Honeywell

Honeywell Building Solutions

Verona School District
Energy Savings Plan

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ENERGY & ENVIRONMENTAL SOLUTIONS

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HONEYWELL PROPRIETARY

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TABLE OF CONTENTS

SECTION A EXECUTIVE SUMMARY

Honeywell is pleased to have the opportunity to submit this Energy Savings Plan for the Verona School District. During the development of the Energy Savings Plan, Honeywell has completed a thorough investment grade energy audit of the Verona School District's buildings and grounds. Based on the audit findings and Honeywell's extensive experience in working with school districts, we are able to confidently state that we can deliver a financially viable, comprehensive solution to address the District's facility concerns. Our Energy Savings Plan includes projects that achieve energy and operational efficiencies, create a more comfortable and reliable learning environment and are actionable via the New Jersey Energy Savings Improvement Program (NJ ESIP) in accordance with NJ PL2012, c.55.

The Energy Savings Plan is the core of the NJ ESIP process. It describes the energy conservation measures that are planned and the cost calculations that support how the plan will pay for itself through the resulting energy savings. Under the law, the Energy Savings Plan must address the following elements:

- The results of the energy audit;
- A description of the energy conservation measures (ECMs) that will comprise the program;
- An estimate of greenhouse gas reductions resulting from those energy savings;
- Identification of all design and compliance issues and identification of who will provide these services;
- An assessment of risks involved in the successful implementation of the plan;
- Identify the eligibility for, and costs and revenues associated with, the PJM Independent System Operator for demand response and curtail-able service activities;
- Schedules showing calculations of all costs of implementing the proposed energy conservation measures and the projected energy savings;
- Maintenance requirements necessary to ensure continued energy savings, and describe how they will be provided; and
- If developed by an ESCO, a description of, and cost estimates of a proposed energy savings guarantee.

The purpose of this document is to provide all the information required for the Verona School District to determine the best path forward in the implementation of a District-Wide NJ ESIP Project. It is important to note that the Energy Savings Plan provides a comprehensive evaluation of ALL potential ECMs within the Verona School District. This is not meant to infer that all of the ECMs identified must be or, based upon legislative requirements, can be implemented at this time. However, as long as the ECM is part of this plan, it may be implemented at a later date as additional funding becomes available or technology changes in order to provide an improved financial return.

The next step in the NJ ESIP process is for the School District to review the information presented in this Energy Savings Plan, and in consideration with District priorities, select the ECMs which merit further development. The selections may include any combination of ECMs as long as the resulting overall project is self-funding in accordance with NJ PL2012, c.55. A project development agreement shall then executed by the School District, which authorizes Honeywell to proceed with development of project design documents and solicitation of bids for the selected ECMs in accordance with New Jersey Public Contracts Law.

Our Energy Savings Plan is structured to clearly demonstrate compliance with the NJ ESIP law, while also presenting the information in an organized manner which allows for informed decisions to be made. The information is divided into the following sections:

A. Executive Summary (This Section)

B. Preliminary Utility Analysis – The Preliminary Utility Analysis (PUA) defines the utility baseline for the school buildings included in the Energy Savings Plan. It provides an overview of the current usage within the District and also a cost per square foot by school of utility expenses. The report also compares the District's utility consumption to that of other similar school districts in the same region on a per square foot basis.

C. Energy Conservation Measures – This section includes a detailed description of the ECMs we have selected and identified for your District. It is specific to your Schools in scope, savings methodology and environmental impact. It is intended to provide a Basis of Design for each measure in narrative form. It is not intended to be a detailed specification for construction. ALL potential ECMs for the District are identified for the purposes of potential inclusion in the program. Final selected ECMs are to be determined by the School District in conjunction with Honeywell during the project development phase of the NJ ESIP process.

D. Technical and Financial Summary – This section includes an accounting of all technical and financial outcomes associated with the ECMs as presented on the New Jersey Board of Public Utilities Forms II through IV. Information detailed on the forms includes projected implementation hard costs, projected energy savings, projected operational savings and projected environmental impact. Form IV: Annual Cash Flow Analysis provides a “rolled-up” view of the overall project financials, inclusive of financing costs, on an annual basis as well as over the entire 15 or 20 year term of the agreement.

The following sample self funding projects have been provided for the District’s review and consideration:

	Recommended ESIP Project
Value of Project	**$3,178,471**
Term of Repayment	**15 Year**
Projected Savings Over Term	**$3,613,421**
Projected NJ Rebates & Incentives	**$459,129**
Projected Interest Rate	**3.00%**

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
1A	Lighting Upgrades	✓	✓	✓	✓	✓	✓
1B	Lighting Controls and Daylight Harvesting	✓	✓	✓	✓	✓	✓
1C	Vending Misers			✓		✓	✓
1D	Plug Load Management Via WIFI	✓	✓	✓	✓	✓	✓
1E	De-Stratification Fans	✓	✓	✓	✓	✓	✓
2A	Boiler Replacements	✓					
2B	Boiler Burner Controls		✓	✓	✓	✓	
2C	Premium Efficiency Motors and VFDs	✓				✓	
2D	Domestic Hot Water Replacements		✓				
2E	Heat Pump Replacement			✓			
2F	Window AC Unit Replacements	✓			✓		
2G	Walk-In Compressor Controllers					✓	✓
2H	Kitchen Hood Controllers					✓	✓
2I	Steam Trap Replacement			✓		✓	
3A	Building Management System Upgrades / Pneumatic to DDC	✓	✓	✓	✓	✓	
3B	Demand Control Ventilation	✓	✓	✓	✓	✓	✓
4A	Building Envelope Improvements	✓	✓	✓	✓	✓	✓
4B	Spray Foam Insulated Roof				✓		
5A	Cogeneration / Energy Security						✓
6A	Computer Power Management	✓	✓	✓	✓	✓	✓
7A	Renewable Energy – Solar Photovoltaic PPA						
8A	Water Conservation	✓	✓	✓	✓	✓	✓
9A	Demand Response	✓	✓	✓	✓	✓	✓

E. Measurement & Verification and Maintenance Plan – This section identified the intended methods of verification and measurement for calculating energy savings. These methods are compliant with the International Measurement and

Verification Protocols (IMVP), as well as other protocols previously approved by the Board of Public Utilities (BPU) in New Jersey. This section also includes the recommended maintenance requirements for each type of equipment that may be included in this program. Consistent maintenance is essential to achieving the energy savings projected in this plan.

F. Design Approach – This section includes a summary of Honeywell's best practices for the successful implementation of a NJ ESIP project. It includes a project specific Safety Management Plan and provides an overview of our project management procedure, construction management and a sample schedule for the overall completion of the project. Within the schedule, we clearly define the tasks directed towards compliance with architectural, engineering and bidding procedures in accordance with New Jersey Public Contracts Law.

G. Independent Energy Audit – This section includes, for reference, the independent energy audits as previously received by the District through the Local Government Energy Audit (LGEA) program. The audits, provided by Concord Engineering Group, have been included on a compact disk marked as Appendix 1. A comparison can be made of the ECMs outlined in this investment grade energy audit to the additional ECMs described in the overall Energy Savings Plan.

H. Energy Calculations and Greenhouse Gas Reduction Summary – This section titled Appendix 2: ECM Calculations includes all the energy calculations required to ensure compliance with the law and to confirm the energy savings can, and will, be achieved. These calculations are subject to an independent 3rd party engineering firm review for verification.

A summary of all savings based on the Recommended ESIP Project includes a reduction in 937,156 kWh (kilowatt hours of electricity), 65703 Therms (natural gas) and 1,866,298 Pounds of Greenhouse Gas (GHG) emissions. It is the equivalent of removing 163 cars from the road for an entire year and is the same as planting 98.2 acres of forest.

I. Equipment Cut-sheets – This section titled Appendix 3: Equipment Cut-sheets includes specification data for the equipment which shall be utilized as the Basis of Design for plans and specifications during the subsequent project development and NJ public bid phase.

J. Safety Management Plan – This section titled Appendix 4: Safety Management Plan establishes a plan for the implementation of Honeywell's Safe Operations Management (SOM) program. The document includes procedures and requirements specific to the Verona School District necessary to support a safe workplace for all stake holders. The Safety Management Plan is a living document, which will be updated and modified to maintain its relevance throughout the project as site conditions and circumstances change.

In accordance with the NJ ESIP process, the next step in the project development phase is for Honeywell to provide our recommendations and for the School District to select the desired content of the project based upon the District's unique goals and objectives. The selections will consider the projected costs, projected energy and operational savings, available financing options at the time of the agreement, interest rates, length of term and District priorities, which will all play a part in the final selection and cash flow of ECMs. The definitive requirement under NJ PL2012, c.55 is that the project is self funding within the 15 or 20 year term as outlined in the legislation.

