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Final Report for:

Town of Pittsford

Pittsford, NY

Energy Efficiency Measures in Town Owned and Operated Buildings

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Prepared for:

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A. Executive Summary

The New York State Pollution Prevention Institute (NYSP2I) at Rochester Institute of Technology (RIT) conducted a project entitled, “Energy Efficiency Measures in Town Owned and Operated Buildings” for Town of Pittsford (Pittsford). The objective of the project was to review the energy use in a selection of town owned and operated buildings, identify energy conservation measures (ECMs), and estimate the approximate payback periods for ECMs requiring capital investment. In pursuit of this objective, NYSP2I reviewed Pittsford’s energy utility costs for the buildings listed in the ENERGY STAR Portfolio Manager®[1], selected two high opportunity buildings, performed high level energy opportunity assessments, and reported a list of opportunities from the two assessments to Pittsford.

The results of this project include lists of suggested ECMs for Pittsford’s Town Hall and Highway Garage. Some of the ECMs should require little to no cost to implement and will provide immediate cost savings while other ECMs have some associated costs but with energy cost savings. Pittsford should prioritize each list and implement as many ECMs as possible to maximize energy cost savings.

B. Introduction

The Town of Pittsford, NY is a community of 29,000 residents (2010 Census) located in southwestern Monroe County approximately eight miles from the city of Rochester. Established in the early 1800s, Pittsford, a 2017 NYSERDA-designated “Clean Energy Community,” continues to grow due to its reputation as one of the more attractive Rochester suburbs.

Pittsford has a long history of sustainability beginning with the 1996 adoption of its GreenPrint Plan. In 2017, Pittsford became a “Clean Energy Community” after implementing four high impact practices and in doing so won a $50,000 NYSERDA grant to pursue two additional greenhouse emission reduction projects. The funds will be used to install a Level 2 (208V-240V source) electric vehicle charging station and a roof mounted solar array to power lodges at King’s Bend Park. Working through the Genesee-Finger Lakes Regional Planning Council (GFLRPC), Pittsford

[1] Portfolio Manager by ENERGY STAR - https://www.energystar.gov/buildings/facility-owners-and-managers/existing-buildings/use-portfolio-manager

requested assistance from NYSP2I in the assessment and identification of potential energy efficiency measures (EEM) in Pittsford owned and operated buildings.

In 2013, with permission from Pacific Northwest National Laboratories (PNNL), NYSP2I expanded PNNL's Building Re-tuning Training for small to medium commercial buildings to include similar sized industrial buildings. NYSP2I then trained cohorts of building managers around New York State. NYPS2I used the techniques of Building Re-tuning to perform building energy assessments of Pittsford's highest opportunity buildings. Using the information in Portfolio Manager and Pittsford's energy utility bills, Pittsford's Town Hall and Highway Garage were selected for energy assessments.

C. Project Objective

The objectives of this project were to find energy waste or inefficiencies within Pittsford's highest opportunity buildings and recommend ECMs to correct or improve the problems.

D. Work Performed and Results

To achieve the project objectives, NYSP2I performed the following tasks as specified by the project contract:

Task 1 – Review Energy Use Data

Pittsford provided NYSP2I access information to their Portfolio Manager account. NYSP2I compared both the energy use index (EUI) and annual energy consumption of each of Pittsford's buildings. NYSP2I then reviewed utility bills from Pittsford's buildings to understand the various charges like delivery, use, and demand.

Task 2 – Select High Opportunity Buildings

NYSP2I and Pittsford (the project team) considered EUI, energy consumption, and building age to select the Town Hall and the Highway Garage as having highest potential opportunities. The project team also discussed the Pittsford Community Library but later chose to focus more deeply on the Town Hall instead of performing an assessment of the nearly new library.

Task 3 – Perform High Level Energy Assessments

NYSP2I led Pittsford staff on building energy walk-throughs known as walkdowns in the Pittsford Town Hall and the Town Highway Garage to demonstrate assessment procedures. For each

building, NYSP2I walked through and around the building using tools to identify energy waste. Some of the tools used were:

- Thermal Imaging Camera
- Handheld environmental multi-meter that includes:
  - Temperature
  - Relative Humidity
  - Anemometer
  - Light meter
- Extendible hot-wire anemometer
- Handheld thermocouple sensor

In a later visit, NYSP2I attached a water meter to the cooling tower supply pipe in the Town Hall mechanical room.

During the walk-throughs, NYSP2I observed or measured building conditions, environmental conditions, mechanical equipment, temperature set-points, and light switch status. Specifically, the following items were observed or measured:

- Building Envelope – insulation, walls, roof, windows, doors, utility entrances, etc.
- Lighting – interior and exterior control schedules, lamp types, lighting levels, etc.
- Office Equipment
- Indoor Environmental Conditions
- HVAC – temperature set-points and schedules, chiller and boiler equipment condition and maintenance, equipment sizing, outdoor air reset, plumbing, air distribution, makeup air control, economizers, etc.
- Hot Water set-points and use

The results of the walkdown were used to identify opportunities and recommend ECMs for each building. The Wakdown Reports for the Town Hall and Highway Garage are included in this report as Appendix A.

Pittsford Town Hall

The Town Hall walkdown started at 7:00 am on Monday, December 2, 2019 – the first working day after a four day Thanksgiving weekend. The outdoor air temperature ranged between 30°F

and 33°F during NYSP2I's visit. The exercise revealed a variety of issues, many related to the age of the building and some related to its operation. Windows throughout the building are single-pane units in original wood frames. Most of the windows have storm window mounts, but not all had the storm windows installed. Some window panes were cracked, further increasing heat loss. Blinds can reduce heat loss through leaky windows but most blinds were open.

Temperature set-points in most areas were set near ASHRAE recommended heating set points (68°F to 72°F) but some were set very high (79°F). Additionally, building occupants and visitors have access to thermostats and heat pump consoles throughout the building. In areas served by multiple heat pumps, this can cause simultaneous heating and cooling as was found in the basement meeting room where a heat pump was running in cooling mode while heated supply air was fed from a diffuser directly above it. It was also observed by and communicated to NYPS2I that unoccupied temperature set-backs are not used due to the anticipated cost to re-heat/cool. Maintaining occupied temperatures during evenings and over weekends consumes energy unnecessarily.

The largest potential energy waste identified was the in the cooling tower. Boiler water is run through the cooling tower all winter to avoid freezing because there is no means to bypass the tower. In most applications in cold climates, valves and a bypass are incorporated to allow cooling towers to be bypassed and drained in winter. NYSP2I estimated the heat lost through the cooling tower during average Rochester, NY months of November through March. The estimate was based on:

- Measurement of cooling water flow over a three day period in January, 2020
- Measurement of cooling water pipe temperatures leading to and returning from the cooling tower
- Measurement of inlet and exhaust air temperature through the cooling tower
- Calculating the induced draft through the tower based on the change in air density and cooling tower dimensions
- Calculating the cooling tower effectiveness during the measured time
- Calculating the heat transfer from the boiler water to the air using weather data for five winter months.

