PRISM ENERGY SERVICES
1150 Hancock Street, Suite 400 ▲ Quincy, MA 02169
T 617 328-9896 ▲ F 617 328-0496
www.prismenergyservices.com

PRISM ENERGY SERVICES
HELPING YOUR BUSINESS GO GREEN

ENERGY CONSERVATION MEASURES

Presented to

TOWN OF Millis

For

DOER APPLICATION

January 4, 2018

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Sites are broken down based on their addresses

EXISTING CONDITIONS

SITE 1:
DPW HIGHWAY DEPARTMENT

Heating and Cooling Systems

The DPW garage is occupied during the day until 3:00 PM, Monday through Friday. It is occasionally occupied 24/7 on days when there are snow storms. The garage bay is heated by four gas-fired fan coil units, each of which has a manual thermostat generally set at one temperature set point during the heating season regardless of occupancy. It is manually adjustable, but most of the time nobody remembers to set it back to lower temperatures at night or on weekends when the garage is not in use.

We propose to install programmable thermostats to allow automatic temperature setback during the hours the garage bay is not occupied.

SITE 2:
MIDDLE/HIGH SCHOOL

Heating and Cooling Systems

Heating Hot Water Pumps

The building is heated by three gas-fired hot water boilers. Water is circulated from the boilers to HVAC equipment such as air handling units, unit ventilators, fan coils, etc. via three dedicated hot water pumps. Each pump has a 20 HP motor which runs at constant flow all the time during the heating season. Two pumps run at a same time, with the third one serving as backup.

We propose to install a variable frequency drive on each of the three 20 HP pump motors to match the flow rate output to the building with the pumps speed. In addition, the energy management system will run two pumps at the same time and stage their speed based on the hot water demand by maintaining the differential set points between the supplied and returned hot water temperature.

Building Envelope- Weatherization

Air infiltration through entrance doors with poor or deteriorating weather stripping add a thermal load to the heating system during the winter. They also add an electric load to the cooling system during the summer.



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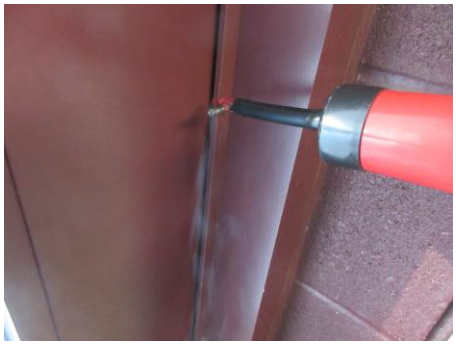


Door Weather-stripping

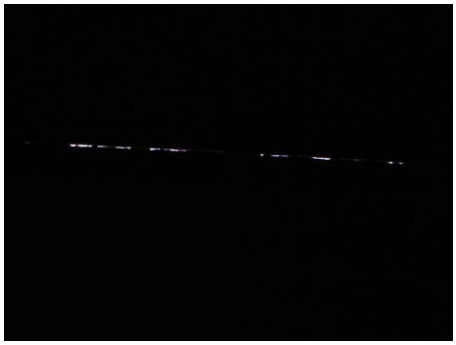
In addition, when the roof-wall intersections are not properly sealed, they create an excessive air infiltration/ exfiltration which add loads to the heating system.



Door Entry Header

Roof/wall joint leakage diagnosed with Air-Current Tester


Side by side roof/wall joint with visible daylight at joint

Side by side roof/wall joint with visible daylight at joint

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We propose to weather-strip all the doors with air gaps around their perimeter and the center of double doors.
We also propose to seal roof/wall joints which create air leaks to the inside/ outside of the school.
See details in the weatherization scope of work section

SITE 3:
TOWN HALL

Heating and Cooling Systems

The Town Hall is 100% heated by two gas-fired high efficiency hot water condensing boilers which were installed in the very recent years. Cooling is provided by a 90 ton packaged air cooled chiller. Hot and/or chilled water is circulated to unit ventilators, fan coil units, and air handling units by two hot water pumps which have newer variable frequency drives.

The piping system consists of a two-pipe system: chilled water and hot water use the same piping system and the same pumps for cooling and heating. The two water pumps are set at a fixed frequency of 42 Hz (Adjustable) when the boilers or the chiller are running. Only one pump runs at a time. The second pump is used for back up.

The boilers have a local controller which allows for hot water temperature reset based on outdoor air temperature.

Two air handling units unit bring in fresh air to the building all year round and they are used to ventilate, heat, and cool the spaces they serve.

Majority of the offices at the Town Hall are served by fan coil units which are controlled by local thermostats. The thermostats are adjustable by occupants and rarely get setback. They are left at the same set points for heating or cooling most of the time, despite offices being unoccupied at night and on weekends.

The rooftop units, air handling units, boilers, and the chiller have no controls to manage their operation, switchover to summer/ winter mode, adjust heating and cooling parameters based on occupancy of the building and outdoor air conditions. The building relies on an adjustable timer for each unit to operate the unit all week long from 6:00 am to 10 PM Monday through Sunday, with almost no setback of the zone temperature in all spaces or monitoring of the HVAC equipment operation.

The gymnasium is served by one rooftop unit (RTU). The RTU brings in a constant volume of outdoor air when in operation. Despite the occupancy of the gymnasium varying greatly throughout the day, the amount of fresh air to be conditioned by the RTU during the heating season is based on the maximum occupancy of the space.

The high ceiling of the gym creates air stratification during the heating season. The thermostat which commands the RTU heating valve to open or close to meet the set points is located at the lower level of the gym (4 feet above ground). The air temperature at the ceiling level is usually six to eight degrees greater than the temperature reading at the thermostat level due to air stratification when the space is being heated.