Overall, it is evident that the Verona School District is well positioned to implement a program that will upgrading your facilities, while funding itself within the requirements of the law and with zero or minimal impact on your taxpayer base. We welcome this opportunity to partner with the Verona School District in order to improve the comfort and efficiency of your facilities through the successful implementation of this Energy Savings Plan.

Sincerely,

Joseph J Coscia

Joseph J Coscia
Energy Account Executive

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SECTION B PRELIMINARY UTILITY ANALYSIS

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Americas M&V Services

Preliminary Utility Analysis

Verona Public Schools
Verona, NJ

Helping customers manage energy resources to improve financial performance

Executive Summary

Honeywell would like to thank you for the opportunity of providing you with this Preliminary Utility Analysis. A detailed billing analysis was completed for all utility data provided by you. The facility's electric, natural gas, and water consumption were compared to a benchmark of typical facilities of similar use and location.

Through our Energy Services offerings, Honeywell's goal is to form a long term partnership for the purpose of meeting your current infrastructure needs by focusing to:

- Improve Operational Cost Structures
- Ensure Satisfaction
- Upgrade Infrastructure While Reducing Costs
- Meet Strategic Initiatives
- Leverage Teamwork
- Pursue Mutual Interests
- Provide Financing Options

How does it work?

Under an energy retrofit solution, Honeywell installs new, energy efficient equipment and optimizes your facility, as part of a multi-year service contract. Most of these improvements are cost-justified by energy and operational savings. Some of the energy conservation measures provide for a quick payback, and as such, would help offset other capital intensive energy conservation measures such as, boilers, package rooftop units, domestic hot water heaters, etc. The objective is to provide you with reduced operating costs, increased equipment reliability, optimized equipment use, and improved occupant comfort.

After review of the utility analysis, you can authorize Honeywell to proceed with the development of a detailed engineering report. The report development phase allows Honeywell to prepare an acceptable list of proposed energy conservation measures, which are specific to the selected facility. Some examples of typical Energy Conservation Measures include:

- Lighting
- Energy Efficient Motors
- Control Systems
- Boilers
- Chillers
- Variable Speed Drives
- Steam Systems
- Package Rooftop Units
- Domestic Hot Water Heaters
- Power Factor Correction

Why Honeywell?

- Honeywell is one of the world leaders in providing infrastructure improvements
- With Honeywell as your building partner, you gain the advantage of more than 115 years of leadership in building services
- Honeywell has the infrastructure and manpower in place to manage and successfully implement your project
- Honeywell has over 30 years experience in the energy retrofit marketplace with over $3 Billion in customer energy savings
- Honeywell provides you with "Single Source Responsibility" - from Engineering to Implementation, Servicing and Financing (if desired)

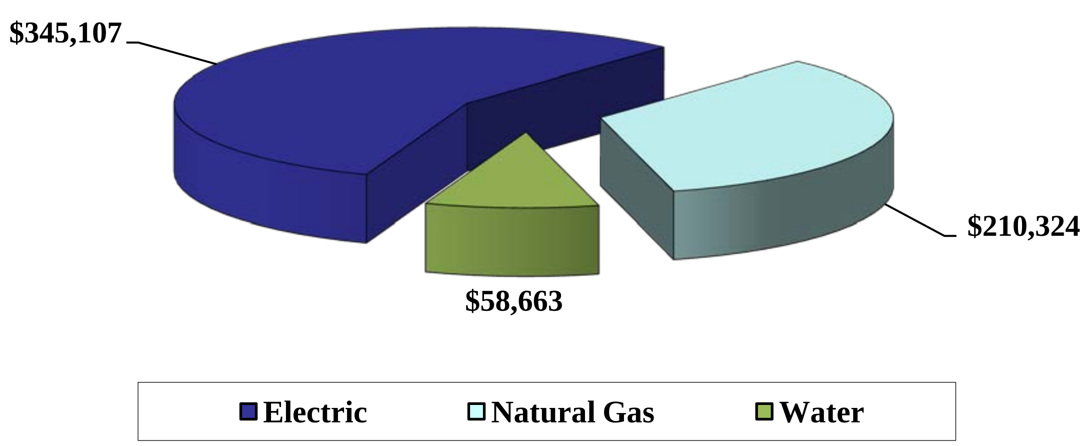
Verona Public Schools
Utility Analysis Period: 4/13-3/14

	April 2013 - March 2014		2013
	Electric	**Natural Gas**	**Water**
Utility Costs*	$345,107	$210,324	$58,663
Utility Usage (kWh, CCF, kGal)	2,328,115	236,678	3,758
$ Cost/Unit (kWh, CCF, kGal)	$0.14823	$0.889	$15.61
Electric Billed Demand (kW)	7,799		

* Costs include energy and demand components, as well as taxes, surcharges, etc.

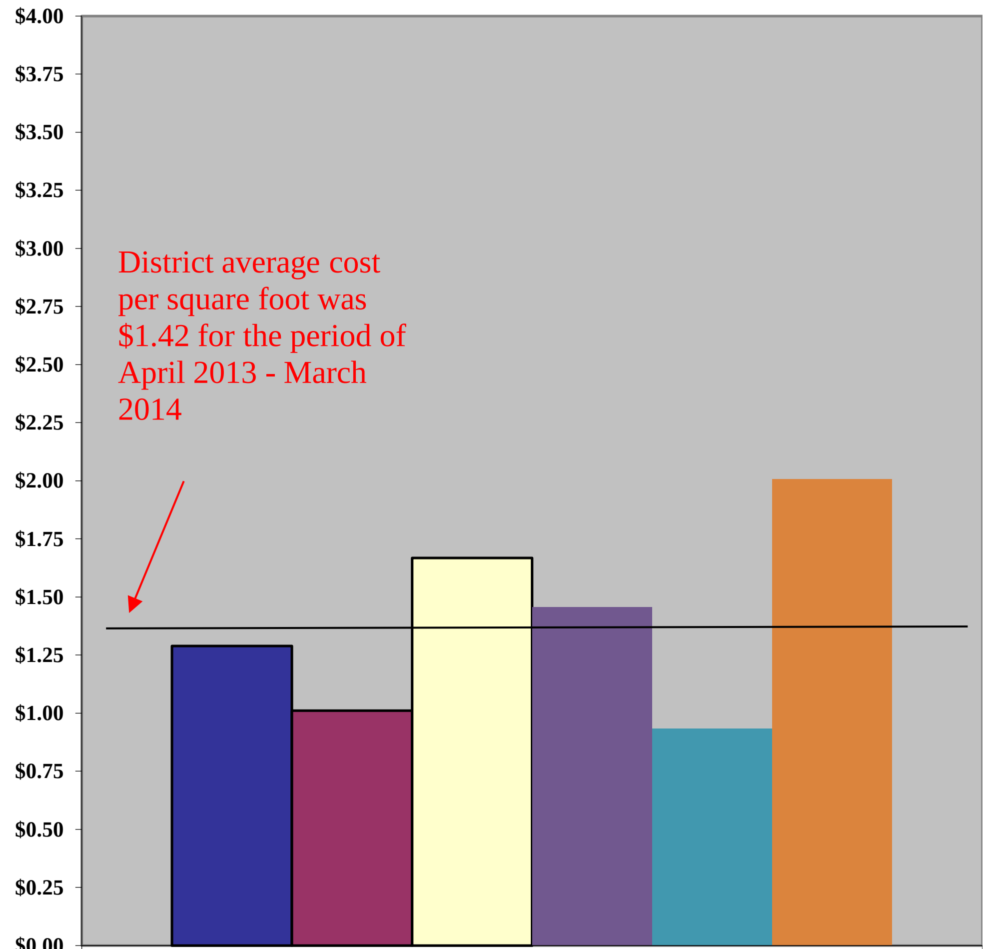
The electric and natural gas costs and usage are for the most recent months' billing (4/2013 - 3/2014); the cost and water usage is for the fiscal year of 2013 (1/2013 - 12/2013).

