Ramsey School District

Energy Savings Plan

Project Number: ESG-Project # DPBWI00602

Ramsey, New Jersey | May 24, 2022 rev.2

energy systems group

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SECTION 1. EXECUTIVE SUMMARY AMENDMENT: *(prepared by Solutions Architecture)*

The development of this Energy Savings Plan (ESP) was originally conducted by Energy Systems Group, expanding upon the original energy audit conducted by TRC Energy Services. The original audit information was used for building descriptions as well as an overall indication of District needs. Various energy conservation measures were evaluated in the development of this Energy Savings Plan (ESP). Energy Systems Group has performed IGEA field verifications, collected data and taken field measurements to ensure the development of the most cost-effective solutions as well as accurate savings calculations. Various solutions were reviewed with the school district's administration to develop a set of Energy Conservation Measures (ECMs) that allow the school district to address the facility's priority items while reducing the total annual energy spend for the District.

In May of 2021, amidst growing concern regarding ESG's ability to complete the project, the District severed ties with ESG and made the decision to pursue the project as a DIY Project. Solutions Architecture and the District took Ownership of the project and have received authorization from ESG to implement the plan using the completed ESIP and work product prepared by ESG.

The scope of work for the resubmitted plan remains consistent with the originally submitted ESP with the exception that quantities have been reduced for certain items (unit ventilators) due to the changes in incentive programs and interest rates from the time the plan was original started including present changes with Direct Install and the NJCEP incentive programs that have transitioned over to the utilities.

The revised plan was submitted to DLB Associates to conduct a second third-party review and was found to be viable.

SECTION 1. EXECUTIVE SUMMARY

Various energy conservation measures were evaluated in the development of this Energy Savings Plan (ESP). Energy Systems Group has performed field verifications, collected data and taken field measurements to ensure the development of the most cost-effective solutions as well as accurate savings calculations. Various solutions were reviewed with the school district's administration to develop a set of Energy Conservation Measures (ECMs) that allow the school district to address the facility's priority items while reducing the total annual energy spend for the District. This study expands upon the original energy audit conducted by TRC Energy Services. The original audit information was used for building descriptions as well as an overall indication of the District needs.

Priority items include:

- LED Lighting Upgrades
- Add Air-Conditioning – Ramsey High School VRF Install
- Replace Roof Top Units
- Replace Unit Ventilators

Energy Savings

Energy saving calculations performed in the development of this ESP was completed using Microsoft Excel worksheets with Bin weather data to accurately model the building systems. Additional spreadsheets were used for measures that are not affected by the weather, such as lighting savings. Energy savings have been provided electronically for ease of review. All the energy savings calculations that have been performed are in accordance with the New Jersey Clean Energy Program Protocols to Measure Resource Savings.

Benefits

The measures investigated in this Energy Savings Plan could result in an annual utility savings of 521,739 kWh's of electricity and save 23,628 therms of natural gas. The total utility cost savings is $1,586,781 over the life of the project (15 years). Additionally, these energy savings will result in a net reduction of greenhouse gases and will reduce the school district's carbon footprint by 856,509 lbs. of CO_2 annually. All these savings are achieved while improving the classroom environment and renewing many items that have been in service beyond useful life expectancy.

SECTION 2. PROJECT DESCRIPTION

This Energy Savings Plan (ESP) addresses the following facilities. Any description in this report-stating district wide or similar refers only to the buildings listed below:

Ramsey School District	
John Dater Elementary School	35 School Street, Ramsey, NJ 07446
Ramsey High School	256 East Main Street, Ramsey NJ 07446
Eric Smith Middle School	2 Monroe Street, Ramsey, NJ 07446
Mary Hubbard Elementary School	10 Hubbard Lane, Ramsey, NJ 07446
Wesley Tisdale Elementary School	200 Island Road, Ramsey, NJ 07446

Facility Descriptions

John Dater Elementary School

Background Information

Exterior of Front Entrance

John Dater Elementary

John Dater Elementary School is a 3-story, 71,448 square-foot building built in 2004. Spaces include classrooms, gymnasium, offices, cafeteria, corridors, stairwells, a commercial kitchen, and mechanical space.

Building Occupancy

Approximately 400 students and faculty members occupy the building.

<u>Hours of Operation</u>

- Monday through Friday – 6:30 am to 10:00 pm.
  - School: 8:00 am to 3:00 pm.
- Saturday – Gym Only: 9:00 am to 6:00 pm
- Sunday – Closed
- The building is at full occupancy September through June

Envelope

The exterior walls are made of poured concrete with a brick veneer, metal studs and sheet rock interior finish.

The flat roof section is supported with steel trusses and a reinforced concrete deck, finished with an insulated layer and a covering of modified bitumen grey membrane. The roof is in good condition.

Steel trusses support a pitched roof over the gym with a metal deck covered in asphalt shingles. The roof encloses semi conditioned space with tapered insulation. The thermal barrier is between this space and the conditioned space below.

Flat Section of Roof

John Dater Elementary

The windows are double-pane, glazed, and have aluminum frames with a thermal break. The glass-to-frame seals of the double-pane windows are in good condition. Exterior doors are fiber-reinforced plastic aluminum framed with single-pane glass, which are in good condition with undamaged door seals.

Lighting

The primary interior lighting system uses LED linear tubes and ambient LED fixtures. There are also several 32-Watt linear fluorescent T8 lamps with electronic ballasts, compact fluorescent lamps, incandescent, and LED general purpose lamps.

Fixture types include 2, 3 and 4-lamp, 2 and 4-foot troffer and recessed fixtures, and 2-foot fixtures with linear tube lamps.

Gymnasium fixtures use occupancy sensors to control high bay 200-Watt LED fixtures at the gym's entrance and hall. Cafeteria fixtures are controlled by wall switches.

All exit signs are LED units.

Most fixtures are in good condition. Interior lighting levels were generally sufficient.

Exterior lighting includes wall packs, recessed canopy, flood lights, decorative, emergency lights and wall mounted fixtures with LED lamps. The pole mounted roadway fixtures incorporate LED lamps.

In general, exterior light fixtures are controlled by a BMS located in the superintendent's office.

	
Classroom Lighting John Dater Elementary	Gymnasium Lighting John Dater Elementary

Mechanical Systems

HVAC Systems and Equipment:

The computer room, main office, conference room, SGI room, IDF/MDF rooms, gym, and library offices are conditioned by packaged air conditioning and split system units controlled by the building energy management system.

The gym offices and storage areas, corridors, toilets, and second and third floor classrooms are served by 10 packaged roof top units. These units are equipped with economizers that are in good condition.

	
Roof Top Unit (RTU-5) John Dater Elementary	Split-System AC Units John Dater Elementary

Heating and ventilation requirements for the kitchen, cafeteria, science room, LGI room, music room and special education room are met by eight stand-alone heating ventilators with supply fan motors. They are controlled by the BMS.

Hot Water Boilers

John Dater Elementary

Two 1,700 MBH, Patterson-Kelly non-condensing hot water boilers with 85% efficiency serve the building's heating load needs. Installed in 2005, they are in good condition and have a service contract in place.

The boilers provide hot water to heating ventilators, unit heaters, and air handling units throughout the building using two identical Armstrong constant speed, 7.5 hp heating hot water pumps.

The school has an installed proprietary Automated Logic System building management system connected to and controlling the hot water system, eight Air Handling Units. Seven (7) Heating & Ventilating Units, ten (10) Roof-Top Units, thirty-seven (37) VAV Boxes, and twenty-four (24)exhaust fans.

Domestic Hot Water

Hot water is produced with a, 100-gallon, 199 MBh, gas-fired A.O. Smith storage water heater with an 80% thermal efficiency and was installed in 2016.

Heating Hot Water Pump

John Dater Elementary

Domestic Hot Water Heater

John Dater Elementary

DHW Heater Nameplate

John Dater Elementary

DHW Circulation Pump

John Dater Elementary

A one-third (1/3) hp circulation pump distributes water to end uses. The circulation pump operates continuously. The domesticated hot water pipes are insulated, and the insulation is in good condition.

Kitchen Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students. Most cooking is done using a convection electric oven, gas rack oven, and one gas griddle. Bulk prepared foods are held in one full size electric holding cabinets. Equipment is high efficiency and is in good condition.

The kitchen has two stand-up refrigerators with solid doors. There is a freezer chest and two chest type milk coolers. All equipment is high efficiency and in good condition.

The walk-in cooler located on the roof has a single fan evaporator with evaporator fan control. The walk-in low temperature freezer also located on the roof has a two-fan evaporator with evaporator fan control as well as electric defrost controls.

Plug Load

There are approximately 74 computer work stations throughout the facility. Plug loads throughout the building include general cafeteria and office equipment. There are classroom typical loads such as smart boards, projectors, and printers.

	
Computers John Dater Elementary	Projectors John Dater Elementary

There are several residential style refrigerators throughout the building that are used to store staff lunches and cold beverages. These vary in condition and efficiency.

There is a refrigerator beverage vending machine which is not equipped with occupancy-based controls.

Plumbing/Water System

There are 12 restrooms with toilets, urinals, and sinks. Faucet flow rates are 1.5 gallons per minute or higher. Toilets are rated at 1.6 gallons per flush and urinals are rated at 1 gallon per flush.

Ramsey High School

Background Information

Ramsey High School is a 200,520 square-foot, 3-story building originally constructed in 1936, with new additions built in 1965 and 1975. Spaces include classrooms, old and new gymnasium, auditorium, offices, cafeteria, corridors, stairwells, a commercial kitchen, an autobody shop and basement mechanical space.

Building Occupancy

Approximately 837 students and faculty members occupy the building.

Hours of Operation

- Monday through Friday – 5:00 am to 10:00 pm.
  - School: 8:00 am to 3:00 pm
- Saturday – Gym Only: 9:00 am to 2:00 pm.
- Sunday – Closed
- The building is at full occupancy September through June

Envelope

The exterior walls on the front side of the building are made of brick whereas the walls on the backside of the building are made from concrete masonry units with a decorative veneer and painted interior finish.

The flat roof section is supported with steel trusses and a reinforced concrete deck finished with an insulated layer and a covering of EPDM white membrane.

Steel trusses support a pitched roof with a metal deck covered with asphalt shingles. The thermal barrier is between this space and the conditioned space below.

Front side windows are double pane glazed and have aluminum frames with a thermal break. The back windows are single hung with aluminum frames. The glass-to-frame seals of the single pane windows are in good condition. The operable window weather seals are also in good condition, with single pan glass and are in good condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

	
Courtyard Windows Ramsey High School	Autobody Shop Ramsey High School
	
Flat Deck Roof Ramsey High School	

Lighting

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps. The office area is illuminated by LED fixtures. There are also several 40-Watt T12 fixtures. Additionally, there are some compact fluorescent lamps, incandescent, and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use magnetic ballasts.

Fixture types include 2, 3, and 4-lamp, 2 and 4-foot long troffer and recessed fixtures and 2-foot fixtures with U-bend tube lamps.

The old gymnasium fixtures have 4-lamp high bay T5 linear fluorescent lamps and the new gym has 6-lamp T5HO linear fluorescent fixtures. Both gym fixtures are controlled by a dimmer switch.

	
Old Gymnasium Lighting Ramsey High School	New Gymnasium Lighting Ramsey High School

Cafeteria have recessed 8' and 4' long LED strips and are controlled by a dimmer switch.

All exit signs are LED units.

Most fixtures are in good condition. Interior lighting levels are generally sufficient.

Lighting fixtures in the main office are controlled by occupancy sensors, however, most lighting fixtures are controlled manually by wall switches.

Exterior lighting includes wall packs, wall sconces, flood lights, emergency lights, and wall mounted fixtures with LED lamps. The pole mounted roadway fixtures incorporate LED lamps.

The athletic fields are illuminated with flood lights that contain high bay metal halide lamps. They are controlled manually from a breaker panel.

In general, exterior light fixtures are controlled by a BMS located in the superintendent's office.

Mechanical Systems

<u>HVAC Systems and Equipment:</u>

Mechanical systems throughout Ramsey High School are controlled pneumatically. This control system is original to the building and appears to be in fair operating condition. The boys' and girls' locker rooms are served by two (2) heating ventilator (HV) units (HV-1 & HV-2). Six (6) classrooms on the 2nd floor are served by stand-alone Airedale unit ventilators (Rm 201-204,216,217), the remaining classrooms are served by a VRF system.

	
Classroom Unit Ventilator Ramsey High School	Hallway Radiator Ramsey High School

Classrooms, offices, and the main office area are conditioned by packaged air conditioning and split system heat pump units controlled by the EMS.

The old gym and new gym are served by four packaged rooftop units with gas-fired furnaces equipped with economizers. These RTUs include two AAON 20-ton and two AAON 50-ton packaged rooftop units with gas-fired furnaces. These units are equipped with economizers that are in good condition.

	
20-Ton RTU (RTU-2) Ramsey High School	50-Ton RTU (RTU-1) Ramsey High School

	
Existing Exhaust Fans Ramsey High School	

There are approximately twenty-five (25) exhaust fans are located on the roof serving the building.

Steam Boiler

Ramsey High School

The Central Heating Plant system is comprised of two (2) Low Pressure Steam Boilers rated for 10,043 MBh with 80% efficiency. The burners are non-modulating with nominal efficiency. The boilers are configured in a lead-lag control scheme. They were installed in 1998 and are in fair condition. There is a service contract in place for the boilers.

The heating plant contains two (2) steam-to-hot water heat exchangers to provide hot water for the 1965 and 1975 new addition wings.

A PQ EMS controls the HVAC equipment, boilers, air handlers, package units, and exterior lighting. The EMS provides equipment scheduling control and monitors and controls space temperature, supply air temperatures, humidity, heating water loop temperatures, and chilled water loop temperatures.

Domestic Hot Water

Hot water is produced with an A. O. Smith gas-fired storage tank water heater. It was installed in 1998 and is in fair condition.

Domestic Hot Water Heater

Ramsey High School

Domestic Hot Water Storage Tank

Ramsey High School

Kitchen Equipment

The kitchen has mixed gas and electric equipment that is used to prepare meals for students. Most cooking is done using a convection electric oven, an electric griddle, and a gas griddle. Bulk prepared foods are held in several electric holding cabinets. Equipment is high efficiency and is in good condition.

The kitchen has three stand-up refrigerators with a mix of solid and glass doors. There is also an energy sufficient stand-up solid door freezer. All equipment is high efficiency and in good condition.

The Home Economics room has seven half-size convection electric ovens and seven small gas griddles. Equipment is standard as well as high efficiency and is in good condition.

Home Economic Room

Ramsey High School

Plug Load

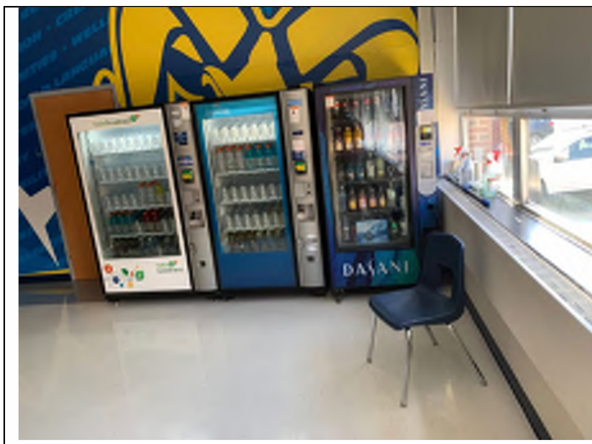
The utility bill analysis indicates that plug loads consume approximately 2% percent of total building energy use. This is lower than a typical building.

The staff seems to already be doing a great job managing the electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 302 computer work stations throughout the facility. Plug loads throughout the building include general cafeteria, woodshop and office equipment. There are classroom typical loads such as smart boards, projectors, and printers.

There are several residential style refrigerators throughout the building that are used to store staff lunches and cold beverages. These vary in condition and efficiency.

There are five refrigerated beverage vending machines and one non-refrigerated vending machine. Vending machines are not equipped with occupancy-based controls.

	
Vending Machines Ramsey High School	

Plumbing/Water System

There are 16 restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.5 gallons per minute or higher. Toilets are rated at 1.6 gallons per flush and urinals are rated at 1 gallon per flush.

Eric Smith Middle School

Background Information

Eric Smith Middle School is a 121,917 square-foot, 2-story building originally constructed in 1968, with additions being added in 1997, 2001 and 2006.There is currently a new addition being built consisting of approximately 9,670 square feet. Spaces include classrooms, gymnasium, cafeteria, corridors, stairwells, a commercial kitchen, and mechanical space.

Building Occupancy

Approximately 742 students and faculty members occupy the building.

Hours of Operation

- Monday through Friday – 6:30 am to 10:00 pm.
    - School: 8:00 am to 3:00 pm
- Saturday – Gym Only: 9:00 am to 4:00 pm
- Sunday – Closed
- The building is at full occupancy September through June

Flat Deck Roof

Eric Smith Middle School

Envelope

Walls are made of poured concrete with a brick veneer and painted CMU interior finish.

The flat roof section is supported with steel trusses and reinforced concrete deck and is finished with an insulated layer as well as a covering TPO black membrane and gravel.

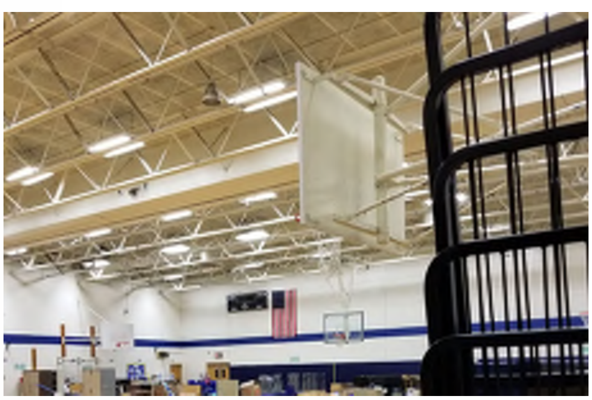
Steel trusses support a pitched roof with a tectum deck covered with asphalt shingles. The roof enclosed unconditioned space. The thermal barrier is between this space and the conditioned space below.

Most of the windows are single glazed and have aluminum frames without a thermal break. The glass-to-frame seals are in fair condition. The operable window weather seals are in fair condition, showing little evidence of excessive wear. Exterior doors are aluminum framed fiber-reinforced plastic with single pane glass. They are in good condition with undamaged door seals. Degraded window and door seals increase drafts and outside air infiltration.

Lighting

The primary interior lighting system uses 32-Watt linear fluorescent T8 lamps with electronic ballasts. Additionally, there are some compact fluorescent lamps, incandescent, and LED general purpose lamps.

Fixture types include 2, 3, and 4-lamp, 2 and 4-foot long troffers and other recessed mounted fixtures. Additionally, there are 2-foot fixtures with U-bend tube lamps.



Gymnasium Lighting

Eric Smith Middle School

Gymnasium fixtures have 6 lamps 4-foot linear fluorescent fixtures, which are controlled by occupancy sensors. Cafeteria fixtures have 4 lamps 4-foot linear fluorescent fixtures and 4 pin CFL lamps with are manually controlled. All exit signs are LED units.

Most fixtures are in good condition. Interior lighting levels were generally sufficient.

Lighting fixtures are in good condition. Interior lighting levels were generally sufficient.

Lighting fixtures in locker rooms, coach's offices, and the gym storage areas are controlled by occupancy sensors.

Exterior lighting includes wall packs, wall flush, recessed canopy, flood lights, emergency lights, spotlights, and wall mounted fixtures with CFL, incandescent, and LED lamps.

In general, exterior wall flush light fixtures are controlled by a BMS located in the superintendent's office and the remaining are controlled by either photocells or wall switches.

Mechanical Systems

HVAC Systems and Equipment:

Approximately twenty-five (25) unit ventilators with fin-tube insulation serve the classrooms. Control is provided by a pneumatic thermostat. This system is original to the building and appears to be in fair operating condition.

Classroom Unit Ventilator

Approximately twenty-five (25) split system heat pumps, air conditioning units and packaged terminal heat pump (PTHP) serve the second floor classrooms, main office, SGI rooms, band, chorus rooms, Office 130, the conference room, and IDF rooms. Existing split system air conditioning units controlled by the BMS.

The Central Heating Plant System consists of four (4) Aerco 2,610 MBh gas-fired condensing hot water boilers. The boiler's burners' are non-modulating with nominal efficiency. The boilers were installed in 2014 and are in good condition.

Hot Water Boilers

The boilers are configured in a variable flow primary distribution. Hot water pumps operating with a lead-lag control scheme. The boilers provide hot water to unit ventilators and gym air handling units.

A PQ BMS controls the HVAC equipment, boilers, air handlers, package units, and exterior lighting. The BMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, heating water loop temperature, and chilled water loop temperature.

Approximately twenty (20) roof mounted exhaust fans provide exhaust for the building.

Domestic Hot Water

Hot water is produced by a 91-gallon, 199.9 MBh Rheem gas-fired storage tank water heater with 80% thermal efficiency. It was installed in 2012 and is in good condition.

Domestic Hot Water Heater

Eric Smith Middle School

Domestic Hot Water Heater Nameplate

Eric Smith Middle School

The circulation pump operates continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.

Kitchen Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students. Most cooking is done with two electric convection ovens and a gas griddle in the main kitchen. Bulk prepared foods are held in two full size electric holding cabinets.

The kitchen has two stand-up refrigerators with solid doors and two stand-up refrigerators with glass doors. There is also a stand-up solid door freezer and an ice cream storage freezer. All equipment of standard and high efficiency, which are in good condition.

There are two walk-in refrigerators with compressors located on the roof and a single fan evaporator with evaporator fan controls. The walk-in medium temperature freezer has a compressor located on the roof and a three-fan evaporator with evaporator fan control and defrost controls.

Plug Load

The utility bill analysis indicates that plug loads consume approximately 3% of the total building energy use. This is lower than a typical building.

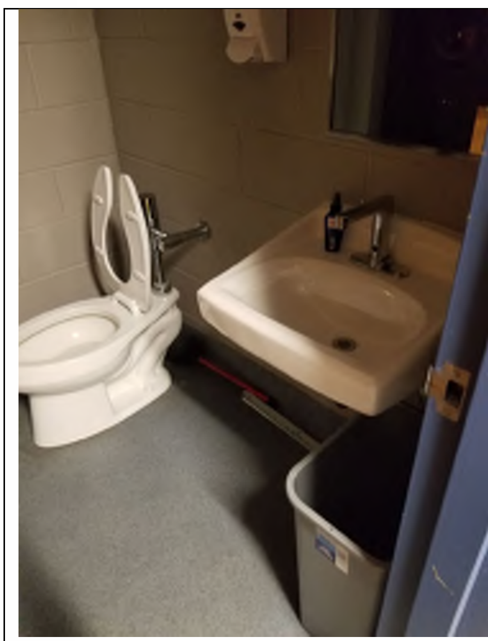
The staff seems to already be doing a great job managing the electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practice.

There are approximately 198 computer work stations throughout the facility. Plug loads throughout the building include general cafeteria, woodshop, and office equipment. There are classroom typical loads such as smart boards, projectors, and printers.

There are several residential style refrigerators throughout the building that are used to store staff lunches and cold beverages. These vary in condition and efficiency.

There is a glass front refrigerated vending machine located in the break room. The vending machine is not equipped with occupancy-based controls.

Plumbing/Water System



Restroom

Eric Smith Middle School

There are 16 restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.5 gallons per minute or higher. Toilets are rated at 1.6 gallons per flush and urinals are 1 gallon per flush.

Mary Hubbard Elementary School

Background Information

Front Entrance

Mary Hubbard Elementary School

Mary Hubbard Elementary School is a 78,836 square foot, 1-story building originally constructed in 1956, with additions being added in 1962, 1998 and 2005. A new addition is currently being built that will add approximately 6,628 square feet. Spaces include classrooms, gymnasium, offices, cafeteria, corridors, a commercial kitchen, and a basement mechanical space.

Building Occupancy

Approximately 379 students and faculty members occupy the building.

<u>Hours of Operation</u>

- Monday through Friday – 6:30 am to 10:00 pm.
  - School: 8:00 am to 3:00 pm
- Saturday – 9:00 am to 3:00 pm
- Sunday – Closed
- The building is at full occupancy September through June

Envelope

The exterior walls are made of brick with concrete masonry blocks, whereas interior walls are made from poured concrete with a wood studs finish.

The flat roof is supported with steel trusses and a reinforced concrete deck. It is finished with an insulated layer and a covering of TPO white membrane. Replaced in 2005, the flat roof is in good condition.

Steel trusses support a pitched roof with a metal deck covered with asphalt shingles over the gym and music room. The roof encloses unconditioned space. The thermal barrier is between this space and the conditioned space below.

Flat Deck Roof

Mary Hubbard Elementary School

Windows are double-pane glazed with low-e glass and have aluminum frames with a thermal break. The glass-to-frame seals of the double-pane windows are in good condition. The operable window weather seals are also in good condition, showing no evidence of excessive wear. Exterior doors are fiber-reinforced plastic with aluminum frames and are single pane glass. They are in good condition with undamaged door seals.

Overhead Lighting

Mary Hubbard Elementary School

Lighting

The primary interior lighting system uses primary LED linear tubes and LED ambient fixtures. There are also several 32-Watt linear fluorescent T8 lamps with electronic ballasts. There are a few T12 tube lamps. Additionally, there are some compact fluorescent lamps, incandescent, and LED general purpose lamps.

Fixture types include 2, 3, and 4-lamp, 2 and 4-foot long troffers and other recessed fixtures. There are 2-foot fixtures with linear tube lamps.

Gymnasium fixtures have 2 and 4 lamp, 2 and 4-foot ceiling mount LED fixtures which are controlled by fixture mounted occupancy sensors. Wall switches control fixtures in storage areas. All exit signs are LED units.

Most fixtures are in good condition. Interior lighting levels were generally sufficient.

Exterior lighting includes wall packs, recessed canopy, wall flushed, wall sconces, flood lights, decorative, emergency lights, and wall mounted fixtures with incandescent, CFLs, and LED lamps. The pole mounted roadway fixtures use LED lamps.

In general, exterior light fixtures are controlled by a BMS located in the superintendent's office.

Mechanical Systems

HVAC Systems and Equipment:

The unit ventilators supply heating to the "old section" classrooms. There are two-unit ventilators in the new section classrooms. Control is provided by a pneumatic thermostat. This system is original to the building.

The cafeteria, SGI rooms and a classroom are conditioned by three (3) split system heat pump units which are controlled by the BMS.These are controlled by pneumatic local controls with a rudimentary start/stop of the zones.

There is a Lennox rooftop unit with a gas fired furnace and is in good condition. The music room is provided ventilation by two (2) Trane air handling units, “AHU”. The gymnasium is served by two (2) roof-mounted make up air units.

Make Up Air Units for Gymnasium

Mary Hubbard Elementary School

Heating and ventilation requirements for the kindergarten and SGI classrooms are met by six stand-alone heating ventilators with supply fan motors controlled by the BMS. Heat is provided from the heating hot water loop and distributed through hot water coils.

A classroom and eight offices are cooled by window air conditioning units.

The HVAC system uses pneumatic controls. No air leaks were observed during the inspection.

Two Easco gas-fired steam boilers with 80% efficiency serve the primary building’s heating load needs. The burners are non-modulating with nominal efficiency. The boilers are configured in a lead/lag control scheme. Both boilers are required under high load conditions. The boilers were installed in 1998 and are in fair condition. There is a service contract in place.

There is a steam to hot water heat exchanger that provides hot water for the new wing.

The boilers serve a primary/secondary distribution system.

A PQ BMS controls the HVAC equipment, boilers, air handlers, package units, and exterior lighting. The BMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperature, humidity, heater water loop temperature, and chilled water loop temperatures.

Boiler Room

Mary Hubbard Elementary School

Domestic Hot Water

Hot water is produced with an A. O. Smith boiler with a separate 100-gallon storage tank.

The circulation pumps operate continuously. The domestic hot water pipes are insulated, and the insulation is in good condition.

	
Tankless Water Heater Mary Hubbard Elementary School	Domestic Hot Water Storage Tank Mary Hubbard Elementary School

Freezer Chest

Mary Hubbard Elementary School

Kitchen Equipment

The kitchen has a mix of gas and electric equipment that is used to prepare meals for students. Most cooking is done using a convection electric oven and a gas griddle. Bulk prepared foods are held in an electric holding cabinet. Equipment is high efficiency and is in good condition.

The kitchen has one stand-up refrigerator with solid doors. There are three energy efficient stand-up solid door freezers. There is a freezer chest as well as two refrigerator chest type milk coolers. All equipment is high efficiency and in good condition.

Plug Load

The utility bill analysis indicates that plug loads consume approximately 2% of total building energy usage. This is lower than a typical building.

The staff seems to already be doing a great job managing the electrical plug loads. This report makes additional suggestions for ECMs in this area as well as Energy Efficient Best Practices.

There are approximately 84 computer work stations throughout the facility. Plug loads throughout the building include general cafeteria and office equipment. There are classroom typical loads such as smart boards, projectors, and printers.

There are several residential style refrigerators throughout the building that are used to store staff lunches and cold beverages. These vary in condition and efficiency.

There is a refrigerated beverage vending machine in the faculty lounge, which is not equipped with occupancy-based controls.

Plumbing/Water System

There are 15 restrooms with toilets, urinals, and sinks. Faucet flow rates are at 1.5 gallons per minute or higher. Toilets are rated at 1.6 gallons per flush and urinals are 1 gallon per flush.

Wesley Tisdale Elementary School

Background Information

Wesley Tisdale Elementary School is a one-story 78,339 square-foot building that was originally built in 1952, with additions being added in 1962, 1998 and 2003. A new addition is being built that will add approximately 5,647 square feet. The building contains office and classroom space, a gymnasium, commercial kitchen, a cafeteria, and mechanical spaces.

Building Occupancy

Approximately 405 students and faculty members occupy the building.

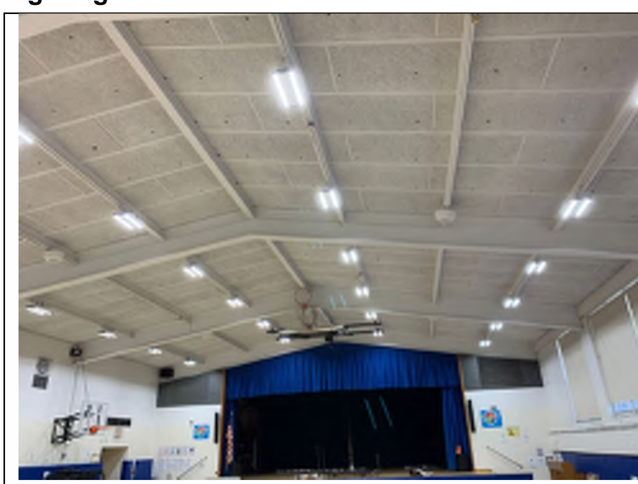
Hours of Operation

- Monday through Friday – 6:00 am to 10:00 pm.
  - School: 8:00 am to 3:00 pm
- Saturday – Gym Only: 9:00 am to 6:00 pm
- Sunday – Closed
- The building is at full occupancy September through June

Envelope

The building is constructed of concrete masonry units with a brick façade. The flat portion of the roof finished with TPO white membrane while the pitched portion is covered with asphalt. The windows are double pane glazed with low-e glass and framed by aluminum. Exterior doors for the building are FRP, or fiber reinforced plastic.

Lighting



Gymnasium Lighting

Wesley Tisdale Elementary School

The primary interior lighting system uses LED linear tubes and ambient fixtures. There are also several 32-watt linear fluorescent T8 lamps and 40-Watt T12 fixtures. There are some compact fluorescent lamps (CFL), incandescent, and LED general purpose lamps. Typically, T8 fluorescent lamps use electronic ballasts and T12 fluorescent lamps use less efficient magnetic ballasts.
Fixture types include 3 and 4-lamp, 2 and 4-foot long troffer and recessed mounted fixtures and 2-footfixtures with linear tube lamps.

The gymnasium fixtures have high bay 180-Watt LED lamps and are controlled by wall switches. The cafeteria has recessed 4' long LED linear tubes and are also controlled by wall switches. All exit signs are LED units.

Exterior lighting includes wall packs, recessed canopy, wall sconces, flush mounted wall fixtures, flood lights, decorative, emergency lights, and wall mounted fixtures with LED lamps. The pole mounted roadway fixtures also have LED lamps.

Exterior light fixtures are controlled by a BMS located in the superintendent's office.