The estimated annual heat loss through the cooling tower is 1900 therms or 18,971 kBTU costing an estimated $1444 per year. Since all building heat except fresh air reheat is provided by heat pumps, the heat lost to the cooling tower also increases the work required of the heat pumps and

therefore their electric consumption. Pumping water through the cooling tower increases pump energy all winter as well. Examination of electrical demand and natural gas consumption shows that the coldest months coincided with the highest electric demand (see Figure 1). Addition of three isolation valves and bypass piping could eliminate or significantly reduce these losses.

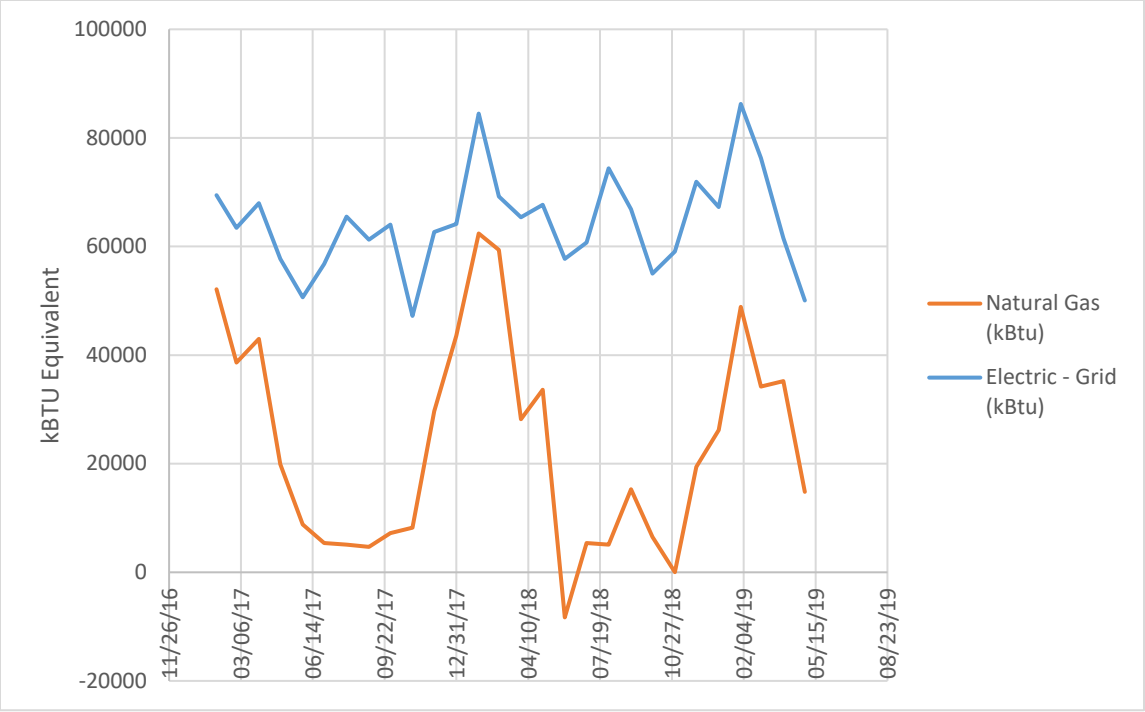


Figure 1 - Electric demand and natural gas use as entered in Portfolio Manager.

Finally, some lights were left on over the holiday weekend but most were off upon the walkdown team's arrival. NYSP2I left a Dent® brand LIGHTING*logger*™ on one of the basement meeting room light fixtures from December 2, 2019 through January 28, 2020. The device logged the on-time of the light circuit during the dates previously noted. While the lights were regularly turned off evenings and weekends, NYSP2I noted that much of the light energy in that room could be eliminated by leaving two of the three light circuits off at all times except during meeitngs or other room use. The front (north) circuit provides enough light for staff to pass through on their way to basement offices and restrooms. Leaving only the north circuit on during the day would save about 50% of the lighting energy in that space.

For a complete list of energy opportunities and ECMs, see the Building Walkdown Report for the Town Hall in Appendix A.