Actual Cost by Utility - 4/13-3/14 for electricity and natural gas and 1/13 - 12/13 for water



Cost Per Square Foot Comparison

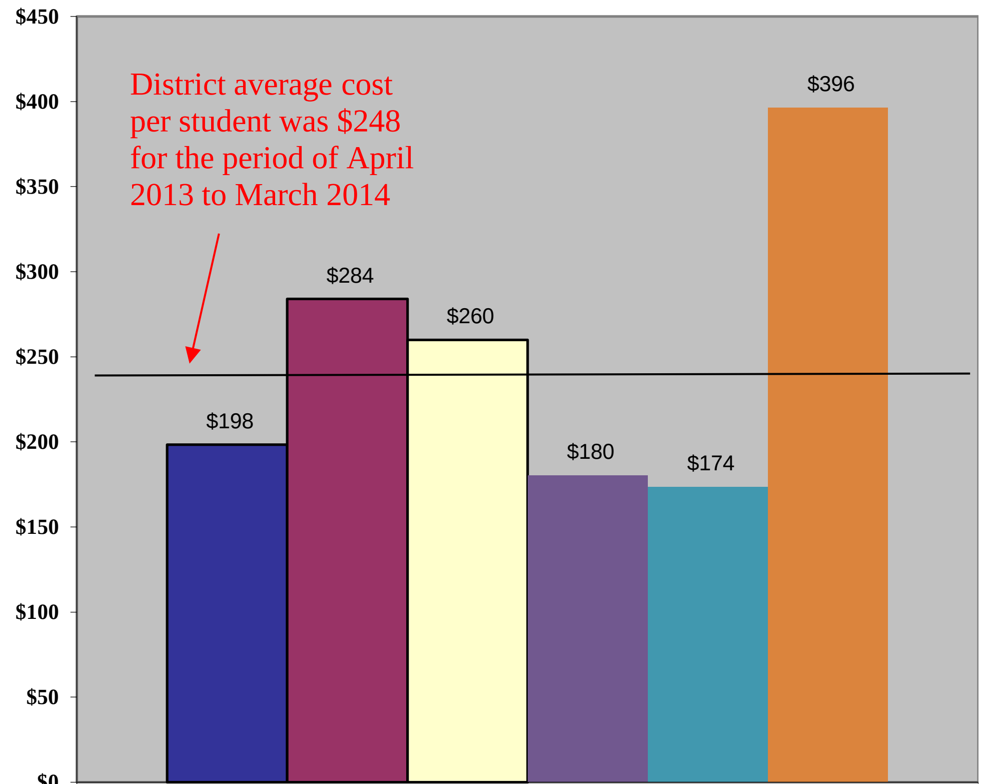
Electric and Natural Gas Costs Combined



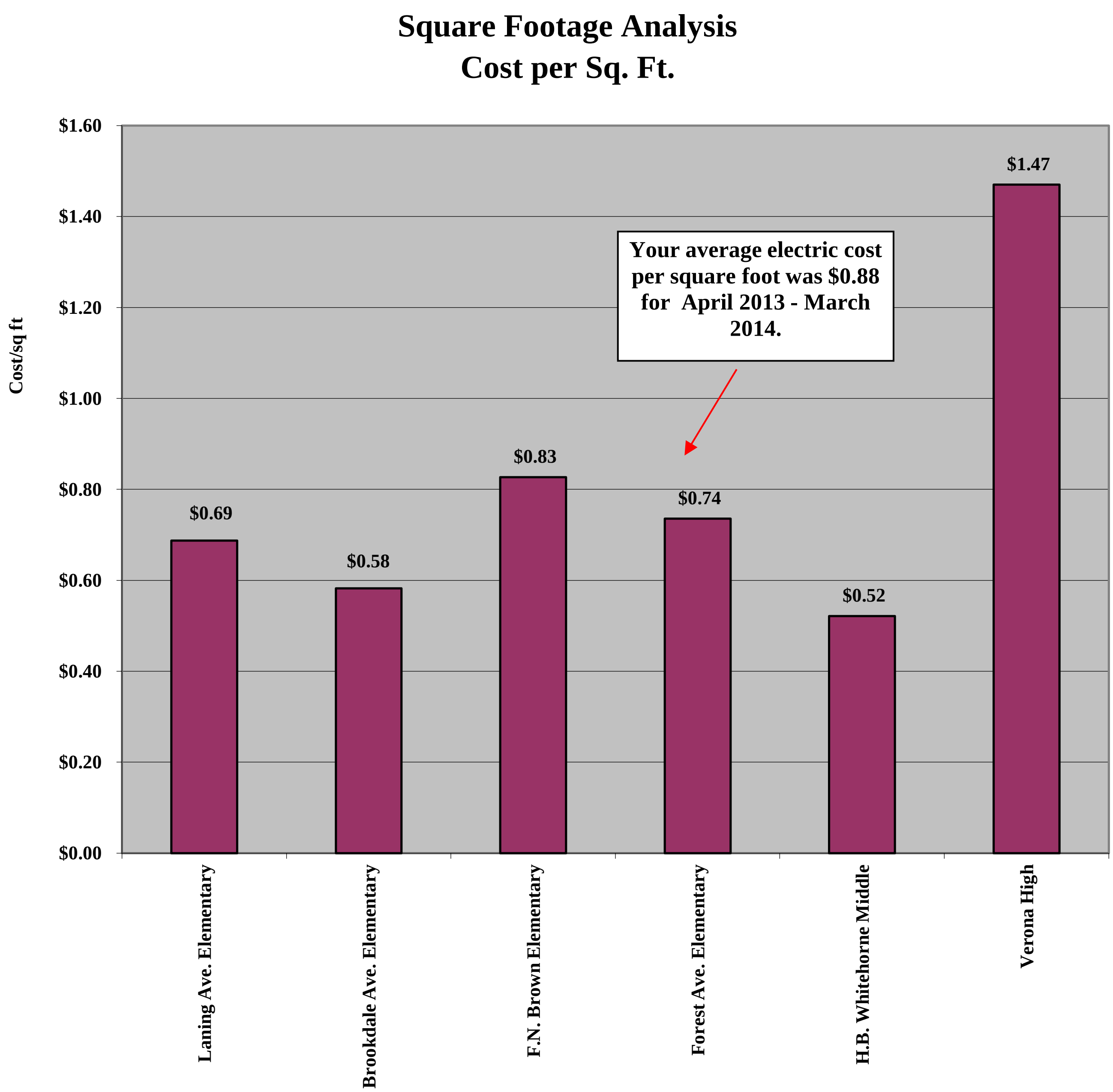
	2013 - 2014
Laning Ave. Elementary	$1.289
Brookdale Ave. Elementary	$1.010
F.N. Brown Elementary	$1.667
Forest Ave. Elementary	$1.4556
H.B. Whitehorne Middle	$0.933
Verona High	$2.008

Cost Per Student Comparison

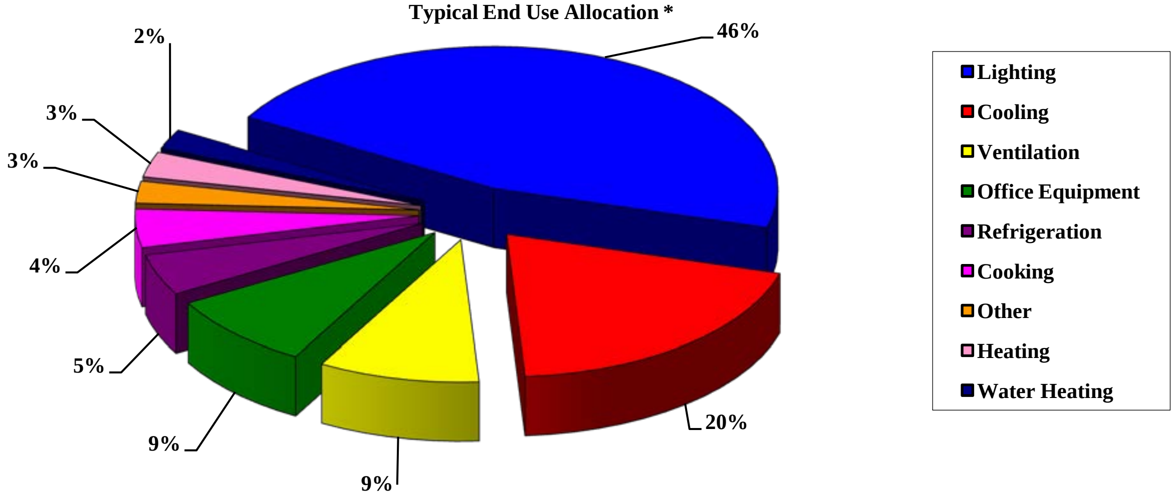
Electric and Natural Gas Combined



	2013 - 2014
Laning Ave. Elementary	$198
Brookdale Ave. Elementary	$284
F.N. Brown Elementary	$260
Forest Ave. Elementary	$180
H.B. Whitehorne Middle	$174
Verona High	$396


Square Footage Analysis
Cost per Sq. Ft.
Cost/sq ft
$1.60
$1.40
$1.20
$1.00
$0.80
$0.60
$0.40
$0.20
$0.00
$0.69
$0.58
$0.83
$0.74
$0.52
$1.47
Your average electric cost per square foot was $0.88 for April 2013 - March 2014.
Laning Ave. Elementary
Brookdale Ave. Elementary
F.N. Brown Elementary
Forest Ave. Elementary
H.B. Whitehorne Middle
Verona High