Mechanical Systems

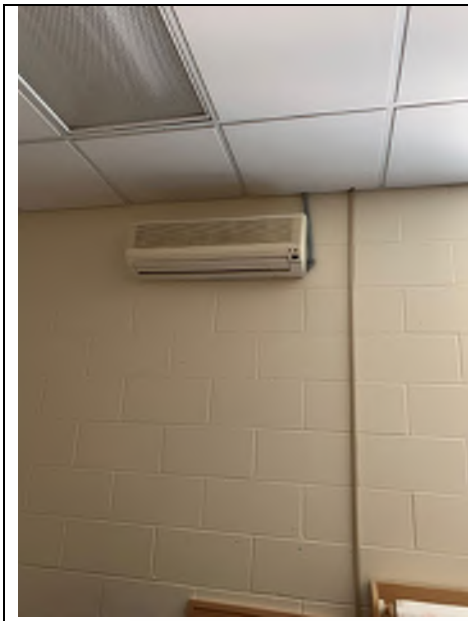
HVAC Systems and Equipment:

Approximately thirty (30) unit The unit ventilators supply heating to the "old section", while four-unit ventilators are located in the media center. Control is provided by a pneumatic thermostat. This system is original to the building and appears to be in fair operating condition.

The cafeteria, media center, gym, classrooms, nurse's office, and library offices are conditioned by packaged air conditioning and split system heat pump units controlled by the EMS. These units have heating capacities ranging from 7.17 MBh to 32 MBh and cooling capacities that range from 1-ton to 7.5-tons. They range in efficiency between 9 and 10 EER.

Two Trane air handling units with 0.5 hp and 1.5 hp supply fan motors serves gym storage areas. A total of 11 exhaust fans are located on the roof with fan motors ranging in size from 0.1 hp to 1 hp.

There is a Trane make up air unit which serves the kitchen. This unit is equip with a 2-HP supply fan motor.



Nurse's Office AC Unit

Wesley Tisdale Elementary School

The HVAC system uses pneumatic controls. Two 1.5 hp air compressors located in the boiler room serve the system. The main office, conference room, and break room use window air conditioning units. They are in good condition.

Ventillation for the school is provided by eleven (11) exhaust fans are located on the roof.

The building has two newer Weil-McLain steam-boilers, installed in 2011 with 83% efficiency that provide heating for the steam portion of the building. While the hot water section is heated by two Aerco hot water boilers with 87% efficiency that were installed in 2013. All boilers are in good condition and have service contracts in place.

	
Steam Boilers Wesley Tisdale Elementary School	Hot Water Boiler Wesley Tisdale Elementary School

The boilers are configured in a variable flow primary distribution. Hot water pumps operating with a lead-lag control scheme. The boilers provide hot water to unit ventilators and gym air handling units.

A PQ BMS controls the HVAC equipment, boilers, air handlers, package units, and exterior lighting. The BMS provides equipment scheduling control and monitors and controls space temperatures, supply air temperatures, humidity, heating water loop temperature, and chilled water loop temperature.

Domestic Hot Water Heater

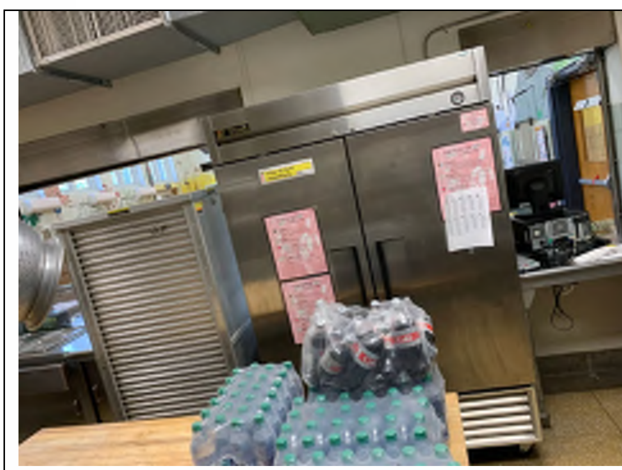
Wesley Tisdale Elementary School

Domestic Hot Water

Domestic Hot Water is provided by a 100-gallon,199.9 MBh gas-fired storage water heaters. Two (2) 0.2 hp Bell and Gosset circulation pumps circulate water continuously. The domestic hot water pipes are insulated. The insulation is in good condition.

Kitchen Equipment

The kitchen has mixed gas and electric equipment that is used to prepare meals for students. Most cooking is done using a convection electric oven and two gas griddles. Bulk prepared foods are held in one full size electric holding cabinets. Equipment is high efficiency and is in good condition.



Refrigeration Equipment

Wesley Tisdale Elementary School

The kitchen has six stand-up refrigerators with a mix of solid and glass doors. There is also an energy efficient chest type ice cream freezer. All equipment is high efficiency and in good condition.

Plug Load

There are approximately 66 computer work stations throughout the facility. Other plug loads throughout the building include general cafeteria and office equipment. There are classroom typical loads such as smart boards, projectors, and printers.

There are several residential style refrigerators throughout the building that are used to store staff lunches and cold beverages. These vary in condition and efficiency.

There is a refrigerated beverage vending machine, which is not equipped with occupancy-based controls.

Plumbing/Water System

There are nine restrooms with toilets, urinals, and sinks, Faucet flow rates are 1.5 gallons per minute or higher. Toilets are rated at 1.6 gallons per flush and urinals are 1 gallon per flush.

Utility Baseline Analysis

NOTE: The billing information was provided by the school district.

Electric

Electrical energy is delivered by Rockland Electric Company and supplied by Direct Energy Business. The electric utility measures consumption in kilowatt-hours (kWh). One kWh usage is equivalent to 1000 watts running for one hour.

Natural Gas

Ramsey School District's natural gas commodity is delivered by Public Service Electric & Gas (PSE&G) and supplied by Direct Energy Business. The total Therms in the buildings with multiple accounts is combined and Blended Avg. $/Therm is the average of multiple meters in a building. The $/Therm is the total 12 month utility costs divided by the total 12 months Therm usage.

Energy Usage Summary

Ramsey School District Energy Summary Analysis Table - Electric

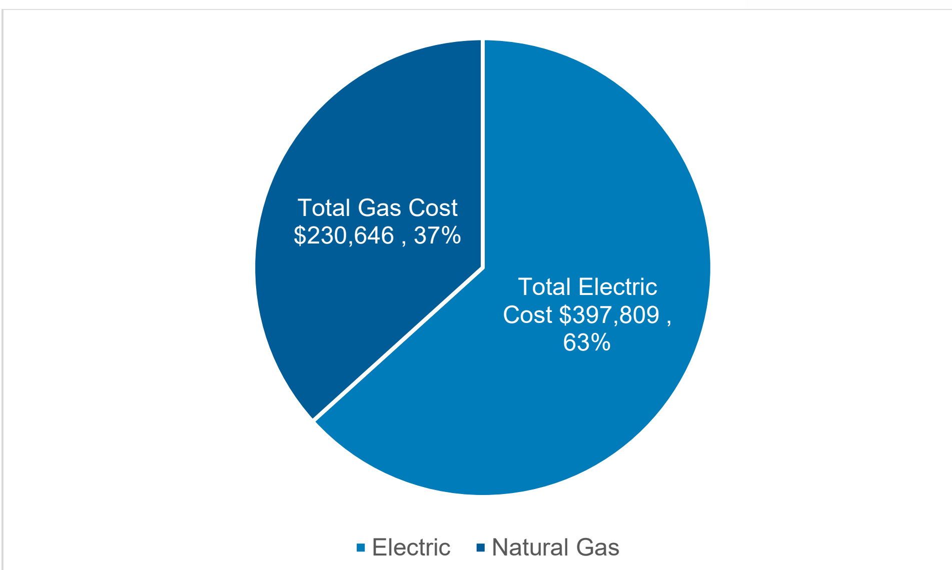
Facility Name	Meter #	Account #	Base Year	Annual kWh	Total kwh $	Total $	$/kWH
Ramsey High School	701034597 / 701034605	19580-75003 / 71490-94009	Jan 2019 - Dec 2019	1,174,100	$149,491	$164,840	$0.127
Eric Smith Middle School	701034556	64331-73003	Jan 2019 - Dec 2019	593,299	$74,733	$82,381	$0.126
John Dater Elementary School	701034600	04230-41007	Jan 2019 - Dec 2019	480,800	$60,141	$65,329	$0.125
Mary Hubbard Elementary School	701202624	30521-76005	Jan 2019 - Dec 2019	288,240	$34,684	$37,488	$0.120
Wesley Tisdale Elementary School	701041823	10172-69001	Jan 2019 - Dec 2019	295,800	$46,871	$50,060	$0.158
Totals				**2,832,239**	**$365,920**	**$400,098**	**$0.129**

Ramsey School District Energy Summary Analysis Table – Natural Gas

Facility Name	Meter #	Natural Gas Transport Account #	Base Year	Therms	Total $	$/Therm
Eric Smith Middle School	2808969	7343911104	Jan 2019 - Dec 2019	35,228	$28,933	$ 0.82
Ramsey High School	2588998 / 4388021	4245516402	Jan 2019 - Dec 2019	129,034	$118,136	$ 0.92
John Dater Elementary School	3275520	7343911406	Jan 2019 - Dec 2019	28,389	$23,338	$ 0.82
Mary Hubbard Elementary School	2279668	7343911201	Jan 2019 - Dec 2019	39,806	$33,277	$ 0.84
Wesley Tisdale Elementary School	3342244	7343911309	Jan 2019 - Dec 2019	31,834	$26,962	$ 0.85
Totals				**264,291**	**$ 230,646**	**$0.873**

Ramsey School District Energy Use Index (EUI) Analysis

The pie chart below shows the distribtuion of these two energy source costs relative to the entire District energy consumption. At 63% of the total consumption, electricity comprises a larger share of the energy costs.



Marginal Rates

For the purposes of determining how energy conservation measures will affect the utility bill, it is important to understand what portions of the cost can be saved. In general, there are costs associated with utility bills that are fixed and independent of usage, such as the monthly meter charge. For example, in the case of a monthly meter charge, this charge often exists even if the energy usage were zero. An energy conservation measure often cannot produce a cost savings on this portion of the bill. The utility rate structure must, therefore, be analyzed to determine what portion of the bill a cost savings can be produced using a specific energy conservation measure. For the purposes of this report, the blended average utility rate is the total cost divided by the total energy units. The effective rate is the portion of the bill effected by energy saving or the applied energy conservation measure.

The utility rates identified below were used for purposes of calculating the dollar effect of the energy savings for the district.

Electric

The effective supply kWh rate is the most recent in the baseline period. The total effective $/kWh rate is the summation of the supply and transport effective rates. For simplification, an Average Effective $/kWh rate was determined by averaging annual effective $/kWh rates and is used for calculations. Rates shown include New Jersey Sales and Use Tax (SUT). A simplified average $/kW demand is used as the effective rate for savings calculations.

Facility Name	Meter #	Account #	Base Year	Peak Monthly	Annual kw	Total kw $	$/kw
Ramsey High School	701034597 / 701034605	19580-75003 / 71490-94009	Jan 2019 - Dec 2019	479	4,496	$15,349	$3.41
Eric Smith Middle School	701034556	64331-73003	Jan 2019 - Dec 2019	250	2,439	$7,648	$3.14
John Dater Elementary School	701034600	04230-41007	Jan 2019 - Dec 2019	192	1,664	$5,188	$3.12
Mary Hubbard Elementary School	701202624	30521-76005	Jan 2019 - Dec 2019	83	865	$2,804	$3.24
Wesley Tisdale Elementary School	701041823	10172-69001	Jan 2019 - Dec 2019	98	1,040	$3,189	$3.07
Totals				**1,102**	**10,504**	**$34,178**	**$3.25**

Ramsey High School has two electric meters (No. 701034597 & No. 701034605) [Account No. 19580-75003 & Account No. 71490-94009]

Eric S. Smith Middle School has one electric meter (No. 701034556) [Account No. 64331-73003]

John Y. Dater Elementary School has one electric meter (No. 701034600) [Account No. 04230-41007]

Mary A. Hubbard Elementary School has one electric meter (No. 701202624) [Account No. 30521-76005]

Wesley D. Tisdale Elementary School has one electric meter (No. 701041823) [Account No. 10172-69001]

Natural Gas

Due to the complex nature and variablity of the gas rates which includes demand and balancing charges in the tarriff rates the blended average unit cost is consided the effective rate for savings calculations. In cases where more than one account/meter serves a school the total average of all combined accounts is used unless the accout is not significant, for instance where the account exists but delivers no natual gas on a regual basis or uses a very small ammout relative to the other accounts.

Baseline Data	Natural Gas			
Facility Name	Therms	Btu/ft2	Total $	$/Unit
Ramsey High School	129,034	64,350	118,136	0.916
Eric S. Smith Middle School	35,228	28,895	28,933	0.821
John Y. Dater Elementary School	28,389	39,734	23,338	0.822
Mary A. Hubbard Elementary School	39,806	50,492	33,277	0.836
Wesley D. Tisdale Elementary School	31,834	40,636	26,962	0.847
Total	**264,291**	**47,949**	**230,646**	**0.873**

Ramsey High School has two gas meters (No. 2588998 & No. 4388021) [Account No. 4245516402]

Eric S. Smith Middle School has one gas meter (No. 2808969) [Account No. 7343911104]

John Y. Dater Elementary School has one gas meter (No. 3275520) [Account No. 7343911406]

Mary A. Hubbard Elementary School has one gas meter (No. 2279668) [Account No. 7343911201]

Wesley D. Tisdale Elementary School has one gas meter (No. 3342244) [Account No. 7343911309]

Utility Breakdown by Building

Electric Usage and Demand

A detailed look at the monthly usage (kWh) in a typical year is shown in the Appendix 9.

Natural Gas Usage

A detailed look at the monthly usage (therms) in a typical year is shown in the Appendix 9.

Utility Escalation Rates

For purposes of calculating the extended value of the energy savings of this project, the following utility escalation rates have been used.

Name of School	Energy					
	Electric Consumption		Annual Electric Demand		Natural Gas	
	Escalation Rate	Start Year of Escalation	Escalation Rate	Start Year of Escalation	Escalation Rate	Start Year of Escalation
Ramsey High School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Eric S. Smith Middle School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
John Y. Dater Elementary School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Mary A. Hubbard Elementary School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Wesley D. Tisdale Elementary School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1

Energy Savings and Cost Summary

The table below provides a summary of the costs and savings associated with the measures recommended in the Energy Savings Plan. The savings have been calculated based on the savings methodology detailed throughout this report and included in the appendix of this report. Costs for each measure have been estimated based on project implementation experience and industry standards.

ECM #	Building	Energy Conservation Measure "ECM"	ECM Hard Cost	Total Savings, $/yr	Simple Payback, yrs
1.1	Ramsey High School	Comprehensive LED Upgrades	**$365,751**	**$17,716**	**20.6**
1.1	Eric Smith Middle School	Comprehensive LED Upgrades	**$601,560**	**$26,348**	**22.8**
1.2	John Dater Elementary School	Direct Install Lighting	**$12,697.00**	**$1,363.00**	**9.3**
1.2	Wesley Tisdale Elem School	Direct Install Lighting	**$1,250.00**	**$156.00**	**8.0**
1.3	John Dater Elementary School	Direct Install Adder	**$174,000.00**	**$433.00**	**401.8**
	Wesley Tisdale ElemSchool	Direct Install Adder	**$144,000.00**	**$1,957.00**	**73.6**
2.1	Ramsey High School	Plug Load Controls	**$11,355**	**$1,265**	**12.21**
	Eric Smith Middle School	Plug Load Controls	**$7,141**	**$504**	**19.29**
	John Dater Elementary School	Plug Load Controls	**$10,653**	**$897**	**16.16**
	Mary Hubbard Elementary School	Plug Load Controls	**$6,087**	**$345**	**24.04**
	Wesley Tisdale Elementary School	Plug Load Controls	**$4,917**	**$776**	**8.63**
2.2	John Dater Elementary School	Transformer Replacements	**$153,266**	**$4,781**	**40.49**
2.3	Ramsey High School	Computer Power Management	**$12,085**	**$2,763**	**5.95**
	Eric Smith Middle School	Computer Power Management	**$7,982**	**$1.189**	**5.97**
	John Dater Elementary School	Computer Power Management	**$3,090**	**$675**	**6.23**
	Mary Hubbard Elementary School	Computer Power Management	**$3,485**	**$737**	**6.43**
	Wesley Tisdale Elementary School	Computer Power Management	**$2,775**	**$763**	**4.95**
3.1	Ramsey High School	Engine Block Heater Control	**$19,000**	**$218**	**87.2**
3.2	Mary Hubbard Elementary School	Intellidyne Boiler Controls	**$15,392.00**	**$2,249.00**	**6.8**
3.3	Ramsey High School	HE Domestic Water Heater Upgrades	**$38,483**	**$388**	**125.19**
	Eric Smith Middle School	HE Domestic Water Heater Upgrades	**$30,881**	**$357**	**81.21**
	Mary Hubbard Elementary School	HE Domestic Water Heater Upgrades	**$28,136**	**$66**	**442.41**
4.1	Ramsey High School	Ramsey High School VRF Install	**$345,000.00**	**$1,320.00**	**261.4**
5.1	Mary Hubbard Elementary School	Unit Ventilator Replacement	**$164,600**	**$166**	**991.5**
	Wesley Tisdale Elementary School	Unit Ventilator Replacement	**$150,800**	**$337**	**447.47**
	Eric Smith Middle School	Unit Ventilator Replacement	**$178,600**	**$322**	**554.6**
6.1	Ramsey High School	Refrigerator Freezer Case EC Motors and Controls	**$9,483**	**$822**	**9.48**
	Eric Smith Middle School	Refrigerator Freezer Case EC Motors and Controls	**$14,660**	**$1,522**	**8.92**
	John Dater Elementary School	Refrigerator Freezer Case EC Motors and Controls	**$10,637**	**$831**	**11.0**
6.2	Ramsey High school	Kitchen Hood Exhaust Control	**$36,106**	**$339**	**106.5**
7.1	Ramsey High School	Building Envelope and Pipe Insulation Upgrades	**$72,080**	**$4,740**	**15.20**
	Eric Smith Middle School	Building Envelope and Pipe Insulation Upgrades	**$49,936**	**$2,214**	**22.55**

	John Dater Elementary School	Building Envelope and Pipe Insulation Upgrades	**$24,453**	**$1,502**	**16.28**
	Mary Hubbard Elementary School	Building Envelope and Pipe Insulation Upgrades	**$44,692**	**$2,077**	**21.51**
	Wesley Tisdale Elementary School	Building Envelope and Pipe Insulation Upgrades	**$56,374**	**$1,500**	**37.58**
8.1	Ramsey High School	Replace Rooftop Units	**$182,658**	**$793**	**205.11**
	Eric Smith Middle School	Replace Rooftop Units	**$213,342**	**$780**	**273.51**
10.1	Eric Smith Middle School	REF – Replace All Single Pane Windows *(1)	**Note (1)**	**$103**	**0.0**
10.2	Ramsey High School	REF – Replace 1965 Addition Windows *(1)	**Note (1)**	**$193**	**0.0**
10.7	Ramsey High School	REF – Replace Boilers – Hot Water (Eliminate Steam)*(1)	**Note (1)**	**$2,503**	**0.0**
10.8	All Schools	Contingency	**$162,407**	**-**	**0.0**
		TOTALS	**$3,410,548**	**$87,495**	**39.0**

Note (1): The installation and operation of the Referendum Energy Conservation Measures are the sole responsibility of the Ramsey School District. Energy Systems Group is not responsible for the installation or cost of installation of the Referendum Energy Conservation Measures. ESG does not guarantee the Total Savings of or performance of or installation timeline of the Referendum Energy Conservation Measures.

“As of July 1, 2021, all of former NJ Clean Energy Program incentive programs transitioned over to the investor-owned gas and electric utility companies. Subsequently, the BPU is requiring that all ESIP projects consult with the DCA and follow all DCA guidance regarding the procurement of all subcontractors.”

Operational Savings Estimates

The lighting retrofits recommended for this project will reduce the number of lamps that need to be replaced each year due to the longer lasting lamps and new technology fixtures. The LED lighting recommended for the exterior fixtures will last much longer than the current high intensity discharge (HID) lighting and will generate material cost savings.

A brief description of the operational savings estimated for this project is included below. Energy Systems Group has worked with the District to quantify the exact sources of savings by going through past invoices and expenses. The operational savings will not be escalated. The total annual savings represents less than 1% of the overall maintenance budget of the District.

Operational Savings for Financial Model

ECM Description	Annual Savings
LED Lighting Upgrades & Occupancy Sensors – District Wide (5 Schools)	$59,763
Mechanical Upgrades – UVs, RTUs, motors, control valves, etc.	$27,732
Totals	$87,495

Potential Revenue Generation Estimates

As part of the Energy Savings Plan for Ramsey School District, several avenues for obtaining rebates and incentives have been investigated which include:

- Orange & Rockland Utility Prescriptive Incentives (High School)
- Orange & Rockland Direct Install (All other schools)
- Pay for Performance
- Combined Heat and Power Incentive
- Demand Response Energy Efficiency Credit

The estimated incentive amount for each program is listed below. Upon final selection of project scope and award of subcontractor bids, the incentive applications will be filed.

Orange & Rockland Utility Incentives

The Equipment Incentives provide prescriptive rebates for defined retrofits. Incentives are applied on a unit-by-unit basis for making energy efficiency upgrades. The table below summarizes the equipment incentives, which will be applied for at Ramsey School District:

Facility	Estimated Incentive
Ramsey High School	$49,834.70
Eric S. Smith Middle School	$184,369.00
John Y. Dater Elementary School	$43,150.00
Mary A. Hubbard Elementary School	$5,640.69
Wesley D. Tisdale Elementary School	$37,915.00
Totals	**$320,909**

"As of July 1, 2021, all of former NJ Clean Energy Program incentive programs transitioned over to the investor-owned gas and electric utility companies. Subsequently, the BPU is requiring that all ESIP projects consult with the DCA and follow all DCA guidance regarding the procurement of all subcontractors."

Pay for Performance Incentives

Pay for Performance incentives are awarded upon the satisfactory completion of three milestones:

Incentive Structure			
Incentive #1: Energy Reduction Plan			
	Incentive Amount:	$0.15	per sq ft
	Minimum Incentive:	$7,500	
	Maximum Incentive:	$50,000	or 50% of facility annual energy cost
This incentive is designed to offset some or all of the cost of services associated with the development of the Energy Reduction Plan (ERP) and is paid upon ERP approval. Incentive is contingent on implementation of recommended measures outlined in the ERP. If installation does not commence within the required timeframe, Incentive #1 may be required to be returned to the program. In the event the project is cancelled and Incentive #1 is not returned, the project may reapply to the program in the future but another Incentive #1 will not be paid.			
Incentive #2: Installation of Recommended Measures			
	Minimum Performance Target:	**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.09	per projected kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.11	
Gas Incentives	Base Incentive based on 15 % savings:	$0.90	per projected Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.25	
	Incentive Cap:	**25%**	**of total project cost**
This incentive is based on projected energy savings outlined in the ERP. Incentive is paid upon successful installation of recommended measures.			
Incentive #3: Post-Construction Benchmarking Report			
	Minimum Performance Target:	**15%**	
Electric Incentives	Base Incentive based on 15% savings:	$0.09	per projected kWh saved
	For each % over 15% add:	$0.005	
	Maximum Incentive:	$0.11	
Gas Incentives	Base Incentive based on 15% savings:	$0.90	per projected Therm saved
	For each % over 15% add:	$0.05	
	Maximum Incentive:	$1.25	
	Incentive Cap:	**25%**	**of total project cost**
This incentive will be released upon submittal of a Post-Construction Benchmarking Report that verifies that the level of savings actually achieved by the installed measures meets or exceeds the minimum performance threshold. Total value of Incentive #2 and Incentive #3 may not exceed 50% of the total project cost. Incentive Caps apply.			

Pay for Performance was analyzed for this project and determined not to be appropriate given the value of the prescriptive incentives available.

Cogeneration Incentives

Incentives are available for Combined Heat and Power (CHP) / Cogeneration systems with heat recovery and productive use of waste heat that are located on-site. Cogeneration units that are powered by natural gas and under 500kW, as in the case of the system recommended Ramsey High School is eligible for an incentive of $2.00/ watt. There is a minimum of 5,000 EFL Run hours that the school will need to meet to qualify for this incentive.

The CHP incentive is paid in three increments as outlined below:

- Thirty percent (30%) of the incentive upon proof of equipment purchase
- Fifty (50%) percent upon project completion and verification of installation
- Remainder twenty percent (20%) upon acceptance and confirmation the project is achieving the required performance thresholds based on twelve (12) months of operating data. proposed and/or minimum efficiency threshold

The minimum payback to be eligible for the CHP incentive was not met and the project is therefore ineligible.

ESCO Name: ENERGY SYSTEMS GROUP / SOLUTIONS ARCHITECTURE

Project Scenario: 3

Note: Respondents must use the following assumptions in all financial calculations:

(a) The cost of all types of energy should be assumed to inflate at 2.2% gas, 2.4% electric per year; and

1. Term of Agreement: 15 years
2. Construction period² (months): 18
3. Cash Flow Analysis Format:

Total Construction Cost	$ 3,410,548.00	
Architect / Consultant	$ 476,423.00	7% of Hard Costs
Bond Counsel / Financial Advisor	$ 44,924.00	
Commissioning/ Training	$ 34,105.00	
District Capital Contribution	$ (25,000.00)	Capital Contribution
Total DIY Project Cost [1]	**$ 3,941,000.00**	

Confirmed Interest Rate from Bids Received : **2.665%**

	Annual Energy Savings	Annual Operational Savings	Energy Rebates/ Incentives	Solar PPA	Total Annual Savings	Annual Project Costs	Board Costs		Net Cash-Flow to client	Cumulative Cash Flow
Installation[5]									$ -	
1	$131,334.00	$ 51,321.00	$320,909.00	$ 170,807.00	$ 674,371.00	$ 504,457.00	$ 504,457.00		$ 2,910.00	$ 2,910.00
2	$89,461.00	$ 51,321.00	$ -	$ 174,564.00	$ 315,346.00	$ 312,436.00	$ 312,436.00		$ 2,910.00	$ 5,820.00
3	$91,471.00	$ 12,956.00	$ -	$ 178,405.00	$ 282,832.00	$ 279,922.00	$ 279,922.00		$ 2,910.00	$ 8,730.00
4	$93,526.00	$ 12,956.00	$ -	$ 182,330.00	$ 288,812.00	$ 285,902.00	$ 285,902.00		$ 2,910.00	$ 11,640.00
5	$95,627.00	$ 12,956.00	$ -	$ 186,341.00	$ 294,924.00	$ 292,014.00	$ 292,014.00		$ 2,910.00	$ 14,550.00
6	$97,776.00	$ -	$ -	$ 190,440.00	$ 288,216.00	$ 285,306.00	$ 285,306.00		$ 2,910.00	$ 17,460.00
7	$99,973.00	$ -	$ -	$ 194,630.00	$ 294,603.00	$ 291,693.00	$ 291,693.00		$ 2,910.00	$ 20,370.00
8	$102,219.00	$ -	$ -	$ 198,912.00	$ 301,131.00	$ 298,221.00	$ 298,221.00		$ 2,910.00	$ 23,280.00
9	$104,516.00	$ -	$ -	$ 203,288.00	$ 307,804.00	$ 304,894.00	$ 304,894.00		$ 2,910.00	$ 26,190.00
10	$106,864.00	$ -	$ -	$ 207,760.00	$ 314,624.00	$ 311,714.00	$ 311,714.00		$ 2,910.00	$ 29,100.00
11	$109,265.00	$ -	$ -	$ 212,331.00	$ 321,596.00	$ 318,686.00	$ 318,686.00		$ 2,910.00	$ 32,010.00
12	$111,720.00	$ -	$ -	$ 217,002.00	$ 328,722.00	$ 325,812.00	$ 325,812.00		$ 2,910.00	$ 34,920.00
13	$114,230.00	$ -	$ -	$ 221,776.00	$ 336,006.00	$ 333,096.00	$ 333,096.00		$ 2,910.00	$ 37,830.00
14	$116,796.00	$ -	$ -	$ 226,655.00	$ 343,451.00	$ 340,541.00	$ 340,541.00		$ 2,910.00	$ 40,740.00
15	$119,420.00	$ -	$ -	$ 231,642.00	$ 351,063.00	$ 348,153.00	$ 348,153.00		$ 2,910.00	$ 43,650.00
Totals	**$1,584,198.00**	**$ 141,510.00**	**$320,909.00**	**$ 2,996,883.00**	**$ 5,043,501.00**	**$ 4,832,847.00**	**$ 4,832,847.00**		**$ 43,650.00**	**$ -**

NOTES:

Includes: Hard costs and project service fees defined in ESCO's PROPOSED 'FORM V"

Total Financed Cost includes all Fees and project costs.

Interest rate is confirmed from bids received

The annual energy 2.25% and labor .% escalation are in accordance with the RFP

The utility incentive amount shown is typical expected and is not indicative of the actual amount as project timing, changes to utility program and availability of funds affect the outcome

"As of July 1, 2021, all of former NJ Clean Energy Program incentive programs transitioned over to the investor-owned gas and electric utility companies. Subsequently, the BPU is requiring that all ESIP projects consult with the DCA and follow all DCA guidance regarding the procurement of all subcontractors."

Business Case for Recommended Project

Greenhouse Gas Reductions

Avoided Emissions	Total Electric Savings	Total Natural Gas Savings	Total Annual Avoided Emissions
Annual Unit Savings	**kWh**	**Therms**	**Total**
NO_X	496 Lbs	217 Lbs	**713 Lbs**
SO_2	1,153 Lbs	0 Lbs	**1,153 Lbs**
CO_2	580,064 Lbs	276,445 Lbs	**856,509 Lbs**

Factors Used in Calculations:

CO_2 Electric Emissions:	*1,111.79*	*lbs.*	*per*	*MWh*	*saved*
CO_2 Gas Emissions:	*11.7*	*lbs.*	*per*	*therm*	*saved*
NO_X Electric Emissions:	*0.95*	*lbs.*	*per*	*MWh*	*saved*
NO_X Gas Emissions:	*0.0092*	*lbs.*	*per*	*therm*	*saved*
SO_2 Electric Emissions:	*2.21*	*lbs.*	*per*	*MWh*	*saved*

1-1 Comprehensive LED Upgrades

ECM Summary

Lighting Retrofit and Replacement: Most of the lighting fixtures throughout the district, utilize older technologies that can be upgraded. Improvements to lighting will reduce electrical consumption and improve lighting levels. The costs of material to maintain the current systems will also be reduced since these renovations replace items (i.e., lamps and ballasts) that are near the end of their life cycle and/or considered environmentally hazardous.

Where appropriate, lighting levels will be adjusted to meet Illumination Engineering Society (IES) standards.

Lighting Levels: Our proposed lighting system improvements will maximize savings while maintaining or improving existing light levels in each area. All installations will comply with IES standards. Post-retrofit light levels are typically increased because of the improved design and installation of newer equipment, but areas that are currently over lit will be adjusted to maintain IES recommended light level. Before and after sample light level reading will be performed to confirm expected results.

Exterior Lighting: In an effort to reduce electricity consumption and provide better security Ramsey School District's buildings, ESG is proposing to retrofit the existing outside lighting (excludes parking lots) on the buildings with newer, LED technology with photocells for automatic control. In addition, every effort will be made to standardize the installed components for equipment uniformity and maintenance simplicity. Typical LED lighting system exhibit the following characteristics:

- Extremely Long Life – up to 50,000+ hours
- Highly efficient with very low wattage consumption
- Solid state lighting technology ensures that the fixtures are highly durable

Facilities Recommended for this Measure

- Ramsey High School
- Eric S. Smith Middle School

Scope of Work

Scope of work details and complete Line x Line documents are located in Appendix 6.

Savings Methodology

In general, savings calculations for lighting retrofits are calculated using the following methodology:

Savings Calculation Method		
Baseline Energy Usage (kWh / yr)	=	Existing Fixture Watts x Operating Hours / yr x 1 kW / 1000 Watts
Estimated Energy Usage (kWh / yr)	=	Proposed Fixture Watts x Op. Hours/yr x 1 kW / 1000 Watts
Energy Savings (kWh / yr)	=	Baseline Energy Usage – Estimated Energy Usage
Baseline Demand (kW)	=	Existing Fixture Watts / 1000 Watts
Retrofit Demand (kW)	=	Proposed Fixture Watts / 1000 Watts
Energy Savings (kW)	=	(Existing Fixture Watts – Proposed Fixture Watts) x 1 kW / 1000 Watts

Maintenance

Lighting will need to be replaced in order to provide consistent light quality throughout the exterior space. It is recommended to conduct group re-lamping on regularly scheduled intervals in order to minimize maintenance requirements.