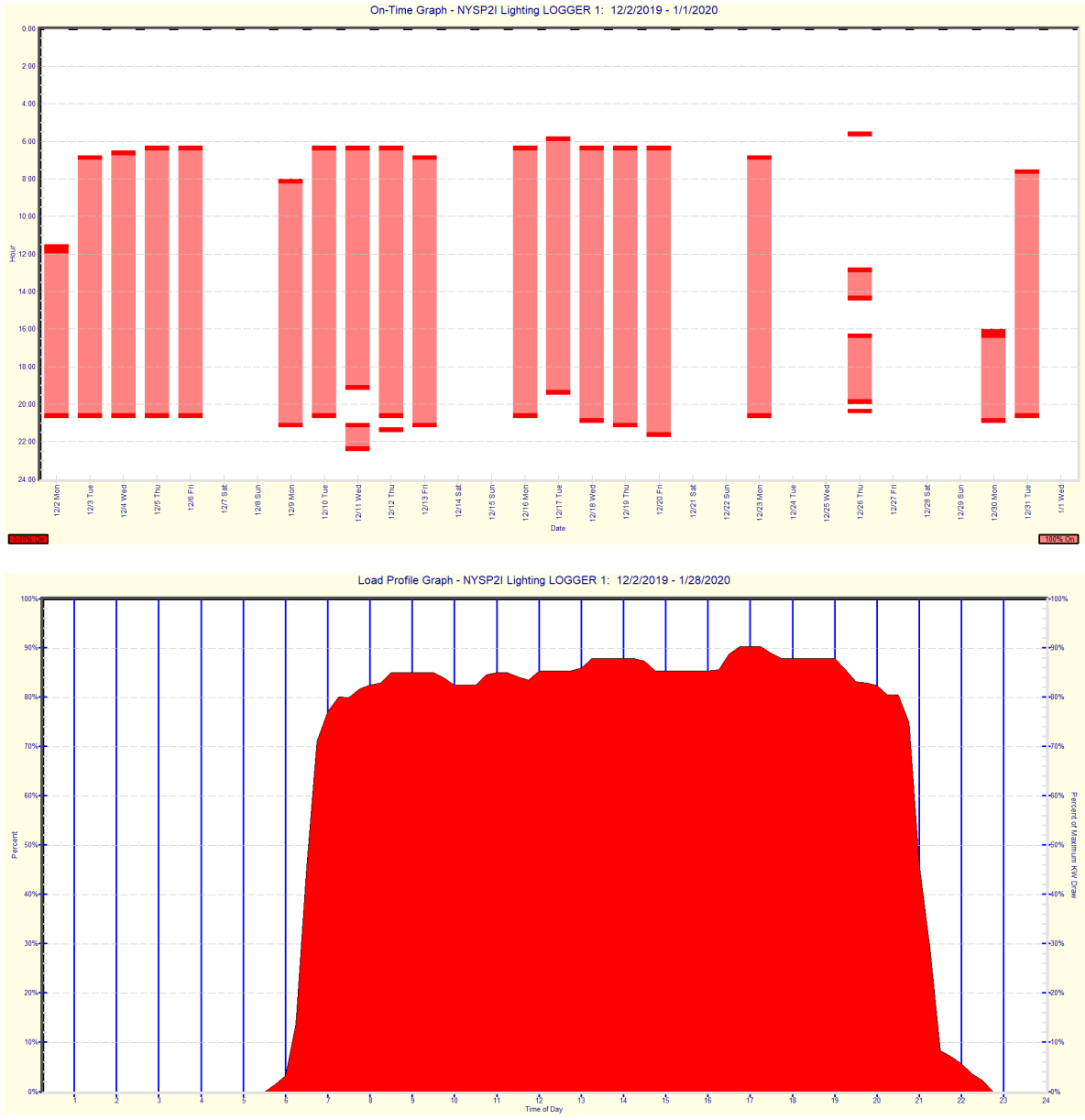


Figure 2 - Light log for the rear (south) light circuit during the December, 2019. The top pane shows the actual times that lights were on. The bottom pane shows the on percentage for each hour of an average weekday. The lights were regularly turned off evenings and weekends.

Pittsford Town Highway Garage

The Town Highway Garage walkdown was performed on December 12, 2019. The outdoor air temperature was about 13°F at the beginning of the visit and warmed to about 25°F by the end of the walkdown. The visit to the Town Garage revealed excess energy use related to building

age and condition, initial building design, building modifications, and building use. Figure 3 shows the electrical demand and natural gas usage (units converted to KBTU for comparison) in the building. This section will discuss a few of the higher value opportunities.

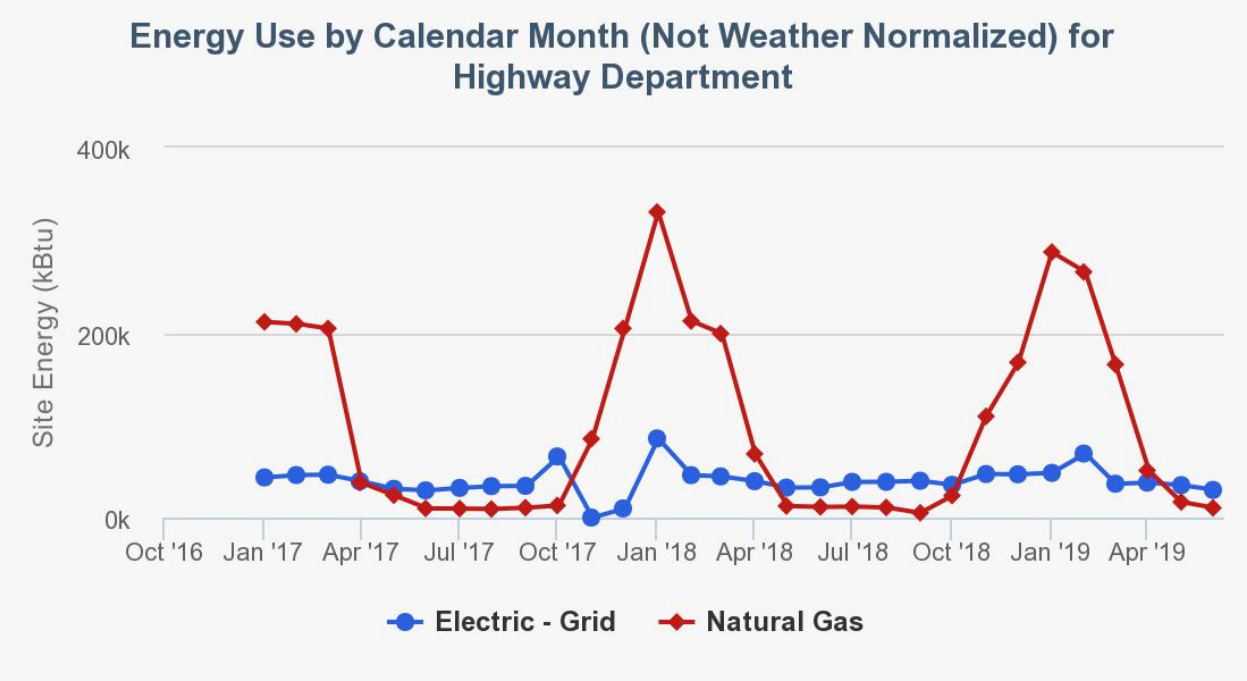


Figure 3 - Electric energy and natural gas consumption in the Town Highway Garage.

The Highway Garage heats and cools the office areas with an outdoor, gas fired, packaged unit with supply and return connected to the building via sheet metal ducts. The packaged unit serves the office area, the break room, the locker room, and the rest rooms. The packaged unit is scheduled for replacement in the near future. The ducting and diffusers allowed most of the air to exit into the offices and the south end of the break room. Relatively little air made it to the locker and rest rooms. Pittsford should consider improving the ducts through the break room and into the locker and rest rooms when the packaged unit is replaced.

A gas fired unit serves the parts room but is rarely used, according to the parts room staff. The bays and repair shop are heated by gas fired radiant heaters. Temperature set points throughout the bays were about 64°F. The truck bay doors all operate by remote door openers in the truck cabs to minimize open time during parking operations. There are two different truck exhaust ventilation systems in the repair shop bays. The on-duty repair technicians stated that they do not use the ventilation systems because they don't believe they work properly. Instead, they open the bay doors when they need to run trucks in the bays. Pittsford should repair at least one of the

exhaust ventilation systems and instruct repair staff to use them to minimize heat loss during service. Man doors in the bays were propped open to allow convenient access to drivers. The partially open doors are a significant heat loss and NYSP2I observed that at least one of the doors was propped open unnecessarily because it was not locked. NYSP2I also observed that the damper under one of the roof vents was stuck open, allowing warm air to escape through the roof.

Compressed air is used throughout the garage. NYSP2I observed several air leaks during the walkdown. Since compressed air efficiency is very low (5% - 10% efficient) air leaks are particularly costly. Pittsford should consider periodic leak audits to measure the overall leak rate and to find and repair air leaks.