Sources of Electric Consumption



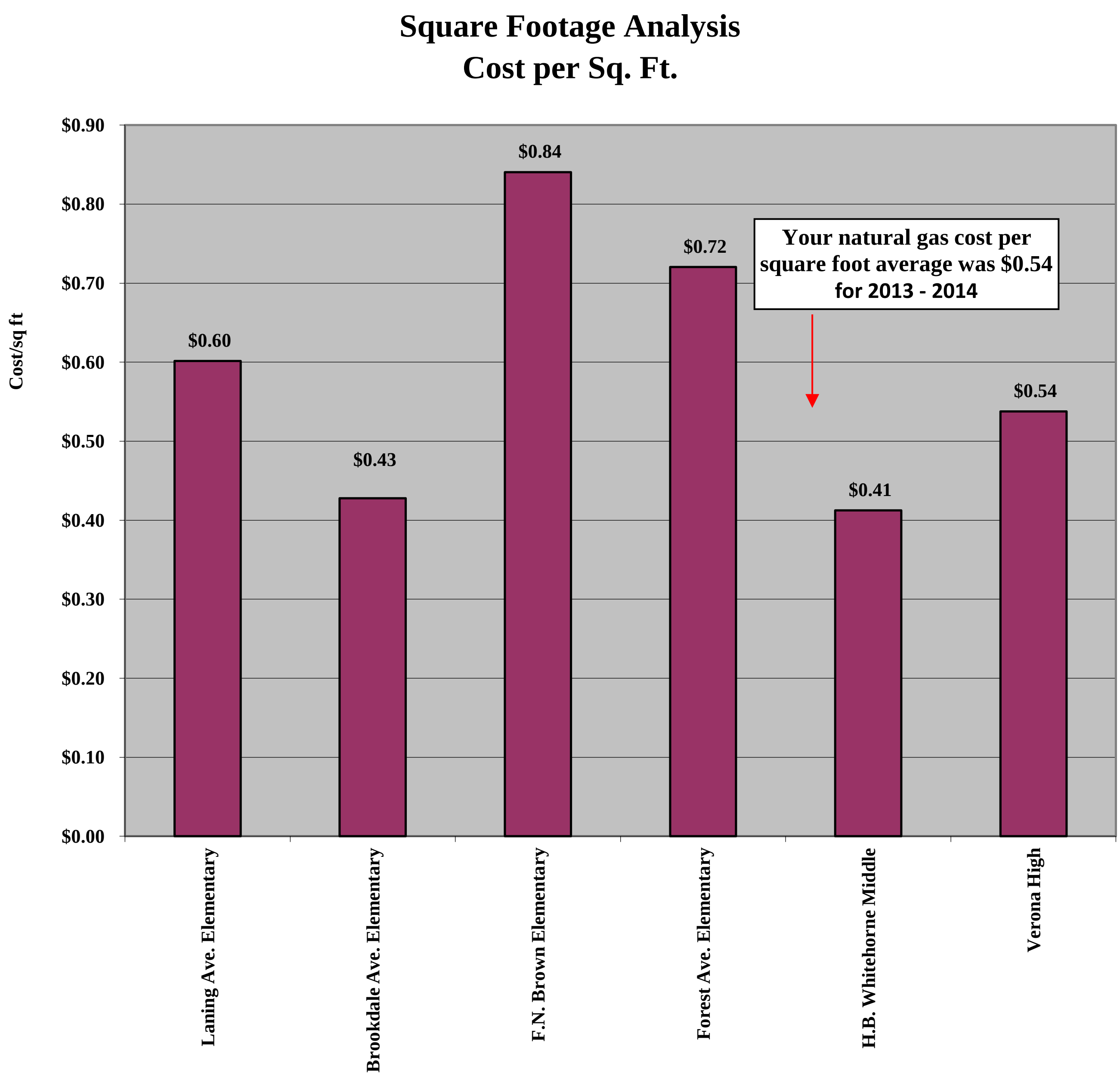
*Source: Commercial Benchmark Data by Business Segment and Climate Zone - Schools Climate Zone 3

Typical Allocation Applied to Your Electric Cost**

Lighting	$159,784
Cooling	$67,641
Ventilation	$31,750
Office Equipment	$29,679
Refrigeration	$16,220
Cooking	$15,185
Other	$8,628
Heating	$10,008
Water Heating	$7,592
Your 2013 - 2014 Total Cost	**$345,107**

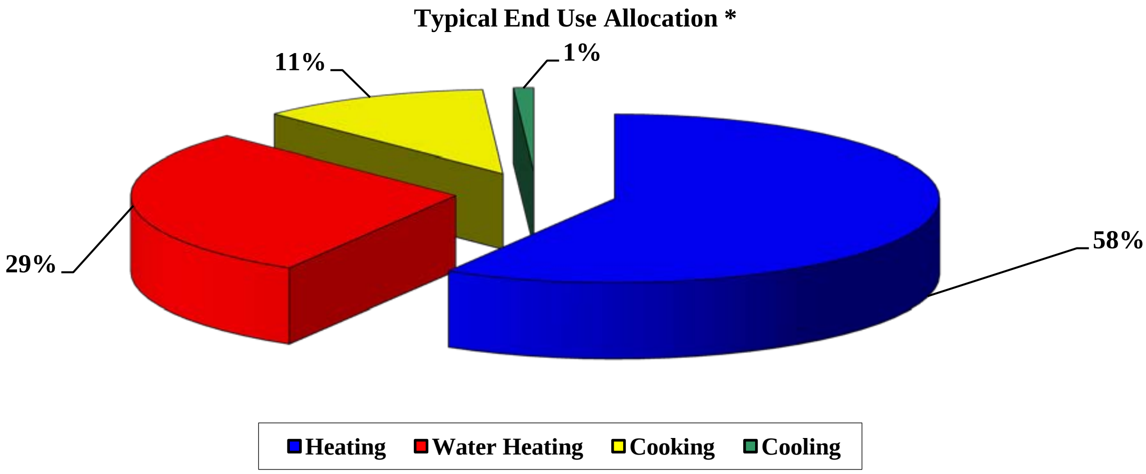
**This allocation is generic and is not a representation of the actual end use in your buildings included in this report.

Utility Analysis - Natural Gas



Utility Analysis - Natural Gas

Sources of Natural Gas Usage



**This allocation is generic and is not a representation of the actual end use in your buildings included in this report.

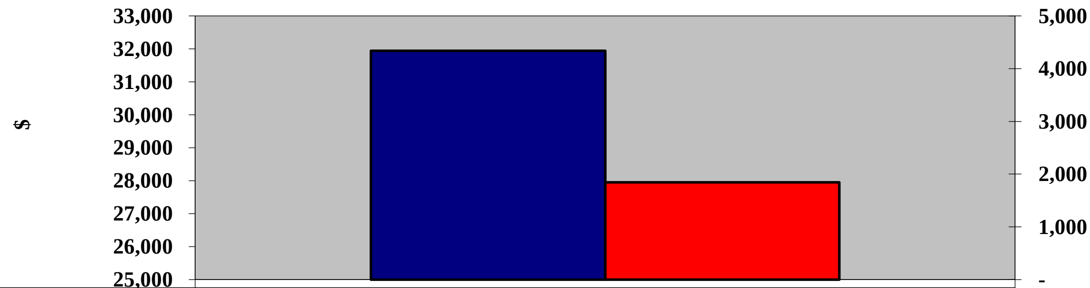
Typical Allocation Applied to Your Gas Cost**

Heating	$122,619
Water Heating	$60,784
Cooking	$23,977
Cooling	$2,103
Your 2013 - 2014 Total Cost	**$210,324**

*Source: Commercial Benchmark Data by Business Segment and Climate Zone - Schools Climate Zone 3

