ______ Toilet Exhaust
- ______ Locker Exhaust
- ______ General Exhaust

Other:

- ______ Cogeneration
- ______ Energy Monitoring & Controls
- ______ On-site Generation
- ______ Active Solar Equipment
- ______ Energy Recovery
- ______ Thermal Storage
- ______ Humidifiers/Dehumidifiers
- ______ Dessicant System
- ______ Evaporative Cooling
- ______ Other

Describe if other: ____________________

Notes:

Take photos of nameplates

Take photos of equipment

Building HVAC System Summary

Heating Plant

Boiler Quantity: 1 Size: Type: Hot Water

Manufacture & Model: Burnham Fuel Used: Natural Gas

Hot Water Supply Setpoint: Steam Pressure Setpoint:

Number of Pumps: 1 Total HP:

Additional Comments: Heating plant upgrades include heat timer and boiler controls, thermostatic radiator valves, burner replacement, condensate heat recovery, boiler replacement

– small residential grade boiler with HW recirculation pump

Cooling Plant

Manufacture & Model:

Chiller Quantity: Total Tonnage/kW:

Chilled Water Pumps Quantity: Total HP:

Chilled Water Supply/Return Temp Setpoint:

Condenser Water Pumps Quantity: Total HP:

Cooling Tower Fans Quantity: Total HP:

Additional Comments:

– Window AC units only (3 total)
– 1.5 tons each

Air-Side Systems

Tag	Model	Type (i.e. DX, VAV)	Location	Serves	Capacity/ CFM	Horsepower	Drive (VFD, etc.)

HVAC Operation and Maintenance

CONSULTING ENGINEERS

Unoccupied Setback

Shutdown of: Check all that apply

AHU's by Time Schedule ________

Exhaust Fans by Time Schedule ________

Chillers:

By Time Schedule ________

By Outside Air Temperature ________

Boilers:

By Time Schedule ________ → Boiler appears to be controlled by single thermostat

By Outside Air Temperature ________

Additional notes on operation and maintenance procedures related to energy efficiency:

Domestic Hot Water Summary

Fuel Type:

_____ Electricity
✓ Natural Gas
_____ Oil
_____ Steam
_____ Heat Pump
_____ Other (describe if other)

Number of Units: 1 Location: Boiler Room Re-circ Loop? (Y/N): Yes

Gallons: 40 Hot Water Supply Temperature: ✗

Tank Insulated? (Y/N): No Condensing DHW Heater? (Y/N):

Additional Comments:

- Bradford White DHW heater
- serves three sinks and one bathroom

Sketch of DHW piping schematic:

Food Preparation Summary

Item	Quantity	Load (kW)
Ranges		
Steam Tables		
Freezers		
Refrigerators	1	
Walk-In Refrigerators		
Walk-In Freezers		
Infra-Red Warmer		
Microwaves	1	
Mixers		
Ovens		
Frying Tables		
Dishwashers		
Exhaust Hoods		

Additional Comments:

- 1 refrigerator and 1 microwave

Sketch of kitchen layout:

Lighting Summary

Space	Type of Fixture	No. of Fixtures	Average Watts/fixture	Type of Controls	Ballast Type
Lounge	4' T8 Fl.	6	34(2) = 68W	Manual	—
Bathroom	2x2' Fl.	1			
Garage	4' T8 Fl.	16	34(4) = 136W	Manual	

Additional Comments:

- Timers for exterior lighting

Space Summary

Space Type	Lounge	Garage							
Conditioned Area (ft^2)									
Primary HVAC Type	-window AC -No heating	-2 window AC units -Baseboard heat							
Primary Lighting Type	-4' T8 fluorescent	T8 Fluorescent							
Lighting Controls	Manual	Manual							
# of Occupants									
Weekday Hours in Use									
Weekend Hours in Use									

Space Type									
Conditioned Area (ft^2)									
Primary HVAC Type									
Primary Lighting Type									
Lighting Controls									
# of Occupants									
Weekday Hours in Use									
Weekend Hours in Use									

Building Characteristics

Building ID: Chemka Pool Building Date of Audit:

City: Hastings-on-Hudson State: NY Zip: 10706

Gross Floor Area: 4,500 ft^2

Number of Conditioned Floors: Above Grade: 1 Below Grade:

Year of Construction:

Primary Building Function: School

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

From Utility Bills:

Utility Company: Account Number: Energy Type:

Utility Company: Account Number: Energy Type:

Utility Company: Account Number: Energy Type:

Electricity (kBtu/ft^2/yr):

Gas (kBtu/ft^2/yr):

Oil (kBtu/ft^2/yr):

EUI (kBtu/ft^2/yr): 83.3

Cost Index (\$/ft^2/yr):

Brief Building Description:

Site Plan (meter locations)

Building Envelope

Construction Types (check all that apply)

Walls:	Insulated?
______ Wood	______
______ Masonry	______
______ Concrete (above grade)	______
______ Concrete (below grade)	______
______ Metal	______
______ Stone	______
______ Glass	______
______ Other (describe if other)	______

Doors:

______ Solid Wood	______
______ Hollow Wood	______
______ Uninsulated Metal	______
______ Glass (<85%)	______
______ Other (describe if other)	______
______ Weatherstripping	

Roofs	Insulated?
______ Concrete Deck	______
______ Wood Deck	______
______ Metal Deck	______
______ Other (describe if other)	______
Windows (Metal Framed)	
______ Single Glazing	______
______ Double Glazing	______
Windows (Wood Framed)	
______ Single Glazing	______
______ Double Glazing	______

Additional Notes: ______________________________

Building Use Schedule

Average Hours/Week: ____ Average Weeks/Year: ____

After Hours Cleaning (Y/N): ____

Schedule for the months of (i.e. School Year Sept - June):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of (i.e. Summer Months July - Aug):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Building HVAC System Summary

Check all major systems that apply

Primary Cooling:

- ________ Centrifugal Chiller
- ________ Reciprocating Chiller
- ________ Screw Chiller
- ________ Absorption Chiller
- ________ Packaged DX
- ________ Split DX
- ________ Air-Cooled Heat Rejection
- ________ Water-Cooled Heat Rejection
- ________ Ground-Source Heat Pump
- ________ Air-Source Heat Pump
- ________ Recirculating Water-Source Heat Pump
- ________ Variable Refrigerant Flow

Primary Heating:

- ________ Cast Iron Hot Water Boiler
- ________ Condensing Boiler
- ________ Steam Boiler
- ________ Furnace
- ________ Ground-Source Heat Pump
- ________ Air-Source Heat Pump
- ________ Recirculating Water-Source Heat Pump

AHU/Terminal Systems:

- ________ Single Zone
- ________ Multi Zone
- ________ Dual Duct
- ________ Variable Air Volume
- ________ Reheat
- ________ Fan Coil Units
- ________ Unit Ventilators
- ________ Packaged Terminal Air Conditioners
- ________ Steam/Hot Water Radiators/Convectors
- ________ Above Systems with Economizer

Exhaust Systems:

- ________ Fume Hoods, Constant Volume
- ________ Fume Hoods, VAV
- ________ Kitchen Hoods
- ________ Toilet Exhaust
- ________ Locker Exhaust
- ________ General Exhaust

Other:

- ________ Cogeneration
- ________ Energy Monitoring & Controls
- ________ On-site Generation
- ________ Active Solar Equipment
- ________ Energy Recovery
- ________ Thermal Storage
- ________ Humidifiers/Dehumidifiers
- ________ Dessicant System
- ________ Evaporative Cooling
- ________ Other

Describe if other: ________________________________

Notes:

Take photos of nameplates

Take photos of equipment

Building HVAC System Summary

Heating Plant

Boiler Quantity: Size: Type:

Manufacture & Model: Fuel Used:

Hot Water Supply Setpoint: Steam Pressure Setpoint:

Number of Pumps: Total HP:

Additional Comments: Heating plant upgrades include heat timer and boiler controls, thermostatic radiator valves, burner replacement, condensate heat recovery, boiler replacement

Cooling Plant

Manufacture & Model:

Chiller Quantity: Total Tonnage/kW:

Chilled Water Pumps Quantity: Total HP:

Chilled Water Supply/Return Temp Setpoint:

Condenser Water Pumps Quantity: Total HP:

Cooling Tower Fans Quantity: Total HP:

Additional Comments:

Air-Side Systems

Tag	Model	Type (i.e. DX, VAV)	Location	Serves	Capacity/ CFM	Horsepower	Drive (VFD, etc.)

HVAC Operation and Maintenance

Unoccupied Setback

Shutdown of:	Check all that apply
AHU's by Time Schedule	________
Exhaust Fans by Time Schedule	________
Chillers:	
By Time Schedule	________
By Outside Air Temperature	________
Boilers:	
By Time Schedule	________
By Outside Air Temperature	________

Additional notes on operation and maintenance procedures related to energy efficiency:

Domestic Hot Water Summary

Fuel Type:

_______ Electricity

_______ Natural Gas

_______ Oil

_______ Steam

_______ Heat Pump

_______ Other (describe if other)

Number of Units: Location: Re-circ Loop? (Y/N):

Gallons: Hot Water Supply Temperature:

Tank Insulated? (Y/N): Condensing DHW Heater? (Y/N):

Additional Comments:

Sketch of DHW piping schematic:

Food Preparation Summary

Item	Quantity	Load (kW)
Ranges	________	________
Steam Tables	________	________
Freezers	________	________
Refrigerators	________	________
Walk-In Refrigerators	________	________
Walk-In Freezers	________	________
Infra-Red Warmer	________	________
Microwaves	________	________
Mixers	________	________
Ovens	________	________
Frying Tables	________	________
Dishwashers	________	________
Exhaust Hoods	________	________

Additional Comments: ____

____

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____

Sketch of kitchen layout:

Lighting Summary

Space	Type of Fixture	No. of Fixtures	Average Watts/fixture	Type of Controls	Ballast Type
Men's Locker	ceiling	~18		Manual	
Room	mount				
Women's	–	18		–	
Locker Room	–				
Entry		6		–	
Lifeguard	–	6		Manual	
office					
Exterior	Compact FL	~~8~~ 7	23 W	Manual	
Pool Equip.	T8 FL.	8	32(2)=64W	Manual	
Room					
Exterior	2 bulb other	3		Manual	

– Mix of LED and fluorescent

~18 LED bulbs

Additional Comments:

– Tower lighting is likely 220 V feed ⇒ Bulb wattage unknown

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Space Summary

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Building Characteristics

Building ID:	James Harmon Community Center			Date of Audit:	
City:	Hastings-on-Hudson	State:	NY	Zip:	10706
Gross Floor Area:	17,000	ft^2			
Number of Conditioned Floors:		Above Grade: 3		Below Grade: 1	
Year of Construction:					
Primary Building Function: ~~School~~					
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	

From Utility Bills:

Utility Company:	Account Number:	Energy Type:
Utility Company:	Account Number:	Energy Type:
Utility Company:	Account Number:	Energy Type:

Electricity ($kBtu/ft^2/yr$):	
Gas ($kBtu/ft^2/yr$):	
Oil ($kBtu/ft^2/yr$):	
EUI ($kBtu/ft^2/yr$):	109.6
Cost Index ($\$/ft^2/yr$):	

☑ Utility Meters
☑ Light Fixtures
☐ Drawings (Arch, Mech, Lighting)
☑ HV-1

Brief Building Description:

- Building is typically open Monday – Friday → Comm. Room and Youth Services open
- Community Room is occassionally open on weekends on Saturdays
- Lower Level is open for kids programs every weekend (~12pm-7pm) on Sat. (RTU-4) during winter months (school year only)
- RTU-1 remains active during weekends due to need to cool server room and Raph's office

Site Plan (meter locations)

Building Envelope

Construction Types (check all that apply)

Walls:		Insulated?	Roofs		Insulated?
________	Wood	________	________	Concrete Deck	________
________	Masonry	________	________	Wood Deck	________
________	Concrete (above grade)	________	________	Metal Deck	________
________	Concrete (below grade)	________	________	Other (describe if other)	________
________	Metal	________	Windows (Metal Framed)		
________	Stone	________	________	Single Glazing	________
________	Glass	________	________	Double Glazing	________
________	Other (describe if other)	________	Windows (Wood Framed)		
Doors:			________	Single Glazing	________
________	Solid Wood	________	________	Double Glazing	________
________	Hollow Wood	________			
________	Uninsulated Metal	________			
________	Glass (<85%)	________			
________	Other (describe if other)	________			
________	Weatherstripping				

Additional Notes: ____

____

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Building Use Schedule

Average Hours/Week: ____ Average Weeks/Year: ____

After Hours Cleaning (Y/N): ____

Schedule for the months of (i.e. ~~School~~ Year Sept - June):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open	9:00am	–	–	9:00 am	9:00am	~~closed~~	closed	
Hours Closed	4:30pm	–	–	8:00pm	1:00pm	–	–	
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of (i.e. Summer Months July - Aug):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Building HVAC System Summary

Check all major systems that apply

Primary Cooling:

- ________ Centrifugal Chiller
- ________ Reciprocating Chiller
- ________ Screw Chiller
- ________ Absorption Chiller
- ________ Packaged DX
- ________ Split DX
- ________ Air-Cooled Heat Rejection
- ________ Water-Cooled Heat Rejection
- ________ Ground-Source Heat Pump
- ________ Air-Source Heat Pump
- ________ Recirculating Water-Source Heat Pump
- ________ Variable Refrigerant Flow

Primary Heating:

- ________ Cast Iron Hot Water Boiler
- ________ Condensing Boiler
- ________ Steam Boiler
- ________ Furnace
- ________ Ground-Source Heat Pump
- ________ Air-Source Heat Pump
- ________ Recirculating Water-Source Heat Pump

AHU/Terminal Systems:

- ________ Single Zone
- ________ Multi Zone
- ________ Dual Duct
- ________ Variable Air Volume
- ________ Reheat
- ________ Fan Coil Units
- ________ Unit Ventilators
- ________ Packaged Terminal Air Conditioners
- ________ Steam/Hot Water Radiators/Convectors
- ________ Above Systems with Economizer