We propose to install an energy management system (EMS) to allow for optimal start/stop of the HVAC equipment based on the building occupancy (average of 40 hours per week). The EMS will match the HVAC equipment operation with the Town Hall open hours.

We also propose to install a demand control ventilation system on the gymnasium rooftop unit to optimize the amount of outdoor air intake based on the space occupancy during the heating season, reducing unnecessary heating of excessive fresh air intake which gets exhausted after being conditioned.

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In addition we propose install six de-stratification fans in the gymnasium to maintain an even temperature across the space and efficiently save thermal energy during the heating season. The fans will also be used during the non-heating season to circulate air through the space, especially when the windows are open for ventilation.

Lighting System

As with the rest of the facilities, the interior of the Town Hall is lit by mostly linear fluorescent fixtures with a mixture of T5, T8, and T12 tubes. Additionally, there are a number of compact fluorescent and incandescent screw-in lamps and can fixtures throughout the space.

The exterior of the facility is mostly high intensity discharge (HID) Metal Halide and High Pressure Sodium (MH and HPS) lighting which is very inefficient. These fixtures operate seven days per week for approximately 12 hours each day. With these long run hours, there is a lot of opportunity for energy savings. There are some fixtures that have already been upgraded to compact fluorescent and/or LED as well as some specialty halogen fixtures.

Though most of the interior is somewhat efficient, upgrading to LED will result in substantial energy savings. We propose to upgrade the highbay fixtures in the gym to new LED fixtures with integral occupancy sensors. The T8 and T12 fixtures in the office areas will be upgraded to new LED troffers where possible, otherwise new LED tubes and low power fluorescent ballasts have been proposed. The stairwell fixtures will be upgraded to new LED wall mount wraps which will dim automatically when no occupancy is sensed in the stairwell. There are a number of areas in the Town Hall that are only used for a few hours annually, such as some utility/storage rooms and many of the areas in the basement which will not be upgraded as the energy savings gained by upgrading far exceed the benefit due to the low hours of use.

Exterior HIDs will be upgraded with new LED fixtures. No recommendations have been made for existing halogen, CFL, and LED fixtures.

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Scope of Work

SITE 1:
DPW HIGHWAY DEPARTMENT

Programmable Thermostats

- Remove four (4) existing manual thermostats in the garage area
- Provide and install four (4) programmable thermostat where the manual thermostats are located
- Program the thermostats to setback the temperature to 58 degrees F (adjustable) during unoccupied hours or per schedule provided by the department (6:00 AM – 3:00 PM)
- Program the thermostats to an occupied temperature set point of 68 degrees F (adjustable) based on the schedule provided

SITE 2:
MIDDLE/HIGH SCHOOL

Variable Frequency Drives on Hot Water Pumps

Scope of work includes:

- Supply and Install (3) new VFDs for hot water pumps
- VFDs to come as 20 HP each
- Tie-in VFD controls into the energy management system (EMS)
- Program the VFDs operation in the EMS to modulate based on temperature differential between supply and return hot water temperature
- Start-up and commission the VFDs
- One year warranty

Weatherization

Doors Weather-stripping

14	Single commercial doors to be weather-stripped
1	Single commercial roof access door to be weather-stripped
1	Single commercial interior boiler room door to be weather-stripped
8	Double commercial doors to be weather-stripped
1	Overhead garage door to be weather-stripped, 34 linear feet

Door Header sealing

48’	Door entry header to be sealed, various penetrations at outer wall above side entry doors

Exhaust Fans air sealing

4	Roof top ventilators to be opened, dampers lubricated and perimeters sealed, 16 linear feet

Roof/Joint Sealing

1,835’	Roof/wall joint to be sealed at various building perimeters

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SITE 3:

TOWN HALL

De-stratification Fans in Gym

New De-stratification fan installation

- Provide and install six (6) new single phase 120V de-stratification ceiling fans in the gymnasium
- De-stratification fans to have fan safe guard around them
- Provide and install a new breaker for the ceiling fans in the electric panel dedicated to the gym plug in loads
- Install all the wiring from the breaker in the electric panel, to the switch, to all the fans
- Install one switch to turn on/off the ceiling fans
- Install all the wiring from the main control panel
- Start-up and commissioning of fans operation
- One year warranty

Energy Management System

Scope of work consists of installing a new energy management system (EMS) at the Millis Town Hall building. The new EMS will have the capability for remote access and will allow control and monitoring of HVAC Equipment.

The proposed Energy Management System and its control devices (Distech Technology) is an Open Protocol and compatible with any other control vendor.

The scope of work also includes:

- Install new Distech EC-BOS-8 /HTML 5 front end web server for control, monitoring and remote access.
- Provide new EMS software. Software implementation includes all graphics and mechanical screens
- Install three (3) BacNet communications to the existing boilers (3) control panel
- Install one (1) DDC control for one packaged air cooled chiller. System controls to include chiller enable/disable, chiller reset, chiller status, Chilled/ Hot supply and return water temperature
- Install one (1) DDC controls for one rooftop unit (Gym). System controls to include fan start/stop, fan status, gas heat stages, outdoor air damper modulation, and discharge air temperature.
- Install two (2) DDC controls for 2 indoor air handling units .System controls to include fan start/stop, fan status, face & By-Pass damper modulation, outdoor air damper modulation, discharge air temperature, and space temperature
- Install DDC controls for four (4) unit ventilators .System controls to include space temperature fan start/stop, fan status, and Hot water/Chilled water valve modulation
- Provide and install current switches for fan status
- Provide and install pilot duty relays for On/Off Control.
- Provide training and commissioning
- One Year Warranty

Town Hall Lighting

Please see the line by line below for a more detailed listing of measures to be installed.