Benefits

- Electrical energy savings
- Improved exterior light quality
- Reduction in maintenance of exterior lighting system
- Improved safety around school perimeter
- Reduced lamp and fixture replacement for 5 to 10 years for LEDs

1-2 Direct Install Lighting

ECM Summary

Existing small to mid-sized commercial and industrial facilities with a peak electric demand that did not exceed 200 kW in any of the preceding 12 months are eligible to participate in Direct Install. Applicants will submit the last 12 months of electric utility bills indicating that they are below the demand threshold and have occupied the building during that time. Buildings must be located in New Jersey and served by one of the state's public, regulated electric or natural gas utility companies. Created specifically for existing small to medium-sized facilities, Direct Install is a turnkey solution that makes it easy and affordable to upgrade to high efficiency equipment. The program pays up to 70% of retrofit costs, dramatically improving your payback on the project.

Facilities Available for Direct Install

- John Y. Dater School
- Wesley D. Tisdale School

Scope of Work

ESG will work closely with one of the program partners to evaluate the Direct Install Program

The systems and equipment addressed by the program are

- Lighting
- HVAC Upgrades
- Boiler Controls
- Water Conservation

Refer to the appendix section 4, for more detailed information concerning Direct Install.

Savings Methodology

In general, savings calculations for lighting retrofits are calculated using the following methodology:

Savings Calculation Method		
Baseline Energy Usage (kWh / yr)	=	Existing Fixture Watts x Operating Hours / yr x 1 kW / 1000 Watts
Estimated Energy Usage (kWh / yr)	=	Proposed Fixture Watts x Op. Hours/yr x 1 kW / 1000 Watts
Energy Savings (kWh / yr)	=	Baseline Energy Usage – Estimated Energy Usage

Baseline Demand (kW)	=	Existing Fixture Watts / 1000 Watts
Retrofit Demand (kW)	=	Proposed Fixture Watts / 1000 Watts
Energy Savings (kW)	=	(Existing Fixture Watts – Proposed Fixture Watts) x 1 kW / 1000 Watts

Maintenance

Lighting will need to be replaced in order to provide consistent light quality throughout the exterior space. It is recommended to conduct group re-lamping on regularly scheduled intervals in order to minimize maintenance requirements.

Benefits

- Reduced installation cost utilizing Direct Install Incentive Program.
- Electrical energy savings

1-3 Direct Install Adder

ECM Summary

Participating in the Direct Install program to upgrade lighting provides for the upgrade of additional building systems. These include HVAC replacements, fuel use economizers, walk-in cooler/freezer upgrades, and low-flow aerators for kitchen/lavatory sinks in the case of Ramsey School District.

A heating system must be able to provide acceptable comfort at the lowest anticipated outdoor temperature. Most commercial/industrial boilers have a heating capacity 1.5 to 2 times larger than needed to maintain space temperature on extreme days. Due to this oversizing of the boiler, the burner will cycle on and off to prevent overheating of the system water during any call for heat.

Intellidyne Heating System Economizers increase system efficiency; thus, the heating system uses less fuel to generate the same amount of heat. This is done by dynamically changing the aquastat's effective dead-band based on the measured heating load. This causes the average water temperature to be varied (depending on the measured load) and is accomplished by extending the burner's off-time. Extending the off time also results in longer, more efficient burns and a reduction in burner cycling. Just as computer control has increased the gas mileage of automobiles, Intellidyne Heating System Economizers improve the fuel utilization of heating systems by supplementing the antiquated on/off control action of the aquastat with the analysis and control capabilities of a computer.

Facilities Recommended for this Measure

- John Dater Elementary School
- Wesley D. Tisdale Elementary School

Scope of Work

John Dater Elementary School

Scope

- HVAC Split-System AC Replacement
  - (3) 2-ton units – RTU-5, RTU-6, and RTU-15
  - (1) 3-ton unit – RTU-11
  - (1) 4-ton unit – RTU 10
  - (1) 7.5-ton unit – RTU 4
- HVAC Packaged Unit
  - (1) 8.5-ton RTU – RTU-13

Wesley D. Tisdale Elementary School

Scope

- HVAC Split-System Replacement
  - (3) 2.5-ton units – RTU-7, RTU-8, RTU-9
  - (1) 4-ton unit – RTU-2
  - (1) 7.5-ton unit – RTU 1

- Boiler Fuel Use Economizers
    - (2) Fuel Use Economizers

Savings Methodology

HVAC Savings

Savings Calculation Method		
Cooling Savings (kWh)	=	Unit-Size (Tons) x Cooling gradient (%) x (Existing Unit kW/Ton – New Unit kW/Ton) x Bin Hours

Fuel Use Economizers

Energy savings will result from reducing the boilers cycling. In general, ESG uses the following approach to determine savings for this specific measure:

Savings Calculation Method		
Total Existing Boiler Natural Gas Usage (Therms)	=	Therms
Savings (% of Total)	=	13%*
Factor of Safety	=	50%
Total Natural Gas Savings (Therms)	=	(Existing Usage)*(Savings %)*(Factor of Safety)

The savings estimate (%) matches the value stipulated by the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings. ESG has also applied a 50% factor of safety to lower the estimated savings.

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electric savings
- Natural Gas savings

2-1 Plug Load Controls

ECM Summary

BERT Plug Load Management Software

BERT Plug Load Management Devises

Energy Systems Group recommends utilizing specialty wall sockets from BERT that have software to track real-time electrical usage of your appliances. The software also allows you to use your web browser to view this usage and automatically turn on/off any and all appliances plugged into these outlets.

Facilities Recommended for this Measure

- All Schools

Scope of Work

Energy Systems Group proposes to install (190) BERT plug load management devices. See Appendix for detailed scope of Work.

Savings Methodology

Savings are calculated using the following methodology for all devices plugged in:

Savings Calculation Methodology		
Baseline Energy Usage (kWh / yr)	=	Average kW x Baseline Weekly Hours x 4.348 wks/mo. x Months/yr
Proposed Energy Usage (kWh/ yr)	=	Average kW x Proposed Weekly Hours x 4.348 wks/mo. x Months/yr
Electrical Savings (kWh/ yr)	=	Baseline Energy Usage – Proposed Energy Usage

Maintenance

Periodically the equipment should be checked to ensure proper operation.

2-2 Transformer Replacements

ECM Summary

The primary goal of this ECM is increased energy savings through replacement of old, inefficient transformers with new, ultra-high efficiency transformers. While facilities are unique, electrical infrastructure is almost always based on U.S. industry standard transformers. Transformers are typically purchased as part of a total electrical distribution package, installed, and forgotten for 40-50 years. The majority of these transformers are operating at a small fraction of their nameplate capacity, resulting in very low efficiency, and are producing large amounts of excess heat, resulting in energy losses and higher utility costs. In addition, half of all existing transformers, according to the Dept. of Energy, are approaching a mean time to failure of 32 years. Replacing these units prior to a sudden end of life, results in lower risk of facility down time.


PowerSmiths ESaver Transformer

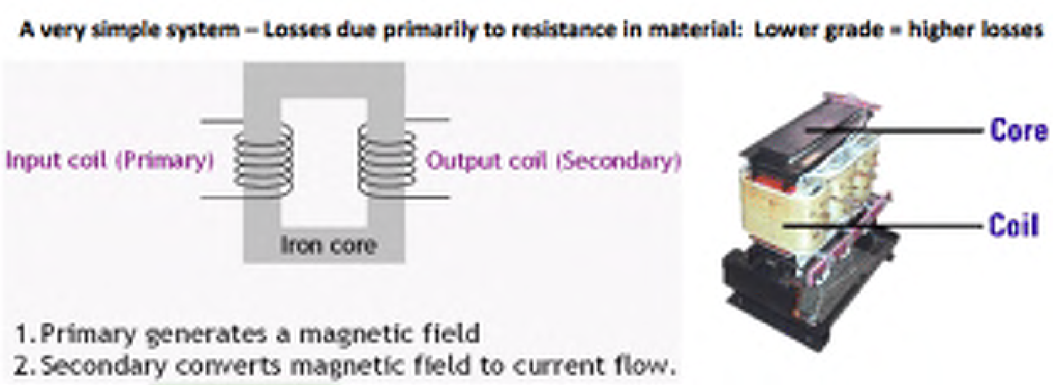
Energy Systems Group identified fifteen (15) existing transformers that are of standard, or lower, efficiency.

A. Performance Validation: Metering for Real World Losses

For a transformer retrofit to deliver real energy savings, the losses of the new transformer must be measurably lower than those of the existing transformer. Losses of existing transformers are not widely understood in relation to actual load conditions and load profiles.

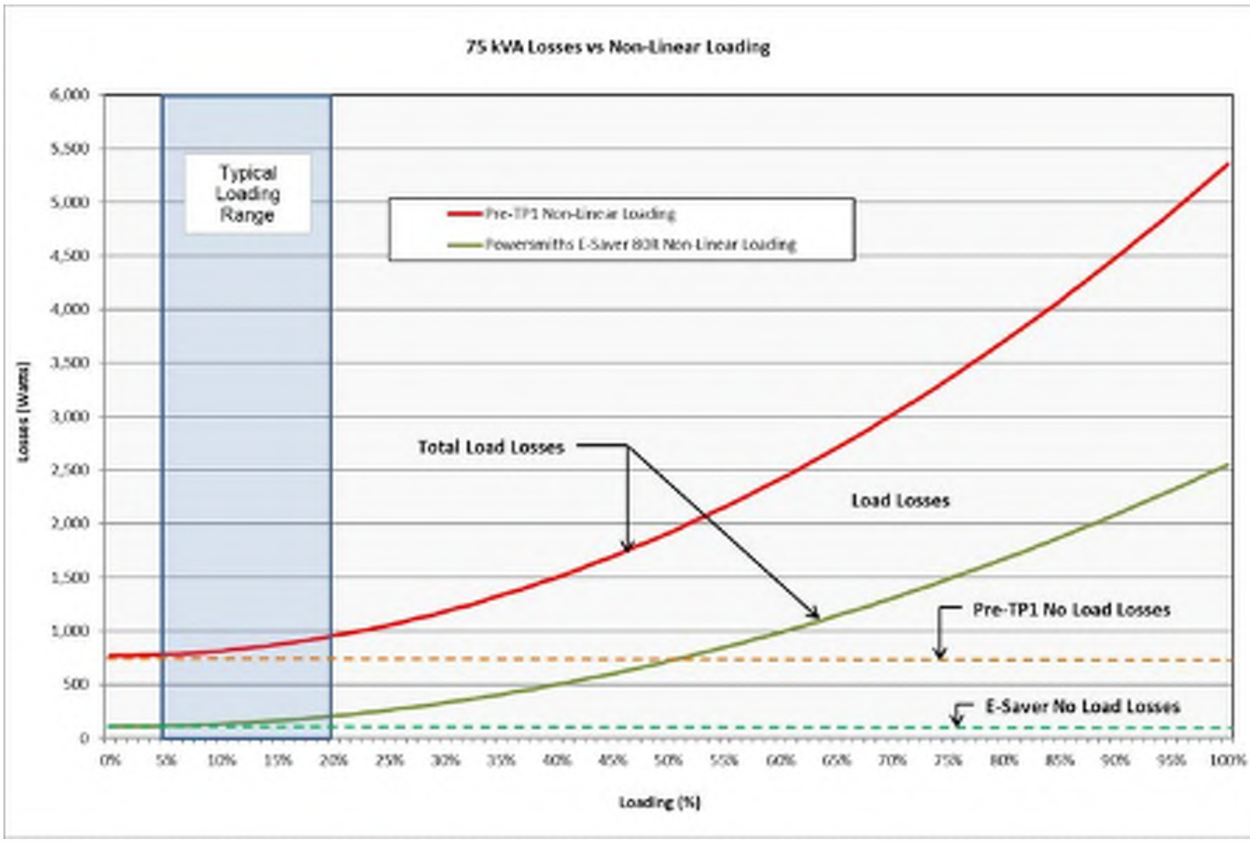
B. Origin of Transformer Losses

Transformers are comprised of two major components: a steel core, and windings made of aluminum or copper.



B . Origin of Transformer Losses

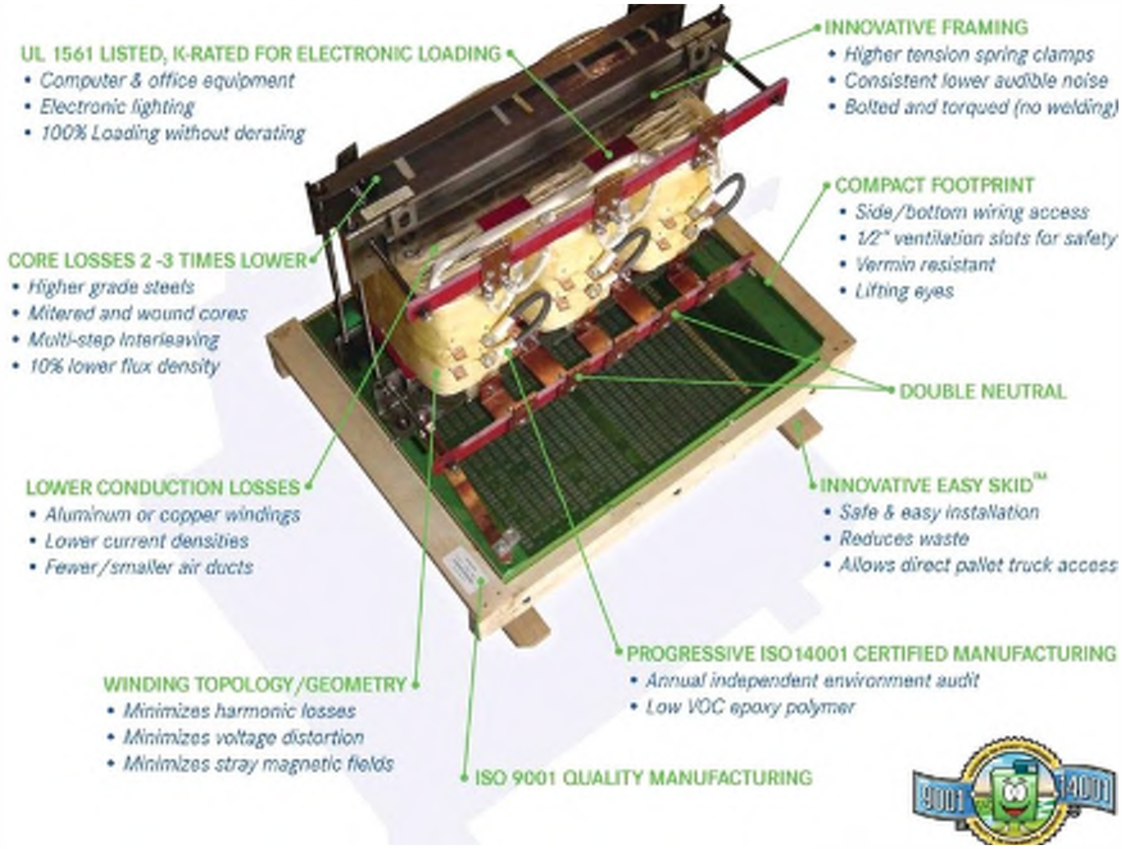
Unlike lighting, which is binary - either on or off, transformers are in operation 24 hours/day, 365-days/year, so they produce energy losses around the clock. Core losses, also known as no load losses or energizing losses, are present continuously, regardless of whether or not there is any load (the core is always energized). Coil losses, also known as load losses, vary with the square of the load placed upon them (i.e. 2 times the load creates 4 times the losses). Therefore, at low load the core losses dominate, and the coil losses dominate at heavy load.



kVa Losses vs Non-Linear Loading

Department of Energy, and the majority of manufacturer published data, are based on transformer performance at a single 35%, linear load. This drives transformer manufacturers to design for their highest efficiency under the 35% linear load profile. However, this profile is extremey rare in the real world. Linear loads essentially ceased to exist with the widespread use of computers, monitors and printers. The average load on a transformer, across almost all vertical markets, is only about 13%-14%. To reach this extremely low percentile, the vast majority of transformers are loaded at below 10%.

Through the use of superior design and manufacturing processes, and better materials (higher available grade of steel, and AL or CU when called for), Powersmiths E-Saver OPAL transformers produce extremely low no-load-losses and minimize load-losses.



C. The Powersmiths E-Saver-OPAL Benefits Summary

Lowest Life-Cycle Cost: The E-Saver sets new benchmarks for environmental protection, energy efficiency and reliability. Designed to provide the lowest life cycle cost, the E-Saver goes beyond US DOE 2016 efficiency, ensuring lower operating losses than standard off-the-shelf transformers. To provide superior performance and reduce environmental impact, the E-Saver comes with a superior Nomex based insulation system impregnated with an organic epoxy adhesive. Superior insulation prevents shorts as well, substantially prolonging the life of the transformer.

Customizable Design: Based on the detailed field survey, the replacement E-Saver transformers will be a like-for-like, nominal kVA capacity, designed and manufactured to minimize losses for the application and fit within the existing constraints. Flexible manufacturing allows for customized terminal configuration to maximize the potential for the electrical contractor to re-use the existing conductors & conduits. Terminal configurations require final approval from the selected Electrical Contractor.

Quiet Operation: Indoor environments can be degraded or disrupted when noisy transformers are located close to people.

Facilities Recommended for this Measure

- John Y Dater Elementary School

Scope of Work

The old, inefficient transformers at John Y. Dater School will be replaced with state-of-the-art, ultra-efficient transformers that will yield substantial energy savings and renew a key component of the infrastructure that powers all connected equipment, such as computers, monitors and printers.

Transformer Upgrade Summary (John Y. Dater)		
Rating	**Total Quantity**	**Replacement Quantity**
45 kVa	7	7
75 kVa	6	6
112.5 kVa	2	2

Savings Methodology

Savings are calculated using the following methodology for all the transformers:

Savings Calculation Methodology		
Baseline Annual losses from Transformers(kWh/yr)		
Powersmith Annual losses from Tansformers (kWh/yr)	=	(Powersmiths Transformer kW Losses (Normal Operation) x Equipment Operating hrs/ day x Equipment Operating days/yr) + Powersmiths Transformer kW Losses(Outside Op. hrs) x (24 x 365 - Equipent Operating hrs/ day x Equipment Operating days/yr)
Electrical Savings (kWh/yr)	=	Baseline Annul losses from Transformers – Powersmith Annual losses from Transformers

Maintenance

- Periodically the equipment should be checked to ensure proper operation.

Warranty Statement
(E-Saver): The E-Saver's long life and dependable performance is backed up by Powersmiths' industry leading 32-year pro-rated warranty, for both operation and performance.

Benefits

- Electrical Energy Savings
- Infrastructure Upgrade

2-3 Computer Power Management

ECM Summary

Energy Systems Group will furnish and install a software utility that measures, manages, and minimizes the energy consumed by the network's PC clients through one centralized interface. It provides IT departments with a powerful approach to automate energy-efficient "best practices" throughout their networks, while it adds new control and flexibility to traditional PC power management.

With the help and cooperation of the District, ESG will install and rapidly deploy PC Power Management software on the District's PC network. A one-day deployment plan will address server and client installation., basic administrative configurations, logical power management profile groupings, and energy consumption reporting. Ongoing technical support and product revisions, with an annual energy audit to ensure maximized energy savings are also included for a period of three years.

Facilities Recommended for this Measure

- District Wide

Scope of Work

Category	Quantity
Computers	**724**

Power Management software/hardware and installation will include approximately 724 existing computers. Details concerning computer quantities are listen in the appendix concerning the energy savings calculations .

Savings Methodology

In general, savings calculations for lighting retrofits are calculated using the following methodology:

Savings Calculation Method	
Existing kW	= Listed Equipment Amperage x Voltage of Equipment
Cost per kWh	= Average Site Data Package $/kWh
Cost of Existing Equipment	= Existing kW x Cost per kWh x Effective Full Load Hours
Cost of Proposed Equipment	= Existing kW x Cost per kWh x Full Load Hours Using Control
Energy Savings	= Existing Equipment Costs – Proposed Equipment Costs

Maintenance

Update software as needed.

Benefits

- Energy Savings
- Better control and monitoring
- Prolonged equipment life

3-1 Engine Block Heater Control

ECM Summary

Ramsey High School's stand-by generator is designed to start instantaneously during a power outage. Due to this design, an engine block heater is required to maintain a specified temperature allowing instantaneous startup. The current technology used to heating the generator is resistance heating, which have a high failure rate prior to 5 years of use. This ECM will install a heat pump heater in series with the current resistance heater, providing better control and redundancy for this critical system. Additionally, the specified heat pump has a typical life expectancy of over 20 years.

Facilities Recommended for this Measure

• John Dater Elementary School	**Make** – Model **Baldor** – IDLC400D

Scope of Work

Add heat pump heater in series with current resistance heater to provide required heating for stand-by generator at Ramsey High School.

Savings Methodology

Savings Calculation Method		
Heating Savings (kWh)	=	(Existing Unit kW – (Unit-Size (Tons) x Heating gradient (%) x New Unit kW/Ton)) x Bin Hours

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electric savings
- Improved heating control

3-2 Intellidyne Boiler Controls

ECM Summary

A heating system must be able to provide acceptable comfort at the lowest anticipated outdoor temperature. Most commercial/industrial boilers have a heating capacity 1.5 to 2 times larger than needed to maintain space temperature on extreme days. Due to this oversizing of the boiler, the burner will cycle on and off to prevent overheating of the system water during any call for heat.

Intellidyne Heating System Economizers increase system efficiency, thus, the heating system uses less fuel to generate the same amount of heat. This is done by dynamically changing the aquastat's effective dead-band based on the measured heating load. This causes the average water temperature to be varied (depending on the measured load) and is accomplished by extending the burner's off-time. Extending the off-time also results in longer, more efficient burns and a reduction in burner cycling. Just as computer control has increased the gas mileage of automobiles, Intellidyne Heating System Economizers improve the fuel utilization of heating systems by supplementing the antiquated on/off control action of the aquastat with the analysis and control capabilities of a computer.

Facilities Recommended for this Measure

- Mary Hubbard Elementary School

Scope of Work

Mary Hubbard Elementary School

New Installation Work:
Proposed are the following:

- Furnish & install (F&I) (2) each Intellidyne IntelliCon Controls at the boiler burners (existing only)
- Provide connection to existing, or newly installed, building Energy Management System (EMS)
- Provide factory commissioning of system (start up and testing).

Savings Methodology

Energy savings will result from reducing the compressor cycling. In general, ESG uses the following approach to determine savings for this specific measure:

Savings Calculation Method		
Total Existing Boiler Natural Gas Usage (Therms)	=	Therms
Savings (% of Total)	=	13%*
Factor of Safety	=	50%
Total Natural Gas Savings (Therms)	=	(Existing Usage)*(Savings %)*(Factor of Safety)

The savings estimate (%) matches the value stipulated by the New Jersey Board of Public Utilities New Jersey Clean Energy Program Protocols to Measure Resource Savings. ESG has also applied a 50% factor of safety to lower the estimated savings.

Maintenance

Periodically the equipment should be checked to ensure proper operation.

3-3 High-Efficiency Domestic Water Heater Upgrades

ECM Summary

The existing domestic water heaters at some Ramsey School District facilities are nearing the end of their useful life. As existing DHW boiler(s) age, they typically experience a loss in efficiency due to fouling and scaling on the internal heat exchange components, as well as an increase in maintenance costs. This measure will include replacing these units with new high-efficiency domestic water heating systems.

The existing domestic hot water heaters are standard efficiency models that operate at a nameplate value of around 80% thermal efficiency. This measure will include the installation of new hot water heaters to replace these aging, lower efficiency ones. New condensing water heaters are available that operate at efficiencies up to 97%.

Facilities Recommended for this Measure

Eric Smith Middle School
Mary Hubbard Elementary School
Ramsey High School

Scope of Work

Eric Smith Middle School

Demolition and Removal Work

- Drain, disconnect hot water piping, gas piping, electrical and metal flue venting for removing and properly disposing of existing Rheem Model G91-200-1, 199 MBH, 91-gallon natural draft gas fired domestic hot water heater.

New Installation Work

- Furnish and Install (F&I) Qty. (1) AO Smith Model BTH-199(A) (199MBH Input, 100-gallon Capacity, 97% Thermal Efficiency) gas-fired domestic hot water heater or equal.
- F&I new copper pipe, fittings, valves and insulation to reconnect existing hot and cold-water piping to new water heater.
- Expansion tank and anti-scald valve to remain.
- F&I new 3” PVC concentric vent kit on roof with new 3” PVC exhaust and combustion air piping connecting to new water heater.
- Reconnect existing gas piping to new water heater.
- Reconnect existing electric to new water heater.
- (3) Year Limited Manufacturer Warranty on tank.
- Existing piping, pump and check valve to remain.

Ramsey High School

Demolition and Removal Work

- Drain, disconnect hot water piping, gas piping, electrical and metal flue venting for removing and properly disposing of existing AO Smith 520 MBH natural draft gas fired domestic hot water heater.

New Installation Work

- Furnish and Install (F&I) Qty. (1) AO Smith Model BTH-500(A) (499,900 BTU Input, up to 97% Thermal Efficiency) gas fired domestic hot water heater or equal.
- New water heater is to reconnect into existing DHW storage tank.
- F&I new copper pipe, fittings, valves and insulation to reconnect existing hot water piping to new water heater.
- Reconnect existing gas piping to new water heater.
- Reconnect existing electric to new water heater.
- Provide factory authorized start-up.
- All existing piping, supply pumps and check valve to remain.

Mary Hubbard Elementary School

Demolition and Removal Work

- Drain, disconnect hot water piping, gas piping, electrical and metal flue venting for removing and properly disposing of existing AO SMITH 160 MBH natural draft gas fired domestic hot water heater.

New Installation Work

- Furnish and Install (F&I) Qty. (1) AO Smith Cyclone Mxi Model BTH-150(A) (150MBH Input, up to 98% Thermal Efficiency) gas fired domestic hot water heater. The existing storage tank will remain.
- F&I new copper pipe, fittings, valves and insulation to reconnect existing hot water piping to new water heater.
- Reconnect existing gas piping to new water heater.
- Reconnect existing electric to new water heater.
- Provide factory authorized start-up.
- (3) Year Limited Manufacturer Warranty on Tank.
- All existing piping, supply pumps and check valve to remain.

Savings Methodology

Savings Calculation Method		
Heating Savings (kWh)	=	E_pre= 〖DHW〗_usage*N*ODY*HTV* η_(pre-sys) E_post= 〖DHW〗_usage*N*ODY*HTV* η_(post-sys) E_saved=E_pre- E_post

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Natural gas savings
- Improved heating control
- Infrastructure Upgrade

4-1 Addition of Cooling - Ramsey High School VRF Install

ECM Summary

The second floor of Ramsey High School only has heating capabilities and the district desires to add cooling. In order to most effectively supply the cooling, it is the intent of this ECM to install Variable Refrigerant Flow (VRF) heat pumps. These VRF heat pumps will provide high-efficiency cooling during the summer months and baseline heating during the winter months. The proposed system will reduce cooling costs compared to a standard DX equipment and will include DDC controls that can be easily integrated into the proposed Building Management System. The new systems will also ensure that all equipment operates with a common, environmentally low-impact refrigerant minimizing the plants ozone depletion potential.

The classrooms on the second floor of the 1986 Wing are currently conditioned via classroom unit ventilators (with steam heating coils), steam radiators, and a ducted exhaust system (with local exhaust fans located in the classrooms). The classrooms on the third floor are served in a similar manner, but a VRF air conditioning system (Fujitsu) was added to provide air conditioning for the classrooms. The indoor units were ceiling-cassette models (some wall-mounted units were also observed in some areas). The first floor classrooms are served in a manner similar to the third floor classrooms, but the VRF system is Mitsubishi, and we were advised that the first floor was converted from steam heat to hot water heat (although at least one steam radiator was still observed on the first floor). A VRF system was also installed to serve the cafeteria. This is a Daikin system.

Facilities Recommended for this Measure

- Ramsey High School

Scope of Work

Add Air Conditioning to the 2nd floor of Ramsey High School. This will be done by upgrading the existing mechanical systems to be able to perform cooling duties.

Room	Indoor Unit(s)
Office near Room 206	1 @ 12,000 Btuh
Classroom 206	2 @ 12,000 Btuh
Classroom 208	1 @ 12,000 Btuh, 1@ 8,000 Btuh
Classroom 210	1 @ 15,000 Btuh
Classroom 211	1 @ 18,000 Btuh
Classroom 212	2 @ 12,000 Btuh
Office near Room 212	1 @ 8,000 Btuh
Classroom 209	2 @ 15,000 Btuh
Classroom 207	3 @ 15,000 Btuh
Classroom 205	2 @ 12,000 Btuh

Total number of indoor units = 16

Outdoor Unit = 20 tons (2 modules)

Savings Methodology

Savings Calculation Method		
Cooling Savings (kWh)	=	Unit-Size (Tons) x Cooling gradient (%) x (Existing Unit kW/Ton – New Unit kW/Ton) x Bin Hours
Heating Savings (Therms)		((Boiler Efficiency (%) x HHW Heat Exchanger Efficiency (%) x Heating Gradient (%) x Heat Exchanger Output (Btu/Hr)) / 100,000) x ((Unit-Size (Tons) x Heating Gradient (%) x New Unit kW/Ton) / 0.03413 (Therms/kWh)) x Bin Hours

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Natural gas savings
- Improved occupant comfort

5-1 Unit Ventilator Replacement

ECM Summary

Energy Systems Group proposes to replace the existing aged unit ventilators with high efficiency unit ventilators. Replacing aged unit ventilator units will reduce the operating and maintenance costs of these systems. Motor efficiency, heating and outdoor air damper efficiency of unit ventilators will improve with the installed units.

Facilities Recommended for this Measure

- Mary A. Hubbard Elementary School
- Wesley D. Tisdale Elementary School
- Eric Smith Middle School

Scope of Work

Mary A. Hubbard School

Demolition and Removal Work

- Remove (27) twenty seven Unit Vent Systems inclusive of cabinet, filler pieces and false back. Existing wall sleeve and outside grille is to remain.
- Disconnect and make safe electrical, plumbing (Hot water, steam, etc.) and controls and prepare for new work
- Remove piping from unit ventilator to point of isolation ball valve located at the branch take-off for each unit's supply and return. If applicable, disconnect existing condensate piping and prepare for connection to new equipment.
- Provide rigging/equipment to safely remove/install overhead located Unit Ventilators.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:
Proposed are the following:

- F&I (27) twenty seven McQuay Model (or approved equal) Unit Ventilators each with high-efficiency EC motor, 2-Row HW/CW Coils, Cold Weather Damper Assembly, 208V/1PH, 1" Filter, End Panels, 1,250 CFM Supply Air.
- Rig new unit ventilator into the building and anchor to exterior wall
- Provide new pneumatic control valve, if necessary
- Reconnect existing piping to new unit ventilator and reinsulate piping
- Reconnect condensate drain piping
- Reconnect power and control plumbing/wiring
- Provide testing and balancing (air & water) for each new unit ventilator.

Wesley D. Tisdale School

Demolition and Removal Work

- Remove (31) thirty one Unit Vent Systems inclusive of cabinet, filler pieces and false back. Existing wall sleeve and outside grille is to remain.
- Disconnect and make safe electrical, plumbing (Hot water, steam, etc.) and controls and prepare for new work
- Remove piping from unit ventilator to point of isolation ball valve located at the branch take-off for each unit's supply and return. If applicable, disconnect existing condensate piping and prepare for connection to new equipment.
- Provide rigging/equipment to safely remove/install overhead located Unit Ventilators.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- F&I (31) thirty one McQuay Model (or approved equal) Unit Ventilators each with high-efficiency EC motor, 2-Row HW/CW Coils, Cold Weather Damper Assembly, 208V/1PH, 1" Filter, End Panels, 1,250 CFM Supply Air.
- Rig new unit ventilator into the building and anchor to exterior wall
- Provide new pneumatic control valve, if necessary
- Reconnect existing piping to new unit ventilator and reinsulate piping
- Reconnect condensate drain piping
- Reconnect power and control plumbing/wiring
- Provide testing and balancing (air & water) for each new unit ventilator.

Eric Smith Middle School

Demolition and Removal Work

- Remove (17) seventeen Unit Vent Systems inclusive of cabinet, filler pieces and false back. Existing wall sleeve and outside grille is to remain.
- Disconnect and make safe electrical, plumbing (Hot water, steam, etc.) and controls and prepare for new work
- Remove piping from unit ventilator to point of isolation ball valve located at the branch take-off for each unit's supply and return. If applicable, disconnect existing condensate piping and prepare for connection to new equipment.
- Provide rigging/equipment to safely remove/install overhead located Unit Ventilators.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:
Proposed are the following:

- F&I (17) seventeen McQuay Model (or approved equal) Unit Ventilators each with high-efficiency EC motor, 2-Row HW/CW Coils, Cold Weather Damper Assembly, 208V/1PH, 1” Filter, End Panels, 1,250 CFM Supply Air.
- Rig new unit ventilator into the building and anchor to exterior wall
- Provide new pneumatic control valve, if necessary
- Reconnect existing piping to new unit ventilator and reinsulate piping
- Reconnect condensate drain piping
- Reconnect power and control plumbing/wiring
- Provide testing and balancing (air & water) for each new unit ventilator.