The hot and cold water valves at the points of use (POU) are unusual in that the hot and cold supplies are tied together between the separate hot and cold water valves and the hose connections. The water valves were left open at all of the POUs, connecting the cold water system to the hot water supply. The result is that when water is used in the building, even cold water, hot water is consumed. A thermal image of one of the water POUs in the Highway Garage Walkdown Report shows that hot water is circulated back through the cold water supply. Hot water is therefore being used unnecessarily. Pittsford should train employees to close the hot water valves at each POU when not in use. See the Highway Garage Walkdown Report in Appendix A for more information.

E. Conclusions and Next Steps

During the performance of this Energy Efficiency Assessment project, NYSP2I, working with Pittsford staff, identified many ECMs. Many of the ECMs, like turning off unnecessary lights or keeping doors closed in winter, have no implementation costs and provide immediate cost savings. Other ECMs, like closing roof dampers in heated garage bays, may require a small cost or effort, but will provide energy cost savings with a quick payback. There were also some ECMs that require a more significant investment, like installing a bypass circuit and valves in the Town Hall cooling tower water circuit but could save significant energy cost. NYSP2I estimated the winter cooling tower energy cost exceeds $1400 per year. A cost estimate for the bypass circuit is necessary to predict the payback time.

As required by the funding source for this project, NYSP2I will publish a case study about this project on its website and will collect project metrics for a period of three years after the end of the project.

F. Appendix (optional)

Building Re-Tuning Walk-down Observations for Pittsford Town Hall

Background

Commercial buildings account for almost 20% of the total U.S. energy consumption and up to 30% of the energy they use is stated due to improper and inefficient operations[2]. As a result, in recent years, much attention has been given to energy efficiency of large commercial buildings. The concept of re-commissioning these large buildings to reduce energy use after a period of operation has shown that improvements are possible even to well designed and maintained buildings. More recently, reduced scope versions of building re-commissioning have been developed for commercial buildings called Building Re-Tuning. The U.S. Department of Energy's Building Technologies Office and the Pacific Northwest National Laboratory (PNNL) have developed classroom and online training for commercial Building Re-Tuning.

In 2012, the National Institute of Standards and Technology sponsored the development of a Building Re-Tuning (BRT) Curriculum for Small to Medium sized Industrial buildings. Rochester Institute of Technology (RIT), in partnership with PNNL and the City University of New York (CUNY) developed a curriculum to train owners of small to medium sized industrial buildings how to perform building energy retuning assessments of their buildings.

Using walkdown and analysis techniques from the BRT curriculum, New York State Pollution Prevention Institute (NYSP2I) from RIT performed a BRT walkdown of Pittsford's Town Hall building located at 11 South Main Street in the village of Pittsford.

Executive Summary

NYSP2I accompanied by Randal Lewis of the Town of Pittsford performed a Walkdown assessment of the Pittsford Town Hall building. An early start time of 7:00 am on December 2, 2019 was chosen to allow the team to see how the building was left over the long holiday (Thanksgiving) weekend. The Building Re-Tuning walk-down report presents the preliminary re-tuning results of the walk-down exercise and subsequent analysis of the observed results. The purpose of the walk-down was to identify

[2] US Energy Information Administration's 2018 Commercial Buildings Energy Consumption Survey (CBECS) - https://www.eia.gov/consumption/commercial/

energy conservation measures (ECM) in the building and to demonstrate the BRT techniques to Town of Pittsford staff.

The Building Re-tuning effort focuses on evaluating the building's operation and energy performance and on low and no cost opportunities that may lead to reduced energy consumption and improved comfort.

The following list covers the opportunities identified by NYSP2I during the Pittsford Town Hall walkdown and suggested energy conservation measures to mitigate the inefficiencies. The list is categorized by energy users and includes occupant behavior since the occupants can impact building energy use. Many of the opportunities are low or no cost implementations but some will require capital expenditures. In the following list, some of the re-tuning opportunities and ECMs are qualified for effort and energy savings. The qualitative ratings of low, medium, and high are somewhat subjective but low effort generally means that the ECM takes a few hours to implement and low savings indicate less than 5% reduction. High effort indicates extensive capital cost and/or many hours of effort and high savings indicate 10% to 30% energy reduction[3]. NYSP2I encourages Pittsford to contact the local utility to inquire about energy conservation programs that might offset the cost of implementing costly measures, but may still have a reasonable payback (less than three years).

Building Envelope

- Single pane windows in wood frames throughout the building. Not all storm windows were in place
    - Consider a window retrofit with double or triple pane windows and new frames
        - Could save about 6% of total energy cost
        - This ECM would be considered medium to high effort and medium savings
    - Install storm windows an all windows. This is a low effort task that can provide measureable savings.
    - Consider reflective film to reduce solar gain in summer
- Cracked windows in basement
    - Replace with double or triple pane, or glass block windows
- Air leakage around some windows
    - Seal windows with new weather-strip or caulk
    - Seal windows with plastic shrink-film. This is a low effort ECM that can provide medium savings.
- Front vestibule windows and doors.
    - Windows in doors are single pane and allow leaks around glass. Consider replacing doors with insulated doors containing double or triple pane windows.
    - Consider an air curtain to limit exchange of outside air when door is opened.
    - Nice job on well-maintained weather-strip and threshold seals.

[3] The savings are relative to the component or system level savings and not whole building level.

    - Door from vestibule to interior has large gap under it. Consider a threshold seal to minimize air exchange into building if vestibule temperature set-backs are used.
- Blinds in most offices remain open
    - Blinds can reduce air infiltration and heat loss through windows. Instruct occupants to close blinds to conserve energy.
    - Consider translucent insulating window treatments to allow light in while providing insulation.
- Leaks between north side door and door frame
    - Install new weather-strip and sweep
- Leaks around north side door frame
    - Remove door casing, insulate with expanding foam insulation and re-install casing
- Insulation appears to be missing or thinner in ceiling space between floors
    - Install insulation on exterior walls in ceiling space.
    - Check supply air ducts in ceiling space to make sure conditioned air is not leaking into the space.
- Cracks in external walls allow heat to escape (See Figure 1 and Figure 2).
    - Locate cracks, insulate with expanding foam, and re-grout

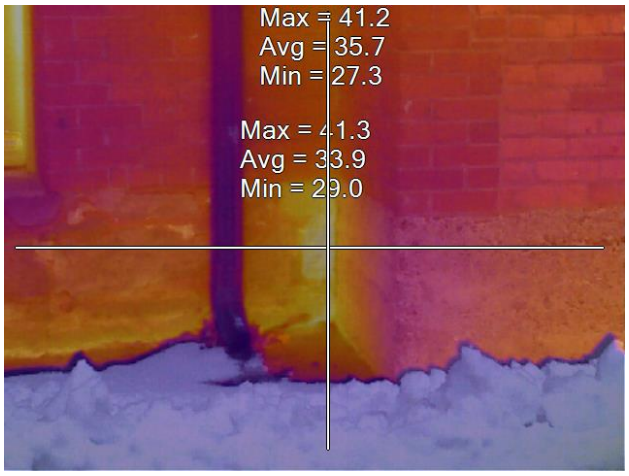


Figure 4 - IR000199.IS2: Thermal image of apparent crack in a corner on the south side of the building.