Exhaust Systems:

- ________ Fume Hoods, Constant Volume
- ________ Fume Hoods, VAV
- ________ Kitchen Hoods
- ________ Toilet Exhaust
- ________ Locker Exhaust
- ________ General Exhaust

Other:

- ________ Cogeneration
- ________ Energy Monitoring & Controls
- ________ On-site Generation
- ________ Active Solar Equipment
- ________ Energy Recovery
- ________ Thermal Storage
- ________ Humidifiers/Dehumidifiers
- ________ Dessicant System
- ________ Evaporative Cooling
- ________ Other

Describe if other: ____________________________________

____

____

____

____

____

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____

Notes:

Take photos of nameplates

Take photos of equipment

Building HVAC System Summary

Heating Plant

Boiler Quantity: 1 Size: Type: Hot Water

Manufacture & Model: Weil McLain Model 80 Fuel Used: Nat. Gas

Hot Water Supply Setpoint: 165°F Steam Pressure Setpoint: —

Number of Pumps: 2 Total HP: 6 (3 each)

Additional Comments: Heating plant upgrades include heat timer and boiler controls, thermostatic radiator valves, burner replacement, condensate heat recovery, boiler replacement

- HW pumps appear to have VFD's installed according to BMS

Cooling Plant

Manufacture & Model:

Chiller Quantity: Total Tonnage/kW:

Chilled Water Pumps Quantity: Total HP:

Chilled Water Supply/Return Temp Setpoint:

Condenser Water Pumps Quantity: Total HP:

Cooling Tower Fans Quantity: Total HP:

Additional Comments:

- Cooling provided via DX coils in RTU's

Air-Side Systems

Tag	Model	Type (i.e. DX, VAV)	Location	Serves	Capacity/ CFM	Horsepower	Drive (VFD, etc.)
RTU-1	Carrier 50HJ-007	CAV	Roof	2nd Floor			None
RTU-2	Carrier 50HJ-006	CAV	—	1st Floor			—
RTU-3	Carrier 50AJ-025	CAV	—	Community Rm			—
RTU-4	Carrier 50AK-028	CAV	—	~~Basement~~ Lower Level			—
HV-1	Magic Aire	CAV		Basement			—

HVAC Operation and Maintenance

Unoccupied Setback

Shutdown of:	Check all that apply
AHU's by Time Schedule	✓ → Schedules range for each RTU
Exhaust Fans by Time Schedule	

Chillers:	
By Time Schedule	
By Outside Air Temperature	

Boilers:	
By Time Schedule	✓ → Boilers controlled automatically by BMS Typical hours → 3am-7pm active
By Outside Air Temperature	

Additional notes on operation and maintenance procedures related to energy efficiency:

- RTU fans appear to be constant volume
- Supply air for each space is modulated by VAV boxes
- All RTU's ~~[illegible]~~ contain HW coils for heating and DX cooling
- HV-1 appears to be heating only → No cooling coil displayed on BMS graphics
- Each VAV box has an associated radiation valve or convector on the BMS graphics
- Radiation valves appear to be controlled by BMS, but convectors are not
- Each VAV box has an associated temperature sensor
- temp setpoints can be controlled/adjusted at the BMS

RTU-1 Schedule

M-F: occupied hours - 3am-12am
Sat.: 3am-11pm
Sunday: 9am-11pm

RTU-2 Schedule

Mon: 2am-7pm
Tues: 5am-7pm
Weds: 4am-7pm
Thurs: 4am-8pm
Fri: 6am-1pm
Sat/Sun: No schedule

RTU-3 Schedule

M-F: 9am-2:30pm
Sat/Sun: Inactive
Weds: Also active 7pm-8:30pm

RTU-4 Schedule

Mon: 3am-9pm
Tues-Thurs: 4am-9pm
Fri: 3am-9pm
Sat/Sun: Inactive

HV-1 Schedule

M-F: 9am-2pm
Sat/Sun: No schedule

Domestic Hot Water Summary

Fuel Type:

	Electricity
✓	Natural Gas
	Oil
	Steam
	Heat Pump
	Other (describe if other)

Number of Units: 1 Location: Boiler Room Re-circ Loop? (Y/N): Yes

Gallons: 125 Hot Water Supply Temperature: ~110°F

Tank Insulated? (Y/N): No Condensing DHW Heater? (Y/N): No

Additional Comments:

- DHW heater as a recirculation loop that ~~maintains~~ is set to maintain 110°F

Sketch of DHW piping schematic:

Food Preparation Summary

CONSULTING ENGINEERS

Item	Quantity	Load (kW)
Ranges		
Steam Tables		
Freezers		
Refrigerators	1	
Walk-In Refrigerators		
Walk-In Freezers		
Infra-Red Warmer		
Microwaves	1	
Mixers		
Ovens	1	
Frying Tables		
Dishwashers		
Exhaust Hoods		

Additional Comments:

-All electric appliances

Sketch of kitchen layout:

Lighting Summary

Space	Type of Fixture	No. of Fixtures	Average Watts/fixture	Type of Controls	Ballast Type
✓TV Office	T8 LED	2	32(3)=96W	Occ. Sensor	
✓Comm. Room	ceiling pendant	4	*40W	Manual	
	wall mounted	6	*150W		
	Track Lights	5	*75W		
	2bulb wall mount	4			
✓Staff Lounge	T8 LED	1	96W	occ. sensor	
✓First Floor Cor.	T8 LED	3	32(2)=64W	Manual	
✓Superintendent Office	T8 LED	2	96W	occ. sensor	
✓Activity Room	T8 FL. (Sylvania)	5	96W	occ sensor	
✓Multi-purpose	Sylvania T8 FL.	11	96W	occ. senser	
Room					
✓Multi-media	Sylvania T8	4	96W	occ sensor	
Room					
✓Youth Services	Sylvania T8	4	96W	occ. senser	
Dept.					
✓Youth Office	Sylvania T8	2	96W	occ. senser	
✓Youth Staff	Sylvania T8	1	64W	occ. senser	
Lounge					
✓Youth Office 2	Sylvania T8	2	64W	occ. sensor	
✓Activity rm 2	Sylvania T8	3	96W	occ. sensor	
✓Bathrooms	Sylvania T8	5	64W	occ. senser	
*Same in first floor					
and lower level					

(4 total)

Additional Comments:

- All bathrooms in the bldg are controlled by occ. sensors
- Community Room controlled by occ. sensors
- All of lower level has occ. sensors
-

Space Summary

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Building Characteristics

Building ID: Department of Public Works Garage
Date of Audit:
City: Hastings-on-Hudson State: NY Zip: 10706
Gross Floor Area: 12,000 ft^2
Number of Conditioned Floors: Above Grade: 1 Below Grade:
Year of Construction:
Primary Building Function: School
Meter Number: Utility: Meter Location:
Meter Number: Utility: Meter Location:
Meter Number: Utility: Meter Location:
Meter Number: Utility: Meter Location:
Meter Number: Utility: Meter Location:

From Utility Bills:
Utility Company: Account Number: Energy Type:
Utility Company: Account Number: Energy Type:
Utility Company: Account Number: Energy Type:
Electricity ($kBtu/ft^2/yr$):
Gas ($kBtu/ft^2/yr$):
Oil ($kBtu/ft^2/yr$):
EUI ($kBtu/ft^2/yr$): 72.9
Cost Index ($\$/ft^2/yr$):

- ☑ Light fixtures
- ☑ EnA heater data
- ☑ Bldg operating hours
- ☑ Utility Meters

Brief Building Description:

Site Plan (meter locations)

OLA Consulting Engineers
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Building Envelope

Construction Types (check all that apply)

Walls:		Insulated?	Roofs		Insulated?
________	Wood	________	________	Concrete Deck	________
________	Masonry	________	________	Wood Deck	________
________	Concrete (above grade)	________	________	Metal Deck	________
________	Concrete (below grade)	________	________	Other (describe if other)	________
________	Metal	________	Windows (Metal Framed)		
________	Stone	________	________	Single Glazing	________
________	Glass	________	________	Double Glazing	________
________	Other (describe if other)	________	Windows (Wood Framed)		
Doors:			________	Single Glazing	________
________	Solid Wood	________	________	Double Glazing	________
________	Hollow Wood	________			
________	Uninsulated Metal	________			
________	Glass (<85%)	________			
________	Other (describe if other)	________			
________	Weatherstripping				

Additional Notes:

- Doors throughout have been replaced within past 5-8 years
- Most windows are original to bldg, 1 window in Jerry's office was replaced ~ 8 years ago
- roof is original to building
-

Building Use Schedule

Average Hours/Week: Average Weeks/Year:

After Hours Cleaning (Y/N):

Schedule for the months of (i.e. School Year Sept - June):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open	7:00	–	–	–	–	8:00	closed	
Hours Closed	3:30	–	–	–	–	12:00pm	closed	
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of (i.e. Summer Months July - Aug):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Building HVAC System Summary

Check all major systems that apply

Primary Cooling:

- ________ Centrifugal Chiller
- ________ Reciprocating Chiller
- ________ Screw Chiller
- ________ Absorption Chiller
- ________ Packaged DX
- ________ Split DX
- ________ Air-Cooled Heat Rejection
- ________ Water-Cooled Heat Rejection
- ________ Ground-Source Heat Pump
- ________ Air-Source Heat Pump
- ________ Recirculating Water-Source Heat Pump
- ________ Variable Refrigerant Flow

Primary Heating:

- ________ Cast Iron Hot Water Boiler
- ________ Condensing Boiler
- ________ Steam Boiler
- ________ Furnace
- ________ Ground-Source Heat Pump
- ________ Air-Source Heat Pump
- ________ Recirculating Water-Source Heat Pump

AHU/Terminal Systems:

- ________ Single Zone
- ________ Multi Zone
- ________ Dual Duct
- ________ Variable Air Volume
- ________ Reheat
- ________ Fan Coil Units
- ________ Unit Ventilators
- ________ Packaged Terminal Air Conditioners
- ________ Steam/Hot Water Radiators/Convectors
- ________ Above Systems with Economizer

Exhaust Systems:

- ________ Fume Hoods, Constant Volume
- ________ Fume Hoods, VAV
- ________ Kitchen Hoods
- ________ Toilet Exhaust
- ________ Locker Exhaust
- ________ General Exhaust

Other:

- ________ Cogeneration
- ________ Energy Monitoring & Controls
- ________ On-site Generation
- ________ Active Solar Equipment
- ________ Energy Recovery
- ________ Thermal Storage
- ________ Humidifiers/Dehumidifiers
- ________ Dessicant System
- ________ Evaporative Cooling
- ________ Other

Describe if other: ________________________________

____

____

____

____

____

____

____

____

____

Notes:

Take photos of nameplates

Take photos of equipment

Building HVAC System Summary

Heating Plant

Boiler Quantity: Size: Type:

Manufacture & Model: Fuel Used:

Hot Water Supply Setpoint: Steam Pressure Setpoint:

Number of Pumps: Total HP:

Additional Comments: Heating plant upgrades include heat timer and boiler controls, thermostatic radiator valves, burner replacement, condensate heat recovery, boiler replacement

- Heating for garage provided by gas-fired unit heaters
- Gas-fired furnace serves office section of garage

Cooling Plant

Manufacture & Model:

Chiller Quantity: Total Tonnage/kW:

Chilled Water Pumps Quantity: Total HP:

Chilled Water Supply/Return Temp Setpoint:

Condenser Water Pumps Quantity: Total HP:

Cooling Tower Fans Quantity: Total HP:

Additional Comments:

- Cooling provided by 3 total window AC units and ceiling fans

Air-Side Systems

Tag	Model	Type (i.e. DX, VAV)	Location	Serves	Capacity/ CFM	Horsepower	Drive (VFD, etc.)

HVAC Operation and Maintenance

Unoccupied Setback

Shutdown of:	Check all that apply	Repair Shop
AHU's by Time Schedule	________	- Typical furnace occupied temp: ~68°F
Exhaust Fans by Time Schedule	________	- Unoccupied temp: ~62°F (manually setback)
Chillers:		- Garage is usually setback to same temp. during unoccupied hours
By Time Schedule	________	
By Outside Air Temperature	________	
Boilers:		- Ventilation is only provided by opening doors and windows
By Time Schedule	________	
By Outside Air Temperature	________	

Additional notes on operation and maintenance procedures related to energy efficiency:

- Jerry's office is served by electric radiator (~8 ft. long)
- gas furnace is controlled by Honeywell thermostat
- Garage space is heating by two Rezner gas fired unit heaters, controlled by individual Honeywell thermostats
- Remaining unit heaters are dysfunctional (2 in garage space and 2 in office space)
-

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Domestic Hot Water Summary

Fuel Type:

______ Electricity
✓ Natural Gas
______ Oil
______ Steam
______ Heat Pump
______ Other (describe if other)

Number of Units: 1 Location: Garage Re-circ Loop? (Y/N):

Gallons: 40 Hot Water Supply Temperature:

Tank Insulated? (Y/N): No Condensing DHW Heater? (Y/N): No

Additional Comments:

Sketch of DHW piping schematic:

Food Preparation Summary

Item	Quantity	Load (kW)
Ranges		
Steam Tables		
Freezers		
Refrigerators		
Walk-In Refrigerators		
Walk-In Freezers		
Infra-Red Warmer		
Microwaves		
Mixers		
Ovens		
Frying Tables		
Dishwashers		
Exhaust Hoods		

Additional Comments:

Sketch of kitchen layout:

Lighting Summary

Space	Type of Fixture	No. of Fixtures	Average Watts/fixture	Type of Controls	Ballast Type
Secretary	T8 FL.	5	32(2) = 64W	Manual	
Storage	T8 FL.	1	64W	Manual	
Bathroom	T8 FL.	2	64W	—	
	T8 FL.	1	32W	—	
Locker Room	T8 FL.	2	64W	—	
Upper Floor	T8 FL.	4	64W	—	
Shop					
Jerry's Office	T8 FL.	6	64W	—	
Garage Space	ceiling hung	8	*	HPS (1 bulb)	
	Street lamp	1			
Garage ~~Space~~		3	*	(Metal halide) 1 bulb	
Repair Shop				(Manual)	