Savings Methodology

Energy savings will result from reducing the amount of energy the compressor will consume. In general, ESG uses the following approach to determine savings for this specific measure:

Savings Calculation Method		
Energy Savings (kWh)	=	Tons * Equivalent Full Load Hours * (IPLV Baseline – IPLV New Equipment)
Demand Savings (kW)	=	Tons * (Peak Duty Cycle = 67%) * (IPLV Baseline – IPLV New Equipment)

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Reduced energy consumption
- Improve system performance

6-1 Refrigerator Freezer Case EC Motors and Controls

ECM Summary

The kitchens throughout Ramsey District Schools contain walk-in freezers, walk-in coolers, reach-in freezers and reach-in coolers. These units are controlled by a dry bulb temperature and as a result run continuously throughout the year. Installing an **NRM** Cooltrol® retrofit was assessed. The refrigeration systems usually monitor circulating air temperature in order to decide when to switch on and off. The circulating air temperature tends to rise far more quickly than the food temperature, and as result, the refrigeration unit works harder than necessary to maintain stored products at the right temperature. This, in turn, leads to excessive electricity consumption and undue wear and tear on the equipment. With **NRM** Cooltrol®, the thermostat regulates the refrigeration temperature based upon product temperature rather than air temperature, thereby maintaining product at the proper temperature. Savings is a result of reduced frequency of the compressor cycles, which are now based on food temperature rather than volatile air temperature. The equipment present in the schools are shown in the table below.

Existing Refrigeration Systems	
Ramsey High School	Cooler
	Freezer
Eric S. Smith Middle School	Freezer A
	Freezer B
	Cooler C
John Y. Dater Elementary School	Freezer A
	Freezer B

Facilities Recommended for this Measure

- Ramsey High School
- Eric S. Smith Middle School
- John Y. Dater School

Scope of Work

Furnish and install NRM Cooltrol® at the following locations:

Ramsey High School

- Two zone(s) of energy-saving CoolTrol refrigeration controls to cycle temperature and evaporator fans
- Replace two (2) existing shaded-pole motors with two (2) EC motors in evaporators
- Dewpoint-based pulse control for anti-sweat door heaters

John Dater Elementary School

- Two zone(s) of energy-saving CoolTrol refrigeration controls to cycle temperature and evaporator fans
- Replace three (3) existing shaded-pole motors with three (3) EC motors in evaporators
- Dewpoint-based pulse control for anti-sweat door heaters

Eric Smith Middle School

- Three zone(s) of energy-saving CoolTrol refrigeration controls to cycle temperature and evaporator fans
- Replace three (3) existing shaded-pole motors with three (3) EC motors in evaporators
- Dewpoint-based pulse control for anti-sweat door heaters

Savings Methodology

Energy savings will result from reducing the compressor cycling. In general, ESG uses the following approach to determine savings for this specific measure:

Savings Calculation Method		
Pre - kW	=	Compressor (HP) x 0.746 x Pre Cycles/hr
Post - kW	=	Compressor (HP) x 0.746 x Post Cycles/hr
Summer Season Hrs (Hs)	=	Total Hrs/yr x 55%
Winter Season Hrs (Hw)	=	Total Hrs/yr x 45%
Compressor Summer Cycling (% On) (Cs)	=	55%
Compressor Winter Cycling (% On) (Cw)	=	35%
Compressor Summer Operating (Hrs)	=	Hs x Cs
Compressor Winter Operating (Hrs)	=	Hw x Cw
Savings (kW)	=	Pre – Post (KW)
Savings (kWh)	=	(Compressor Summer Operating (Hrs)+ Compressor Winter Operating (Hrs)) x (Pre – Post (KW))

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electrical energy savings
- Reduces evaporator fan run-time

6-2 Kitchen Hood Exhaust Control

ECM Summary

In this measure we examined optimizing kitchen hood operation through Melink's Intelli-Hood®(or equal) control system. The proposed system is designed for commercial kitchen ventilation systems and can save fan energy by improving the efficiency of the hoods. With the Melink system installed, when the hood is started, the fans go to a preset minimum speed of 10-50% (typical). The speed control is achieved using a variable frequency drive. When the cooking appliances are turned on, the fan speed increases upon detecting an increase in the exhaust air temperature (detected by a temperature sensor). During the actual cooking the fan reaches 100% of the speed until smoke/vapor, detected by an optical sensor, is removed. Each Optic Sensor enclosure has a purge fan that keeps the environment inside the enclosure under a positive air pressure. This prevents contaminated air from entering the sensor unit. If applicable, the makeup-air unit associated with the hood exhaust fan, simply follows the speed (airflow) of the exhaust fan, so proper pressurization is maintained during the entire operation.

TEL Kitchen Control System

Facilities Recommended for this Measure

- Ramsey High School

Scope of Work by School

Ramsey High School

Provide and install the following:

- (1) Single hood controller, 1 duct temp sensor, 1 room temp sensors, 1 IR kits, 1 controllers, 1- 7 day time clocks, 1 pre-wired terminal rails, relays, power supplies, 1 - 6A circuit breaker, 1 - door mounted display / configuration units, 1 – door mounted live indicators, 1 - door interlocked isolator, ABS enclosure and UL listed.
- (3) Additional Sets of IR Sensors
- (1) 3hp/208V/3Ph VFD – for Exhaust Fan – ABB - ACS 310 with smart key pad and NEMA 1enclosure
- (1) 2hp/208V/3Ph VFD – for MAU – ABB- ACS 310 with smart key pad and NEMA 1 enclosure
- (1) 3hp/208V/3Ph inverter rated motor for Exhaust Fan
- (1) 2hp/208V/3Ph inverter rated motor for MAU

Provide project engineering, project management, start-up, commissioning and O&Ms

Clarifications:

- All wire below ceiling will be housed in conduit.
- All low voltage wire above ceiling will be plenum rated and not housed in conduit.
- Assumes all motor starters are within 50' of kitchen and VFD's can be mounted indoors.

- Assumes existing motors are inverter duty rated
- Payment and Performance Bond not included
- Hazardous Materials abatement not included
- Stamped Drawings not included

Savings Methodology

Savings Calculation Methodology		
Fan Energy Savings (kWh/yr)	=	((Total kWh/hp/yr – Total kWh/hp/yr) x Fan Motor HP x Fan Motor Load Factor x $/kWh)
Cooling Savings (kWh/yr)	=	((Previous net cooling load x supply air cooling multiplier x $/fuel unit) / energy content per fuel unit x COP)
Heating Savings (kBtu/yr)	=	((Previous Net Heat Load x Supply Air Heating Multiplier x $/fuel unit) / (btu/fuel unit x system efficiency))

Definitions

Load Factor: Used to discount motor nameplate HP.

Motor Efficiency: A value that can be edited, but unless we know better typically leave motor efficiency at 90% (sticking with the conservative route as this is obviously higher than most motors).

Average Fan Speed Profile: Used to "bin" average fan speeds into 10% increments. For sites where log data is available, this is the result of taking histogram data from the log files. For new sites, the average fan speed profile is estimated based on market segment along with historical knowledge/experience from Melink.

Previous Net Heating/Cooling Load: Based on the Previous Net Exhaust Volume, this is calculated via the Outdoor Airload Calculator (OAC) with added parameters of daily run hours (time X to time Y) and dehumidification (if applicable).

New Net Heating/Cooling Load: Based off the Previous Net Cooling Load and calculated by multiplying total average run speed from the Average Fan Speed Profile.

System Efficiency (Heating): A measure of how efficient the heating system is. For direct-fired heaters, efficiency is approximated as 100%. For indirect heaters, efficiency is approximated at 80%

COP: Coefficient of Performance. A measure of how efficient an HVAC system is. For reference, a COP of 3 approximates to a SEER of 12 or EER of 10.5. A COP of 4 approximates to a SEER of 18 or EER of 13.7. A COP of 3 is typical.

Supply Air Heating/Cooling Multiplier: Factors that are utilized to discount the savings calculations for heating and cooling.

Maintenance

Periodically the equipment should be checked to ensure proper operation.

7-1 Building Envelope and Pipe Insulation Upgrades

ECM Summary

Infiltration drives energy costs higher by allowing unconditioned air to enter the building, thus adding to the building load and causing additional unnecessary heating and cooling loads. All schools were surveyed in order to identify potential improvements for outside reduction. The main observations are listed below:

- Most entrance doors need weather stripping, sweeps or the closure or strike plate adjusted
- Sealant is recommended around the perimeter of several windows
- Numerous penetrations were observed that need to be sealed.

These deficiencies mostly reflect the skin of the buildings, which either have existed since original construction of the building, were added during some retrofit periods, or were caused by deterioration.

Door Weather Stripping – daylight showing through the sides of the door is a clear indicator that there is not a tight weather-stripping seal

Overhang Air Sealing – there is no barrier separating the exterior overhang (area beyond metal framing) from the conditioned interior space

Facilities Recommended for this Measure

- Ramsey High School
- Eric S. Smith Middle School
- John Y. Dater School
- Mary A. Hubbard School
- Wesley D. Tisdale School

Scope of Work

An investment grade audit was performed for the entire district. The results of the audit were the identification of several areas of envelope deficiency. The demand and their savings potential calculated. Building Envelope Scope drawings are listed in the Appendix 8.

Findings

- Attic Flat Insulation –attic insulation is crucial for controlling conductive heat loss in a building. After air gaps are sealed and convective air loss is reduced, conduction is the most significant form of heat loss. Under-insulated surfaces at Central Regional High School result in excessive energy loss due to the lack of a properly insulated thermal barrier.

- Buck Frame Air Sealing – the buck frame is the rough opening in the structural framing of the building left open for windows or doors to later be installed. This opening is sometimes filled with foam insulation sealants and finished with a variety of casing materials. The buck frame is often improperly sealed with fiberglass or not sealed at all, leaving buck frames very susceptible to air leakage.

- Caulking – there are unsealed perimeter joints and cracks found at the door systems at both Central Regional High School and Ramsey School District. These gaps allow air to find its way into the wall and door cavities or directly from outside to inside resulting in unwanted energy losses.

- Door Weather Stripping – deteriorated weather-stripping materials, ineffective weatherstripping installation and daylight showing at the perimeter of door systems create direct pathways for unwanted infiltration/ exfiltration.

- Overhang Air Sealing – overhangs are roofs, floor systems or areas above entryways that extend beyond the plane of the exterior wall system. These areas of construction are often misunderstood by builders and the cavity that extends beyond the plane of the exterior wall system is often incorrectly “connected” to the interior heated spaces of the building. Overhangs that are not properly sealed at the plane of the surface that should separate the conditioned space from the outdoors lead to excessive air leakage and heat loss at these vulnerable areas in the building envelope.

- Roof-Wall Intersection Air Sealing – the roof-wall intersection is regularly an area that allows unwanted air leakage through the building shell. This makes up one of the greatest weaknesses in the assessed building envelopes. Exterior flashing and finish details at this area are not constructed to stop air leakage (exterior flashings are for water control, not air control); unsealed exterior flashing details combine with interior gaps in the framing between the roof and wall assembly to allow infiltration/ exfiltration.

- Install Attic Access – construct custom attic hatches at the existing access ladders; use lumber to frame around the ladder to the attic and fit pieces together so that the hatch swings on hinges and creates an air-tight seal on a compression weather strip around the existing ladder.

- Attic Insulation Baffles – install insulation baffles at the eaves; install in an air-tight fashion at the exterior top plate using sealants. The baffles should create a space for air to properly flow to the ridge of the attic between the underside of the roof deck and the cellulose insulation.

Savings Methodology

The physics of air leakage guide the requirements for the design of an effective air leakage control retrofit project.

- Big Holes = Area
  Sealing big holes and/or a lot of small holes generates savings.
- Big Pressure Differentials = ΔP
  Sealing surfaces that have the highest pressures acting on them generates savings: at the top and bottom of the building (stack pressure), spaces that are pressurized or depressurized (mechanical pressure) and surfaces that are most exposed to the elements (wind pressure).
- Big Temperature Differentials = ΔT or HDD
  Sealing interior-to-exterior air leakage pathways generates savings. Isolating interior spaces (or compartmentalizing) is effective only across interior spaces with very different interior environment needs.

Thermal Upgrade
ESG uses standard heat loss calculations (U, A, ΔT) to estimate savings from thermal barrier improvements.

As with air leakage, the physics of thermal heat loss guide the requirements for the design of an effective energy saving insulation upgrade project.

- Weak Existing Insulation Values: U-Value
  Insulating surfaces with the weakest existing insulation values generates savings.
- Big Surface Areas: Area
  Insulating large surface areas generates savings.
- Big Temperature Differentials: ΔT or Degree Days
  Insulating interior-to-exterior surfaces (attic surfaces are included in this category) generates savings. Isolating interior surfaces (or compartmentalizing) is effective only across interior spaces with very different interior environment needs.

INFILTRATION/ EXFILTRATION SAVINGS CALCULATION METHODOLOGY

Cooling Savings

		Flow Factor		$(\Delta P)^{n}$		A		CFM Reduction
1) Q	=	Flow Factor	x	Wind Pressure	x	Aggregate Air Leakage Pathway Hole	=	Cubic Feet / Minute (CFM)
		Total Heat Constant		CFM Reduction		Enthalpy		Tons
2) Tons	=	4.5	x	CFM Reduction	x	Enthalpy Value	=	Tons
				12,000				
				BTU Hour per Ton				
3) kWh Savings	=	Tons		kW per Ton		Cooling Hours		kWh
		Tons	x	1.2	x	Cooling Hours for Location	=	kWh
4) Savings	=	kWh		Fuel Cost/kWh				
		kWh Savings	x	Fuel Cost in $	=	Savings in Dollars		

5) Savings from Air Leakage Control .... = Savings in Dollars

6) Project Investment .... = Investment in Dollars

7) Simple Payback .... = Investment / Savings

INFILTRATION/ EXFILTRATION SAVINGS CALCULATION METHODOLOGY

Cooling Savings

			Flow Factor		$(\Delta P)^n$		A		CFM Reduction
1)	Q	=	Flow Factor	x	Wind Pressure	x	Aggregate Air Leakage Pathway Hole	=	Cubic Feet / Minute (CFM)
			Total Heat Constant		CFM Reduction		Enthalpy		Tons
2)	Tons	=	4.5	x	CFM Reduction	x	Enthalpy Value	=	Tons
					12,000				
					BTU Hour per Ton				
3)	kWh Savings	=	Tons		kW per Ton		Cooling Hours		kWh
			Tons	x	1.2	x	Cooling Hours for Location	=	kWh
4)	Savings	=	kWh		Fuel Cost/kWh				
			kWh Savings	x	Fuel Cost in $	=	Savings in Dollars		
5)	Savings from Air Leakage Control				....			=	Savings in Dollars
6)	Project Investment				....			=	Investment in Dollars
7)	Simple Payback				....			=	Investment / Savings

Row 2 as printed: $\text{Tons} = \dfrac{4.5 \times \text{CFM Reduction} \times \text{Enthalpy Value}}{12{,}000} = \text{Tons}$

Scope of Work

Findings

- Pipe Insulation
    - Uninsulated refrigerant, heating and domestic hot water pipes result in excessive energy losses throughout heating and cooling distribution systems.
- · Valve & Fitting Insulation
    - There is increased complexity when insulating mechanical system components. Within the distribution system since these poorly or un-insulated components have the same temperature fluids passing through them as the pipes which are more likely to be insulated.
- Refer to calculations for a detailed inventory of insulation scope of work.

***Note**: All insulation thickness shall be confirmed to be in accordance with the New Jersey Energy Conservation Code, ASHRAE 90.1 2016. Contract shall be responsible for verification of these thicknesses.*

Savings Methodology

Mechanical Insulation Savings Calculations

This section describes our methodology for calculating energy savings. We use standard heat transfer methods to compute heat loss from bare and insulated mechanical systems (piping, valves, fittings, tanks and ductwork). The difference in heat loss is the energy savings, as follows:

Energy Savings = [Existing Heat Loss] – [Insulated Heat Loss]

Methodology

We use standard heat transfer methods to compute radiation, convection, and conduction heat loss from

(Alternatively, gain to, for cold systems) bare and insulated systems. Key parameters that affect the heat transfer rate include: temperature of fluid (e.g. steam, hot water, chilled water, etc.); surface temperature of the component (e.g. pipe, fitting, tank, ductwork); temperature of environment; emissivity of surface; average wind speed where applicable; percentage of existing component covered with insulation; and condition of existing insulation, where applicable.

Energy Use

Existing and proposed energy use are computed as follows:

Pipes & Fittings

Heat Loss (Btu/h) = (Heat Loss / lin.ft. bare pipe) * (lin.ft. of pipe) * [1 – (%insulated)] +
(Heat Loss / lin.ft. insulated pipe) * (lin.ft. of pipe) * (%insulated)

Fuel Loss (MMBTU/yr) = (Heat Loss Btu/h) * (heating hrs/year) ÷ (efficiency)
Electric Loss (kWh/yr) = (Heat Loss Btu/h) * (cooling hrs/year) ÷ (12,000 Btu/ton-hr) x (cooling kW/ton)

Tanks Plates, & Ductwork

Existing and proposed heat loss for tanks, plates, and ductwork are calculated as follows:

Heat Loss (Btu/h) = (Heat Loss / sq.ft.) * (sq.ft. of component) * (qty) * [1 – (%insulated)] +
(Heat Loss / sq.ft. insulated) * (qty) * (sq.ft. of component) * (%insulated)
Fuel Loss (MMBTU/yr) = (Heat Loss Bu/h) * (heating hrs/year) ÷ efficiency)
Electric Loss (kWh/yr) = (Heat Loss Btu/h) * (cooling hrs/year) ÷ (12,000 Btu/ton-hr) x (cooling kW/ton)

Energy Savings

Energy savings are the difference between existing and prosed heat loss:

Fuel Savings (MMBTU/yr) = (Existing Fuel Loss) – proposed Fuel Loss)
Electric Savings (MMBTU/yr) = (Existing Electric Loss) – (Proposed Electric Loss)
Cost Savings ($/yr) (Fuel Savings MMBTU/yr) * (Fuel Rate $/MMBTU) +
(Electric Savings kWh/yr) * (Electric Rate $/kWh)

Heat Transfer: Bare Systems

Bare systems are subject to convection and radiation heat transfer. We ignore conductive heat transfer through the pipe/fitting material (e.g. steel, copper, PVC etc.) as this is negligible as compared to heat transfer through insulation and air convection.

Pipes & Fittings

This section describes the heat transfer calculations for pipes and fittings for indoor systems subject to natural convection (no wind). The calculations for outdoor systems subject to forced convection (wind) are similar except that the formulas are more complicated. These methods are presented following this section.

For fittings (valves, elbows, strainers, etc.), we estimate heat loss based on equivalent length of straight pipe, which is the ratio of the area of the fitting to the area of 1 linear foot of pipe of the same size (fitting equivalent length = Area of fitting, ft^2 / Area of pipe of equivalent diameter, ft^2).

$$q_{pipe} = \frac{2 * \pi * \Delta T}{\frac{1}{h * \left(D_{outer}/2\right)}}$$

Where:
q_{pipe} = *heat loss per linear foot = Btu/h/lin.ft.*

$h = total\ convective\ heat\ transfer\ factor = h_{convection} + h_{radiation}$

$h_{convection} = 0.213 * \left(\frac{\Delta T}{D}\right)^{\left(\frac{1}{4}\right)}$ [ASHRAE 2005, Ch. 3, Eq. T10.16]

□T = $T_{surface} - T_{air}$
$\Delta T = T_{surface} - T_{air}$
D = Outer diameter
$h_{radiation} = \varepsilon * \sigma * \left(T_{surface}^4 - T_{air}^4\right) / \left(T_{surface} - T_{air}\right)$

e = emissivity of surface
s = Stefan-Boltzmann constant = 0.1714 x 10-8 Btu / (hr-ft^2-°R^4)
$T_{surface} = Temperature\ of\ surface$
$T_{air} = Average\ ambient\ air\ temperature$

Heat Transfer: Insulated Systems

Insulated systems are subject to convection, radiation, and conductive heat transfer. We ignore conductive heat transfer through the pipe/fitting material (e.g. steel, copper, PVC etc.) as this is negligible when compared to heat transfer through insulation and air convection.

$$q_{pipe} = \frac{2 * \pi * \Delta T}{\frac{ln\left(D_{outer}/D_{inner}\right)}{k} + \frac{1}{h * \left(D_{outer}/2\right)}}$$

Where:

q_{pipe} = *heat loss per linear foot = Btu/h/lin.ft.*

$$h_{convection} = 0.213 * \left(\frac{\Delta T}{D}\right)^{\left(\frac{1}{4}\right)}$$ [ASHRAE 2005, Ch. 3, Eq. T10.16]

□T = $T_{surface} - T_{air}$

$\Delta T = T_{surface} - T_{air}$

D = Outer diameter

$$h_{radiation} = \varepsilon * \sigma * \left(T_{surface}^4 - T_{air}^4\right) / \left(T_{surface} - T_{air}\right)$$

e = emissivity of surface

s = Stefan-Boltzmann constant = 0.1714 x 10-8 Btu / (hr-ft^2-°R^4)

$T_{surface}$ = *Temperature of surface*

T_{air} = *Average ambient air temperature*

L = Pipe length or fitting equivalent length

Heat Transfer for Outdoor Systems

The methods for computing heat loss for outdoor systems subject to forced convection (wind) are identical to the methods for indoors systems described above except that the formulas to compute the convective heat transfer coefficient h is more complicated. These methods are described below:

Pipes & Fittings: Outdoor Systems

The convection heat transfer coefficient is:

$$h_{convection} = Nu * k / D_{outer}$$

$$Nu = Nussault\ number = 0.3 + \frac{0.62 * Re^{\left(\frac{1}{2}\right)} * Pr^{\left(\frac{1}{3}\right)}}{\left[1 + \left(\frac{0.4}{Pr}\right)^{\left(\frac{2}{3}\right)}\right]^{\left(\frac{1}{4}\right)}} * \left[1 + \left(\frac{Re}{282{,}000}\right)^{\left(\frac{5}{8}\right)}\right]^{\left(\frac{4}{5}\right)}$$

$$Re = Reynolds\ number = \frac{V * D_{outer}}{v}$$

$$\mathrm{Pr} = Prandtl\ number = 0.7\ (for\ air)$$

$$v = kinematic\ viscosity\ of\ air$$

$$V = wind\ speed$$

$$D_{outer} = outer\ pipe\ diameter$$

Plates, Tanks, Ductwork: Outdoor Systems

The convection heat transfer coefficient for flat surfaces is estimated as follows

$$h_{convection} = Nu * k / D_{outer}$$

$$Nu = Nussault\ number = 0.415 * Re^{\left(\frac{1}{2}\right)} * Pr^{\left(\frac{1}{3}\right)}$$

$$Re = Reynolds\ number = \frac{V * L}{v}$$

$$\mathrm{Pr} = Prandtl\ number = 0.7\ (for\ air)$$

$$v = kinematic\ viscosity\ of\ air$$

$$V = wind\ speed$$

$$L = width\ or\ diameter\ of\ component$$

Maintenance

After the building envelopes have been improved and mechanical insulation has been installed, operations and maintenance should be reduced, due to improved space conditions and lower humidity during the cooling season. The maintenance staff should maintain the newly installed equipment per manufacturers' recommendations. The manufacturer specification sheets will be provided for exact maintenance requirements.

Benefits

- Electrical energy savings
- Fuel energy savings
- Increased thermal comfort

8-1 Replace Rooftop Units

ECM Summary

Rooftop units in the Ramsey School District vary based on age and condition. Replacing aged rooftop HVAC units will reduce the operating and maintenance costs of these systems. Both heating and cooling efficiencies of packaged rooftop equipment have significantly increased in the past 10 years. ESG has identified several older units that still utilize R22 refrigerant as the prime candidates for replacement.

Facilities Recommended for this Measure

- Eric S. Smith Middle School
- Ramsey High School

Scope of Work by School

Smith Middle School

Install (5) HE gas-electric rooftop units to replace the service of (5) existing gas-electric rooftop units. The proposed rooftop units shall match the total cooling and heating capacity of the existing equipment, will re-use existing roof curb, and will require that natural gas pipe is extended from the existing units.

Demolition and Removal Work

- Replace (5) existing gas/electric RTU's and install new high efficiency replacement units to set on existing roof steel.
- Disconnect electrical, gas piping, and controls.
- Reclaim refrigerant.
- Crane units off roof onto flatbed trailer for disposal.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- Furnish & install (F&I) (5) new, Lennox (or approved equal) packed gas heating/electric cooling rooftop units, matching total heating and cooling capacity of current units:
  - (2) 4-ton units
  - (1) 5-ton unit
  - (1) 7.5-ton unit
  - (1) 10-ton unit.
- Units to include return and supply smoke detectors.
- Provide air test and balance of each of the new RTU's only.

Ramsey High School

Install (7) HE gas-electric rooftop units to replace the service of (7) existing gas-electric rooftop units. The proposed rooftop units shall match the total cooling and heating capacity of the existing equipment, will require a new roof curb including structural supports, and will require that natural gas pipe is extended from the existing units.

Demolition and Removal Work

- Replace (7) existing gas/electric RTU's and install new high efficiency replacement units to set on existing roof steel with new custom manufacturers curb adapters.
- Disconnect electrical, gas piping, and controls.
- Reclaim refrigerant.
- Crane units off roof onto flatbed trailer for disposal.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- Furnish & install (F&I) (7) new, Lennox gas heating/electric cooling rooftop units (as applicable), matching total heating and cooling capacity of current units:
    - (1) 2-ton unit
    - (1) 2.5-ton unit
    - (4) 4-ton units
    - (1) 15-ton unit

- Units to include return and supply smoke detectors.
- Provide air test and balance of each of the new RTU's only.

Savings Methodology

Savings Calculation Method		
Cooling Savings (kWh)	=	RTU-Size (Tons) x Cooling gradient (%) x (Existing RTU kW/Ton – New RTU kW/Ton) x Bin Hours
Heating Savings (Therm)	=	((RTU-Size (Btu/h)/Existing RTU Eff.) – (RTU-Size (Btu/h)/ New RTU Eff.)) x Heating gradient (%) x Bin Hours/100000

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Minimizes fan coil unit energy efficiency
- Lower operating cost
- Drastically reduced humidity
- Improved indoor air quality

10-1 REF-Replace All Single Pane Windows

ECM Summary

The intent of this ECM is to capture savings from the replacement of aged single-pane windows with low-e, insulated windows. This work will increase the overall efficiency of the building envelope by providing an improved thermal insulation barrier, reducing the air infiltration around existing windows, and improving the occupant comfort in the classrooms.

Facilities Recommended for this Measure

- Eric Smith Middle School

Scope of Work

The following work to be completed by RSD:
Provide all plant, labor, materials, accessories, equipment, incidentals, scaffolds and supervision necessary to complete window replacement with hardware, exterior trim, components and related work shown and/or specified including but not necessarily limited to the following:

- Remove existing window assemblies, modify, repair and recondition existing opening and damaged conditions as required for installation of new windows.
- Double Hung Windows
- Projected Windows.
- Fixed Windows.
- Removal and reinstallation of window air conditioners exhaust vents, louvers, etc., in insulated aluminum panels.
- Miscellaneous trim, closures, brake metals, receptors, panning, sills, mullions, mullion covers, and flashing.

Savings Methodology

Savings Calculation Method		
Heating Savings (Therm)	=	((Window Area (ft^2)*(Heating Degree Days)*(Hours/Day (hrs)) / (Current R-Value – New R-Value)

Maintenance

Periodically the equipment should be checked to ensure proper operation

10-2 REF-Replace 1965 Addition Windows

ECM Summary

The intent of this ECM is to capture savings from the replacement of aged single-pane windows with low-e, insulated windows. This work will increase the overall efficiency of the building envelope by providing an improved thermal insulation barrier, reducing the air infiltration around existing windows, and improving the occupant comfort in the classrooms

Facilities Recommended for this Measure

- Ramsey High School

Scope of Work

The following work to be completed by RSD:
Provide all plant, labor, materials, accessories, equipment, incidentals, scaffolds and supervision necessary to complete window replacement with hardware, exterior trim, components and related work shown and/or specified including but not necessarily limited to the following:

- Remove existing window assemblies, modify, repair and recondition existing opening and damaged conditions as required for installation of new windows.
- Double Hung Windows
- Projected Windows.
- Fixed Windows.
- Removal and reinstallation of window air conditioners exhaust vents, louvers, etc., in insulated aluminum panels. Miscellaneous trim, closures, brake metals, receptors, panning, sills, mullions, mullion covers, and flashing.

Savings Methodology

Savings Calculation Method		
Heating Savings (Therm)	=	((Window Area (ft^2)*(Heating Degree Days)*(Hours/Day (hrs)) / (Current R-Value – New R-Value)

Maintenance

Periodically the equipment should be checked to ensure proper operation.

10-7 REF-Replace Boilers-Hot Water (Eliminate Steam)

ECM Summary

The intent of this ECM is to capture savings from the replacement of Steam boilers used to provide heating, through the use of a hot water heat exchanger, to various areas throughout the building. In schools where the boilers are old and in a poor condition, the replacement of existing boilers with a similar output of new greater efficiency units will provide efficiency gains that will generate operating and fuel cost savings. The radiant and convective heat losses will also be reduced with the installation of new boilers which makes the entire hot water system more efficient. Where applicable, the steam boilers that are recommended for replacement will be replaced by condensing boilers with increased efficiencies (including thermal and combustion losses).

Additional losses are incurred when converting steam to heating hot water through the use of a shell-and-tube heat exchanger. This is the current situation at Ramsey High School and the district will gain additional efficiency through the elimination of the thermal and pump losses associated with removing the heat exchanger from the new system.

The replacement of the single boiler in these boiler plants with multiple new high-efficiency units will generate significant energy savings as well as provide redundancy to the heating system. Each new boiler will be slightly smaller than the existing single boiler, but as a whole central plant will meet or exceed the heating capacity of the current boiler. The installation of the smaller boilers will increase the efficiency of the entire plant by operating more efficiently at low loads than the single boiler.

Facilities Recommended for this Measure

- Ramsey High School

Scope of Work

The following work to be completed by RSD:

Demolition and Removal Work

- Replace (2) each fire-tube boilers with new high-efficiency AERCO Benchmark (or approved equal) condensing boilers
- Demolition of (2) existing steam boilers.
- Demolition of existing feed water tank and pumps – cut up for removal, if necessary
- Demolition of HHW pumps, condensate pumps, heat exchanger, condensate receiver and all related steam piping and equipment in boiler mechanical room
- Disconnect, remove and properly dispose of hot water supply and return piping for boilers to nearest isolation valves or as required for new installation.
- Disconnect, remove and properly dispose of gas flue for boilers as required.
- Disconnect all electric, controls, gas piping, water lines, pressure reliefs and drains.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

The following work to be completed by RSD:

New Installation Work:

Proposed are the following:

- Furnish & install (F&I) high-efficiency AERCO Benchmark (or approved equal) condensing boilers set on existing concrete pad.

Details of installation to include the following:

- F&I Qty. new AERCO Benchmark (or approved equal) condensing hot water boilers
- Set boilers on concrete pad
- F&I new boiler circulating pumps
- F&I heating hot water supply Pumps.
- New pumps to include Suction Diffusers, Flanged Multi-purpose Valves, Gauges and Shut-Off Valves.
- New base-mounted pumps and motors are to be specified to match process, electrical and controls requirements.
- F&I all motor mounting adapters required for new motors.
- F&I all power transmission components required to adapt motors to pumps.
- F&I new TACO Dura-Flex Stainless Steel Pipe Couplings.
- F&I new flanged air separator, floor-mounted expansion tanks, condensate neutralization kits with new chemical treatment system.
- F&I all new insulated VIC hot water supply and return piping, valves, fittings to connect from boilers to new Hot Water Header system.
- F&I new boiler drains, pressure reliefs piped to floor drains, water supply, blow down drains piped over to existing floor drains.
- F&I new 2" fiberglass insulation on all new and existing hot water supply and return piping "that has no insulation".
- F&I new gas line piping from existing gas line to new boilers with new shut off valves. Include vent relief piping as designed by engineer.
- F&I new CPVC combustion air intake and AL29-4C Stainless Steel flue exhaust piping for each boiler to vent to the outside.
- F&I proper pipe suspensions for all piping.
- F&I pipe identification and tags for all pipe, valves, etc.
- Install new line voltage electrical circuits to new boilers.
- Power wash boiler room floor once all demolition has been completed and paint floor with epoxy grade paint with color selected by school facility department.
- Provide factory startup; assist during startup and testing of both new boilers.