Figure 5 - IR000192.IS2: Thermal image of exterior wall on east side of building. The heat escaping at the bottom of the wall may also indicate a gap.

- Hot spot in peak (Figure 4) and heat from ridge vents indicates possible substandard attic insulation
  - Concern also supported by thermal image of 2nd floor ceiling shown in Figure 3.

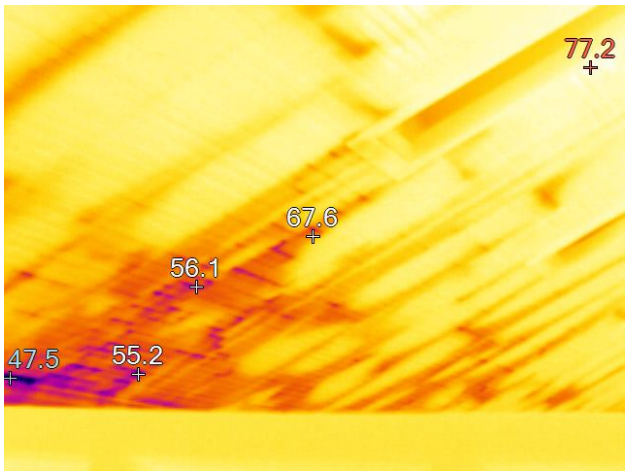


Figure 6 - IR000137.IS2: Thermal image showing cold area of 2nd floor ceiling. Compromised insulation could cause cold areas.

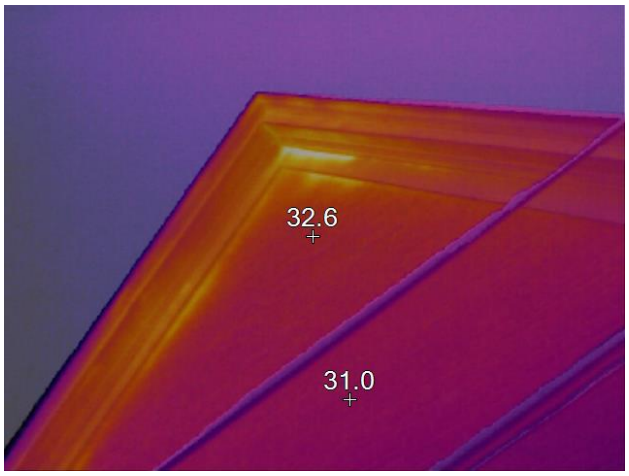


Figure 7 - IR000194.IS2: Thermal image showing heat loss near the peak of the east end of the building that could indicate that heat is escaping into the attic space.

Occupant Behavior

- Occupants open windows for fresh air even though the HVAC brings in adequate fresh air. Opening windows while HVAC is running can cause the HVAC system to operate more than necessary.
  - Leave storm windows on all year
  - Install signage to discourage occupants from opening windows
  - ISO-50001 style training for occupants to educate them on the operation, energy efficiency, and performance of the HVAC system.
- Building occupants set their own thermostats. Most are reasonable, but some areas are set higher. For example, the town historian's office measured over 80°F.
  - Calibrate thermostats so the temperature reads accurately.
  - Install wall thermometers in offices so occupants can see the actual temperature.
  - Install signage with ASHRAE recommended set-points.
  - Restrict control to building manager.
- Occupants and visitors can adjust heat pump consoles; e.g. - One basement console was running in cooling mode while the fresh air system was heating the space.

Figure 8 - Basement heat pump console running in cooling mode directly under an air vent supplying heat to the room.

- Restrict access to controls to responsible occupants or building manager
- Install timers so changes to settings are temporary

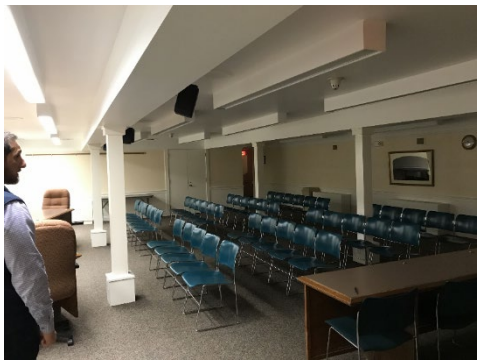
- Temperature set-backs are not used for unoccupied times due to the belief that the energy to re-heat the building exceeds the energy saved with night and weekend set-backs. Therefore the building operates in occupied mode all of the time.
  - Have the building manager perform an experiment comparing set-back operation to full time occupied operation. NYSP2I can advise on experiment protocol if requested.
  - Install interval meters and have building manager evaluate daily
- Some computer monitors were left on over the Thanksgiving weekend.
  - Program computers to turn off displays during inactivity.
  - Instruct office staff to turn off displays at end of day.

Occupancy

- Evening meetings in basement meeting room extends the occupied time of that space.
  - Use different set-back schedules on upper floors than in meeting room
  - Allow a two or three hour hold function in meeting room so attendees can temporarily adjust the temperature for an event.
  - Install signage near the exits reminding attendees to turn off the consoles when at the end of evening use.
- Cleaning staff work after hours extending the building occupied hours.
  - Consider scheduling cleaning staff during occupied hours
  - Use smart thermostats to limit set-backs while cleaning staff is working
  - Different set-back for summer and winter - cleaning staff is more active than office staff and can be comfortable in cooler temperatures during the heating season.

Lighting

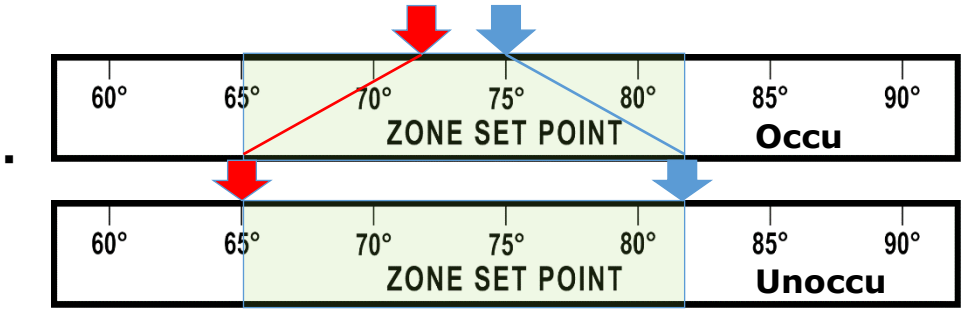
- Basement meeting room lights are fully on all day (8 am to 8 pm) even though the room is only occasionally used during normal working hours. Staff members pass through on the way to and from offices so some light is needed.
    - Lights in that space are on three circuits. Consider turning two off unless there is a meeting in progress. Leave one on for occupants that need to pass through that space. The photos below show the room with all lights on and just the front lights on. Note that the front light circuit also covers the elevator and stairwell entrance.