Additional Comments:

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Space Summary

Space Type	Secretary		Locker Rm		Jerry's Office			
Conditioned Area (ft^2)								
Primary HVAC Type	-1 window AC -space heater (plug in)		-1 window AC -plug in radiator		-1 window AC unit -Electric radiator			
Primary Lighting Type	T8 FL.		T8 FL		T8 FL.			
Lighting Controls	Manual		Manual		Manual			
# of Occupants	2				1			
Weekday Hours in Use								
Weekend Hours in Use								

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Building Characteristics

Building ID: Hook and Ladder Company Date of Audit:

City: Hastings-on-Hudson State: NY Zip: 10706

Gross Floor Area: 9,000 ft^2

Number of Conditioned Floors: Above Grade: 2 Below Grade:

Year of Construction:

Primary Building Function: School

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

Meter Number: Utility: Meter Location:

From Utility Bills:

Utility Company: Account Number: Energy Type:

Utility Company: Account Number: Energy Type:

Utility Company: Account Number: Energy Type:

Electricity ($kBtu/ft^2/yr$):

Gas ($kBtu/ft^2/yr$):

Oil ($kBtu/ft^2/yr$):

EUI ($kBtu/ft^2/yr$): 75.3

Cost Index ($\$/ft^2/yr$):

☑ Utility ~~Bills~~ Meters

☒ Drawings – None

Brief Building Description:

Site Plan (meter locations)

Building Envelope

Construction Types (check all that apply)

Walls: (Insulated?)

- Wood
- ✓ Masonry
- Concrete (above grade)
- Concrete (below grade)
- Metal
- Stone
- Glass
- Other (describe if other)

Doors:

- Solid Wood
- Hollow Wood
- Uninsulated Metal
- Glass (<85%)
- Other (describe if other)
- Weatherstripping

Roofs (Insulated?)

- Concrete Deck
- Wood Deck
- Metal Deck
- Other (describe if other)

Windows (Metal Framed)

- Single Glazing
- ✓ Double Glazing

Windows (Wood Framed)

- Single Glazing
- Double Glazing

Additional Notes: -Windows in 2nd floor lounge appear to have been replaced at some point
-Some windows throughout the bldg have been replaced with double paned wood frame windows
-Truck Room windows upgraded ~5 years ago according to staff
-Remaining windows upgraded ~20 years ago

Building Use Schedule

Average Hours/Week: ______ Average Weeks/Year: ______

After Hours Cleaning (Y/N): ______

Schedule for the months of (i.e. School Year Sept - June):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open	Always							
Hours Closed	on call							
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of (i.e. Summer Months July - Aug):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Building HVAC System Summary

Check all major systems that apply

Primary Cooling:

_________ Centrifugal Chiller
_________ Reciprocating Chiller
_________ Screw Chiller
_________ Absorption Chiller
_________ Packaged DX
_________ Split DX
_________ Air-Cooled Heat Rejection
_________ Water-Cooled Heat Rejection
_________ Ground-Source Heat Pump
_________ Air-Source Heat Pump
_________ Recirculating Water-Source Heat Pump
_________ Variable Refrigerant Flow

Primary Heating:

_________ Cast Iron Hot Water Boiler
_________ Condensing Boiler
_________ Steam Boiler
_________ Furnace
_________ Ground-Source Heat Pump
_________ Air-Source Heat Pump
_________ Recirculating Water-Source Heat Pump

AHU/Terminal Systems:

_________ Single Zone
_________ Multi Zone
_________ Dual Duct
_________ Variable Air Volume
_________ Reheat
_________ Fan Coil Units
_________ Unit Ventilators
_________ Packaged Terminal Air Conditioners
_________ Steam/Hot Water Radiators/Convectors
_________ Above Systems with Economizer

Exhaust Systems:

_________ Fume Hoods, Constant Volume
_________ Fume Hoods, VAV
_________ Kitchen Hoods
_________ Toilet Exhaust
_________ Locker Exhaust
_________ General Exhaust

Other:

_________ Cogeneration
_________ Energy Monitoring & Controls
_________ On-site Generation
_________ Active Solar Equipment
_________ Energy Recovery
_________ Thermal Storage
_________ Humidifiers/Dehumidifiers
_________ Dessicant System
_________ Evaporative Cooling
_________ Other

Describe if other: ____________________________________

____
____
____
____
____
____
____
____
____

Notes:
Take photos of nameplates
Take photos of equipment

Building HVAC System Summary

OLA CONSULTING ENGINEERS

Heating Plant

Boiler Quantity: 1 Size: 366 MBH (Input) Type: Hot Water

Manufacture & Model: Weil McLain PFG Fuel Used: Nat. Gas

Hot Water Supply Setpoint: ~170°F Steam Pressure Setpoint:

Number of Pumps: 4 Total HP:

Additional Comments: Heating plant upgrades include heat timer and boiler controls, thermostatic radiator valves, burner replacement, condensate heat recovery, boiler replacement

- 4 zones and recirc pumps

Cooling Plant

Manufacture & Model:

Chiller Quantity: Total Tonnage/kW:

Chilled Water Pumps Quantity: Total HP:

Chilled Water Supply/Return Temp Setpoint:

Condenser Water Pumps Quantity: Total HP:

Cooling Tower Fans Quantity: Total HP:

Additional Comments:

Air-Side Systems

Tag	Model	Type (i.e. DX, VAV)	Location	Serves	Capacity/ CFM	Horsepower	Drive (VFD, etc.)

Unoccupied Setback

Shutdown of:	Check all that apply
AHU's by Time Schedule	________
Exhaust Fans by Time Schedule	________

Chillers:	
By Time Schedule	________
By Outside Air Temperature	________

Boilers:	
By Time Schedule	________
By Outside Air Temperature	________

Additional notes on operation and maintenance procedures related to energy efficiency:

- Thermostat in workout room appears to be broken
- Diffusers in Bar room are used as an exhaust system → Installed when smoking was common
- Fan is located up in ceiling → One fan for bar section and another for the rest of the room
-
- Boilers cycles continuously → ~~the~~ Staff indicated thermostats are always set between 68-72° F and do not setback at night

Domestic Hot Water Summary

Fuel Type:

	Electricity
✓	Natural Gas
	Oil
	Steam
	Heat Pump
	Other (describe if other)

Number of Units: 1 Location: Basement Re-circ Loop? (Y/N): Yes

Gallons: 50 Hot Water Supply Temperature:

Tank Insulated? (Y/N): No Condensing DHW Heater? (Y/N):

Additional Comments:

Sketch of DHW piping schematic:

Food Preparation Summary

Item	Quantity	Load (kW)
Ranges	1	
Steam Tables		
Freezers	1	
Refrigerators	1	
Walk-In Refrigerators		
Walk-In Freezers		
Infra-Red Warmer		
Microwaves	1	
Mixers		
Ovens	1	
Frying Tables		
Dishwashers		
Exhaust Hoods		