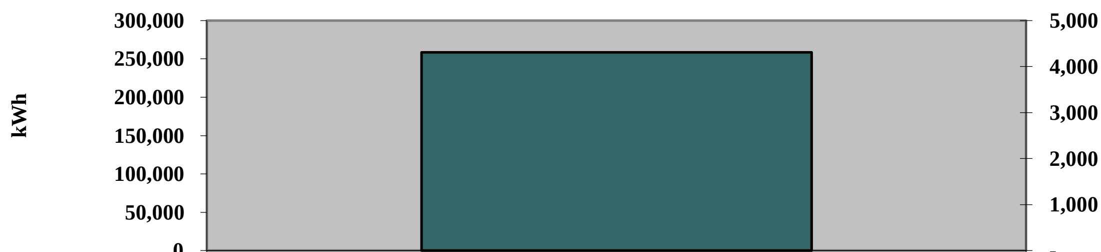
Laning Ave. Elementary

Annual Historical Cost and Usage Comparisons



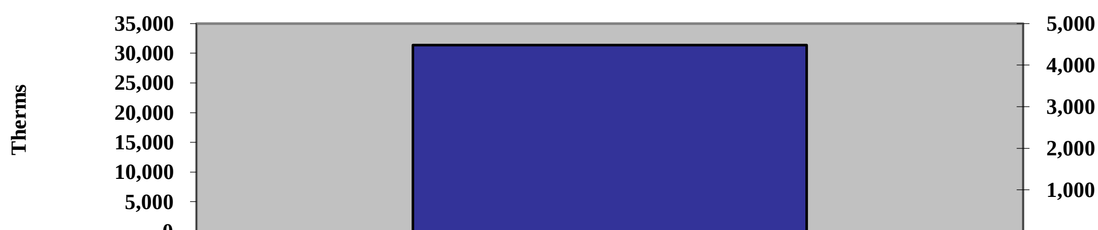
Electric Cost	$31,945
Gas Cost	$27,954
Heating Deg. Days	6,543

Electric Usage (kWh)



kWh	258,360
Heating Deg. Days	6,543

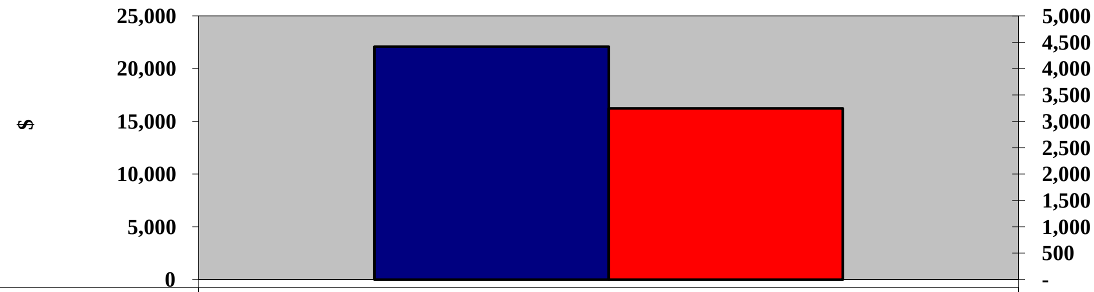
Natural Gas Usage



Therms	31,389
Heating Deg. Days	6,543

Brookdale Ave. Elementary

Annual Historical Cost and Usage Comparisons

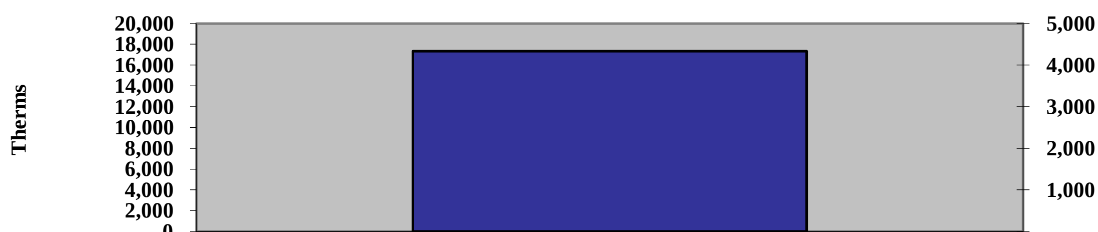


Electric Cost	$22,110
Gas Cost	$16,240
Heating Deg. Days	6,543

Electric Usage (kWh)

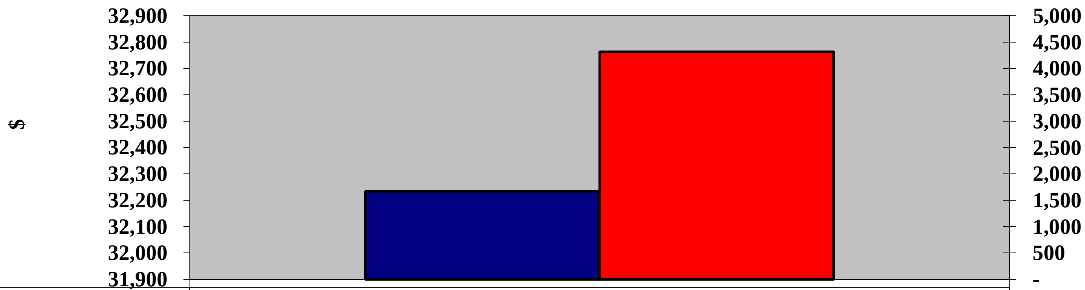
kWh	173,800
Heating Deg. Days	6,543

Natural Gas Usage



Therms	17,333
Heating Deg. Days	6,543

Annual Historical Cost and Usage Comparisons

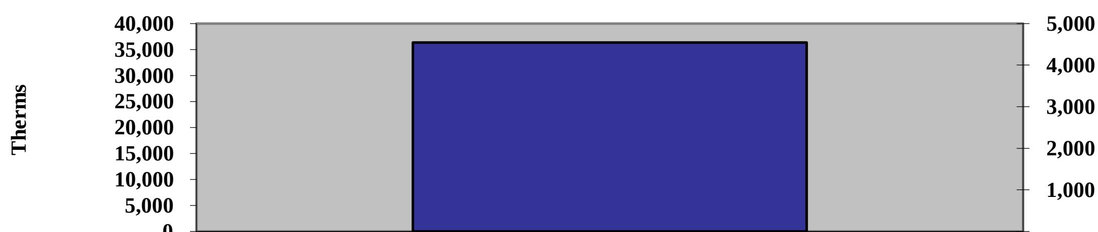


Electric Cost	$32,234
Gas Cost	$32,763
Heating Deg. Days	6,543

Electric Usage (kWh)

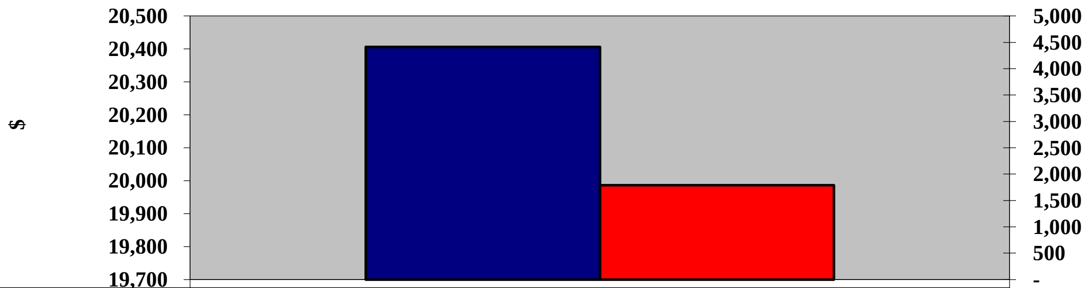
kWh	189,795
Heating Deg. Days	6,543

Natural Gas Usage



Therms	36,357
Heating Deg. Days	6,543

Annual Historical Cost and Usage Comparisons

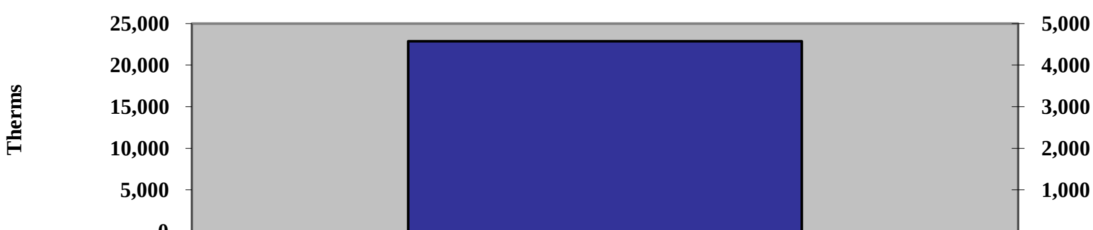


Electric Cost	$20,406
Gas Cost	$19,987
Heating Deg. Days	6,543

Electric Usage (kWh)