    - Install signage to instruct staff on proper light use.
    - Install occupancy sensors on the two rear (south) circuits.
- Most lights are on manual switches.
    - Consider occupancy sensors in low use areas
- Mix of lamp types: T-5, T-8, and T-12
    - Consider full LED retrofit
- Second floor office lighting level was over 80 ft.-candles.
    - Guidelines for open office lighting levels are 30-50 ft.-candles. Consider reducing overall light levels with an LED conversion from the existing T-5 fluorescents. See Table 1 for more information.

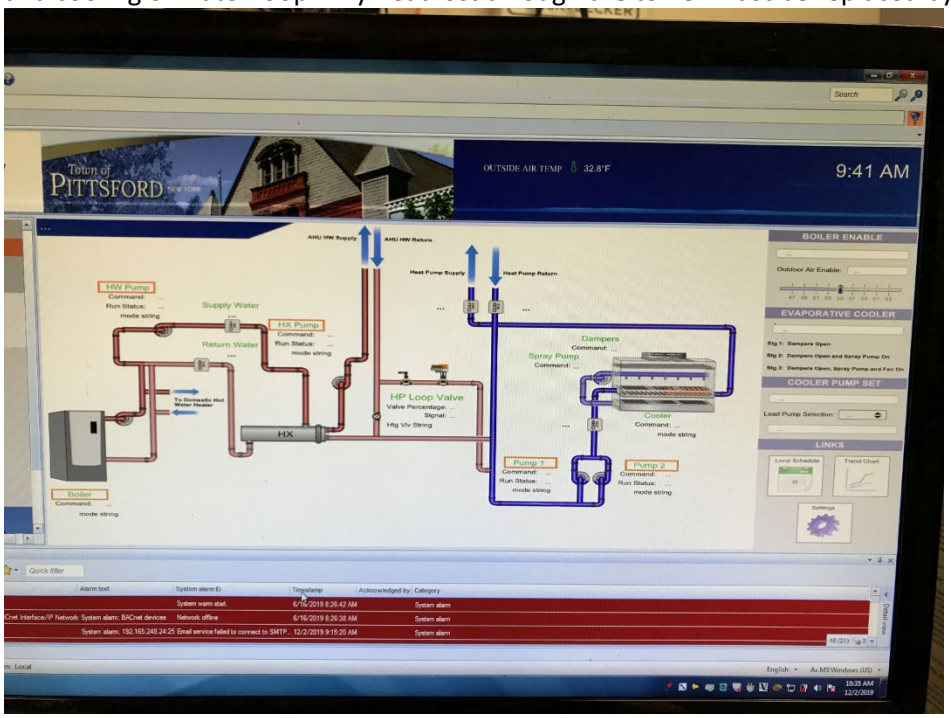
HVAC

- Mix of programmable and manual (mercury type) thermostats
    - Switch to all programmable or smart thermostats.
    - Utilize programmed set-backs and auto adaptive start/stop features.
    - Utilize auto start feature to calculate optimum time to switch to occupied mode.
- Not currently using set-backs on current programmable thermostats
    - Set-backs are known to reduce energy use when ASHRAE guidelines are followed.
        - 70-72°F occupied set-point is comfortable for most office staff
        - Minimum of 5°F heating set-back for unoccupied times
        - Minimum of 2°F difference between heating and cooling occupied set-points (3°F is better). 75-78°F is recommended cooling set-point for cooling season.
        - Minimum of 5°F increase for unoccupied cooling set-point



- See note in behavior section

- Heating/cooling is used in front vestibule
  - Consider reducing heating and increasing cooling temperatures in the vestibule
    - Make sure it doesn't adversely affect the clerk's office staff when the entry door is opened.
- Duct attached to HPL-13 leaking due to aged duct sealing tape.
  - Use UL listed metal tape to seal ducts instead of duct tape.
  - Consider an inspection of all ceiling and attic ducts. Are the unheated spaces through which they pass showing signs of air leakage? i.e. – warm in winter and cool in summer. Are there any visible leaks? Are the ducts well insulated?
- Boiler water is run through cooling tower prior to heat pumps. Staff said it is to keep cooling tower from freezing. This is not a common practice and is the same as simultaneous heating and cooling of water loop. Any heat lost through the tower must be replaced by the boiler.



  - Winterize the cooling tower in the fall and valve off the water to it. This will save electricity used by the tower pumps and reduce natural gas used by the boiler.
  - This ECM is considered medium to high effort because it requires plumbing changes to the heat pump circuit but it is expected to yield high energy savings.
- Space heaters in offices indicate that the heating system is not well balanced.

- Work to balance the heating system
- Use ASHRAE recommended temperatures. Ensure that the set points are the actual space temperatures. Recalibrate or replace thermostats if necessary.
- Look for localized air leaks or missing insulation near space heater locations and repair.

○ Diffusers and covers on HVAC ducts indicate system imbalance.
- Look for the root cause the occupant discomfort and correct.

○ Electric heater in lower level women's restroom was set very high (over 80F).
- Set temperature according to ASHRAE recommendations and restrict use
- Install a thermometer in room so occupants can see the actual temperature

Table 1 - Guidelines for Acceptable Lighting Levels

Guidelines for Acceptable Lighting Levels
(all values are in foot candles)

Area	Guideline Average	Recommended Minimum	Recommended Maximum
Parking lot	N/A	0.1	5
Elevator	N/A	5	10
Inactive storage	5	5	10
Active storage	10	5	15
Stairs	10	10	15
Restroom	10	10	20
Corridor	10	10	30
Dining area	10	10	30
Lounge	10	10	30
Atrium	10	10	30
Lobby	10	10	30
Mechanical room	30	20	40
Enclosed office	30	20	50
Open office	30	30	50
Conference Room	30	30	50

Follow-Up Re-Tuning Recommendations

Re-tuning should be continued on a continuous or periodic basis, after the initial re-tuning visit. Follow-up actions should include the following.

1) All operation and maintenance actions recommended in this report should be implemented to maximize energy savings, reduce energy costs, and improve the comfort of occupants. Actions with a status of “recommended” should be implemented in the days and weeks following initial re-tuning.