Exclusions

The Energy Savings generated from this ECM was designed from the upgrade to only the hot water generation system and does not include any of the following:

- Electrical infrastructure upgrades, repairs, and/or modifications are restricted to only what is described in the New Installation Work section.
- Piping and insulation will be replaced to the first shut-off valve for the equipment. This project does not include any other piping systems.

- Any ancillary system outside of the heating hot water system is not in scope, and thus excluded from this project.

Savings Methodology

In general, savings calculations for boiler replacement are calculated using the following methodology:

Boiler Replacement

E_E $= \sum_{i=1}^{8760}(Q_i \div \square_E)$

E_P $= \sum_{i=1}^{8760}(Q_i \div \square_P)$

E_S $= E_E - E_P$

C_S $= E_S \times FUR$

Where,

E_E = Annual energy (fuel) use of existing system

E_P = Annual energy use of proposed system

E_S = Annual energy savings

C_S = Annual cost savings

Q_i = Hourly heating demand, modeled as a linear fit of OA DBT (dry-bulb temperature), with a cut-off temperature above which there is no heating

$\square$ = Combustion efficiency of heating system based on field data, manufacturer's rating or snap-shot measurements

FUR = Fuel unit utility rate, determined from baseline utility rate analysis

Subscript "i" denotes the number of hours in a year. Subscripts "E" and "P" stand for Existing and Proposed system, respectively.

Maintenance

Follow manufacturers' recommendations for preventive maintenance.

10-8 Construction Contingency

ECM Summary

Energy Systems Group proposes to maintain contingency for unforeseen construction-related issues. Due to the age of the buildings in the Ramsey School District . Asbestos issues will be handled by the Ramsey School District and not the responsibility of Energy Systems Group .

Solar PPA

ECM Summary

Grid-tied solar electric systems convert sunlight into electricity. As long as your solar electric system is connected to the utility grid, its clean electricity can be used in your school, or "banked" into the utility grid for later use. Through a process known as net metering, your utility will accept your excess solar power when you are producing more than you are using and will supply you with reliable grid power when the sun is not shining. Your utility company will calculate your bill on the difference between your solar production and electric use.

Facilities Recommended for this Measure

- Smith Middle School
- Dater Elementary School
- Hubbard Elementary School
- Ramsey High School
- Tisdale Elementary School

Scope of Work

Solar PPA is a separate contract between RSD and solar PPA provider. ESG is not responsible for the installation, maintenance or energy generated by the solar system

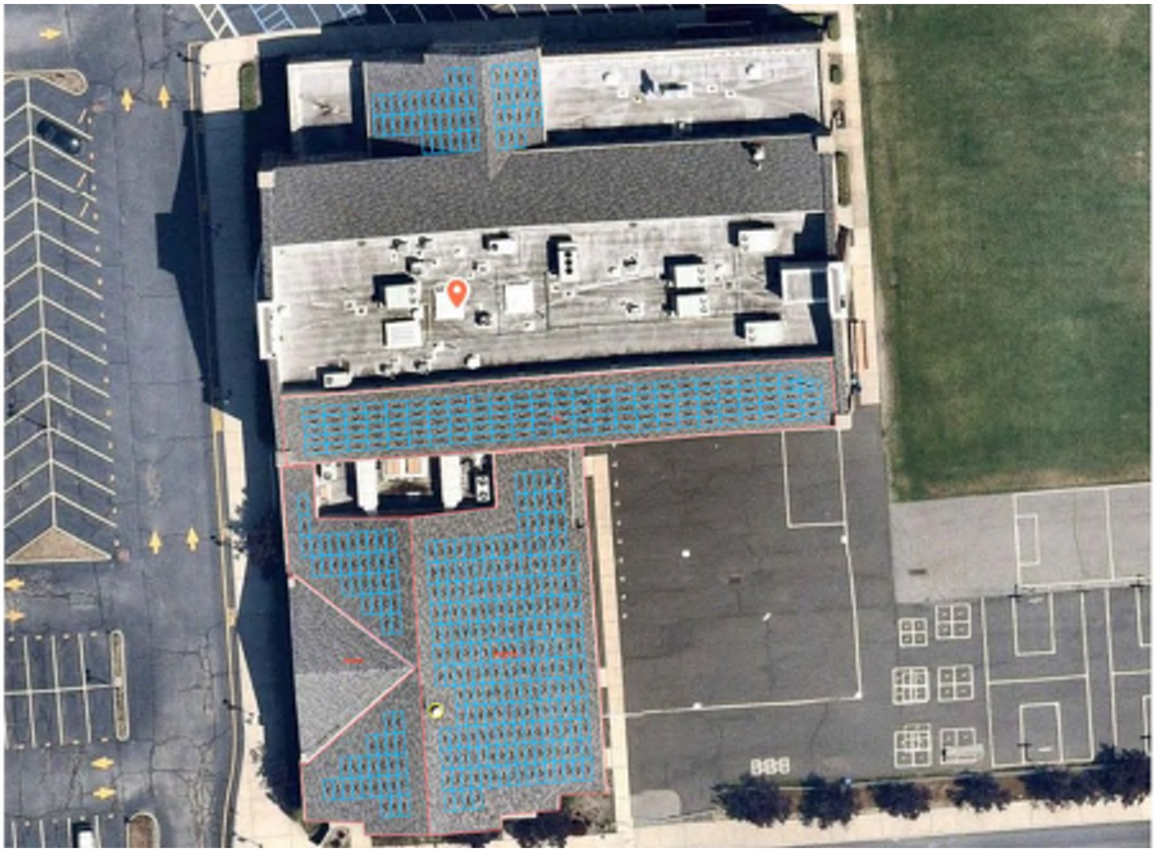
SMITH MIDDLE SCHOOL

2 MONROE ST
RAMSEY, NJ 07446

TOTAL SYSTEM SIZE:
291.97 kW-DC

TOTAL MODULES:
679 @ 430 WATTS EACH

AZIMUTH & TILT:
180° & 5°



DATER ELEMENTARY

35 SCHOOL ST
RAMSEY, NJ 07446

TOTAL SYSTEM SIZE:
188.34 kW-DC

ARRAY 1:
125 @ 430 WATTS EACH
AZIMUTH & TILT:
175° & 25°

ARRAY 2:
224 @ 430 WATTS EACH
AZIMUTH & TILT:
85° & 25°

ARRAY 3:
85 @ 430 WATTS EACH
AZIMUTH & TILT:
265° & 25°

HUBBARD ELEMENTARY

10 HUBBARD LN
RAMSEY, NJ 07446

TOTAL SYSTEM SIZE:
186.19 kW-DC

ARRAY 1:
374 @ 430 WATTS EACH
AZIMUTH & TILT:
220° & 5°

ARRAY 2:
70 @ 430 WATTS EACH
AZIMUTH & TILT:
189° & 25°

RAMSEY HIGH SCHOOL

256 EAST MAIN ST
RAMSEY, NJ 07446

TOTAL SYSTEM SIZE:
427.85 kW-DC

ARRAY 1:
925 @ 430 WATTS EACH
AZIMUTH & TILT:
189° & 5°

ARRAY 2:
70 @ 430 WATTS EACH
AZIMUTH & TILT:
189° & 25°

TISDALE ELEMENTARY

200 ISLAND RD
RAMSEY, NJ 07446

TOTAL SYSTEM SIZE:
215.86 kW-DC

FLAT ARRAYS:
414 @ 430 WATTS EACH
AZIMUTH & TILT:
167° & 5°

PITCHED ARRAY 1:
84 @ 430 WATTS EACH
AZIMUTH & TILT:
167° & 25°

PITCHED ARRAY 1:
84 @ 430 WATTS EACH
AZIMUTH & TILT:
167° & 25°

Measurement & Verification (M&V) Methodologies

This section contains a description of Measurement and Verification (M&V) methodologies that Energy Systems Group will use to guarantee the performance of this project.

They have been developed and defined by two independent authorities:

- International Performance Measurement and Verification Protocol (IPMVP)

Federal Energy Management Program (FEMP four guarantee options that may be used to measure and verify the performance of a particular energy conservation measure. Each one is described below.

Option A – Retrofit Isolation: Key Parameter Measurement

Energy savings is determined by field measurement of the key parameters affecting the energy use of the system(s) to which an improvement measure was applied separate from the energy use of the rest of the facility. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the measured parameter, and the length of the reporting period.

Measurement of key parameters mean that those parameters not selected for field measurement will be estimated. Estimates can be based on historical data, manufacturer's specifications, or engineering judgment. Documentation of the source or justification of the estimated parameter will be described in the M&V plan in the contract. Energy savings is determined through engineering calculations of t baseline and post-retrofit energy used based on the combination of measured and estimated parameters, along with any routine adjustments.

Option B – Retrofit Isolation: Is determined by field measurement of the energy use of the systems to which an improvement measure was applied separate from the energy use of the rest of the facility. However, all of the key parameters affecting energy use are measured; there are no estimated parameters used for Option B. Measurement frequency ranges from short-term to continuous, depending on the expected variations in the savings and the length of the reporting period. Energy savings is determined through engineering calculations of the baseline and post-retrofit energy used based on the measured parameters, along with any routine adjustments.

Option C – Whole Building Metering/Utility Bill Comparisons

Option the use of utility meters or whole building sub-meters to assess the energy performance of a total building. Option C assesses the impact of any type of improvement measure, but not individually if more than one is applied to an energy meter. This option determines the collective savings of all improvement measures applied to the part of the facility monitored by the energy meter. In addition, since whole building meters are used, savings reported under Option C include the impact of any other change made in facility energy use (positive or negative).

Option C may be used in cases where there is a high degree of interaction between installed improvement measures or between improvement measures and the rest of the building or the isolation and measurement of individual improvement measures is difficult or too costly.

This Option is intended for projects where savings are expected to be large enough to be discernable from the random or unexplained energy variations that are normally found at the level of the whole facility meter. The larger the savings, or the smaller the unexplained variations in the baseline, the easier it will be to identify savings. In addition, the longer the period of savings analysis after installing the improvement measure, the less significant is the impact of short-term unexplained variations. Typically, savings should be more than 20% of the baseline energy use if they are to be separated from the noise in the baseline data.

Periodic inspections should be made of all equipment and operations in the facility after the improvement measure installation. These inspections will identify changes from baseline conditions or intended operations. Accounting for changes (other than those caused by the improvement measures) is the major challenge associated with Option C-particularly when savings are to be monitored for long periods.

Savings are calculated through analysis of whole facility utility meter or sub-meter data using techniques from simple comparison to regression analysis.

Option D – Calibrated Simulation

Option D involves the use of computer simulation software to predict energy use, most often in cases where baseline data does not exist. Such simulation models must be calibrated so that it predicts an energy use and demand pattern that reasonably matches actual utility consumption and demand data from either the base-year or a post-retrofit year.

Option D may be used to assess the performance of all improvement measures in a facility, akin to Option C. However, different from Option C, multiple runs of the simulation in Option D allow estimates of the savings attributable to each improvement measure within a multiple improvement measure project.

Option D may also be used to assess just the performance of individual systems within a facility, akin to Option A and B. In this case, the system's energy use must be isolated from that of the rest of the facility by appropriate meters.

Savings are calculated using energy use simulation models, calibrated with hourly or monthly utility billing data and/or end-use metering.

Selecting M&V Options for a Specific Project

The tailoring of your specific M&V option is based on the level of M&V precision required to obtain the desired accuracy level in the savings determination and is dependent on:

- The complexity of the Energy Conservation Measure
- The potential for changes in performance
- The measured savings value.

The challenge of the M&V plan is to balance three related elements:

- The cost of the M&V Plan
- Savings certainty
- The benefit of the particular conservation measure.

Savings can also be non-measured. If savings are non-measured, these savings are mutually agreed upon as achieved at substantial completion of the respective facility improvement measure and shall not be measured or monitored during the term of the performance contract. Non-measured energy savings are limited to no more than 10-15% of the overall project savings.

Recommended Performance Verification Steps

Energy Systems Group's performance verification methods are designed to provide the facility's administration with the level of M&V necessary to protect them from an under-performing ECM yet have a minimal impact on the project's financial success.

The selection of the M&V methods to be used is based on the criteria as detailed by IPMVP and Energy Systems Group's experience with hundreds of successful performance contracts in the K-12, state, and local government sectors. Following is a table illustrating how the savings of the major energy conservation measures proposed for this project will be verified.

ECM Description	Measurement and Verification Method – Summary	Detail of M&V Methodology
Comprehensive LED Lighting	Option A: One-time pre and post-retrofit kW measurement. Burn hours agreed upon with school district.	Pre M&V: Lighting power readings will be taken on a sample of lighting fixtures. Lighting burn hours were agreed Upon. Post M&V: Lighting power readings will be taken on a sample of lighting fixtures. Measurements will occur once at the outset of the agreement. Energy Savings: Energy savings will be calculated using spreadsheet calculators.
Plug Load Controls	Option A: Savings are from reduced electric consumption by controlling plugged equipment.	Pre M&V: Manufacturer's data of the plug load and the occupancy mode of the affected spaces will be collected during the field audit. Typical plug load is assumed to run 24 hours per day. Post M&V: The occupancy mode is assumed to be same pre and post, so the post retrofit operating hours are determined as the "occupied" hours from the pre- installation. Following the installation, a sample of sensors and correspondent equipment associated with them will be inspected to ensure the sensors are in place and operating. Energy Savings: Savings are from reduced electric consumption by controlling plugged equipment.
Computer Power Management	Option A: Savings are from reduced electric consumption by controlling computer equipment.	Pre M&V: Manufacturer's data of the computer power draw and the occupancy mode of the affected spaces will be collected during the field audit. Post M&V: Following the installation, a sample of computer equipment will be inspected to ensure the software is in place and operating. Energy Savings: Savings are from reduced electric consumption by controlling computer equipment.
Transformer Replacement	Non-measured: Agreed Upon Energy Savings	Pre M&V: Manufacturer's data and operating parameters will be collected on the existing transformers.

ECM Description	Measurement and Verification Method – Summary	Detail of M&V Methodology
		Post M&V: Once the installation is completed, the new transformers will be inspected to verify that they are working properly. Energy Savings: Savings are from reduced losses from installing high efficiency transformers.
Building Envelope & Weatherization	Option A: Existing envelope deficiencies will be documented based on collected field data to provide a baseline for evaluating the effectiveness of the air barrier system. Post-retrofit verifications of parameters will be documented.	Pre M&V: The magnitude of the air infiltration caused by cracks and joint deficiencies was determined by field surveys. Post M&V: The area identified for weatherization improvements will be verified to be complete trough visual inspections and as-built documentation. Energy Savings: Energy savings will be based on the ASHRAE crack method calculations. If the commissioning process reveals any variation in the as-built conditions, then savings will be adjusted accordingly.
Mechanical Insulation	Option A: Existing mechanical insulation deficiencies will be documented based on collected field data to provide a baseline for evaluating the effectiveness of the air barrier system. Post-retrofit verifications of improvements will be documented.	Pre M&V: The magnitude of the missing insulation was determined by field surveys. Post M&V: The areas identified for replacement of mechanical insulation will be verified to be complete through visual inspections and as-built documentation. Energy Savings: Energy savings will be based on measured lengths of insulation.
Kitchen Hood Exhaust Control	Non-Measured: Agreed Upon Savings	Pre M&V: Existing use will be estimated based on anticipated and agreed upon usage. Post M&V: Post use will be estimated after completion of work. Savings are from retrofitting of motors and decreased run time of fan.
UV Replacement	Non-measured: Agreed Upon Savings	Pre M&V: Manufacturer data. Post M&V: Sampling of classrooms to ensure outdoor air ventilation rates are properly based on

ECM Description	Measurement and Verification Method – Summary	Detail of M&V Methodology
		outdoor air conditions. Energy Savings: Savings are from properly ventilating the classrooms based on occupancy and more efficient motors and equipment.
Refrigerator Freezer Case EC Motors and Controls	Non-Measured: Agreed Upon Savings.	Pre M&V: Manufacturer's data and operating parameters will be collected on the freezer and refrigerator. Post M&V: Once the installation is compete walk-in box control system will be inspected to ensure proper operation. Energy Savings: Savings are from the reduced electric consumption of freezers and coolers.
Replace Roof Top Units	Non-measured: Agreed Upon Savings	Pre M&V: Manufacturer data. Post M&V: Sampling of units to ensure proper operation. Energy Savings: Savings are from more efficient motors and equipment.
HE Domestic Water Heater Upgrades	Non-measured: Agreed Upon Savings	Pre M&V: Manufacturer data. Post M&V: Sampling of units to ensure proper operation. Energy Savings: Savings are from more efficient equipment.
Direct Install Adder	Non-measured: Agreed Upon Savings	Pre M&V: Manufacturer data. Post M&V: Sampling of units to ensure proper operation. Energy Savings: Savings are from more efficient equipment.

Measurement and Verification Services

Measurement and Verification Services will be provided in association with the guarantee provided by Energy Systems Group. The guarantee will be in effect for each year that the District elects to participate in the Measurement and Verification Services. The cost of the measurement and verification services is included in the business case in the "Annual Services" column as outlined in the table below:

Year	Annual Amount ($/Yr)
1	$22,181
Total	$22,181

ESG will provide the M&V Services set forth below in connection with the Assured Performance Guarantee.

- During the Installation Period, an ESG Performance Engineer will track Measured Project Benefits. ESG will report the Measured Project Benefits achieved during the Installation Period, as well as any Non-Measured Project Benefits applicable to the Installation Period, to Customer within 60 days of the commencement of the Guarantee Term.
- Within 60 days of each anniversary of the commencement of the Guarantee Term, ESG will provide Customer with an annual report containing:
    - An executive overview of the project's performance and Project Benefits achieved to date;
    - A summary analysis of the Measured Project Benefits accounting; and
    - Depending on the M&V Option, a detailed analysis of the Measured Project Benefits calculations.
- During the Guarantee Term, an ESG Performance Engineer will monitor the on-going performance of the Improvement Measures, as specified in this Agreement, to determine whether anticipated Measured Project benefits are being achieved. The Performance Engineer will visit Customer regularly and assist Customer on-site or remotely, with respect to the following activities:
    - Review of information furnished by Customer from the facility management system to confirm that control strategies are in place and functioning;
    - Advise Customer's designated personnel of any performance deficiencies based on such information;
    - Coordinate with Customer's designated personnel to address any performance deficiencies that affect the realization of Measured Project Benefits; and
    - Inform Customer of opportunities to further enhance project performance and of opportunities for the implementation of additional Improvement Measures.
    - Track utility bills on a monthly basis to determine current utility rate costs and to identify any billing anomalies.
    - For specified Improvement Measures, ESG will:
    - Conduct pre and post installation measurements required under this Agreement;
    - Confirm the building management system employs the control strategies and set points specified in this Agreement; and
    - Analyze actual as-built information and adjust the Baseline and/or Measured Project Benefits to conform to actual installation conditions (e.g., final lighting benefits calculations

will be determined from the as-built information to reflect the actual mix of retrofits encountered during installation).

- Confirm that the appropriate metering and data points required to track the variables associated with the applicable Improvement Measures' benefits calculation formulas are established; and
- Set up appropriate data capture systems (e.g., trend and totalization data on the facility management system) necessary to track and report Measured Project Benefits for the applicable Improvement Measure.

Maintenance Impacts/ On-Going Service

New pieces of equipment that are installed as part of the ESIP project will be provided with the standard manufacturer warranty. Once installation of the equipment is complete, the remaining warranty period will be transferred to Ramsey School District; any warranty issues will be handled directly with the equipment manufacturer rather than with Energy Systems Group.

a) ESG subcontractors will warranty the installation for a period of 12 months, beginning at substantial completion.

b) In addition, ESG will facilitate warranty related issues for a period of 12 months, beginning at substantial completion. Extended manufacture warranties beyond the 12-month installation warranty period will be facilitated by the District.

The installation of recommended measures will reduce the amount of emergency maintenance required by the district through the installation of new equipment; however, preventative maintenance is still required in order to ensure the correct operation of the equipment for the expected lifetime. A service agreement cannot be included as part of this project per the New Jersey Local Finance Notice 2009-11. Once the scope is finalized and bids are received, Energy Systems Group will assist the District in preparing bids for any preventative service agreement that is felt necessary for the new equipment. The service agreement will cover recommended maintenance per each equipment manufacturer. Training on the proper maintenance and operation of each piece of equipment has also been included as part of the ESIP project which will allow the District to complete a majority of maintenance and repair in-house in order to utilize District resources.

In order to ensure the District is fully capable of achieving the energy savings and fully utilizing the new HVAC and Building Automation Systems, Energy Systems Group has included training for district employees.

Services for Lighting, Plug Load Management, and walk-in freezer controller upgrades, such as filter changes and on-going maintenance can be completed by District staff.

Design and Compliance Issues

Ramsey School District will work closely with Energy Systems Group to oversee and complete all design engineering for the purposes of public bidding of the work as well as completing construction drawings.

As part of the Energy Savings Plan development, Energy Systems Group completed a thorough analysis of the building electrical and mechanical systems. The existing light levels are typically within 10-20% of current Illumination Engineering Society (IES) recommendations, which is reasonable given the varying age of lamps throughout the District. The proposed lighting solution will continue to adhere to current IES and NJ Education Code guidelines for light levels, which in many cases may increase the current light levels to the spaces. At this time, Energy Systems Group did not observe any compliance issues in the development of this Energy Savings Plan.

Customer Risks

Asbestos reports were obtained and reviewed for all schools as part of Energy Systems Group's safety policy. Based on the reports, asbestos materials will have to be abated prior to any work being performed. Pursuant to direction from the Board of Education, all asbestos abatement shall be performed by the District's abatement contractor under direct contract with the District. If any additional asbestos is found during the installation of the measures, Energy Systems Group will stop work and notify the Board of Education. Any work associated with testing or remediation of asbestos containing material will be the responsibility of Ramsey School District.

The NJ SmartStart, Pay for Performance, Demand Response Energy Efficiency Credit, and Combined Heat and Power Incentives outline the anticipated incentive amounts to Ramsey School District. Energy Systems Group does not guarantee the rebate or state incentive structure. If the programs change or the incentive amounts differ, Ramsey School District will be responsible to make up the difference in received incentives for the financing. The difference could result from over performance of energy conservation measures, other rebates/ incentives that may be available, restructuring the loan payment for years 1 and 2, or capital contributions by the District.

Public Engagement and Community Outreach

Student Engagement in ESIP Development: ESG has involved students at all levels in the energy related fields. At RAMSEY SCHOOL DISTRICT, we plan to **expand on interests related to energy conservation throughout the district and would welcome and actively encourage student involvement in various phases of the proposed project. Furthermore, in line with our commitment, and with RAMSEY SCHOOL DISTRICT's concurrence, we propose to offer presentations to Energy Clubs, including them in** the process.

STEM EXPO Sponsorship: ESG has a history of sponsoring STEM programs for many school districts and Universities across the country. If selected, ESG would like to sponsor the RAMSEY 's Annual STEM EXPO and further complement your Engineering/Technology Science curriculum.

Community Outreach Program: ESG is focused on creating a partnership with Ramsey School District that will extend beyond the scope of this project. Keeping the community informed and involved in the process is key to success. One way this can be achieved is thru a ***Community Scholarship Program.*** At Northern Illinois University (NIU), ESG established The **Energy Systems Group Scholarship Award in Engineering** to underscore our commitment. Established in 2001, ESG and NIU jointly select students for award of this scholarship. To date, we have awarded **$35,000** to NIU engineering students with superior academic excellence. ESG would like to establish a similar program for Ramsey School District.

ESG will seek to develop and build partnerships between The National Education Foundation (NEF) and the Ramsey School District. These partnerships were developed by ESG and the NEF, to bring engineering and engineering technology career opportunities to students through the educational programs offered by the University of Salt Lake City Utah. These programs help students who might not otherwise consider careers in these sciences or further expand the knowledge of the children who are participating in such class. In addition, this affords local colleges and Universities the opportunity to recruit future applicants from the local school boards. Some of these programs are listed below:

Student Engagement in ESIP Development: ESG has involved students at all levels in the energy related fields. At EBPS, we plan to **expand on interests related to energy conservation throughout the EBPS campus and would welcome and actively encourage student involvement in various phases of the proposed project. Furthermore, in line with our commitment, and with EBPS's concurrence, we propose to offer presentations to Energy Clubs, including them in** the process.

Solar Photovoltaic Systems at Work Grades 9-12: This program includes learning activities for the secondary levels and a supply kit to investigate solar energy and its uses. Additional instructional materials include the Renewable Energy Sources poster, Energist, the Electrical Generation poster and Energist, the Energy Basics CD, and the Eye Chart poster. The program can stand alone or complement Energy Fun, Energy Fundamentals, Energy Action Technology, or Energy Action Patrol.

Career Exploration, grades 11-12: Provides students with career related work experience while obtaining up to 40 hours of academic credit. The program allows students a superb opportunity to integrate classroom theory into the world of work, as well as providing career option exploration, skill development, work environment exposure, and professional contacts.

SECTION 7: IMPLEMENTATION SCHEDULE

A preliminary installation schedule for the measures implemented as part of the ESP is included below to provide a reasonable expectation for the timeline of construction. Once final bids are received and financing of the project is complete, the installation will be finalized in much greater detail and reviewed with the team from the Ramsey School District to ensure agreement. A high-level review of the next steps in the process is shown below as well as the estimated time frame to complete each step:

- Complete Third-Party Engineering Review of Energy Savings Plan – 2 weeks (April 26 – May 7)
- Complete Board of Public Utilities Review of Energy Savings Plan – 21 days (May 10 – May 28)
- Approval resolution to contract with Energy Systems Group: June 27, 2021
- Financing of project: 21 days (June – July)
- Complete 100% design drawings and bid specifications – September 2021
- Public bidding for Sub-Contractors – October 2021
- Installation – November 2021 - December 2022
- Maintenance: On-going

SECTION 8. SAMPLE ENERGY PERFORMANCE CONTRACT

A sample Energy Performance Contract has been provided electronically to the District for review.

ECM: Window Film – Solar/Security Film

ECM Summary

Security window film mitigates hazards from shattered glass during natural disasters. Helps protect people from flying glass shards, one of the most common causes of blast-related injuries and fatalities. Micro-layered and tear resistant to help increase security and provide added protection against smash and grab burglaries. Solar Film shields ultraviolet rays in order to maintain heat loss and gain year-round. Total run time for air conditioning is often reduced in the summer, while heat is retained indoors during the colder months.

The existing windows throughout some of the facilities are un-tinted glass which enables significant heat gain from solar radiation during summer months as well as head loss by convention and radiation during the winter months.

Facilities Recommended for the Measure

- Ramsey High School
- Eric S. Smith Middle School
- Mary A. Hubbard School
- Wesley D. Tisdale School
- John Dater School

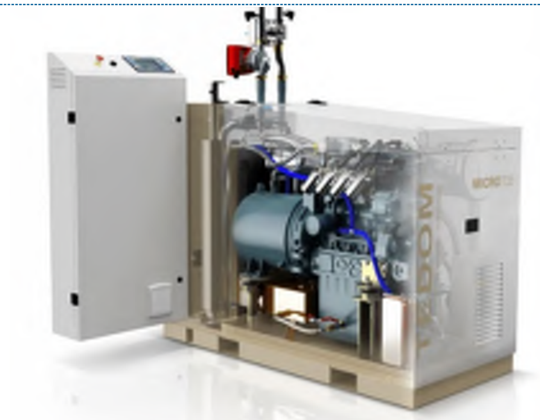
Scope of Work

- Provide all labor, equipment, and materials to safely install the low e film on the interior glass surface.
- Furnish all necessary floor protection and ladders to gain access and protect all areas.

ECM: Cogeneration (CHP) 35 kW

ECM Summary

Energy Systems Group proposes to install one (1) 35 kW cogeneration machine at Ramsey High School to supply electricity and heat to the buildings, which will offset a portion of the boiler load. The recovered heat will be rejected into the boiler hot water heating system.



Facilities Recommended for this Measure

- Ramsey High School
- Eric Smith Middle School

Scope of Work

The Yanmar CHP engines will be installed next to existing boilers on concrete pad with module, etc.

New Installation Work:

Furnish & Install (1) Yanmar (35 kW) cogeneration unit using natural gas, the high-efficiency generator provides 35kW of electrical power. The engine heat is captured and heats water at a rated temperature of 158°F for immediate use or storage in your facility. Excess electricity production may be sold back onto the grid in certain states, creating a credit on your electric bill.

- Natural gas fired CHP unit with heat rejection system located on outside wall of boiler room mounted in existing combustion air louver converted for radiator and fan.
- New CHP location will be in basement and set on new concrete housekeeping pad.
- F&I new gas piping to CHP unit from main gas meter bank.
- F&I new insulated hot water piping overhead from Yanmar CHP pump module to heating hot water system piping and heat rejection system.
- F&I new electrical power from Yanmar CHP unit to building electrical main switchgear.
- New exhaust vent piping to go through exterior wall.
- Provide factory commissioning of system (start up and testing).

Savings Methodology

In general, savings calculations for lighting retrofits are calculated using the following methodology:

Savings Calculation Method	
Energy:	35 kW/module x 1 module(s) x 1 net after "parasitic losses"
	= 35 net kW output x $/kWh avg. displaced energy x run hours
Demand :	35 kW/module x 1 module(s) available x 1 net after "parasitic losses"
When Heat Used to Displace Boiler Gas Use:	$\frac{\left(\frac{Th}{hr\ module}\right) x}{boiler\ efficiency}\ x\ 1\ modules\ x\ \$/\text{Th boiler gas rate}$

Maintenance

Follow manufacturers' recommendations for preventative maintenance. In order to be eligible for New Jersey Clean Energy incentives, Ramsey School District must demonstrate that they have contracted for an extended maintenance agreement to service the cogeneration units. This maintenance agreement will be conducted outside of the Energy Savings Improvement Program, as required by law.

Benefits

The installation of a cogeneration unit will result in significant economic benefits to the overall ESIP program. These benefits include:

- Up to 20-year financing term.
- Substantial NJ Clean Energy incentives.
- Potential demand response revenue generation.
- Additional funding from FEMA grants and other local, state, and national incentives.

Energy Savings

Energy savings were calculated using an Excel based bin calculation workbook developed by Energy Systems Group; all savings calculations and field measurements will be provided electronically.

Operational Savings

New LED Fixtures

Annual operational savings are calculated based on the reduced amount of material needed for replacement of the lighting system. This is calculated by comparing the existing lifetime of the T8, HID and halogen lamps to the new lifetime of LED lighting. The calculations are based on replacements of T8 fixtures every three years, T8 ballasts every 5 years, HID lamps every 5 years and halogen lamps being replaced every 2 years. The table below highlights the various lamp types and associated replacement timing as well as total cost with replacement. These savings do not include any costs for labor to replace the bulbs or additional material needed for replacement such as lifts, replacement fixtures, new sockets, etc.

Material Type	Lifetime	Cost/ Unit
Linear fluorescent (T8)	3 years	$5
Electronic Ballast	5 years	$25
HID Lamp	5 years	$25
HID Ballast	5 years	$75
Halogen, PARs, BRs	2 years	$10
Incandescent, CFLs, MRs	2 years	$2

This methodology is used to determine the annual savings through the replacement of all lamp types with new LED lamps and fixtures. The fixture warranty associated with each of these replacements is 10 years. Operational savings have been claimed for a total of 5 years per the BPU regulations.

Mechanical Upgrades (Boiler Replacement & Controls Upgrades)

The annual operating expenses for Ramsey School District was provided to Energy Systems Group in order to determine the amount of emergency repair maintenance conducted annually at the District. The installation of new equipment along with manufacturers' warranties will effectively eliminate the need for these emergency repair costs. The operational savings for these measures have been claimed for 2 years per the BPU regulations. A complete breakdown of the operational analysis for the District is included on the following pages.

Operational Savings Summary

Energy Systems Group has worked with the District to quantify the exact sources of savings by going through past invoices and expenses. The table below summarizes the cost savings estimated from invoices provided by the District; these invoices are summarized only by the applicable ECMs and any non-recurring charge. Any preventative maintenance or service contracts that will remain were not factored into this analysis. The complete list of invoices is provided electronically. The operational savings will not be escalated.