Additional Comments:

- Gas range/oven
- Electric refrigerator and ice maker

Sketch of kitchen layout:

Lighting Summary

Space	Type of Fixture	No. of Fixtures	Average Watts/fixture	Type of Controls	Ballast Type
Main Garage	T8 FL.	14	32(3)=96W	Manual	
	Round	6	13W	Manual	
Chief's Office	T8 FL.	9	32(3)=96W	Manual	
Storage Rm	T8 FL.	1	96W	Manual	
2nd Floor Bath	Round fixtures	4		Manual	
Kitchen	Round fixtures	10		Manual	
Back Corridor	2x2' tile	3	32(2)=64W	Manual	
	(U-tube bulb) → Satco T8				
Main Garage	Round	3	13W	occ. sensor	
Workout Room	2x2' tile	4	64W	Manual	
	(U-tube bulb) → Satco T8			Manual	
Lounge	2x2' tile (single bulb)	7			
Bar Room	Round	27	13W	Manual	
	ceiling pend.	3		–	

Additional Comments:

Space Summary

"Exempt Room" Zone → T "Truck Room" Zone → T T "Chief's Office" Zone → T "Lounge" Zone → T

Space Type	Chief Office	Main Garage	Workout Room		Lounge		Bar Room	
Conditioned Area (ft^2)								
Primary HVAC Type	-Split AC unit -Baseboard	-No cooling heat Baseboard	-1 window AC unit -Baseboard		-Window AC -Baseboard		-2 split AC units -Baseboard	
Primary Lighting Type	T8 FL.	T8 FL.					Panel 13W	
Lighting Controls	Manual	Mix					Manual	
# of Occupants	~6						~20	
Weekday Hours in Use								
Weekend Hours in Use								

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Building Characteristics

Building ID:	Public Library			Date of Audit:	
City:	Hastings-on-Hudson	State:	NY	Zip:	10706
Gross Floor Area:	13,225	ft^2			
Number of Conditioned Floors:		Above Grade:	2	Below Grade:	
Year of Construction:					
Primary Building Function:	~~School~~				
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	

OA temp ~ 23°F
Joan office temp ~ 81°F

From Utility Bills:

Utility Company:		Account Number:		Energy Type:	
Utility Company:		Account Number:		Energy Type:	
Utility Company:		Account Number:		Energy Type:	

Electricity ($kBtu/ft^2/yr$):	
Gas ($kBtu/ft^2/yr$):	
Oil ($kBtu/ft^2/yr$):	
EUI ($kBtu/ft^2/yr$):	111.2
Cost Index ($\$/ft^2/yr$):	

- ☑ Utility Meter
- ☑ Light fixtures
- ☐ Arch. plans → Wall/Window details

Brief Building Description:

- Renovation added to the bldg in 2001 → AC-2 and AC-3 installed
- AC-1 (HVU) appears to be original to the building

Site Plan (meter locations)

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Site Plan (meter locations)

Building Envelope

Construction Types (check all that apply)

Walls: Insulated?

		Insulated?
____	Wood	____
____	Masonry	____
____	Concrete (above grade)	____
____	Concrete (below grade)	____
____	Metal	____
____	Stone	____
____	Glass	____
____	Other (describe if other)	____

Doors:

		Insulated?
____	Solid Wood	____
____	Hollow Wood	____
____	Uninsulated Metal	____
____	Glass (<85%)	____
____	Other (describe if other)	____
____	Weatherstripping	

Roofs

		Insulated?
____	Concrete Deck	____
____	Wood Deck	____
____	Metal Deck	____
____	Other (describe if other)	____

Windows (Metal Framed)

		Insulated?
____	Single Glazing	____
____	Double Glazing	____

Windows (Wood Framed)

		Insulated?
____	Single Glazing	____
____	Double Glazing	____

Additional Notes: -original bldg envelope has had no major upgrades -> see blue prints
-Windows have been replaced where required
-2001 new addition has updated envelope -> see dwgs

Building Use Schedule

Average Hours/Week: Average Weeks/Year:

After Hours Cleaning (Y/N):

Schedule for the months of (i.e. School Year Sept - June):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open	9:30	–	–	9:30	9:30	–	1:00	
Hours Closed	8:30	–	6:00pm	8:30	5:00pm	5:00pm	5:00	
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of (i.e. Summer Months July - Aug):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Building HVAC System Summary

Check all major systems that apply

Primary Cooling:

________ Centrifugal Chiller
________ Reciprocating Chiller
________ Screw Chiller
________ Absorption Chiller
________ Packaged DX
________ Split DX
________ Air-Cooled Heat Rejection
________ Water-Cooled Heat Rejection
________ Ground-Source Heat Pump
________ Air-Source Heat Pump
________ Recirculating Water-Source Heat Pump
________ Variable Refrigerant Flow

Primary Heating:

________ Cast Iron Hot Water Boiler
________ Condensing Boiler
________ Steam Boiler
________ Furnace
________ Ground-Source Heat Pump
________ Air-Source Heat Pump
________ Recirculating Water-Source Heat Pump

AHU/Terminal Systems:

________ Single Zone
________ Multi Zone
________ Dual Duct
________ Variable Air Volume
________ Reheat
________ Fan Coil Units
________ Unit Ventilators
________ Packaged Terminal Air Conditioners
________ Steam/Hot Water Radiators/Convectors
________ Above Systems with Economizer

Exhaust Systems:

________ Fume Hoods, Constant Volume
________ Fume Hoods, VAV
________ Kitchen Hoods
________ Toilet Exhaust
________ Locker Exhaust
________ General Exhaust

Other:

________ Cogeneration
________ Energy Monitoring & Controls
________ On-site Generation
________ Active Solar Equipment
________ Energy Recovery
________ Thermal Storage
________ Humidifiers/Dehumidifiers
________ Dessicant System
________ Evaporative Cooling
________ Other

Describe if other: ______________________________

Notes:

Take photos of nameplates

Take photos of equipment

Building HVAC System Summary

CONSULTING ENGINEERS

Heating Plant

Boiler Quantity: Size: Type:

Manufacture & Model: Fuel Used:

Hot Water Supply Setpoint: Steam Pressure Setpoint:

Number of Pumps: 2 Total HP: 2.5 (1 1/4 each)

Additional Comments: Heating plant upgrades include heat timer and boiler controls, thermostatic radiator valves, burner replacement, condensate heat recovery, boiler replacement

- Hot water provided by Village Hall via heat exchanger

Cooling Plant

Manufacture & Model: Trane CGAD040GAFA19G Chiller

Chiller Quantity: 1 Total Tonnage/kW: ~40 200A Fuse (R-22)

Chilled Water Pumps Quantity: 2 Total HP: 3 (1.5 HP each)

Chilled Water Supply/Return Temp Setpoint:

Condenser Water Pumps Quantity: Total HP:

Cooling Tower Fans Quantity: Total HP:

Additional Comments:

- 4 compressors

Air-Side Systems

Tag	Model	Type (i.e. DX, VAV)	Location	Serves	Capacity/ CFM	Horsepower	Drive (VFD, etc.)
AC-2				Barnes Room			
AC-3			Picture Book Room	Picture Book Room			
HV-1				Main Library			
Mitsubishi			Ceiling of Conf. Rm	Conference Room			

HVAC Operation and Maintenance

Unoccupied Setback

Shutdown of: Check all that apply

AHU's by Time Schedule _________

Exhaust Fans by Time Schedule _________

Chillers:

By Time Schedule _________

By Outside Air Temperature _________

Boilers:

By Time Schedule _________

By Outside Air Temperature _________

Additional notes on operation and maintenance procedures related to energy efficiency:

- AC-3 serves Picture Book room and likely Joan's office ✓
- Mitsubishi heat pump serves community Room, controlled locally by thermostat → Installed in 2013
- AC-3 located in closet in Picture Book Room
→ Joan office is to be upgraded with new Mitsubishi heat pump
-

Domestic Hot Water Summary

Fuel Type:

✓ Electricity

______ Natural Gas

______ Oil

______ Steam

______ Heat Pump

______ Other (describe if other)

Number of Units: 1 Location: Basement Re-circ Loop? (Y/N): Yes

Gallons: 40 Hot Water Supply Temperature:

Tank Insulated? (Y/N): No Condensing DHW Heater? (Y/N):

Additional Comments:

Sketch of DHW piping schematic:

Food Preparation Summary

Item	Quantity	Load (kW)
Ranges		
Steam Tables		
Freezers		
Refrigerators	1	
Walk-In Refrigerators		
Walk-In Freezers		
Infra-Red Warmer		
Microwaves	1	
Mixers		
Ovens	1	
Frying Tables		
Dishwashers		
Exhaust Hoods		

Additional Comments: - Staff lounge contains all electric appliances

Sketch of kitchen layout:

Lighting Summary

Space	Type of Fixture	No. of Fixtures	Average Watts/fixture	Type of Controls	Ballast Type
Main Library	Large round ceiling pendant	20		Manual	
2 bulb	4' Linear tube (LED)	45	18(2) = 36 W (LED)		
Book Shop	Small ceiling flush mount	4	12W (LED)	–	
	Small round flush mount	15	12(2) = 24 W		
Staff Room	Small round flush mount (2 bulb)	5	24 W	–	
Picture Book Room	Small round flush mount	12	24 W	–	
Director's Office	Small round flush mount	5	24 W	–	
Basement Corridor	" "	8 (1 bulb)	12 W	–	
Basement Restroom	2x2' U-tube (2 bulb)	1		–	
Elevator Machine Room	wall mounted round fixture	1		–	
Basement Lobby	Topaz LED	7 (1 bulb)	12W	–	
–	Topaz LED	2 (2 bulb)	24 W		
–	Topaz LED wall mount	3 (2 bulb)	24 W		
Community Room	Topaz LED	31 (2 bulb)	24 W	–	
	Track Lights	19 (1 bulb)	75 W		
Comm. Room Closet	2x2' U-tube	2 (2 bulb)		–	
Barnes Room	Topaz LED	9 (1 bulb)	12 W	–	
–	Topaz LED	9 (2 bulb)	24 W		
Basement Staff Restroom	Luxrite LED	1 (2 bulb)	20(2) = 40W	–	
Staff Lounge	Topaz LED	6 (2 bulb)	24W	–	
Main Floor Restrooms	Luxrite LED	4 (2 bulb)	40W	–	
–	–	4 (2 bulb)	40W		
Electrical Room	4' LED tubes	3 (2 bulb)	36W	–	

* Contains sky light

* Contains skylight

Additional Comments:

- All lighting is controlled by light switches → occ. sensors appear to be installed but do not function
-

Space Summary

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Space Type								
Conditioned Area (ft^2)								
Primary HVAC Type								
Primary Lighting Type								
Lighting Controls								
# of Occupants								
Weekday Hours in Use								
Weekend Hours in Use								

Building Characteristics

Building ID:	Village Hall			Date of Audit:	
City:	Hastings-on-Hudson	State:	NY	Zip:	10706
Gross Floor Area:	8,700	ft^2			
Number of Conditioned Floors:		Above Grade: 2		Below Grade:	
Year of Construction:					
Primary Building Function: ~~School~~					
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	
Meter Number:		Utility:		Meter Location:	

From Utility Bills:

Utility Company:	Account Number:	Energy Type:
Utility Company:	Account Number:	Energy Type:
Utility Company:	Account Number:	Energy Type:

Electricity ($kBtu/ft^2/yr$):	
Gas ($kBtu/ft^2/yr$):	
Oil ($kBtu/ft^2/yr$):	
EUI ($kBtu/ft^2/yr$):	111.2
Cost Index ($\$/ft^2/yr$):	

☑ Utility meters → big meter is for Village Hall, other two are for cellular data (not paid for by Village)
☑ Light fixtures

Brief Building Description: – Bldg was built in 1929
– 2001 renovation included interior wall additions

Site Plan (meter locations)

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Site Plan (meter locations)

Building Envelope

Construction Types (check all that apply)

Walls:		Insulated?
____	Wood	____
____	Masonry	____
____	Concrete (above grade)	____
____	Concrete (below grade)	____
____	Metal	____
____	Stone	____
____	Glass	____
____	Other (describe if other)	____

Doors:		
____	Solid Wood	____
____	Hollow Wood	____
____	Uninsulated Metal	____
____	Glass (<85%)	____
____	Other (describe if other)	____
____	Weatherstripping	

Roofs		Insulated?
____	Concrete Deck	____
____	Wood Deck	____
____	Metal Deck	____
____	Other (describe if other)	____

Windows (Metal Framed)		
____	Single Glazing	____
____	Double Glazing	____

Windows (Wood Framed)		
____	Single Glazing	____
____	Double Glazing	____

Additional Notes:

-Windows are likely original to the building

Building Use Schedule

Average Hours/Week: Average Weeks/Year:

After Hours Cleaning (Y/N):

* Building is "occupied" 24/7 due to Police dept.

Schedule for the months of (i.e. School Year Sept - June):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open	8:30	–	–	–	–	closed	closed	
Hours Closed	4:00	–	–	–	–			
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of (i.e. Summer Months July - Aug):

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Schedule for the months of:

Days	M	T	W	Th	F	Sat	Sun	Holiday
Hours Open								
Hours Closed								
Peak # of Occupants								
Average # of Occupants								

Building HVAC System Summary

Check all major systems that apply

Primary Cooling:

_______ Centrifugal Chiller
_______ Reciprocating Chiller
_______ Screw Chiller
_______ Absorption Chiller
_______ Packaged DX
_______ Split DX
_______ Air-Cooled Heat Rejection
_______ Water-Cooled Heat Rejection
_______ Ground-Source Heat Pump
_______ Air-Source Heat Pump
_______ Recirculating Water-Source Heat Pump
_______ Variable Refrigerant Flow

Primary Heating:

_______ Cast Iron Hot Water Boiler
_______ Condensing Boiler
_______ Steam Boiler
_______ Furnace
_______ Ground-Source Heat Pump
_______ Air-Source Heat Pump
_______ Recirculating Water-Source Heat Pump