2) Continue to re-tune your building as changes occur (such as changes in tenants, schedules, remodels, etc.). A similar walkdown should be performed during spring, summer and fall seasons.

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Building Re-Tuning Walk-down Observations for Pittsford Highway Garage

Background

Commercial buildings account for almost 20% of the total U.S. energy consumption and up to 30% of the energy they use is stated due to improper and inefficient operations[4]. As a result, in recent years, much attention has been given to energy efficiency of large commercial buildings. The concept of re-commissioning these large buildings to reduce energy use after a period of operation has shown that improvements are possible even to well designed and maintained buildings. More recently, reduced scope versions of building re-commissioning have been developed for commercial buildings called Building Re-Tuning. The U.S. Department of Energy's Building Technologies Office and the Pacific Northwest National Laboratory (PNNL) have developed classroom and online training for commercial Building Re-Tuning.

In 2012, the National Institute of Standards and Technology sponsored the development of a Building Re-Tuning (BRT) Curriculum for Small to Medium sized Industrial buildings. Rochester Institute of Technology (RIT), in partnership with PNNL and the City University of New York (CUNY) developed a curriculum to train owners of small to medium sized industrial buildings how to perform building energy retuning assessments of their buildings.

Using walkdown and analysis techniques from the BRT curriculum, New York State Pollution Prevention Institute (NYSP2I) from RIT performed a BRT walkdown of Pittsford's Town Highway Garage located at 6.

Executive Summary

NYSP2I, accompanied by Randal Lewis of the Town of Pittsford, performed a Walkdown assessment of the Town of Pittsford's Highway Garage. NYSP2I met Mr. Lewis and Matt O'Connor at the Highway Garage at 8:00 am of 7:00 am on December 2, 2019. The Building Re-Tuning walk-down report presents the preliminary re-tuning results of the walk-down exercise and subsequent analysis of the observed results. The purpose of the walk-down was to identify energy conservation measures (ECM) in the building and to demonstrate the BRT techniques to Town of Pittsford staff.

[4] US Energy Information Administration's 2018 Commercial Buildings Energy Consumption Survey (CBECS) - https://www.eia.gov/consumption/commercial/

The Building Re-tuning effort focuses on evaluating the building's operation and energy performance and on low and no cost opportunities that may lead to reduced energy consumption and improved comfort.

The following list covers the opportunities identified by NYSP2I during the Pittsford Town Hall walkdown and suggested energy conservation measures to mitigate the inefficiencies. The list is categorized by energy users and includes occupant behavior since the occupants can impact building energy use. Many of the opportunities are low or no cost implementations but some will require capital expenditures. In the following list, some of the re-tuning opportunities and ECMs are qualified for effort and energy savings. The qualitative ratings of low, medium, and high are somewhat subjective but low effort generally means that the ECM takes a few hours to implement and low savings indicate less than 5% reduction. High effort indicates extensive capital cost and/or many hours of effort and high savings indicate 10% to 30% energy reduction[5]. NYSP2I encourages Pittsford to contact the local utility to inquire about energy conservation programs that might offset the cost of implementing costly measures, but may still have a reasonable payback (less than three years).

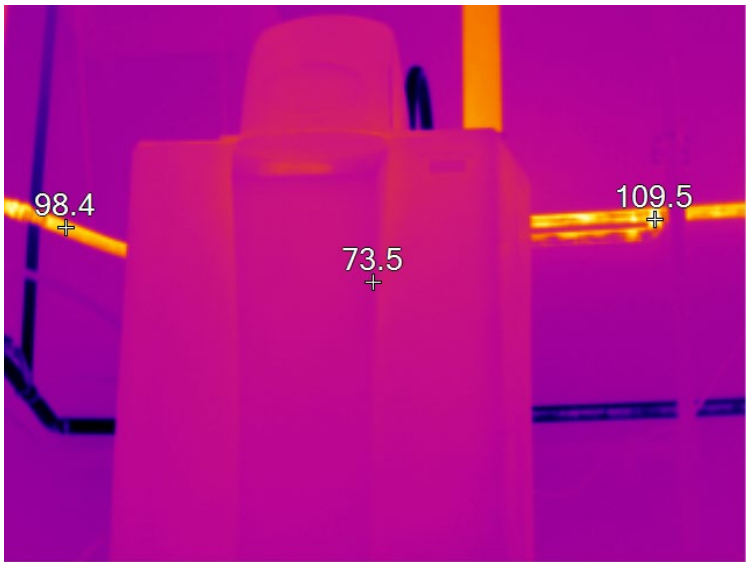
Building Envelope

The outdoor air temperature was in the mid-teens during the walkdown.

- Front Office
    - The damper above the workstation was nearly closed due to overcooling in the summer. Meanwhile an electric space heater was running in that area. Airflow from the damper was 15 – 30 fpm. Flow from the other damper in that room was 360 fpm. Consider opening the damper in the winder to avoid the cost of the electric heater.
    - Aluminum window frames in the front offices lose a lot of heat through the frames. Consider insulating window treatments to block the heat loss.
- Break Room
    - The break room supply duct is not tapered or stepped. As a result the airflow ranged from 1157 fpm near the air handler to 660 fpm at the far end. Damper adjustments could balance the diffuser flow.

[5] The savings are relative to the component or system level savings and not whole building level.

- 
- The temperature set-point was 80F. When measured, the temperature in the room was 74F and the heat was not running. There are three possible causes:
    - The thermostat may be out of calibration
    - The imbalance of the diffusers may be overheating the thermostat area
    - The thermostat may be located near a heat source
- The Foyer temperature was 64F. There are no supply air diffusers in the Foyer.
- The Assistant Superintendent's office temperature was 65F. The supply air flow was 300 fpm at 76F.
    - There is a window air conditioner in that office indicating that the supply air is inadequate. When the new air handler is installed, consider increasing the duct size to that office.
- The employee entrance/locker room was 65F. This room is at the end of the break room duct.
- The Men's Restroom has an occupancy sensor for the lights but the exhaust fan is not tied to the sensor.
- Women's Lounge
    - Uses electric baseboard heat
    - Also has an aluminum framed window
- Utility Room between locker room and repair shop
    - Two full sized refrigerators
    - Two water heaters
        - Hot water pipes



- Sign Shop
  - There was a window air conditioner in the sign shop with a loose fitting, uninsulated plywood panel blocking the remainder of the open window. Consider removing the AC unit for the winter and closing the window.