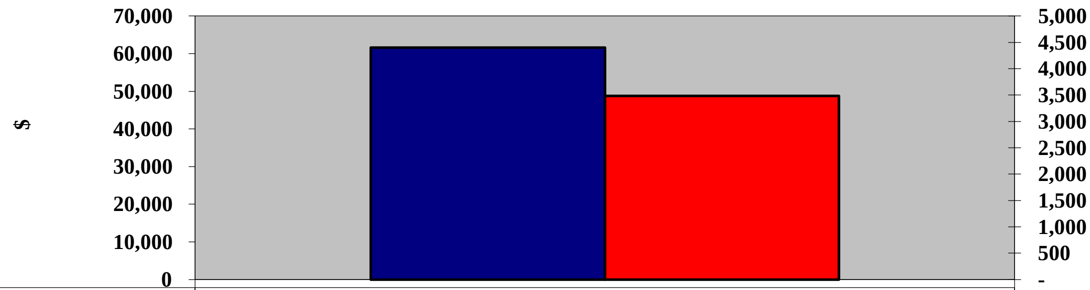
kWh	177,720
Heating Deg. Days	6,543

Natural Gas Usage



Therms	22,860
Heating Deg. Days	6,543

Annual Historical Cost and Usage Comparisons



Electric Cost	$61,623
Gas Cost	$48,737
Heating Deg. Days	6,543

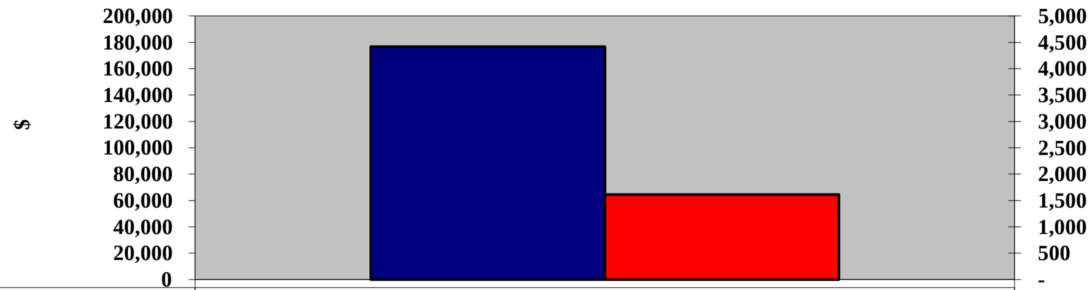
Electric Usage (kWh)

kWh	499,500
Heating Deg. Days	6,543

Natural Gas Usage

Therms	54,378
Heating Deg. Days	6,543

Annual Historical Cost and Usage Comparisons

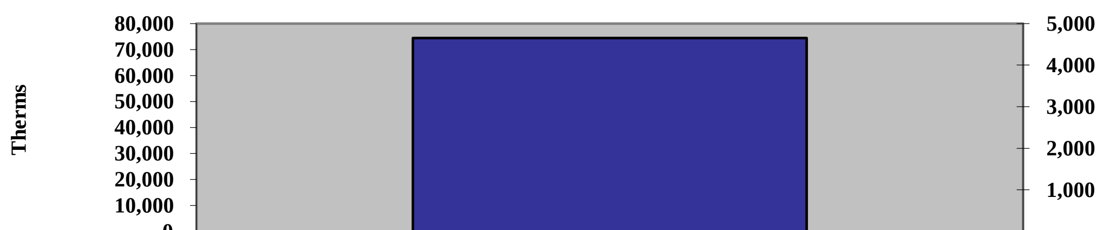


Electric Cost	$176,789
Gas Cost	$64,644
Heating Deg. Days	6,543

Electric Usage (kWh)

kWh	1,028,940
Heating Deg. Days	6,543

Natural Gas Usage



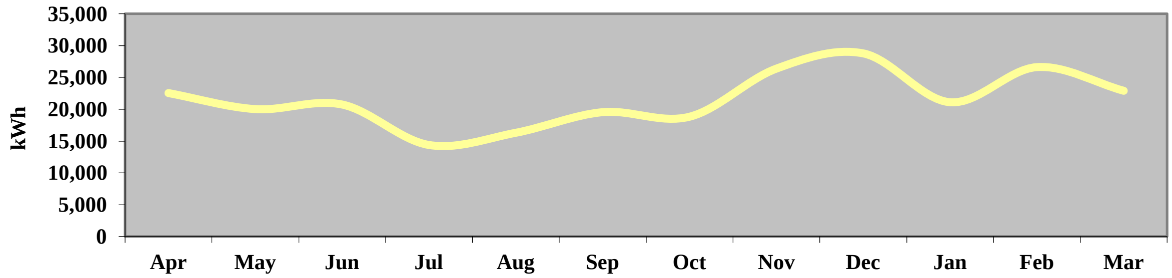
Therms	74,361
Heating Deg. Days	6,543

Monthly Usage Comparisons

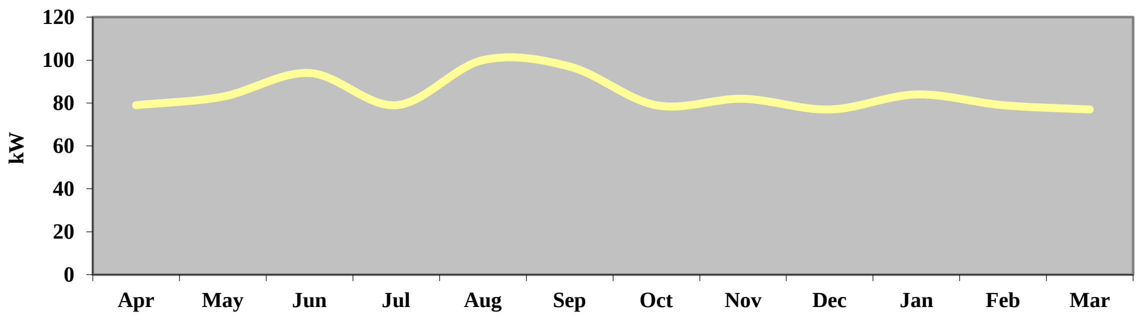
Laning Ave. Elementary

April 2013 - March 2014

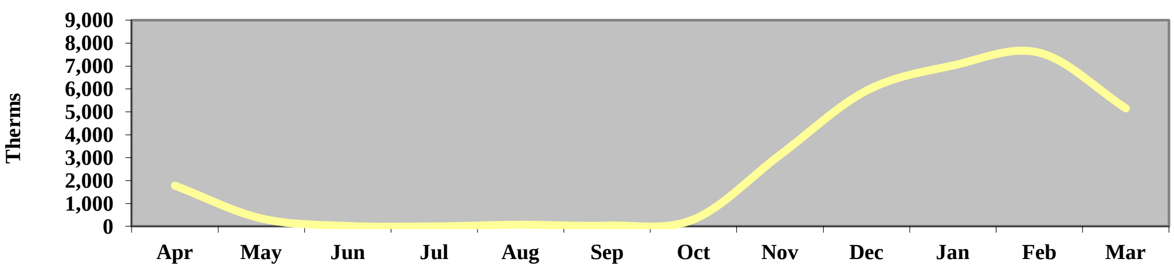
Electric Usage Detail



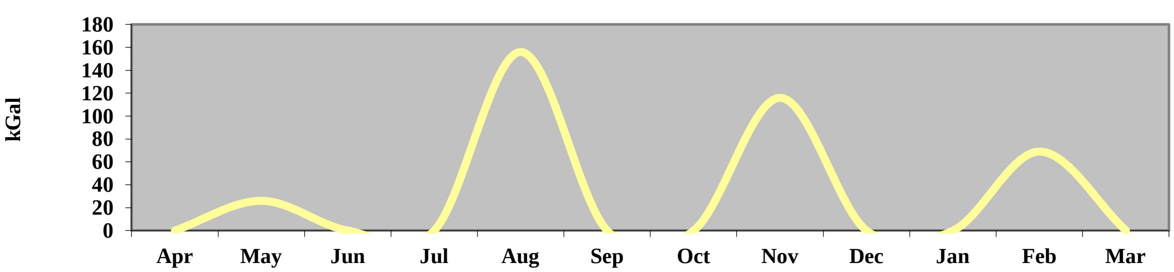
Actual Demand



Natural Gas Usage Detail



Water Usage Detail (kGals)