AHU/Terminal Systems:

_______ Single Zone
_______ Multi Zone
_______ Dual Duct
_______ Variable Air Volume
_______ Reheat
_______ Fan Coil Units
_______ Unit Ventilators
_______ Packaged Terminal Air Conditioners
_______ Steam/Hot Water Radiators/Convectors
_______ Above Systems with Economizer

Exhaust Systems:

_______ Fume Hoods, Constant Volume
_______ Fume Hoods, VAV
_______ Kitchen Hoods
_______ Toilet Exhaust
_______ Locker Exhaust
_______ General Exhaust

Other:

_______ Cogeneration
_______ Energy Monitoring & Controls
_______ On-site Generation
_______ Active Solar Equipment
_______ Energy Recovery
_______ Thermal Storage
_______ Humidifiers/Dehumidifiers
_______ Dessicant System
_______ Evaporative Cooling
_______ Other

Describe if other: _______________________________

____
____
____
____
____
____
____
____
____

Notes:
Take photos of nameplates
Take photos of equipment

Building HVAC System Summary

Heating Plant

Boiler Quantity: 1 Size: 2.45 MBH (output) Type: Steam

Manufacture & Model: Weil McLain 88 Boiler Fuel Used: Natural Gas

Hot Water Supply Setpoint: N/A Steam Pressure Setpoint: ~~5~~ psi ~~(high limit)~~

Number of Pumps: Total HP: 7 psi (high limit

Additional Comments: Heating plant upgrades include heat timer and boiler controls, thermostatic radiator valves, burner replacement, condensate heat recovery, boiler replacement

- Village hall served by 2-pipe steam radiators
- No heating plant renovations aside from upgrading to dual-fuel
- small heat exchanger and HW pumps intended to serve Police station locker rooms ~~has~~ is not used

Cooling Plant

Manufacture & Model:

Chiller Quantity: Total Tonnage/kW:

Chilled Water Pumps Quantity: Total HP:

Chilled Water Supply/Return Temp Setpoint:

Condenser Water Pumps Quantity: Total HP:

Cooling Tower Fans Quantity: Total HP:

Additional Comments:

- Window AC units only ~11 window AC's
- Court room cooled by Trane RTU (DX cooling)
- 2 PTAC units serving Finance Dept.
- 2 split AC units serving Police Station.

Air-Side Systems

Tag	Model	Type (i.e. DX, VAV)	Location	Serves	Capacity/ CFM	Horsepower	Drive (VFD, etc.)
Court Rm	Trane	CAV	Roof	Court Room			

HVAC Operation and Maintenance

Unoccupied Setback

Shutdown of:	Check all that apply
AHU's by Time Schedule	________
Exhaust Fans by Time Schedule	________

Chillers:

By Time Schedule	________
By Outside Air Temperature	________

Boilers:

By Time Schedule	✓ → Boilers operate 24/7 due to police dept.
By Outside Air Temperature	________

Additional notes on operation and maintenance procedures related to energy efficiency:

- Steam radiators located in every office → controlled locally by thermostats
- Cooling is provided by window AC units only
- Bldg was forced to switch over to oil
- 3 zone valves for boiler plant
- Steam radiators in back vestibule, chiefs office, and rear vestibule
- Boiler was upgraded in 1997 to dual fuel burners
- Thermostatic steam traps are all original to bldg → renovations are under way to replace all ~~30~~ 36-40 total steam traps

- 2 thermostats controlling steam radiators in bldg
- 1 side (bldg dept., 2nd floor conference room, court room, court clerk office)
  ↳ occupied mode (~7:00am – 4:00pm) Monday through Friday 67°F and 63°F in unoccupied mode remainder of the time (weekends and nights
- Stair case is divider
- Second side covers (police dept., clerks office, village manager) and are t-stat is set at 69°F 24/7 due to police dept.

Domestic Hot Water Summary

Fuel Type:

✓ Electricity

Natural Gas

Oil

Steam

Heat Pump

Other (describe if other)

Number of Units: 1 Location: Basement Re-circ Loop? (Y/N):

Gallons: Hot Water Supply Temperature:

Tank Insulated? (Y/N): Condensing DHW Heater? (Y/N):

Additional Comments:

- DHW heater installed within past 2 years

-

Sketch of DHW piping schematic:

Food Preparation Summary

Item	Quantity	Load (kW)
Ranges	______	______
Steam Tables	______	______
Freezers	______	______
Refrigerators	______	______
Walk-In Refrigerators	______	______
Walk-In Freezers	______	______
Infra-Red Warmer	______	______
Microwaves	______	______
Mixers	______	______
Ovens	______	______
Frying Tables	______	______
Dishwashers	______	______
Exhaust Hoods	______	______

Additional Comments: ____

____

____

____

____

____

Sketch of kitchen layout:

Lighting Summary

Space	Type of Fixture	No. of Fixtures	Average Watts/fixture	Type of Controls	Ballast Type
First Floor	Ceiling pendant	5	13(3) = 39W	Manual	
Corridors	ceiling pendant	4	28(2) = 56W	Manual	
	Track lights	20		—	
	Ceiling pendant	1	13(2) = 26W	—	
Clerk's office	ceiling pendant	4	28(2) = 56W	—	
Bldg Dept.	ceiling pendant	8	28(2) = 56W		
Second floor	ceiling pendant	10	13(3) = 39W		
corridor	~~ceiling pendant~~				
Village Manager office	ceiling pendant	3	28(2) = 56W	—	
Francis Grabel	ceiling pendant	2	56W	—	
office					
Accounting office	ceiling pendant	6	56W	—	
Conference Room	ceiling pendant	3	56W	—	
Second floor Bathrooms	—	1	56W		
—	—	1	56W		
Staff Lounge	—	1	56W		
Judge Chambers	—	2	56W	—	
Court office	—	4	56W		
Police Dept.	—	6	56W		
Detective office		2	56W		
Chief office		2	56W		

Additional Comments:

Space Summary

Space Type	Clerk's Office	Village Manager	Francis' Office	Building Dept.	Conference Room	Finance Dept.	Staff Lounge	Judges Chambers
Conditioned Area (ft^2)								
Primary HVAC Type	window AC / steam radiators	-1 window AC unit -1 steam rad.	-1 window AC unit -Steam rad.	-2 window AC units -2 steam radiators	-1 window AC -Steam rad.	-1 window AC -Steam rad.	-No AC -steam rad.	-1 window AC -steam rad
Primary Lighting Type	ceiling Pendant	ceiling pendant		ceiling pendant				
Lighting Controls	Manual	—						
# of Occupants	2	1	1	4		2		
Weekday Hours in Use								
Weekend Hours in Use								

Space Type	2nd Floor Clerk's Office	Police Station						
Conditioned Area (ft^2)								
Primary HVAC Type	-1 window AC -Steam rad.	-2 Mitsubishi AC units -Steam radiators						
Primary Lighting Type	ceiling pendant	ceiling pendant						
Lighting Controls	Manual	—						
# of Occupants	2	~6-8						
Weekday Hours in Use								
Weekend Hours in Use								