Operational Savings for Financial Model	
LED Lighting & Controls Upgrades	$12,956
HVAC & Mechanical Upgrades	$11,701
Totals	**$24,657**

APPENDIX 3. BUILDING ENVELOPE SCOPE DRAWINGS

RAMSEY BOE, NJ
BUILDING ENVELOPE INVESTMENT & SAVINGS SUMMARY

Building Measure	Location	Heating Fuel Units	Cooling Fuel Units	Units, LF or SF	Unit Price ($)	Investment ($)	Heating + Cooling Savings ($)	Heating Savings (Fuel Units)	Cooling Savings (Fuel Units)	Total Energy Savings (MMBtu)	Simple Payback
Eric Smith Middle School											
Caulking											
Interior Seal (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Door Weather Stripping											
Double Door - Sides, Top, Sweep, Center (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Single Door - Sides, Top, Sweep (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Single Door - Sweep (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Overhang Air Sealing											
Seal (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Roof Wall Intersection Air Sealing											
Block, Seal (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Block, Seal (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Seal (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Seal Expansion (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Window Weatherization											
Awning Weatherization (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Eric Smith Middle School Total						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
John Dater School											
Caulking											
Interior Seal (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Door Weather Stripping											
Double Door - Sides, Sweep, Center (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Single Door - Sides, Sweep (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Single Door - Sweep (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
John Dater School Total						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Mary Hubbard School											
AC Unit Weatherization											
Retrofit Venting Roof Air Barrier (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Door Weather Stripping											
Double Door - Sides, Sweep, Center (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Double Door - Sides, Top, Sweep, Center (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Double Door - Sweep (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years
Double Door - Sweep, Center (LF)	Sq Foot Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible] years

RAMSEY BOE, NJ
BUILDING ENVELOPE INVESTMENT & SAVINGS SUMMARY

Building/ Measure	Location	Heating Fuel Units	Cooling Fuel Units	Units, LF or SF	Unit Price ($)	Investment ($)	Heating + Cooling Savings ($)	Heating Savings (Fuel Units)	Cooling Savings (Fuel Units)	Total Energy Savings (MMBtu)	Simple Payback
Single Door - Sides, Top, Sweep (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Single Door - Sweep (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Overhang Air Sealing											
Block, Seal (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Roof/Wall Intersection Air Sealing											
Block, Seal (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Seal (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Mary Hubbard School Total						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ramsey High School											
Caulking											
Interior Seal (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Exterior Seal (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Door Weather Stripping											
Double Door - Sides, Sweep, Center (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Double Door - Sides, Top, Sweep, Center (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Install Door Jamb Spacer (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Single Door - Sides, Sweep (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Single Door - Sides, Top, Sweep (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Roof/Wall Intersection Air Sealing											
Block, Seal (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Window Weatherization											
Awning Weatherization (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Ramsey High School Total						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wesley Tisdale School											
Attic Bypass Air Sealing											
Block, Seal Roof Vents (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Block, Seal Soffit Ventilation (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Door Weather Stripping											
Double Door - Sides, Sweep, Center (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Double Door - Sweep, Center (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Single Door - Sides, Sweep (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Single Door - Sides, Top, Sweep (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Single Door - Sweep (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

RAMSEY BOE, NJ
BUILDING ENVELOPE INVESTMENT & SAVINGS SUMMARY

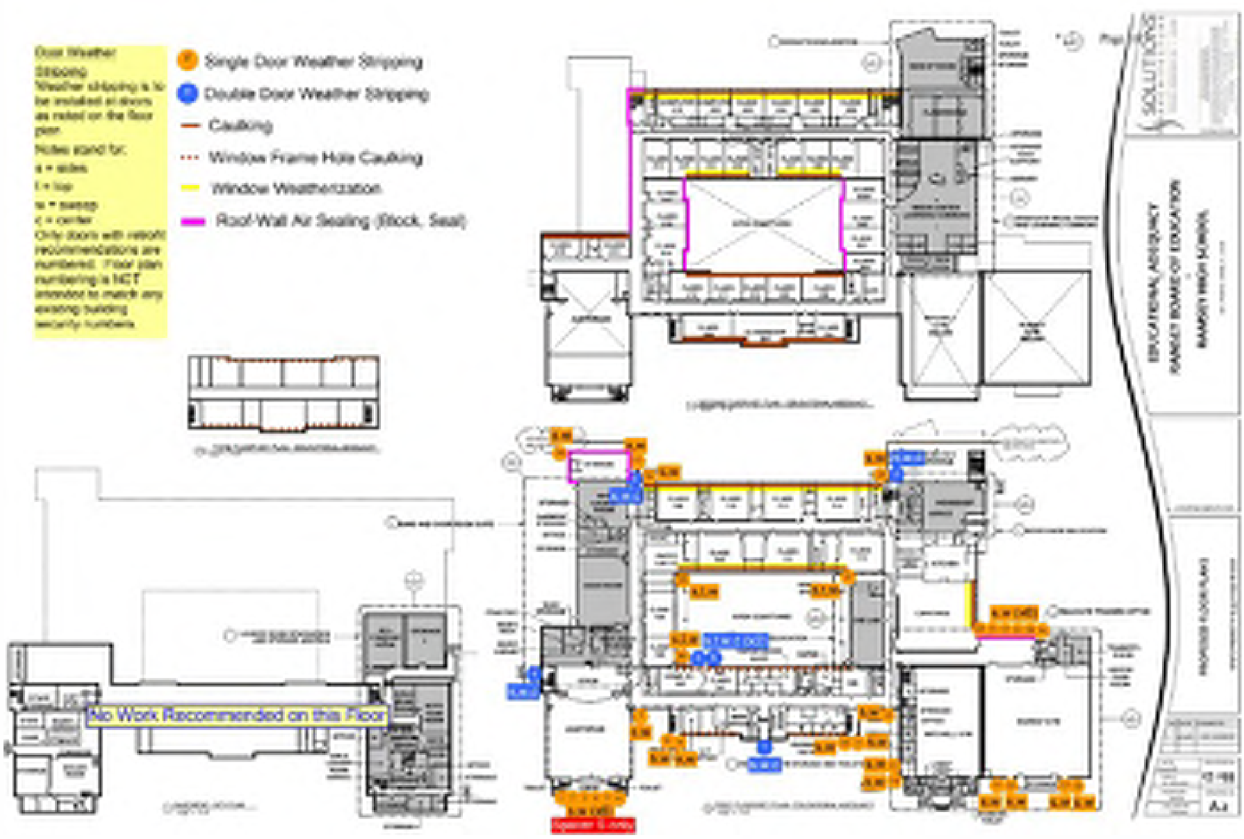
Building/ Measure	Location	Heating Fuel Units	Cooling Fuel Units	Units, LF or SF	Unit Price ($)	Investment ($)	Heating + Cooling Savings ($)	Heating Savings (Fuel Units)	Cooling Savings (Fuel Units)	Total Energy Savings (MMBtu)	Simple Payback
Roof/Wall Intersection Air Sealing											
Block, Seal (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Seal Exposed (LF)	See Floor Plan	therms	kWh	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Wesley Tisdale School Total						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Grand Total						[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]

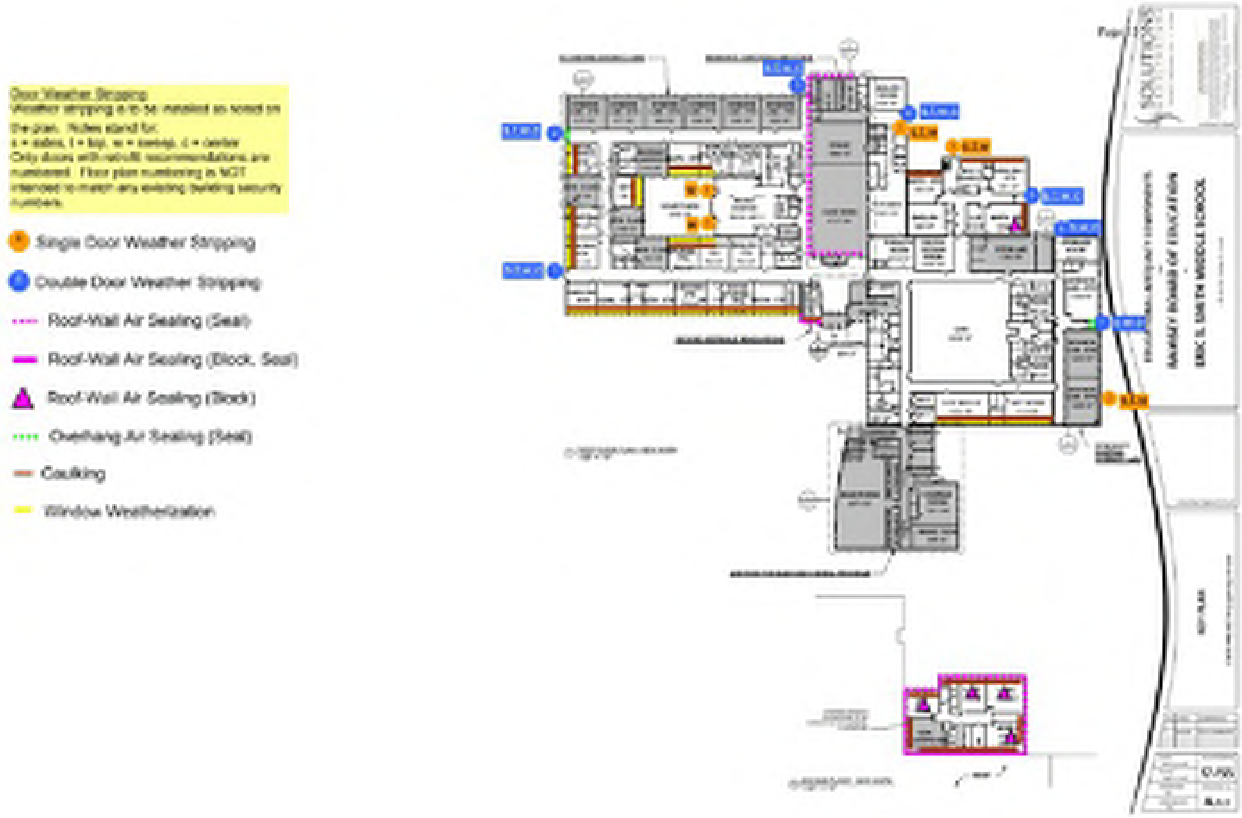
RAMSEY BOE, NJ
BUILDING ENVELOPE ENERGY CALCULATION INPUTS

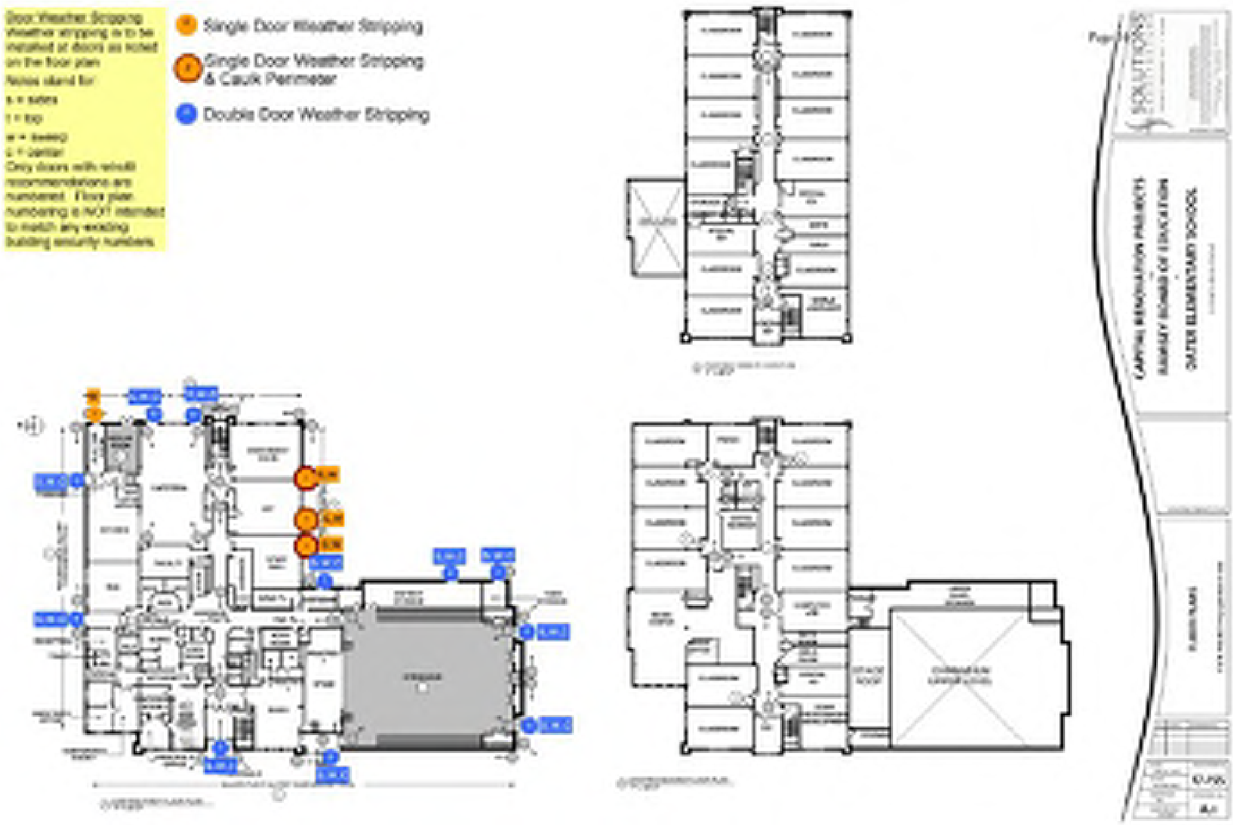
		Infiltration Reduction				Insulation	
Building/ Measure	Location	Sum of Crack Size	Sum of Crack Length (LF)	Sum of Leakage Area (SF)	Sum of Savings (CFM)	Sum of Starting R-Value	Sum of Ending R-Value
Eric Smith Middle School							
Caulking							
Interior Seal (LF)	See Floor Plan	1/64 in.	1,354 LF	1.6 SF	150 CFM	—	—
Door Weather Stripping							
Double Door - Sides, Top, Sweep, Center (LF)	See Floor Plan	1/8 in.	251 LF	2.4 SF	250 CFM	—	—
Single Door - Sides, Top, Sweep (LF)	See Floor Plan	1/8 in.	60 LF	0.6 SF	59 CFM	—	—
Single Door - Sweep (LF)	See Floor Plan	1/8 in.	4 LF	0.1 SF	7 CFM	—	—
Overhang Air Sealing							
Seal (LF)	See Floor Plan	1/8 in.	77 LF	0.7 SF	56 CFM	—	—
Roof Wall Intersection Air Sealing							
Block, Seal (LF)	See Floor Plan	1/8 in.	168 LF	1.1 SF	176 CFM	—	—
Block, Seal (LF)	See Floor Plan	1/8 in.	8 LF	0.1 SF	9 CFM	—	—
Seal (LF)	See Floor Plan	1/8 in.	464 LF	4.5 SF	546 CFM	—	—
Seal Exposed (LF)	See Floor Plan	1/8 in.	351 LF	3.6 SF	[illegible] CFM	—	—
Window Weatherization							
Awning Weatherization (LF)	See Floor Plan	1/16 in.	568 LF	3.2 SF	350 CFM	—	—
Eric Smith Middle School Total			[illegible] LF	[illegible] SF	[illegible] CFM	—	—
John Dean School							
Caulking							
Interior Seal (LF)	See Floor Plan	1/64 in.	31 LF	0.1 SF	7 CFM	—	—
Door Weather Stripping							
Double Door - Sides, Sweep, Center (LF)	See Floor Plan	1/8 in.	297 LF	3.1 SF	346 CFM	—	—
Single Door - Sides, Sweep (LF)	See Floor Plan	1/8 in.	54 LF	0.5 SF	48 CFM	—	—
Single Door - Sweep (LF)	See Floor Plan	1/8 in.	3 LF	0.0 SF	4 CFM	—	—
John Dean School Total			403 LF	3.7 SF	[illegible] CFM	—	—
Mary Hubbard School							
AC Unit Weatherization							
Retrofit Missing Roof Air Barrier (LF)	See Floor Plan	1/2 in.	14 LF	0.7 SF	42 CFM	—	—
Door Weather Stripping							
Double Door - Sides, Sweep, Center (LF)	See Floor Plan	1/8 in.	27 LF	0.3 SF	32 CFM	—	—
Double Door - Sides, Top, Sweep, Center (LF)	See Floor Plan	1/8 in.	33 LF	0.3 SF	39 CFM	—	—
Double Door - Sweep (LF)	See Floor Plan	1/8 in.	42 LF	0.4 SF	46 CFM	—	—
Double Door - Sweep, Center (LF)	See Floor Plan	1/8 in.	17 LF	0.1 SF	15 CFM	—	—
Single Door - Sides, Top, Sweep (LF)	See Floor Plan	1/8 in.	186 LF	1.9 SF	220 CFM	—	—
Single Door - Sweep (LF)	See Floor Plan	1/8 in.	18 LF	0.2 SF	21 CFM	—	—
Overhang Air Sealing							
Block, Seal (LF)	See Floor Plan	1/8 in.	17 LF	0.2 SF	20 CFM	—	—
Roof Wall Intersection Air Sealing							
Block, Seal (LF)	See Floor Plan	1/8 in.	447 LF	4.6 SF	537 CFM	—	—
Seal (LF)	See Floor Plan	1/8 in.	77 LF	0.8 SF	86 CFM	—	—
Mary Hubbard School Total			868 LF	9.5 SF	1,067 CFM	—	—

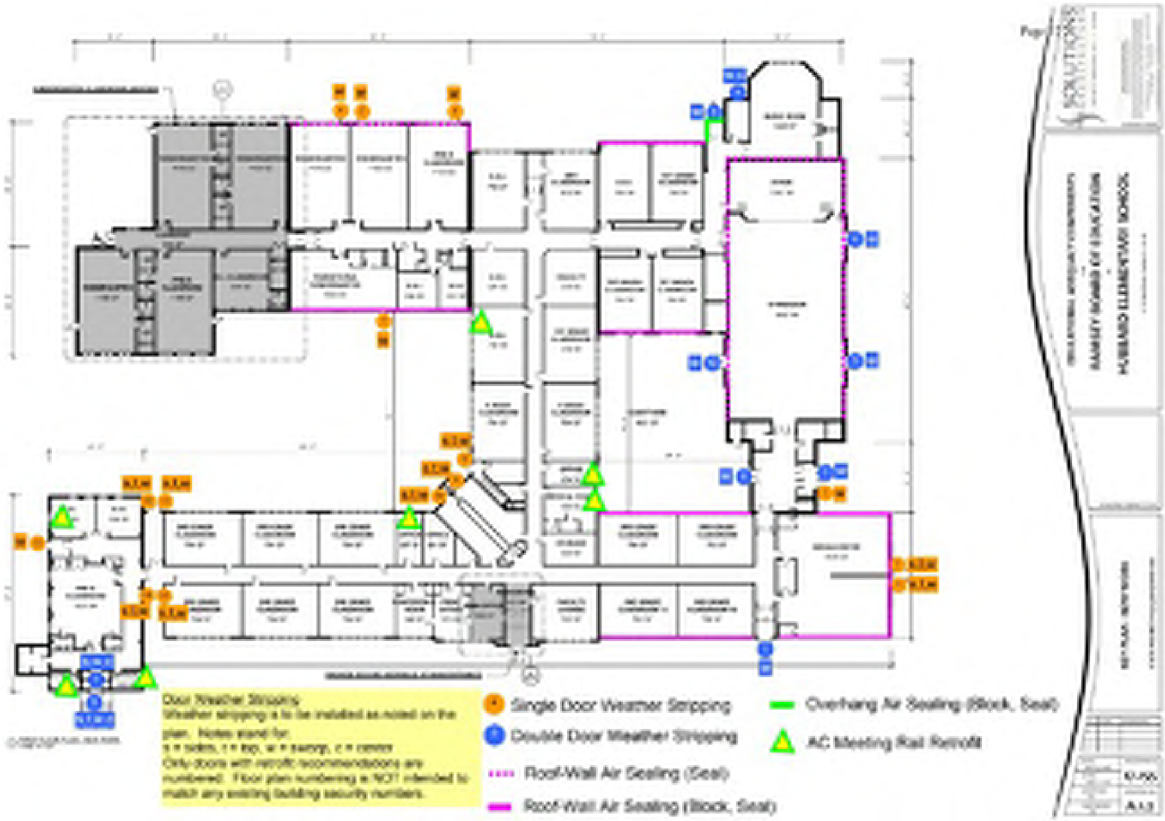
RAMSEY BOE, NJ
BUILDING ENVELOPE ENERGY CALCULATION INPUTS

		Infiltration Reduction				Insulation	
Building/Measure	Location	Sum of Crack Size	Sum of Crack Length (LF)	Sum of Leakage Area (SF)	Sum of Savings (CFM)	Sum of Starting R-Value	Sum of Ending R-Value
Ramsey High School							
Caulking							
Interior Seal (LF)	See Floor Plan	1/16 in.	[illegible]	[illegible]	[illegible]	—	—
Interior Seal (ST)	See Floor Plan	1/4 in.	[illegible]	[illegible]	[illegible]	—	—
Door Weather Stripping							
Double Door - Sides, Sweep, Center (LT)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Double Door - Sides, Top, Sweep, Center (ST)	See Floor Plan	1/8 in.	40 LF	[illegible]	[illegible]	—	—
Install Door Jamb Spacer (ST)	See Floor Plan	—	—	—	—	—	—
Single Door - Sides, Sweep (ST)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Single Door - Sides, Top, Sweep (LT)	See Floor Plan	1/8 in.	40 LF	[illegible]	[illegible]	—	—
Roof-Wall Intersection Air Sealing							
Block, Seal (LF)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Window Weatherization							
Awning Weatherization (LT)	See Floor Plan	1/16 in.	[illegible]	[illegible]	[illegible]	—	—
Ramsey High School Total			[illegible]	[illegible]	[illegible]	—	—
[illegible] School							
[illegible] Air Sealing							
Block, Seal Roof Vents (LT)	See Floor Plan	[illegible]	[illegible]	[illegible]	[illegible]	—	—
Block, Seal Soffit Ventilation (LF)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Door Weather Stripping							
Double Door - Sides, Sweep, Center (LT)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Double Door - Sweep, Center (ST)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Single Door - Sides, Sweep (ST)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Single Door - Sides, Top, Sweep (LT)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Single Door - Sweep (ST)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Roof-Wall Intersection Air Sealing							
Block, Seal (LF)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
Seal Exposed (LF)	See Floor Plan	1/8 in.	[illegible]	[illegible]	[illegible]	—	—
[illegible] School Total			[illegible]	[illegible]	[illegible]	—	—
Grand Total			[illegible]	[illegible]	[illegible]	—	—




Door Weather Stripping
Weather stripping is to be installed as noted on the plan. Nodes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.
Single Door Weather Stripping
Double Door Weather Stripping
Roof-Wall Air Sealing (Seal)
Roof-Wall Air Sealing (Block, Seal)
Roof-Wall Air Sealing (Block)
Overhang Air Sealing (Seal)
Caulking
Window Weatherization
RAMSEY BOARD OF EDUCATION
ERIC S. SMITH MIDDLE SCHOOL


Door Weather Stripping
Weather stripping is to be installed at doors as noted on the floor plan
Notes stand for:
s = sides
t = top
w = sweep
c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.
Single Door Weather Stripping
Single Door Weather Stripping & Caulk Perimeter
Double Door Weather Stripping


Door Weather Stripping
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.
Single Door Weather Stripping
Double Door Weather Stripping
Roof-Wall Air Sealing (Seal)
Roof-Wall Air Sealing (Block, Seal)
Overhang Air Sealing (Block, Seal)
AC Meeting Rail Retrofit

Single Door Weather Stripping
Double Door Weather Stripping
Roof-Wall Air Sealing (Block, Seal)
Roof-Wall Air Sealing (Seal)
Attic Soffit Air Sealing
Roof Vent Air Sealing (Block, Seal)
Door Weather Stripping
Weather stripping is to be installed at doors as noted on the floor plan.
Notes stand for:
t = top
w = sweep
c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

Design Drawings will be available electronically.

2-2 Transformer Replacements

School	Transformer Size/s (kVA)	Existing Qty	Replacement Qty
John Dater Elementary School	45 kVA	7	7
	75 kVA	6	6
	112.5 kVA	2	2

7-1 Building Envelope and PIPE INSULATION UPGRADES

RAMSEY BOE, NJ

MECHANICAL INSULATION WORK SUMMARY

Task	Eric Smith Middle School	John Dater School	Mary Hubbard School	Wesley Tisdale School	Total Quantity
Ball Valve Insulation (Units)			6	4	10
Bonnet Insulation (Units)	2		12	1	15
Butterfly Valve Insulation (Units)		12			12
Check Valve Insulation (Units)		6			6
Control Valve Insulation (Units)		2	2		4
End Cap Insulation (Units)	1	5			6
Flange Insulation (Units)	8	26	27	22	83
Flex Fitting Insulation (UT)	4	4	4		12
Flo-Check Insulation (Units)			3		3
Gate Valve Insulation (Units)			6	7	13
Pipe Fitting Insulation (Units)		2	34	43	79
Pipe Reducer Insulation (Units)	2	2			4
Pump Insulation (Units)	2	4	9	3	18
Steam Trap Insulation (Units)			5	5	10
Straight Pipe Insulation (LF)	2	9	49	132	192
Strainer Insulation (Units)	2	2	10	11	25
Suction Diffuser Insulation (Units)	2	2			4
Tank Insulation (Units)	1	1	2	1	5
Triple Duty Valve Insulation (Units)	2	2			4

1-2 Direct Install Lighting

Wesley D. Tisdale Elementary School Direct Install		
Application	Fixture	Quantity
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / boys room B	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / girls room B	1
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / kitchen storage	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / hall	8
Lighting - DI	Fixture Replacement: LED Outdoor Wall Mount (14 - 60W): 27 W / exterior	1
HVAC Upgrades - DI	Electric Split System A/C: 7.5-Tons / RTU 1	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 4-Tons / RTU 2	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 2.5-Tons / RTU 7	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 2.5-Tons / RTU 8	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 2.5-Tons / RTU 9	1
HVAC Upgrades - DI	Electronic Fuel-Use Economizers (for Steam Heat) / Boiler Room	1
HVAC Upgrades - DI	Electronic Fuel-Use Economizers (for Steam Heat) / Boiler Room	1

1-2 Direct Install Lighting

John Y Dater Direct Install		
Application	Fixture	Quantity
Lighting - DI	Relamp: LED - PAR30 (10 - 20W): 14 W / roof	14
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 3-electrical closet	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 3-IDF closet	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 3-rm 303 closet(304)	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 3-boys rm	4
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 3-girls rm	4
Lighting - DI	Relamp: Direct Line LED - 4-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-IDF closet	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-rm 236 (district storage)	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-media center storage	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 2-boys room	4
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 2-girls room	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-rm 203(storage)	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-rm 146	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-electrical closet A	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-cafeteria closet(rm 125)	1
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-boiler room	9
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-electrical room B	3
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-special services	3
Lighting - DI	Relamp: Direct Line LED - 2-Lamp - 2-Foot T8 / 1-special services restrooom	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-special services conference A	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-special services director	3
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-MDF closet	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-boys rm	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-girls rm	4

Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-girls rm	5
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-GYM storage(rm 158)	2
Lighting - DI	Relamp: Direct Line LED - 2-Lamp - 2-Foot T8 / 1-GYM storage(rm 156)	5
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-GYM storage(rm 157)	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-main office	5
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-principal office	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-conference A	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-kitchen	7
Lighting - DI	Relamp: Direct Line LED - 4-Lamp - 4-Foot T8 (Prem. - 10.5W) / stairtower 3	2
HVAC Upgrades - DI	Electric Split System A/C: 7.5-Tons / RTU 4	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 2-Tons / RTU 5	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 2-Tons / RTU 6	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 4-Tons / RTU 10	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 3-Tons / RTU 11	1
HVAC Upgrades - DI	Packaged RTU (Gas Heating): 8.5-Tons / RTU 13	1
HVAC Upgrades - DI	Electric Split System A/C (Single-Phase): 2-Tons / RTU 15	1

2-1 Plug Load Controls (By School)

Ramsey High School	
Device	Quantity:
Projector	0
Smartboard	2
Projector/Smartboard Combo	5
Amplifier	0
Charging Cart	2
Small Printer	0
Medium Printer	31
Large Printer/Copier (110 only)	1
TV/LCD/Smart TV	2
Snack Vending	1
Soda Vending	3
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC-110 (15A)	2
AC-110 (20A)	0
AC-220 (<=20A)	0
Other Device not listed above	0

Eric S. Smith Middle School	
Device	Quantity:
Projector	0
Smartboard	1
Projector/Smartboard Combo	0
Amplifier	0
Charging Cart	4
Small Printer	0
Medium Printer	11
Large Printer/Copier (110 only)	0
TV/LCD/Smart TV	0
Snack Vending	0
Soda Vending	1
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC-110 (15A)	0
AC-110 (20A)	0
AC-220 (<=20A)	0
Other Device not listed above	0

John Y. Dater Elementary School	
Device	Quantity:
Projector	0
Smartboard	2
Projector/Smartboard Combo	13
Amplifier	0
Charging Cart	6
Small Printer	0
Medium Printer	14
Large Printer/Copier (110 only)	1
TV/LCD/Smart TV	29
Snack Vending	0
Soda Vending	1
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC-110 (15A)	0
AC-110 (20A)	0
AC-220 (<=20A)	0
Other Device not listed above	0

Mary A. Hubbard Elementary School	
Device	Quantity:
Projector	0
Smartboard	3
Projector/Smartboard Combo	5
Amplifier	0
Charging Cart	4
Small Printer	0
Medium Printer	10
Large Printer/Copier (110 only)	1
TV/LCD/Smart TV	0
Snack Vending	0
Soda Vending	0
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC-110 (15A)	4
AC-110 (20A)	0
AC-220 (<=20A)	0
Other Device not listed above	0

2-1 Plug Load Controls (By School)

Wesley D. Tisdale Elementary School	
Device	Quantity:
Projector	0
Smartboard	2
Projector/Smartboard Combo	13
Amplifier	0
Charging Cart	3
Small Printer	0
Medium Printer	8
Large Printer/Copier (110 only)	1
TV/LCD/Smart TV	1
Snack Vending	0
Soda Vending	1
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC-110 (15A)	2
AC-110 (20A)	0
AC-220 (<=20A)	0
Other Device not listed above	0

APPENDIX 5. LIGHTING UPGRADES

1-1 Comprehensive LED Lighting Upgrades

Building	Retrofit Description	Project Qty
Ramsey High School	Retrofit Existing Fixture with 2 New 2' LED Lamps W Internal Driver	3
Ramsey High School	Replace Existing Fixture with New Flat Panel LED Fixture	51
Ramsey High School	Retrofit Existing Fixture with 1 New 4' LED Lamp W Internal Driver	34
Ramsey High School	Retrofit Existing Fixture with 2 New 4' LED Lamps W Internal Driver	20
Ramsey High School	Retrofit Existing Fixture with 3 New 4' LED Lamps W Internal Driver	1
Ramsey High School	Retrofit Existing Fixture with 4 New 4' LED Lamps W Internal Driver	8
Ramsey High School	Replace Existing Fixture with New High Bay LED Fixture	28
Ramsey High School	Replace Existing Fixture with New High Bay LED Fixture	24
Ramsey High School	Retrofit Existing Recessed Can with new LED Conversion Kit	34
Ramsey High School	Retrofit Existing Fixture with New LED Screw in Lamp	65
Ramsey High School	Retrofit Existing Fixture with New LED Screw in Lamp	41
Ramsey High School	Retrofit Existing Fixture with New LED Screw in Lamp	12
Ramsey High School	Replace Existing Fixture with New Strip LED Fixture	621
Ramsey High School	Replace Existing Fixture with New Strip LED Fixture	245
Ramsey High School	Replace Existing Fixture with New Flat Panel LED Fixture	61
Ramsey High School	Replace Existing Fixture with New Flat Panel LED Fixture	527
Ramsey High School	Replace Existing Fixture with New Canopy LED Fixture	9
Ramsey High School	Replace Existing Fixture with New Flood LED Fixture	3
Ramsey High School	Replace Existing Fixture with New LED Exit Sign Fixture	5
Ramsey High School	Replace Existing Fixture with New Wallpack LED Fixture	7
Ramsey High School	Install Low Voltage Occupancy & Power Pack	37
Ramsey High School	Fixture Mounted Occupancy Sensor	52