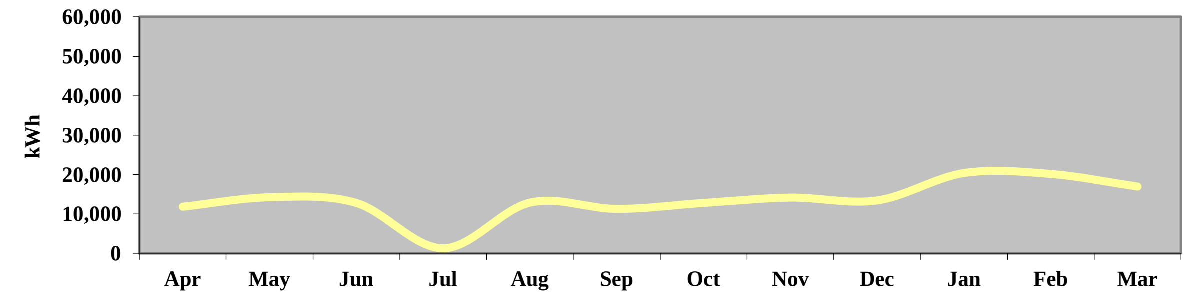


Monthly Usage Comparisons

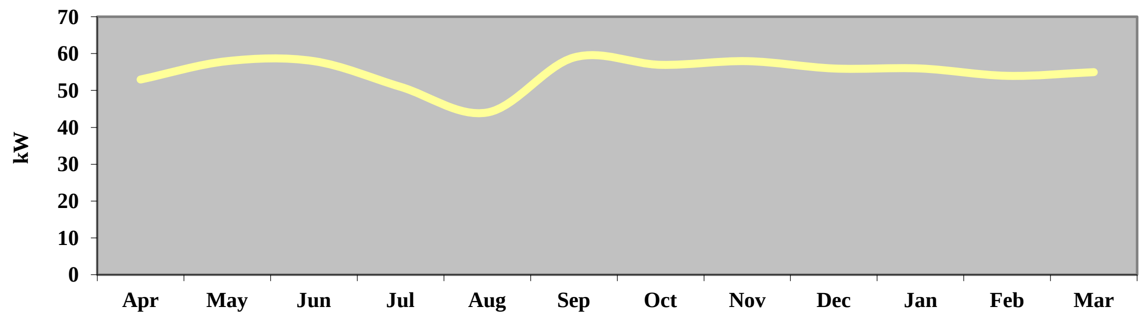
Brookdale Ave. Elementary

April 2013 - March 2014

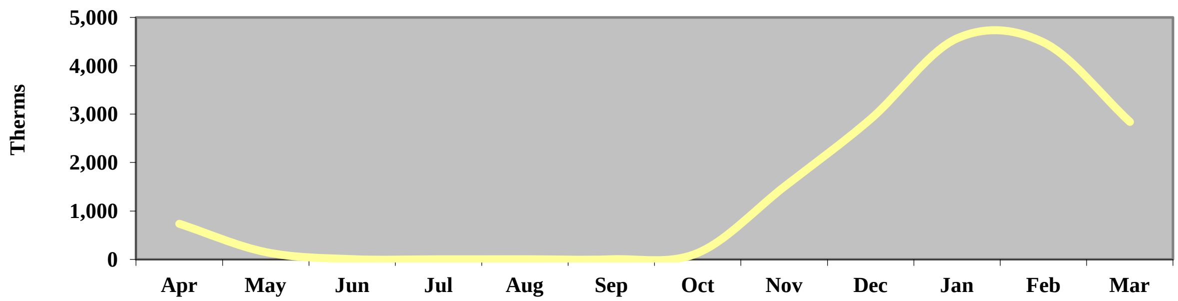
Electric Usage Detail



Actual Demand

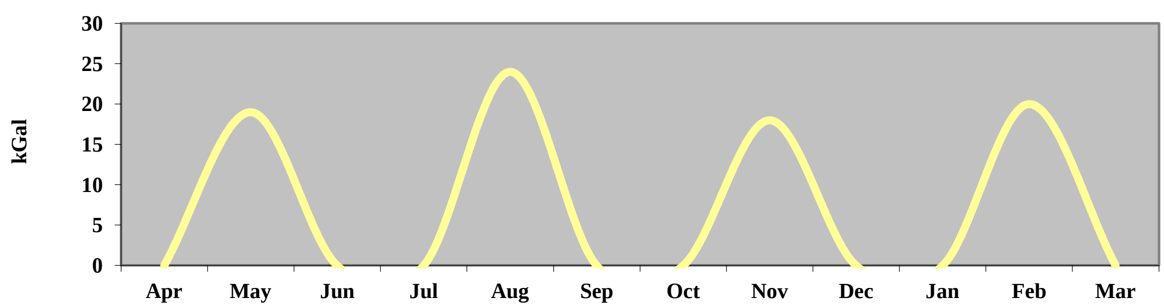


Natural Gas Usage Detail



Water Usage Detail (kGals)

January - December 2013

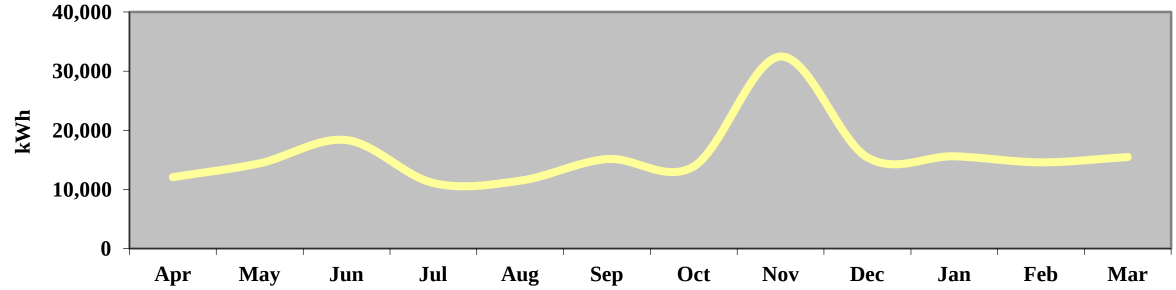


Monthly Usage Comparisons

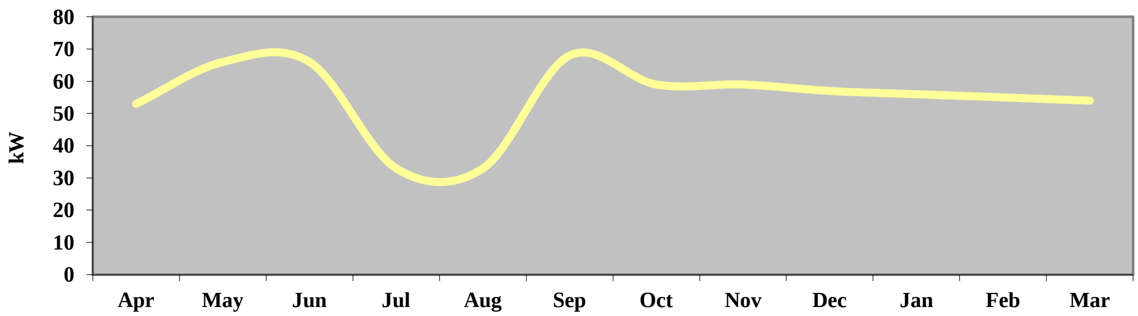
F.N. Brown Elementary

April 2013 - March 2014

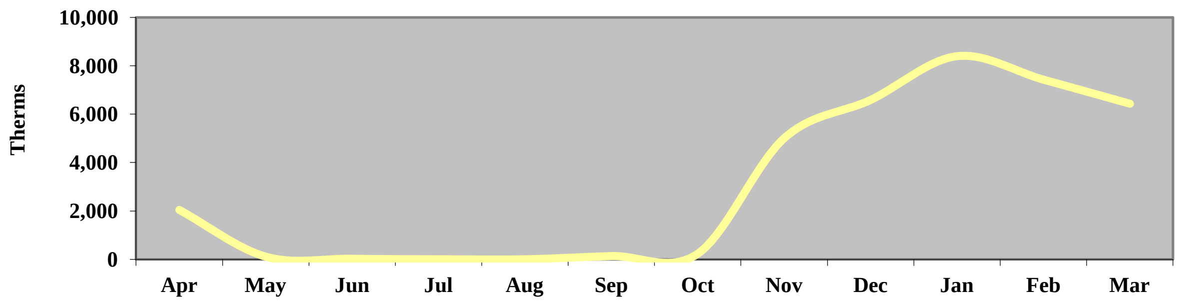
Electric Usage Detail



Actual Demand

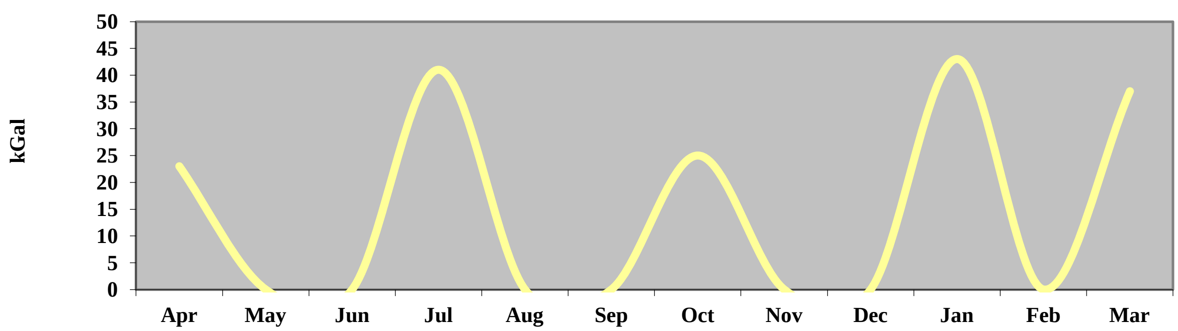


Natural Gas Usage Detail



Water Usage Detail (kGals)