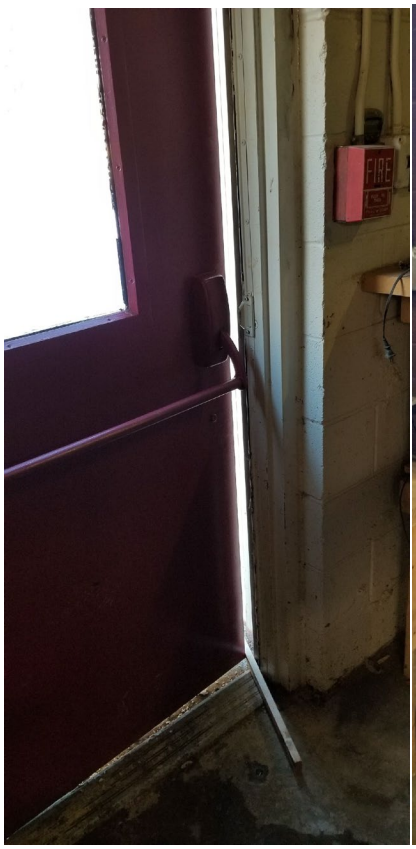
  - Baseboard electric heat. Temperature set-point was 74F and the room was not occupied.
  - Compressed air leak on the roller machine. An air hose with a quick disconnect fitting was plugged into the machine while the sign shop was unoccupied. Consider fixing the

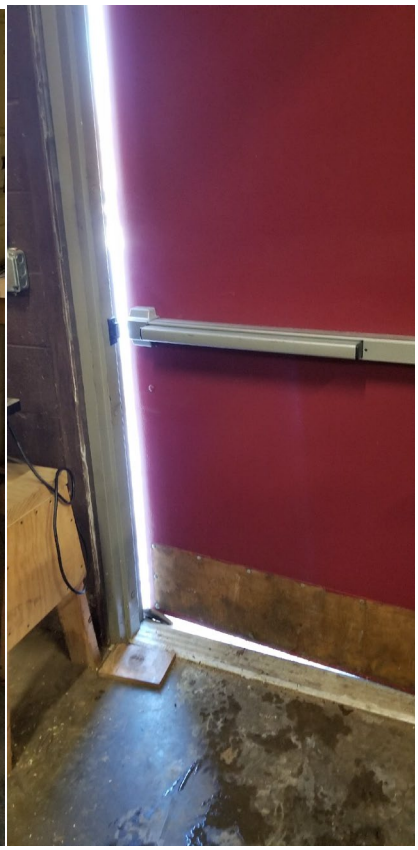
leak or at least disconnecting the air supply when not being used.

- Mechanics Bay
    - The area has two engine exhaust systems. The occupants stated that they don't use either when running trucks inside the bay. Instead, they open the bay doors.
    - Consider looking into repairs of the exhaust systems.
    - Consider a heat interlock with the doors so that the heat cannot run when a bay door is open.
    - Pneumatic oil pump leaking air.

  - Occupant complained that the night crew turns the heat up. The occupant stated that he opens the bay doors in the winter to cool down when he arrives. Consider adjusting and locking the thermostats.

- Truck Bays
  - Temperature in most bays was set to 64°F. Some areas were set higher. All connected bays should be set the same to avoid one area running too frequently.
  - Man doors were found propped open to allow access to the building. This is a large heat loss during cold weather. Consider unlocking the doors during the day (this one was already unlocked).

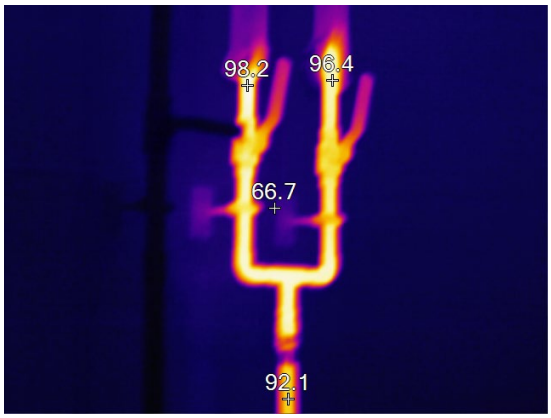




- Roof vent louvers were stuck open.

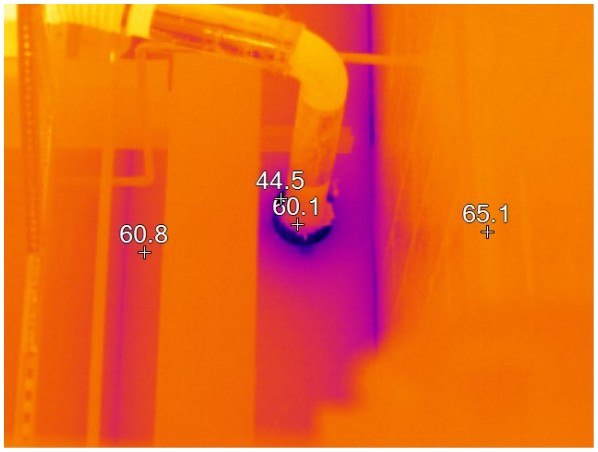
- Most bay doors were new and well sealed. Some of the older doors had gaps.

- Large single pane window on east end of building is poorly insulated.
- Water valves for both hot and cold water were both left open during non-use times at many locations. Using cold water elsewhere in the building would allow some hot water to enter the cold water lines consuming natural gas at the water heaters. The following photo shows both valves open and the heat in the cold water line indicates flow from the hot side to the cold side.



Instruct drivers to close at least one of the supply valves when not using the water hoses.

- Some building penetrations were not well sealed such as this radiant heat exhaust opening. All penetrations should be sealed with temperature appropriate sealant.



Follow-Up Re-Tuning Recommendations

Re-tuning should be continued on a continuous or periodic basis, after the initial re-tuning visit. Follow-up actions should include the following.

1) All operation and maintenance actions recommended in this report should be implemented to maximize energy savings, reduce energy costs, and improve the comfort of occupants. Actions with a status of "recommended" should be implemented in the days and weeks following initial re-tuning.

2) Continue to re-tune your building as changes occur (such as changes in tenants, schedules, remodels, etc.). A similar walkdown should be performed during spring, summer and fall seasons.

3) Re-tuning efforts should include compressed air leak checks and pressure adjustments. Compressed air systems without heat recapture are only about 7% efficient and compressors

are less efficient at higher pressure. Set the compressor pressure to the lowest pressure needed for the pneumatic equipment to minimize compressor energy. Use electric tools instead of air tools wherever possible.

4) Operation and maintenance staff should continually look for the problems and opportunities covered in this report and in the building walkdown. Doing so can be as simple as looking for the sorts of conditions examined during re-tuning while walking routinely through the building or by conducting walk downs periodically.

5) Document your plans for continuous re-tuning. Establish schedules for your re-tuning activities and refer to them frequently as a reminder and to ensure that follow up continues. This is the best way to keep your building at peak operating condition and minimize energy use and costs. You will also find in the long run that the cost of operation and maintenance decreases.