1-1 Comprehensive LED Lighting Upgrades

Building	Retrofit Description	Project Qty
Eric Smith Middle School	Retrofit Existing Fixture with 2 New 2' LED Lamps W Internal Driver	2
Eric Smith Middle School	Replace Existing Fixture with New High Bay LED Fixture	36
Eric Smith Middle School	Retrofit Existing Fixture with New LED Screw in Lamp	15
Eric Smith Middle School	Retrofit Existing Fixture with New LED Screw in Lamp	13
Eric Smith Middle School	Retrofit Existing Fixture with New LED Screw in Lamp	9
Eric Smith Middle School	Direct Wire Ballast Bypass LED CornCob Lamp	8
Eric Smith Middle School	Replace Existing Fixture with New Flat Panel LED Fixture	52
Eric Smith Middle School	Replace Existing Fixture with New Flat Panel LED Fixture	924
Eric Smith Middle School	Direct Wire Ballast Bypass LED PL Lamp	109
Eric Smith Middle School	Fixture Mounted Occupancy Sensor	36

1-2 Direct Install Lighting

John Y Dater Direct Install		
Application	Fixture	Quantity
Lighting - DI	Relamp: LED - PAR30 (10 - 20W): 14 W / roof	14
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 3-electrical closet	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 3-IDF closet	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 3-rm 303 closet(304)	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 3-boys rm	4
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 3-girls rm	4
Lighting - DI	Relamp: Direct Line LED - 4-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-IDF closet	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-rm 236 (district storage)	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-media center storage	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 2-boys room	4
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 2-girls room	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 2-rm 203(storage)	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-rm 146	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-electrical closet A	2
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-cafeteria closet(rm 125)	1
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-boiler room	9
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-electrical room B	3
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-special services	3
Lighting - DI	Relamp: Direct Line LED - 2-Lamp - 2-Foot T8 / 1-special services restrooom	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-special services conference A	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-special services director	3
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-MDF closet	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-boys rm	4
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-girls rm	4
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-girls rm	5

Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-GYM storage(rm 158)	2
Lighting - DI	Relamp: Direct Line LED - 2-Lamp - 2-Foot T8 / 1-GYM storage(rm 156)	5
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / 1-GYM storage(rm 157)	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-main office	5
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-principal office	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-conference A	2
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / 1-kitchen	7
Lighting - DI	Relamp: Direct Line LED - 4-Lamp - 4-Foot T8 (Prem. - 10.5W) / stairtower 3	2

1-2 Direct Install Lighting

Wesley D. Tisdale Elementary School Direct Install		
Application	Fixture	Quantity
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / boys room B	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / girls room B	1
Lighting - DI	Relamp: Direct Line LED - 3-Lamp - 4-Foot T8 (Prem. - 10.5W) / kitchen storage	1
Lighting - DI	Relamp/Reballast: LED 2-Lamp PL 4-Pin / hall	8
Lighting - DI	Fixture Replacement: LED Outdoor Wall Mount (14 - 60W): 27 W / exterior	1

Ramsey School District

ERP Review Questions Part 1

Ramsey School District

ERP Review Questions Part 2

Ramsey School District

ERP Review Questions Part 3

APPENDIX 7. HVAC EQUIPMENT SCHEDULES

Ramsey High School				
Area Served	System Type	Cooling Capacity (Tons)	Heating Capacity (MBh)	Quantity
Classrooms	Split-System Air-Source HP	6.00	81.00	3
Classrooms	Split-System AC	0.75		1
Classrooms	Split-System AC	2.50		1
Classrooms	Packaged AC	4.00		1
Classrooms	Packaged AC	2.00		1
Classrooms	Split-System AC	60.00		2
IDF Room	Split-System Air-Source HP	1.50	16.40	1
Classrooms	Packaged AC	4.00		4
Classrooms	Split-System AC	3.00		1
Classrooms	Split-System AC	2.50		1
Classrooms	Packaged AC	15.00		1
Classrooms	Split-System Air-Source HP	2.50	32.00	2
Classrooms	Split-System AC	3.00		1
Media Center RTU-1	Packaged AC	20.00		1
Classrooms	Split-System AC	0.81		1
Classrooms	Packaged AC	2.00		1
New Gym RTU-1	Packaged AC	50.00	864.00	1
New Gym RTU-2	Packaged AC	50.00	864.00	1
Old Gym RTU-3	Packaged AC	20.00	328.10	1
Old Gym RTU-4	Packaged AC	20.00	328.10	1
Classrooms	Split-System AC	2.50		1
Classrooms	Split-System Air-Source HP	1.50	22.000	1
Classrooms	Split-System Air-Source HP	3.00	42.700	1
Offices	Split-System Air-Source HP	8.00	108.000	1
Offices	Split-System Air-Source HP	3.00	34.000	1
Offices	Split-System Air-Source HP	14.00	188.000	1
Main Office/Principal	Split-System Air-Source HP	8.00	108.000	2
Classrooms	Split-System AC	0.75		1

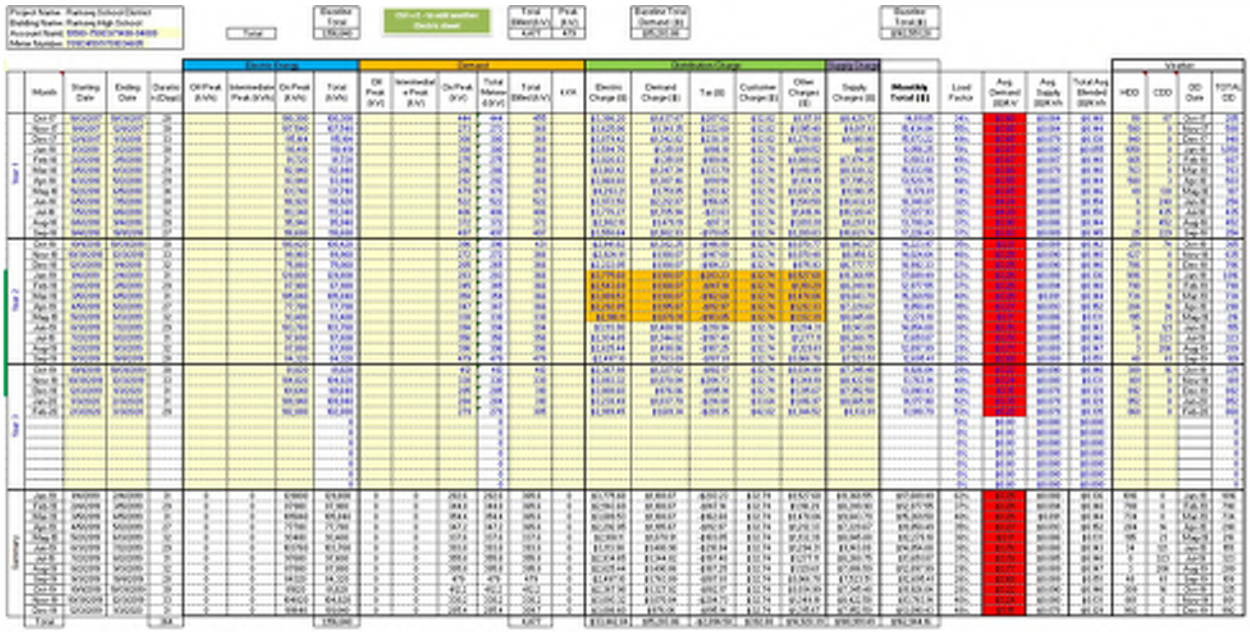
Eric Smith Middle School				
Area Served	System Type	Cooling Capacity (Tons)	Heating Capacity (MBh)	Quantity
Computer Closet 104 AC-1	Split-System AC	1.00		1
Classrooms 102/116 RTU-2,3	Packaged AC	4.00	59.04	2
Computer Corridor 103 RTU-4	Packaged AC	5.00	59.04	1
IDF Room	Split-System Air-Source HP	1.25	16.20	1
Conference Room 107 ACC-2	Split-System Air-Source HP	1.50	18.90	1
Media Center 109 RTU-1	Packaged AC	10.00	147.60	1
Cafeteria	Packaged AC	5.00	120.00	1
CCU-3 Chorus Room	Split-System AC	7.50		1
CCU-2 Band Room/Stage	Split-System AC	7.50		1
Gym Condensing Unit	Packaged AC	30.00		1
Main Office 125 AC-5	Split-System AC	1.50		1
Classroom 205	Split-System AC	3.00		1
2nd Fl Classrooms 201,202,203,204	Split-System AC	3.00		4
Gym RTU	Packaged AC	12.00	188.00	1
Lobby 123 BC-1	Packaged AC	5.00	120.00	1
Computer Room B	Packaged AC	7.50	160.00	1
Room 28	Packaged AC	4.00	60.00	1
Classroom	Packaged AC	6.00	86.00	1
SGI Rooms 110,115 AC-3,4	Split-System AC	1.50		1
Office 130	Packaged Terminal HP	1.00	6.70	1

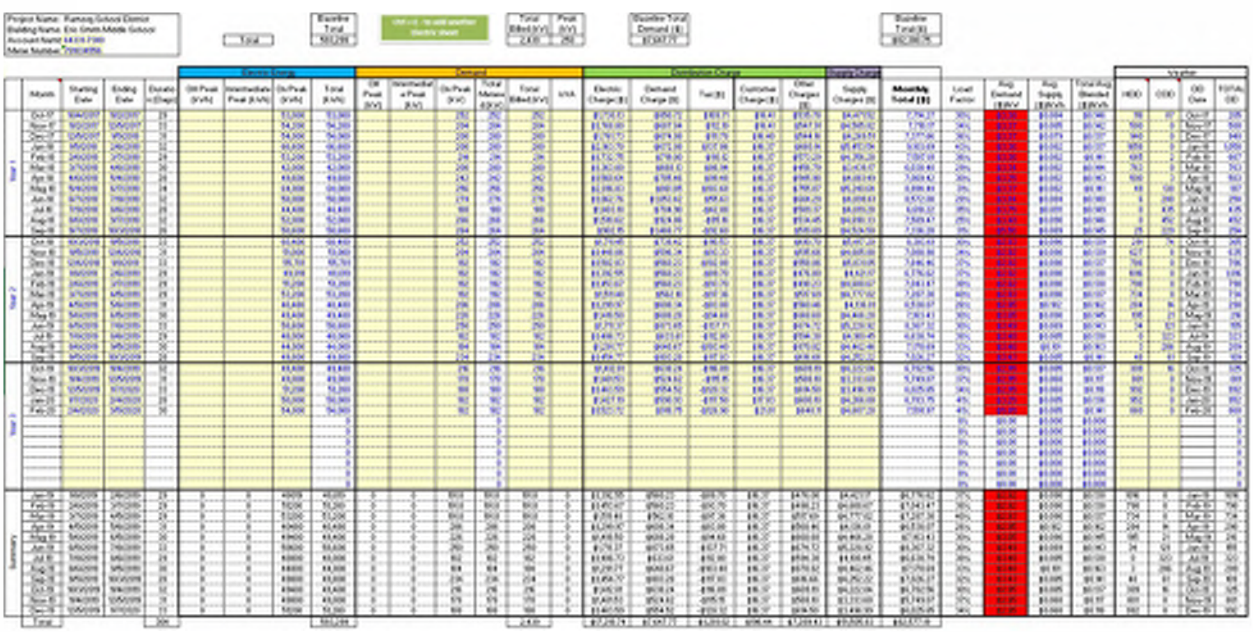
John Dater Elementary School				
Area Served	System Type	Cooling Capacity (Tons)	Heating Capacity (MBh)	Quantity
Media Center Office RTU-6	Packaged AC	8.50	121.50	1
MDF Room 149 AC-1	Ductless Mini-Split AC	1.00		1
IDF Room 231 AC-2	Ductless Mini-Split AC	0.75		1
IDF Room 305 AC-3	Ductless Mini-Split AC	0.75		1
Main Office ACCU-1	Split-System AC	10.00		1
PTOT/Faculty Conf. Rm. ACCU-2	Split-System AC	4.00		1
SGI 148 ACCU-3	Split-System AC	1.50		1
Computer Room 208 ACCU-4	Split-System AC	7.50		1
SGI 204 ACCU-5	Split-System AC	2.00		1
SGI 231 ACCU-6	Split-System AC	2.00		1
Special Education 326 ACCU-7	Split-System AC	2.00		1
SGI 303 ACCU-8	Split-System AC	3.00		1
MDF 149 ACCU-9	Split-System AC	1.42		1
IDF 231/305 ACCU-10	Split-System AC	1.42		1
Gym Office	Ductless Mini-Split AC	1.46		2
3rd Fl Class 312 to 315 RTU-1	Packaged AC	12.50	203.00	1
3rd Fl Class 317 to 320 RTU-2	Packaged AC	12.50	213.00	1
2nd Fl Class 216 to 219 RTU-3	Packaged AC	15.00	203.00	1
2nd Fl Class 209 to 212 RTU-4	Packaged AC	15.00	213.00	1
1st, 2nd & 3rd Fl Corr./Toilets RTU-5	Packaged AC	40.00	480.00	1
2nd & 3rd Fl Class 224,225,200,300/01/02 RTU-7	Packaged AC	15.00	284.00	1
2nd & 3rd Fl Class 202 & 327 RTU-8	Packaged AC	7.50	106.00	1
Gymnasium Offices RTU-9	Packaged AC	25.00	240.00	1
Gymnasium Storages RTU-10	Packaged AC	25.00	240.00	1

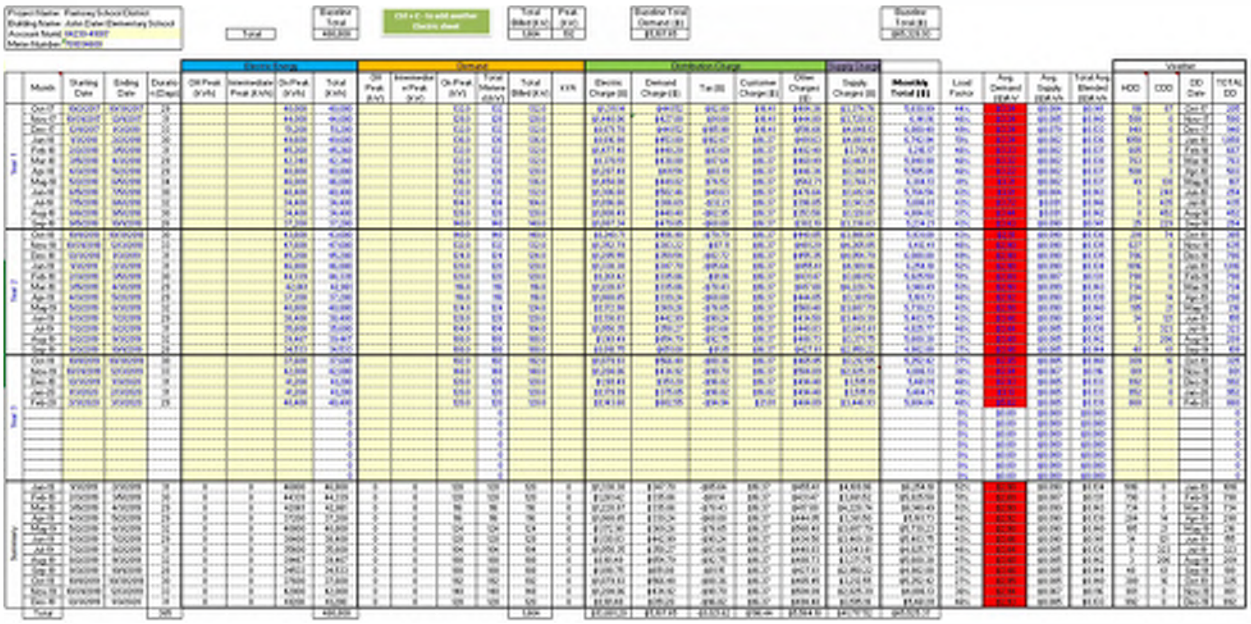
Mary Hubbard Elementary School				
Area Served	System Type	Cooling Capacity (Tons)	Heating Capacity (MBh)	Quantity
Offices	Window AC	1.00		1
Classroom	Ductless Mini-Split HP	1.25	16.20	2
Classroom SGI-3 ACC-1	Split-System AC	2.00		1
RTU-1	Packaged AC	3.00	87.00	1
Classroom	Window AC	0.67		1
Cafeteria	Split-System Air-Source HP	3.50	45.20	1
AHU-1&2	Electric Forced Air Furnace		54.60	1
Make Up Air Unit MA-1,2	Furnace		560.00	2

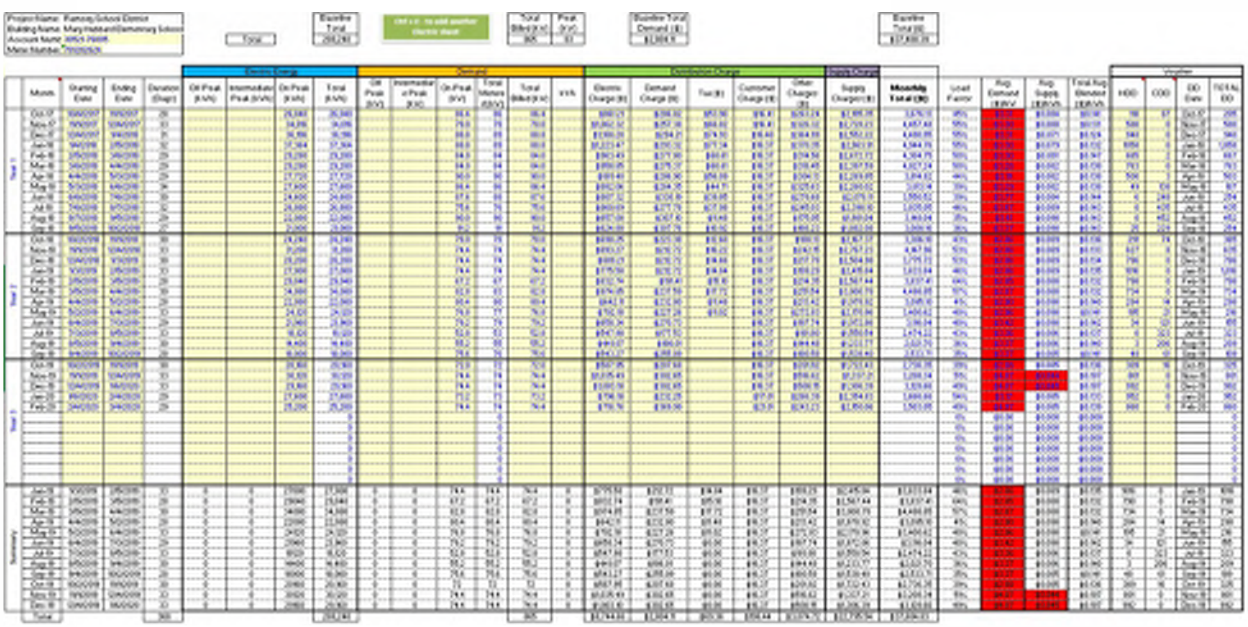
Wesley Tisdale Elementary School				
Area Served	System Type	Cooling Capacity (Tons)	Heating Capacity (MBh)	Quantity
Cafeteria	Split-System Air-Source HP	2.50	32.00	1
Cafeteria	Split-System Air-Source HP	2.50	32.00	3
Classroom	Window AC	0.42		1
Office	Packaged Terminal AC	1.21		1
Conference Room	Window AC	0.83		1
Main Office	Window AC	1.00		1
Break Room	Window AC	1.25		1
Gym	Packaged Air-Source HP	7.50	7.17	1
Gym	Packaged AC	4.00		1
Media Center	Split-System AC	2.50		3
Media Center Office	Split-System AC	1.00		1

APPENDIX 8. UTILITY BREAKDOWN BY SCHOOL









Project Name:	Ramsey School District
Building Name:	Wesley Tisdale Elementary School
Account Number:	[illegible]
Meter Number:	[illegible]

Total	Baseline Total	Ctrl + E - to add another Electric sheet	Total Billed (kW)	Peak (kW)	Baseline Total Demand ($)	Baseline Total ($)
[illegible]	[illegible]		[illegible]	[illegible]	[illegible]	[illegible]

	Month	Starting Date	Ending Date	Duration (Days)	Electric Usage: Off Peak (kWh)	Intermediate Peak (kWh)	On Peak (kWh)	Total (kWh)	Demand: Off Peak (kW)	Intermediate Peak (kW)	On Peak (kW)	Total Metered (kW)	Total Billed (kW)	kVA	Distribution Charge: Electric Charge ($)	Demand Charge ($)	Tax ($)	Customer Charge ($)	Other Charges ($)	Supply Charge: Supply Charges ($)	Monthly Total ($)	Load Factor	Avg. Demand ($/kW)	Avg. Supply ($/kWh)	Total Avg. Blended ($/kWh)	Weather: HDD	CDD	DD Date	TOTAL DD
Year 1	Oct-17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Nov-17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Dec-17	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jan-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Feb-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Mar-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Apr-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	May-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jun-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jul-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Aug-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Sep-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Year 2	Oct-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Nov-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Dec-18	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jan-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Feb-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Mar-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Apr-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	May-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jun-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jul-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Aug-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Sep-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Year 3	Oct-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Nov-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Dec-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jan-20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Feb-20	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
Summary	Jan-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Feb-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Mar-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Apr-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	May-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jun-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Jul-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Aug-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Sep-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Oct-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Nov-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Dec-19	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]
	Total			[illegible]				[illegible]					[illegible]		[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]	[illegible]								

Project Name:	Ramsey School District
Building Name:	Ramsey High School
Account Number:	4245518402
Meter Number:	2500990643080021 Gas Units: Therm

Total Gas (Therms)	Ctrl + N - to add another Natural Gas sheet	Baseline Total ($)
129,034		110,136

	Month	Starting Date	Ending Date	Duration (Days)	Gas Usage: Therm	Total Gas (Therms)	Charges ($): Customer Charge ($)	Distribution Charge ($)	Supply Charge ($)	Fees ($)	Demand ($)	Monthly Total ($)	Weather: HDD	CDD	DD Date	TOTAL DD	Avg. ($/Therm)
Year 1	Oct-17	9/19/2017	10/18/2017	29	476.60	476.60	$107.00	$22.08	$254.53	$21.28		$404.89	118	87	Oct-17	205	$0.85
	Nov-17	10/18/2017	11/16/2017	29	9,164.30	9,164.30	$107.00	$1,406.38	$4,894.23	$395.64	$1,272.27	$8,075.52	580	0	Nov-17	580	$0.88
	Dec-17	11/16/2017	12/19/2017	33	23,609.60	23,609.60	$107.00	$3,636.50	$12,600.81	$1,059.27	$2,800.39	$20,231.97	940	0	Dec-17	940	$0.86
	Jan-18	12/19/2017	1/20/2018	32	31,388.00	31,388.00	$106.85	$4,827.49	$16,600.64	$1,353.53	$4,177.27	########	1,058	0	Jan-18	1,058	$0.86
	Feb-18	1/20/2018	2/21/2018	32	23,079.30	23,079.30	$106.75	$3,559.03	$12,156.68	$993.68	$4,237.77	$21,053.91	865	2	Feb-18	867	$0.91
	Mar-18	2/21/2018	3/23/2018	30	22,151.10	22,151.10	$106.75	$8,609.36	$11,672.32			########	763	0	Mar-18	763	$0.92
	Apr-18	3/23/2018	4/20/2018	28	13,129.00	13,129.00	$106.75	$550.54	$6,918.21	$562.81		$8,138.31	500	3	Apr-18	503	$0.62
	May-18	4/20/2018	5/21/2018	31	1,683.80	1,683.80	$106.75	$73.40	$876.72	$71.59		$1,125.06	49	138	May-18	187	$0.60
	Jun-18	5/21/2018	6/20/2018	30	18.10	18.10	$106.75	$0.78	$9.54	$0.77		$117.84	6	248	Jun-18	254	$6.51
	Jul-18	6/20/2018	7/20/2018	30	0.00	0.00	$106.75		$0.00			$106.75	0	435	Jul-18	435	$0.00
	Aug-18	7/20/2018	8/20/2018	31	0.00	0.00	$213.50		$0.00			$213.50	0	452	Aug-18	452	$0.00
	Sep-18	8/20/2018	9/19/2018	30	0.00	0.00	$106.75		$0.00			$106.75	25	229	Sep-18	254	$0.00
Year 2	Oct-18	9/19/2018	10/18/2018	29	912.70	912.70	$106.75	$39.34	$480.94	$39.93		$666.96	291	74	Oct-18	365	$0.73
	Nov-18	10/18/2018	11/16/2018	29	9,540.00	9,540.00	$227.71	$1,141.33	$4,053.04	$441.02	$4,640.05	$10,511.95	627	0	Nov-18	635	$1.10
	Dec-18	11/16/2018	12/19/2018	33	24,406.10	24,406.10	$102.51	$2,723.06	$12,902.72	$1,106.01	$4,125.45	$21,020.55	706	0	Dec-18	706	$0.86
	Jan-19	12/19/2018	1/23/2019	35	29,070.10	29,070.10	$105.65	$3,562.24	$15,310.22	$1,340.69	$3,496.22	$23,061.02	1,016	0	Jan-19	1,016	$0.82
	Feb-19	1/23/2019	2/20/2019	29	24,206.30	24,206.30	$107.29	$3,055.55	$12,755.29	$1,123.03	$3,502.77	########	790	0	Feb-19	790	$0.85
	Mar-19	2/20/2019	3/21/2019	29	21,737.30	21,737.30	$107.29	$2,743.46	$11,454.27	$1,000.40	$3,502.77	$18,046.27	734	0	Mar-19	734	$0.87
	Apr-19	3/21/2019	4/23/2019	33	9,539.90	9,539.90	$107.29	$6,620.93	$6,589.13	$1,146.03		$14,493.30	284	14	Apr-19	298	$1.52
	May-19	4/23/2019	5/22/2019	29	234.60	234.60	$107.29	$144.46	$123.62	$442.59		$847.96	195	21	May-19	216	$3.61
	Jun-19	5/22/2019	6/20/2019	29	70.90	70.90	$107.29	$0.05	$37.36	$3.29		$170.79	34	121	Jun-19	155	$2.52
	Jul-19	6/20/2019	7/22/2019	32	25.00	25.00	$107.29	$0.30	$10.17	$1.11		$151.67	0	323	Jul-19	323	$6.07
	Aug-19	7/22/2019	8/20/2019	29	25.10	25.10	$107.29	$0.30	$13.23	$1.09		$151.91	3	206	Aug-19	209	$6.05
	Sep-19	8/20/2019	9/19/2019	30	54.50	54.50	$107.29	$0.05	$20.72	$2.45		$160.11	48	61	Sep-19	109	$3.10
Year 3	Oct-19	9/19/2019	10/21/2019	32	969.16	969.16	$130.96	$41.77	$510.69	$42.40	$0.00	$733.82	309	16	Oct-19	325	$0.76
	Nov-19	10/21/2019	11/19/2019	29	12,197.68	12,197.68	$139.84	$1,458.06	$5,944.31	$564.43	$5,171.43	$13,278.08	801	0	Nov-19	801	$1.09
	Dec-19	11/19/2019	12/20/2019	31	30,903.58	30,903.58	$142.30	$3,437.75	$16,204.35	$1,433.74	$5,206.67	########	992	0	Dec-19	992	$0.86
	Jan-20	12/20/2019	1/23/2020	34	320.2	320.20	$143.79	$30.43	$166.40	$15.56	$3,341.05	$3,697.22	952	0	Jan-20	952	$11.55
	Feb-20	1/23/2020	2/21/2020	29	297.366	297.37	$143.79	$27.07	$155.98	$18.92	$43.32	$391.07	860	0	Feb-20	860	$1.28
	Mar-20	2/21/2020	3/23/2020	31	211.654	211.65	$143.79	$18.25		$30.75	$43.32	$236.10	0	0	#####	0	$1.02
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
Summary	Jan-19	12/19/2018	1/23/2019	35	29070.1	29070	$105.65	$3,562.24	$15,310.22	$1,340.69	$3,496.22	$23,061.02	1016	0	Jan-19	1016	$0.82
	Feb-19	1/23/2019	2/20/2019	29	24206.3	24206	$107.29	$3,055.55	$12,755.29	$1,123.03	$3,502.77	$20,573.93	790	0	Feb-19	790	$0.85
	Mar-19	2/20/2019	3/21/2019	29	21737.3	21737	$107.29	$2,743.46	$11,454.27	$1,000.40	$3,502.77	$18,046.27	734	0	Mar-19	734	$0.87
	Apr-19	3/21/2019	4/23/2019	33	9539.9	9540	$107.29	$6,620.93	$6,589.13	$1,146.03	$0.00	$14,493.30	284	14	Apr-19	298	$1.52
	May-19	4/23/2019	5/22/2019	29	234.6	235	$107.29	$144.46	$123.62	$442.59	$0.00	$847.96	195	21	May-19	216	$3.61
	Jun-19	5/22/2019	6/20/2019	29	70.9	71	$107.29	$0.05	$37.36	$3.29	$0.00	$170.79	34	121	Jun-19	155	$2.52
	Jul-19	6/20/2019	7/22/2019	32	25	25	$107.29	$0.30	$10.17	$1.11	$0.00	$151.67	0	323	Jul-19	323	$6.07
	Aug-19	7/22/2019	8/20/2019	29	25.1	25	$107.29	$0.30	$13.23	$1.09	$0.00	$151.91	3	206	Aug-19	209	$6.05
	Sep-19	8/20/2019	9/19/2019	30	54.5	55	$107.29	$0.05	$20.72	$2.45	$0.00	$160.11	48	61	Sep-19	109	$3.10
	Oct-19	9/19/2019	10/21/2019	32	969.15567	969	$130.96	$41.77	$510.69	$42.40	$0.00	$733.82	309	16	Oct-19	325	$0.76
	Nov-19	10/21/2019	11/19/2019	29	12197.684	12198	$139.84	$1,458.06	$5,944.31	$564.43	$5,171.43	$13,278.08	801	0	Nov-19	801	$1.09
	Dec-19	11/19/2019	12/20/2019	31	30903.577	30904	$142.30	$3,437.75	$16,204.35	$1,433.74	$5,206.67	$26,564.09	992	0	Dec-19	992	$0.86
	Total			366	129034.1	129034.1	$1,555.15	$21,066.32	$89,072.36	$7,117.33	$20,979.87	$139,795.04	5,256	762			

Project Name:	Ramsey School District		
Building Name:	Eric Smith Middle School		
Account Number:	7.344E+09		
Meter Number:	2000963	Gas Units	Therm

Total Gas (Therms)
35,228

Ctrl + N - to add another Natural Gas sheet

Baseline Total($)
28,903

					Gas Usage		Charges ($)						Weather				
	Month	Starting Date	Ending Date	Duration (Days)	Therm	Total Gas (Therms)	Customer Charge ($)	Distribution Charge ($)	Supply Charge ($)	Fees ($)	Demand ($)	Monthly Total ($)	HDD	CDD	DD Date	TOTAL DD	Avg ($/Therm)
Year 1	Oct-17	9/19/2017	10/18/2017	29	351	351.10	$107.00	$16.26	$107.51	$15.50		$326.27	118	87	Oct-17	205	$0.93
	Nov-17	10/18/2017	11/16/2017	29	2,410	2,409.90	$107.00	$354.74	$1,297.02	$104.04	$334.56	$2,197.36	580	0	Nov-17	580	$0.91
	Dec-17	11/16/2017	12/19/2017	33	5704.9	5,704.90	$107.00	$860.50	$3,009.45	$240.74	$705.76	$5,020.53	940	0	Dec-17	940	$0.87
	Jan-18	12/19/2017	1/20/2018	32	11447.9	11,447.90	$106.95	$1,744.06	$6,057.54	$490.51	$1,523.53	$9,925.49	1,050	0	Jan-18	1,050	$0.87
	Feb-18	1/20/2018	2/21/2018	32	7181.0	7,181.00	$106.75	$1,093.67	$3,798.85	$309.77	$1,545.60	$6,845.44	665	2	Feb-18	667	$0.95
	Mar-18	2/21/2018	3/23/2018	30	5702.1	5,702.10	$106.75	$865.52	$3,004.67	$245.60	$1,545.60	$5,768.14	763	0	Mar-18	763	$1.01
	Apr-18	3/23/2018	4/20/2018	29	3803.5	3,803.50	$106.75	$161.02	$2,004.22	$163.05		$2,435.04	500	3	Apr-18	503	$0.64
	May-18	4/20/2018	5/22/2018	32	842.6	842.60	$106.75	$36.29	$444.00	$36.06		$623.10	49	108	May-18	157	$0.74
	Jun-18	5/22/2018	6/20/2018	29	204.2	204.20	$106.75	$8.73	$107.60	$8.74		$231.00	6	248	Jun-18	254	$1.14
	Jul-18	6/20/2018	7/20/2018	30	119.7	119.70	$106.75	$5.15	$63.07	$5.12		$180.09	0	435	Jul-18	435	$1.50
	Jul-18	6/20/2018	8/20/2018	61	110	110.00	$106.75	$4.67	$58.54	$4.64		$175.00	0	452	Jul-18	452	$1.56
	Sep-18	8/20/2018	9/19/2018	30	141.60	141.60	$106.75	$6.11	$74.61	$6.06		$193.53	25	229	Sep-18	254	$1.37
Year 2	Oct-18	9/19/2018	10/18/2018	29	519.3	519.30	$106.75	$22.38	$273.64	$22.72		$425.49	290	75	Oct-18	365	$0.82
	Nov-18	10/18/2018	11/16/2018	29	3126.7	3,126.70	$120.96	$373.93	$1,667.59	$142.20	$1,476.40	$3,761.08	827	8	Nov-18	835	$1.20
	Dec-18	11/16/2018	12/19/2018	33	6441.6	6,441.60	$132.50	$696.73	$3,394.34	$298.85	$1,504.64	$6,025.07	786	0	Dec-18	786	$0.94
	Jan-19	12/19/2018	1/23/2019	35	8122.3	8,122.30	$135.65	$873.38	$4,279.97	$376.82	$1,029.64	$6,795.42	1,096	0	Jan-19	1096	$0.84
	Feb-19	1/23/2019	2/20/2019	28	7047.2	7,047.20	$137.29	$872.59	$3,713.46	$326.95	$979.69	$6,028.58	798	0	Feb-19	798	$0.86
	Mar-19	2/20/2019	3/21/2019	29	5858.5	5,858.50	$137.29	$796.35	$3,088.00	$269.94	$979.69	$5,168.27	734	0	Mar-19	734	$0.88
	Apr-19	3/21/2019	4/23/2019	33	2725.5	2,725.50	$137.29	$38.72	$1,436.18	$126.44		$1,738.63	284	14	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	880.4	880.40	$137.29	$10.58	$463.92	$40.85		$652.64	195	21	May-19	216	$0.74
	Jun-19	5/22/2019	6/21/2019	30	212.7	212.70	$137.29	$2.56	$112.08	$9.87		$261.80	34	121	Jun-19	155	$1.23
	Jul-19	6/21/2019	7/22/2019	31	120.9	120.90	$137.29	$1.45	$63.71	$5.35		$207.80	0	323	Jul-19	323	$1.72
	Aug-19	7/22/2019	8/20/2019	29	118.6	118.60	$137.29	$1.42	$62.50	$5.16		$206.35	3	206	Aug-19	209	$1.74
	Sep-19	8/20/2019	9/19/2019	30	214.6	214.60	$137.29	$2.58	$112.98	$9.64		$262.49	48	61	Sep-19	109	$1.22
Year 3	Oct-19	9/19/2019	10/21/2019	32	441.732	441.73	$108.96	$30.95	$237.49	$21.30		$420.70	309	16	Oct-19	325	$0.97
	Nov-19	10/21/2019	11/19/2019	29	3316.173	3,316.17	$109.04	$345.11	$1,703.06	$161.10	$981.30	$3,410.57	801	0	Nov-19	801	$1.03
	Dec-19	11/19/2019	12/20/2019	31	6209.461	6,209.46	$142.30	$659.94	$3,330.80	$301.62	$983.93	$5,426.67	992	0	Dec-19	992	$0.87
	Jan-20	12/20/2019	1/23/2020	34	7204.677	7,204.68	$143.70	$767.01	$3,744.68	$350.19	$928.51	$5,934.17	952	0	Jan-20	952	$0.82
	Feb-20	1/23/2020	2/23/2020	31	5480.053	5,480.05	$143.70	$580.63	$2,001.52	$275.07	$871.15	$4,660.15	860	0	Feb-20	860	$0.85
	Mar-20	2/23/2020	3/23/2020	29	4029.084	4,029.08	$143.70	$409.22		$204.67	$871.15	$1,629.62	0	0	#####	0	$0.40
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
Summary	Jan-19	12/19/2018	1/23/2019	35	8122.3	8122	$135.65	$873.38	$4,279.97	$376.82	$1,029.64	$6,795.42	1096	0	Jan-19	1096	$0.84
	Feb-19	1/23/2019	2/20/2019	28	7047.2	7047	$137.29	$872.59	$3,713.46	$326.95	$979.69	$6,028.58	798	0	Feb-19	798	$0.86
	Mar-19	2/20/2019	3/21/2019	29	5858.5	5859	$137.29	$796.35	$3,088.00	$269.94	$979.69	$5,168.27	734	0	Mar-19	734	$0.88
	Apr-19	3/21/2019	4/23/2019	33	2725.5	2726	$137.29	$38.72	$1,436.18	$126.44	$0.00	$1,738.63	284	14	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	880.4	880	$137.29	$10.58	$463.92	$40.85	$0.00	$652.64	195	21	May-19	216	$0.74
	Jun-19	5/22/2019	6/21/2019	30	212.7	213	$137.29	$2.56	$112.08	$9.87	$0.00	$261.80	34	121	Jun-19	155	$1.23
	Jul-19	6/21/2019	7/22/2019	31	120.9	121	$137.29	$1.45	$63.71	$5.35	$0.00	$207.80	0	323	Jul-19	323	$1.72
	Aug-19	7/22/2019	8/20/2019	29	118.6	119	$137.29	$1.42	$62.50	$5.16	$0.00	$206.35	3	206	Aug-19	209	$1.74
	Sep-19	8/20/2019	9/19/2019	30	214.6	215	$137.29	$2.58	$112.98	$9.64	$0.00	$262.49	48	61	Sep-19	109	$1.22
	Oct-19	9/19/2019	10/21/2019	32	441.732	442	$108.96	$30.95	$237.49	$21.30	$0.00	$420.70	309	16	Oct-19	325	$0.97
	Nov-19	10/21/2019	11/19/2019	29	3316.173	3316	$109.04	$345.11	$1,703.06	$161.10	$981.30	$3,410.57	801	0	Nov-19	801	$1.03
	Dec-19	11/19/2019	12/20/2019	31	6209.461	6209	$142.30	$659.94	$3,330.80	$301.62	$983.93	$5,426.67	992	0	Dec-19	992	$0.87
	Total			366	35227.9	35227.9	$1,655.15	$3,655.10	$18,670.15	$1,655.30	$4,952.33	$30,500.20	5,294	702			

Project Name:	Ramsey School District		
Building Name:	John Dater Elementary School		
Account Number	7.344E+09		
Meter Number:	3275520	Gas Units	Therm

Total Gas (Therms)
28,389

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Baseline Total ($)
28,393

					Gas Usage		Charges ($)						Weather				
	Month	Starting Date	Ending Date	Duration (Days)	Therm	Total Gas (Therms)	Customer Charge ($)	Distribution Charge ($)	Supply Charge ($)	Fees ($)	Demand ($)	Monthly Total ($)	HDD	CDD	DD Date	TOTAL DD	Avg. ($/Therm)
Year 1	Oct-17	9/19/2017	10/18/2017	29	428	427.80	$107.00	$19.82	$228.47	$18.10		$374.39	188	87	Oct-17	205	$0.88
	Nov-17	10/18/2017	11/16/2017	29	2,239	2,238.10	$107.00	$325.39	$1,195.93	$96.67	$370.86	$2,035.72	580	0	Nov-17	580	$0.91
	Dec-17	11/16/2017	12/19/2017	33	5410.4	5,410.40	$107.00	$807.60	$2,888.45	$233.58	$683.07	$4,697.70	940	0	Dec-17	940	$0.87
	Jan-18	12/19/2017	1/20/2018	32	8040.8	8,040.80	$106.85	$1,217.09	$4,254.71	$346.63	$1,073.11	$6,995.39	1,050	0	Jan-18	1,050	$0.87
	Feb-18	1/20/2018	2/21/2018	32	5642.5	5,642.50	$106.75	$850.50	$2,873.26	$243.03	$1,085.61	$5,200.16	685	2	Feb-18	687	$0.92
	Mar-18	2/21/2018	3/23/2018	30	5073.3	5,073.30	$106.75	$765.34	$2,673.33	$218.52	$1,085.61	$4,849.55	763	0	Mar-18	763	$0.96
	Apr-18	3/23/2018	4/20/2018	28	3749.8	3,749.80	$106.75	$559.58	$1,875.92	$160.75		$2,403.00	500	3	Apr-18	503	$0.64
	May-18	4/20/2018	5/21/2018	31	1075.1	1,075.10	$106.75	$46.20	$566.51	$46.00		$765.46	49	138	May-18	187	$0.71
	Jun-18	5/21/2018	6/20/2018	30	174.2	174.20	$106.75	$7.50	$91.79	$7.45		$213.49	6	248	Jun-18	254	$1.23
	Jul-18	6/20/2018	7/20/2018	30	66	66.00	$106.75	$2.84	$34.78	$2.82		$147.19	0	435	Jul-18	435	$2.23
	Jul-18	6/20/2018	8/20/2018	61	97.8	97.80	$106.75	$4.21	$51.53	$4.19		$166.68	0	452	Jul-18	452	$1.70
	Sep-18	8/20/2018	9/19/2018	30	129.00	129.00	$106.75	$5.56	$67.98	$5.52		$185.81	25	229	Sep-18	254	$1.44
Year 2	Oct-18	9/19/2018	10/18/2018	29	615	615.00	$106.75	$26.51	$324.07	$26.30		$484.24	291	74	Oct-18	365	$0.79
	Nov-18	10/18/2018	11/16/2018	29	3754.9	3,754.90	$120.96	$455.67	$1,979.61	$170.77	$1,037.01	$3,762.02	627	0	Nov-18	635	$1.00
	Dec-18	11/16/2018	12/19/2018	33	5840.7	5,840.70	$132.51	$601.23	$3,077.70	$270.37	$1,056.64	$5,169.25	796	0	Dec-18	796	$0.89
	Jan-19	12/19/2018	1/23/2019	35	6742.2	6,742.20	$135.05	$807.60	$3,552.74	$312.00	$810.00	$5,619.75	1,016	0	Jan-19	1,016	$0.83
	Feb-19	1/23/2019	2/20/2019	28	5289.5	5,289.50	$137.29	$651.02	$2,787.25	$245.40	$812.39	$4,635.35	796	0	Feb-19	796	$0.88
	Mar-19	2/20/2019	3/21/2019	29	5069.1	5,069.10	$137.29	$624.72	$2,671.12	$235.10	$812.39	$4,480.70	734	0	Mar-19	734	$0.88
	Apr-19	3/21/2019	4/23/2019	33	2539.9	2,539.90	$137.29	$35.04	$1,330.30	$117.04		$1,629.35	284	14	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	1002.2	1,002.20	$137.29	$12.04	$529.10	$46.50		$723.93	195	21	May-19	216	$0.72
	Jun-19	5/22/2019	6/21/2019	30	130.6	130.00	$137.29	$1.57	$73.16	$6.44		$218.54	34	121	Jun-19	155	$1.57
	Jul-19	6/21/2019	7/22/2019	31	85.3	85.30	$137.29	$1.02	$44.95	$3.77		$187.03	0	323	Jul-19	323	$2.19
	Aug-19	7/22/2019	8/20/2019	29	78.8	78.80	$137.29	$0.95	$41.52	$3.42		$183.18	3	206	Aug-19	209	$2.32
	Sep-19	8/20/2019	9/19/2019	30	123.6	123.60	$137.29	$1.49	$65.10	$5.56		$209.47	40	61	Sep-19	109	$1.69
Year 3	Oct-19	9/19/2019	10/21/2019	32	223.5988	223.60	$138.96	$13.46	$120.20	$10.79		$283.41	309	16	Oct-19	325	$1.27
	Nov-19	10/21/2019	11/19/2019	29	2398.592	2,398.59	$139.84	$249.96	$1,288.05	$116.44	$804.63	$2,600.92	801	0	Nov-19	800	$1.09
	Dec-19	11/19/2019	12/20/2019	31	4696.964	4,696.96	$142.38	$500.91	$2,525.52	$220.29	$816.75	$4,213.85	992	0	Dec-19	992	$0.90
	Jan-20	12/20/2019	1/23/2020	34	5757.25	5,757.25	$143.78	$615.74	$2,882.28	$279.83	$767.88	$4,790.50	952	0	Jan-20	952	$0.83
	Feb-20	1/23/2020	2/21/2020	29	4690.055	4,690.02	$143.78	$469.93	$2,397.82	$235.42	$720.97	$3,987.92	800	0	Feb-20	800	$0.85
	Mar-20	2/21/2020	3/23/2020	31	3368.715	3,368.72	$143.78	$345.41		$171.16	$680.81	$1,341.16	0	0	#####	0	$0.40
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
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						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
Summary	Jan-19	12/19/2018	1/23/2019	35	6742.2	6742	$135.05	$807.60	$3,552.74	$312.00	$810.00	$5,619.75	1016	0	Jan-19	1016	$0.83
	Feb-19	1/23/2019	2/20/2019	28	5289.5	5290	$137.29	$651.02	$2,787.25	$245.40	$812.39	$4,635.35	796	0	Feb-19	796	$0.88
	Mar-19	2/20/2019	3/21/2019	29	5069.1	5069	$137.29	$624.72	$2,671.12	$235.10	$812.39	$4,480.70	734	0	Mar-19	734	$0.88
	Apr-19	3/21/2019	4/23/2019	33	2539.9	2540	$137.29	$35.04	$1,330.30	$117.04	$0.00	$1,629.35	284	14	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	1002.2	1002	$137.29	$12.04	$529.10	$46.50	$0.00	$723.93	195	21	May-19	216	$0.72
	Jun-19	5/22/2019	6/21/2019	30	130.6	109	$137.29	$1.57	$73.16	$6.44	$0.00	$218.54	34	121	Jun-19	155	$1.57
	Jul-19	6/21/2019	7/22/2019	31	85.3	85	$137.29	$1.02	$44.95	$3.77	$0.00	$187.03	0	323	Jul-19	323	$2.19
	Aug-19	7/22/2019	8/20/2019	29	78.8	79	$137.29	$0.95	$41.52	$3.42	$0.00	$183.18	3	206	Aug-19	209	$2.32
	Sep-19	8/20/2019	9/19/2019	30	123.6	124	$137.29	$1.49	$65.10	$5.56	$0.00	$209.47	40	61	Sep-19	109	$1.69
	Oct-19	9/19/2019	10/21/2019	32	223.5988	224	$138.96	$13.46	$120.20	$10.79	$0.00	$283.41	309	16	Oct-19	325	$1.27
	Nov-19	10/21/2019	11/19/2019	29	2398.592	2399	$139.84	$249.96	$1,288.05	$116.44	$814.63	$2,600.92	801	0	Nov-19	801	$1.09
	Dec-19	11/19/2019	12/20/2019	31	4696.964	4697	$142.38	$500.91	$2,525.52	$220.29	$816.75	$4,213.85	992	0	Dec-19	992	$0.90
	Total			366	28388.5	28388.5	$1,655.15	$2,982.76	$15,008.93	$1,332.43	$4,067.04	$28,393.48	5,214	782			

Project Name:	Ramsey School District
Building Name:	Mary Hubbard Elementary School
Account Number:	7.344E+09
Meter Number:	2279868
Gas Units	Therm

Total Gas (Therms)
39,806

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Baseline Total ($)
33,277

					Gas Usage		Charges ($)						Weather				
	Month	Starting Date	Ending Date	Duration (Days)	Therm	Total Gas (Therms)	Customer Charge ($)	Distribution Charge ($)	Supply Charge ($)	Fees ($)	Demand ($)	Monthly Total ($)	HDD	CDD	DD Date	TOTAL DD	Avg ($/Therm)
Year 1	Oct-17	9/19/2017	10/18/2017	29	263.76	263.76	$107.00	$12.72	$146.70	$12.26		$278.68	198	97	Oct-17	295	$1.06
	Nov-17	10/18/2017	11/16/2017	29	2,193.05	2,193.05	$107.00	$339.92	$1,219.94	$98.62	$297.10	$2,002.51	500	0	Nov-17	500	$0.95
	Dec-17	11/16/2017	12/19/2017	33	5,280.65	5,280.65	$107.00	$830.38	$2,940.80	$237.74	$671.03	$4,798.36	940	0	Dec-17	940	$0.91
	Jan-18	12/19/2017	1/20/2018	32	8,867.85	8,867.85	$106.85	$1,408.81	$4,885.81	$398.06	$1,229.64	$8,028.17	1,050	0	Jan-18	1,050	$0.91
	Feb-18	1/20/2018	2/21/2018	32	7,398.64	7,398.64	$106.75	$1,177.22	$4,050.39	$338.88	$1,246.64	$6,921.95	665	2	Feb-18	667	$0.94
	Mar-18	2/21/2018	3/23/2018	30	4,872.37	4,872.37	$106.75	$604.31	$3,584.04	$218.52	$1,246.64	$5,760.26	763	0	Mar-18	763	$1.18
	Apr-18	3/23/2018	4/20/2018	28	4,863.25	4,863.25	$106.75	$214.35	$2,660.32	$217.07		$3,206.49	500	3	Apr-18	503	$0.66
	May-18	4/20/2018	5/22/2018	32	1,434.94	1,434.94	$106.75	$63.42	$787.30	$63.93		$1,021.40	49	138	May-18	187	$0.71
	Jun-18	5/22/2018	6/20/2018	29	155.21	155.21	$106.75	$6.96	$85.21	$6.91		$205.83	6	248	Jun-18	254	$1.33
	Jul-18	6/20/2018	7/20/2018	30	138.94	138.94	$106.75	$6.23	$76.20	$6.19		$195.37	0	435	Jul-18	435	$1.41
	Aug-18	7/20/2018	8/20/2018	31	121.06	121.06	$106.75	$5.43	$66.39	$5.39		$183.96	0	452	Aug-18	452	$1.52
	Sep-18	8/20/2018	9/19/2018	30	129.79	129.79	$106.75	$5.82	$71.18	$5.78		$189.54	25	229	Sep-18	254	$1.46
Year 2	Oct-18	9/19/2018	10/18/2018	29	363.54	363.54	$106.75	$16.31	$199.50	$16.56		$339.12	291	74	Oct-18	365	$0.93
	Nov-18	10/18/2018	11/16/2018	29	4,393.87	4,393.87	$120.96	$555.40	$2,410.81	$200.07	$1,180.83	$4,486.07	627	8	Nov-18	635	$1.02
	Dec-18	11/16/2018	12/19/2018	33	7,497.14	7,497.14	$132.51	$947.23	$4,113.40	$362.17	$1,253.63	$6,808.90	706	0	Dec-18	706	$0.89
	Jan-19	12/19/2018	1/23/2019	35	8,809.35	8,809.35	$135.65	$1,087.31	$4,767.55	$419.76	$1,088.15	$7,498.42	1096	0	Jan-19	1,096	$0.86
	Feb-19	1/23/2019	2/20/2019	28	7,067.03	7,067.03	$137.29	$911.83	$3,877.44	$341.39	$1,090.59	$6,358.14	798	0	Feb-19	798	$0.90
	Mar-19	2/20/2019	3/21/2019	29	6,895.66	6,895.66	$137.29	$879.22	$3,739.54	$329.25	$1,090.59	$6,174.69	734	0	Mar-19	734	$0.91
	Apr-19	3/21/2019	4/23/2019	33	4,306.68	4,306.68	$137.29	$66.01	$2,362.96	$208.04		$2,774.30	284	16	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	836.52	836.52	$137.29	$10.66	$458.75	$40.39		$646.89	195	21	May-19	216	$0.77
	Jun-19	5/22/2019	6/21/2019	30	149.82	149.82	$137.29	$1.87	$82.20	$7.24		$228.60	34	121	Jun-19	155	$1.53
	Jul-19	6/21/2019	7/23/2019	32	126.52	126.52	$137.29	$1.58	$69.45	$5.04		$214.16	0	323	Jul-19	323	$1.69
	Aug-19	7/23/2019	8/20/2019	28	110.73	110.73	$137.29	$1.39	$60.76	$5.00		$204.44	3	206	Aug-19	209	$1.85
	Sep-19	8/20/2019	9/19/2019	30	133.84	133.84	$137.29	$1.67	$73.46	$6.26		$218.68	48	61	Sep-19	109	$1.63
Year 3	Oct-19	9/19/2019	10/21/2019	32	368.11	368.11	$138.96	$26.10	$197.92	$17.81		$380.79	309	16	Oct-19	325	$1.03
	Nov-19	10/21/2019	11/19/2019	29	4,457.01	4,457.01	$139.64	$472.46	$2,396.90	$216.67	$1,093.10	$4,318.05	881	0	Nov-19	881	$0.97
	Dec-19	11/19/2019	12/20/2019	31	6,744.54	6,744.54	$142.30	$721.14	$3,626.51	$327.02	$1,096.02	$5,913.07	992	0	Dec-19	992	$0.88
	Jan-20	12/20/2019	1/23/2020	34	7,437.53	7,437.53	$143.70	$795.54	$3,985.55	$361.50	$1,040.29	$6,206.65	952	0	Jan-20	952	$0.83
	Feb-20	1/23/2020	2/24/2020	32	6,417.92	6,417.92	$143.70	$669.33	$3,280.50	$322.40	$1,009.35	$5,425.36	860	0	Feb-20	860	$0.85
	Mar-20	2/24/2020	3/24/2020	29	4,500.98	4,500.98	$143.70	$462.94		$220.75	$946.21	$1,790.66	0	0	#####	0	$0.40
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
Summary	Jan-19	12/19/2018	1/23/2019	35	8809.3476	8809	$135.65	$1,087.31	$4,767.55	$419.76	$1,088.15	$7,498.42	1096	0	Jan-19	1096	$0.86
	Feb-19	1/23/2019	2/20/2019	28	7067.0279	7067	$137.29	$911.83	$3,877.44	$341.39	$1,090.59	$6,358.14	798	0	Feb-19	798	$0.90
	Mar-19	2/20/2019	3/21/2019	29	6895.6609	6896	$137.29	$879.22	$3,739.54	$329.25	$1,090.59	$6,174.69	734	0	Mar-19	734	$0.91
	Apr-19	3/21/2019	4/23/2019	33	4306.6796	4307	$137.29	$66.01	$2,362.96	$208.04	$0.00	$2,774.30	284	16	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	836.5253	836	$137.29	$10.66	$458.75	$40.39	$0.00	$646.89	195	21	May-19	216	$0.77
	Jun-19	5/22/2019	6/21/2019	30	149.8175	150	$137.29	$1.87	$82.20	$7.24	$0.00	$228.60	34	121	Jun-19	155	$1.53
	Jul-19	6/21/2019	7/23/2019	32	126.5229	127	$137.29	$1.58	$69.45	$5.94	$0.00	$214.16	0	323	Jul-19	323	$1.69
	Aug-19	7/23/2019	8/20/2019	28	110.7318	111	$137.29	$1.39	$60.76	$5.00	$0.00	$204.44	3	206	Aug-19	209	$1.85
	Sep-19	8/20/2019	9/19/2019	30	133.84252	134	$137.29	$1.67	$73.46	$6.26	$0.00	$218.68	48	61	Sep-19	109	$1.63
	Oct-19	9/19/2019	10/21/2019	32	368.11	368	$138.96	$26.10	$197.92	$17.81	$0.00	$380.79	309	16	Oct-19	325	$1.03
	Nov-19	10/21/2019	11/19/2019	29	4457.007	4458	$139.64	$472.46	$2,396.90	$216.67	$1,093.10	$4,318.05	881	0	Nov-19	881	$0.97
	Dec-19	11/19/2019	12/20/2019	31	6744.538	6745	$142.30	$721.14	$3,626.51	$327.02	$1,096.02	$5,913.07	992	0	Dec-19	992	$0.88
	Total			367	39806.2	39806.2	$1,655.15	$4,180.04	$21,710.44	$1,925.47	$5,457.73	$34,931.03	5,214	752			[illegible]

Project Name:	Ramsey School District		
Building Name:	Wesley Tisdale Elementary School		
Account Number:	7043910009		
Meter Number:	3042244	Gas Units	Therm

Total Gas (Therms)
35,834

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Baseline Total($)
26,962

					Gas Usage		Charges ($)						Weather				
	Month	Starting Date	Ending Date	Duration (Days)	Therm	Total Gas (Therms)	Customer Charge ($)	Distribution Charge ($)	Supply Charge ($)	Fees ($)	Demand ($)	Monthly Total($)	HDD	CDD	DD Date	TOTAL DD	Avg. ($/Therm)
Year 1	Oct-17	9/09/2017	10/09/2017	29	218	218.00	$107.00	$30.10	$106.42	$9.73		$243.25	118	87	Oct-17	205	$1.12
	Nov-17	10/10/2017	11/08/2017	29	2,650	2,650.10	$107.00	$297.39	$1,415.30	$118.41	$367.90	$2,402.01	580	0	Nov-17	580	$0.91
	Dec-17	11/09/2017	12/09/2017	33	5885.3	5,885.30	$107.00	$690.64	$3,143.07	$254.08	$718.05	$5,112.93	940	0	Dec-17	940	$0.87
	Jan-18	12/11/2017	1/10/2018	32	11969.1	11,969.10	$106.85	$1,707.75	$5,910.02	$481.50	$1,406.45	$9,692.57	1,058	0	Jan-18	1,058	$0.87
	Feb-18	1/20/2018	2/20/2018	32	9294.2	9,294.20	$106.75	$1,423.92	$4,897.45	$400.32	$1,507.98	$8,336.46	665	2	Feb-18	667	$0.90
	Mar-18	2/21/2018	3/22/2018	30	8587.7	8,587.70	$106.75	$1,235.99	$4,525.21	$369.89	$1,507.98	$7,925.82	763	0	Mar-18	763	$0.96
	Apr-18	3/23/2018	4/20/2018	28	5568.8	5,568.80	$106.75	$235.41	$2,934.43	$238.72		$3,505.31	500	3	Apr-18	503	$0.63
	May-18	4/20/2018	5/21/2018	31	1081	1,081.00	$106.75	$44.46	$569.62	$46.25		$769.06	69	128	May-18	197	$0.71
	Jun-18	5/21/2018	6/20/2018	30	114.7	114.70	$106.75	$4.94	$60.44	$4.91		$177.04	6	248	Jun-18	254	$1.54
	Jul-18	6/21/2018	7/20/2018	29	88.1	88.10	$106.75	$3.79	$46.42	$3.77		$160.73	0	435	Jul-18	435	$1.82
	Aug-18	7/20/2018	8/20/2018	32	89.1	89.10	$106.75	$3.84	$46.95	$3.81		$161.35	0	452	Aug-18	452	$1.81
	Sep-18	8/21/2018	9/18/2018	29	91.60	91.60	$106.75	$3.94	$48.27	$3.92		$162.88	25	229	Sep-18	254	$1.78
Year 2	Oct-18	9/19/2018	10/18/2018	29	425.5	425.50	$106.75	$10.34	$224.21	$10.62		$367.92	291	74	Oct-18	365	$0.86
	Nov-18	10/19/2018	11/16/2018	29	3014.4	3,014.40	$120.96	$465.05	$2,009.96	$173.47	$1,440.46	$4,209.90	627	0	Nov-18	635	$1.40
	Dec-18	11/16/2018	12/20/2018	34	9525.5	9,525.50	$102.51	$1,044.29	$5,018.07	$441.90	$1,460.01	$8,106.11	706	0	Dec-18	706	$0.85
	Jan-19	12/20/2018	1/23/2019	34	7175	7,175.00	$105.74	$865.67	$3,700.00	$332.00	$1,170.66	$6,205.95	1,016	0	Jan-19	1,016	$0.86
	Feb-19	1/23/2019	2/20/2019	28	6021.1	6,021.10	$107.29	$747.64	$3,172.76	$279.35	$1,172.73	$5,509.77	790	0	Feb-19	790	$0.92
	Mar-19	2/20/2019	3/21/2019	29	5470.6	5,470.60	$107.29	$677.71	$2,882.60	$253.01	$969.64	$4,921.10	734	0	Mar-19	734	$0.90
	Apr-19	3/21/2019	4/22/2019	30	2677.2	2,677.20	$107.29	$37.97	$1,410.73	$124.21		$1,710.20	284	14	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	759.9	759.90	$107.29	$9.10	$400.42	$35.26		$582.10	195	21	May-19	216	$0.77
	Jun-19	5/22/2019	6/21/2019	30	115.6	115.60	$107.29	$1.39	$60.91	$5.36		$204.95	34	121	Jun-19	155	$1.77
	Jul-19	6/21/2019	7/22/2019	31	90.3	90.30	$107.29	$1.09	$47.50	$4.00		$169.96	0	323	Jul-19	323	$2.10
	Aug-19	7/22/2019	8/21/2019	30	90.3	90.30	$107.29	$1.00	$47.50	$3.92		$169.67	3	206	Aug-19	209	$2.10
	Sep-19	8/21/2019	9/19/2019	29	95.6	95.60	$107.29	$1.15	$50.40	$4.32		$190.24	48	61	Sep-19	109	$2.02
Year 3	Oct-19	9/19/2019	10/21/2019	32	580.44	580.44	$138.96	$52.53	$312.11	$28.15		$531.75	309	16	Oct-19	325	$0.92
	Nov-19	10/21/2019	11/19/2019	29	3043.29	3,043.29	$139.64	$321.41	$1,636.36	$147.92	$972.31	$3,217.64	801	0	Nov-19	801	$1.06
	Dec-19	11/19/2019	12/20/2019	31	5714.968	5,714.97	$142.30	$612.58	$3,072.30	$277.77	$974.84	$5,080.48	992	0	Dec-19	992	$0.89
	Jan-20	12/20/2019	1/23/2020	34	6144.516	6,144.52	$143.78	$658.77	$3,593.52	$298.65	$976.23	$5,273.95	952	0	Jan-20	952	$0.86
	Feb-20	1/23/2020	2/21/2020	29	5255.7	5,255.70	$143.78	$550.77	$2,606.40	$263.77	$885.77	$4,446.50	880	0	Feb-20	880	$0.85
	Mar-20	2/21/2020	3/23/2020	31	3676.457	3,676.42	$143.78	$1,180.43		$186.80		$1,511.01	0	0	#####	0	$0.41
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
						0.00							0	0		0	$0.00
Summary	Jan-19	12/20/2018	1/23/2019	34	7175	7175	$105.74	$865.67	$3,700.00	$332.00	$1,170.66	$6,205.95	1016	0	Jan-19	1016	$0.86
	Feb-19	1/23/2019	2/20/2019	28	6021.1	6021	$107.29	$747.64	$3,172.76	$279.35	$1,172.73	$5,509.77	790	0	Feb-19	790	$0.92
	Mar-19	2/20/2019	3/21/2019	29	5470.6	5471	$107.29	$677.71	$2,882.60	$253.01	$969.64	$4,921.10	734	0	Mar-19	734	$0.90
	Apr-19	3/21/2019	4/22/2019	30	2677.2	2677	$107.29	$37.97	$1,410.73	$124.21	$0.00	$1,710.20	284	14	Apr-19	298	$0.64
	May-19	4/23/2019	5/22/2019	29	759.9	760	$107.29	$9.10	$400.42	$35.26	$0.00	$582.10	195	21	May-19	216	$0.77
	Jun-19	5/22/2019	6/21/2019	30	115.6	116	$107.29	$1.39	$60.91	$5.36	$0.00	$204.95	34	121	Jun-19	155	$1.77
	Jul-19	6/21/2019	7/22/2019	31	90.3	90	$107.29	$1.09	$47.50	$4.00	$0.00	$169.96	0	323	Jul-19	323	$2.10
	Aug-19	7/22/2019	8/21/2019	30	90.3	90	$107.29	$1.00	$47.50	$3.92	$0.00	$169.67	3	206	Aug-19	209	$2.10
	Sep-19	8/21/2019	9/19/2019	29	95.6	96	$107.29	$1.15	$50.40	$4.32	$0.00	$190.24	48	61	Sep-19	109	$2.02
	Oct-19	9/19/2019	10/21/2019	32	580.44	580	$138.96	$52.53	$312.11	$28.15	$0.00	$531.75	309	16	Oct-19	325	$0.92
	Nov-19	10/21/2019	11/19/2019	29	3043.29	3043	$139.64	$321.41	$1,636.36	$147.92	$972.31	$3,217.64	801	0	Nov-19	801	$1.06
	Dec-19	11/19/2019	12/20/2019	31	5714.968	5715	$142.30	$612.58	$3,072.30	$277.77	$974.84	$5,080.48	992	0	Dec-19	992	$0.89
	Total			365	35834.5	35834.5	$1,656.24	$3,329.55	$16,875.32	$1,686.95	$5,260.18	$28,617.24	5,256	762			