January - December 2013

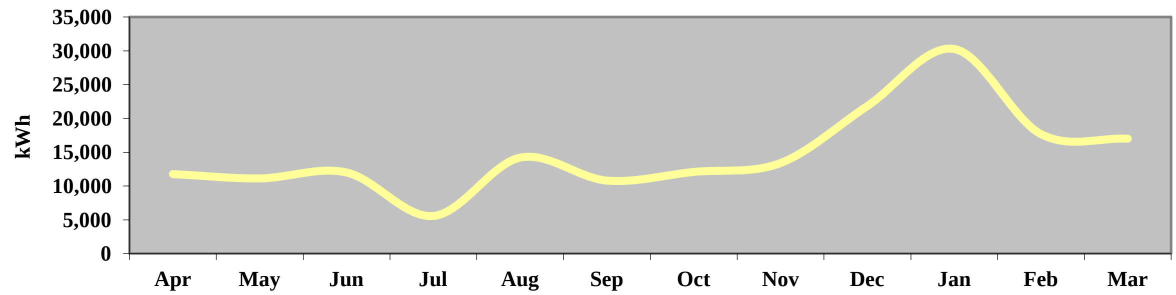


Monthly Usage Comparisons

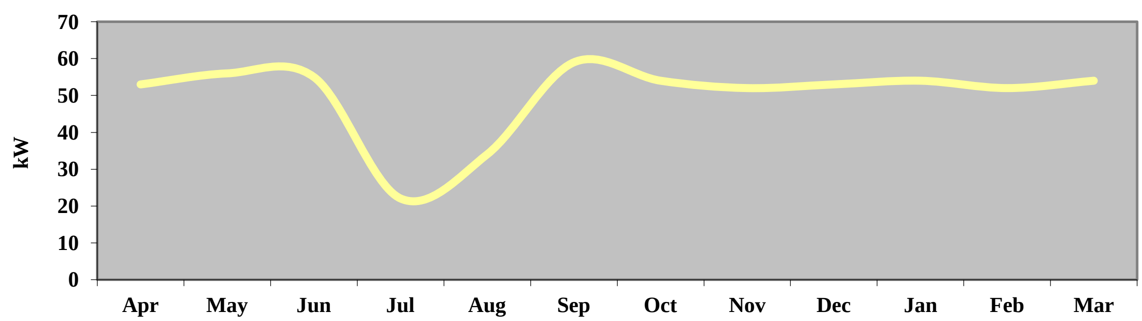
Forest Ave. Elementary

April 2013 - March 2014

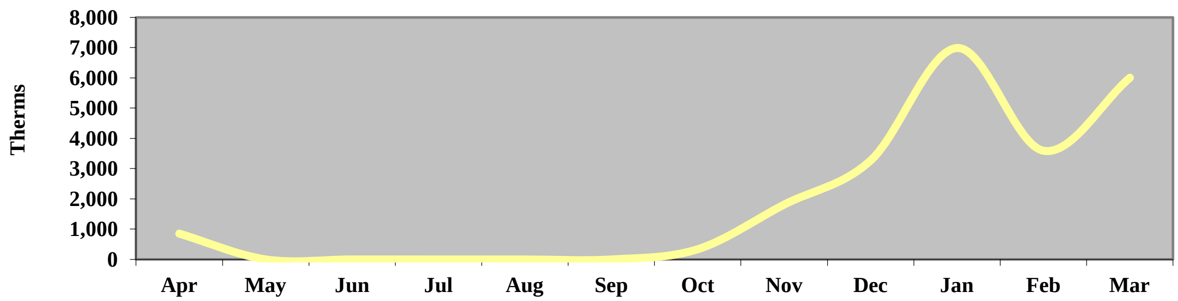
Electric Usage Detail



Actual Demand

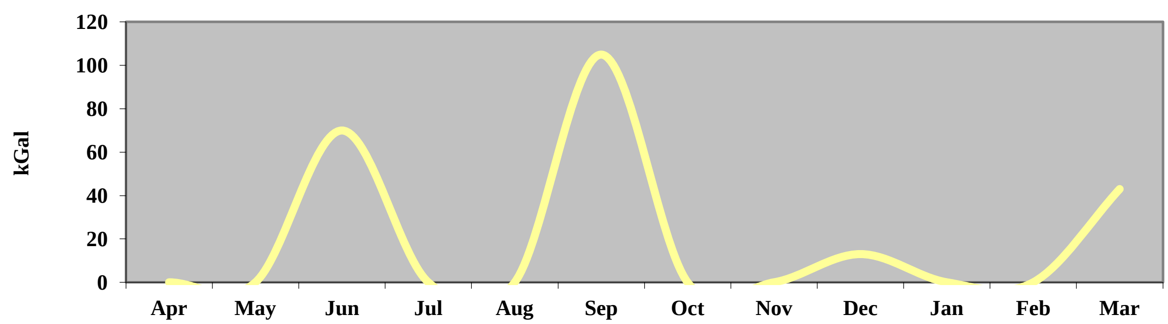


Natural Gas Usage Detail



Water Usage Detail (kGals)

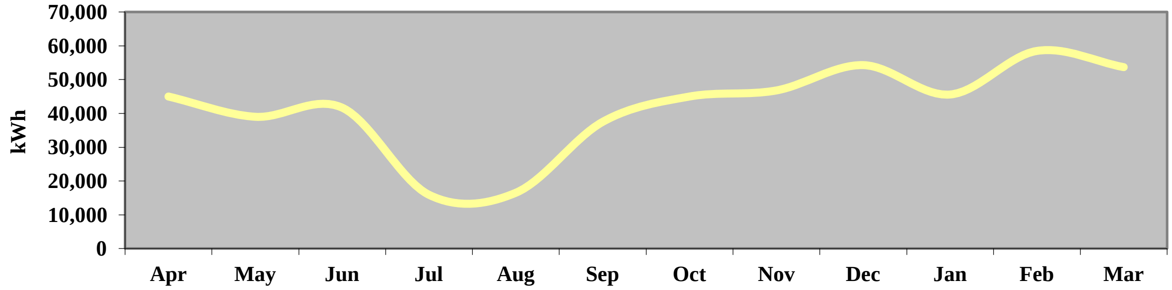
January - December 2013



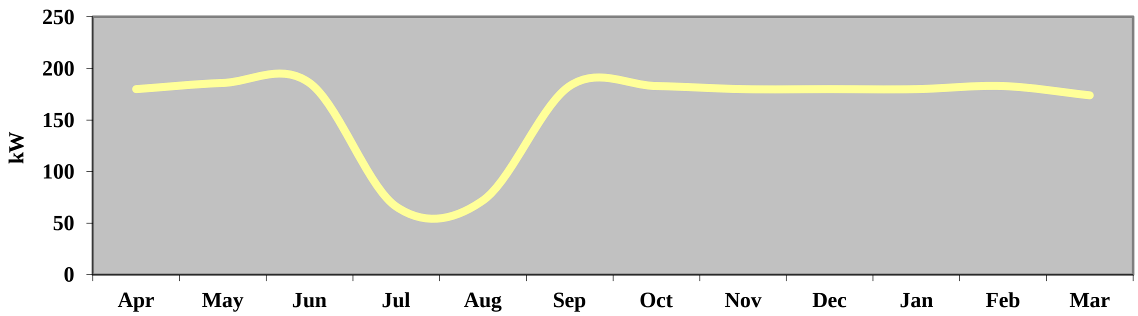
Monthly Usage Comparisons

H.B. Whitehorne Middle

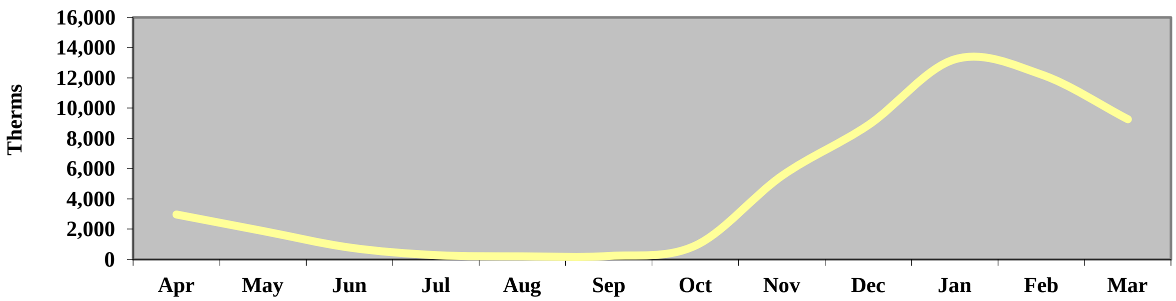
April 2013 - March 2014
Electric Usage Detail



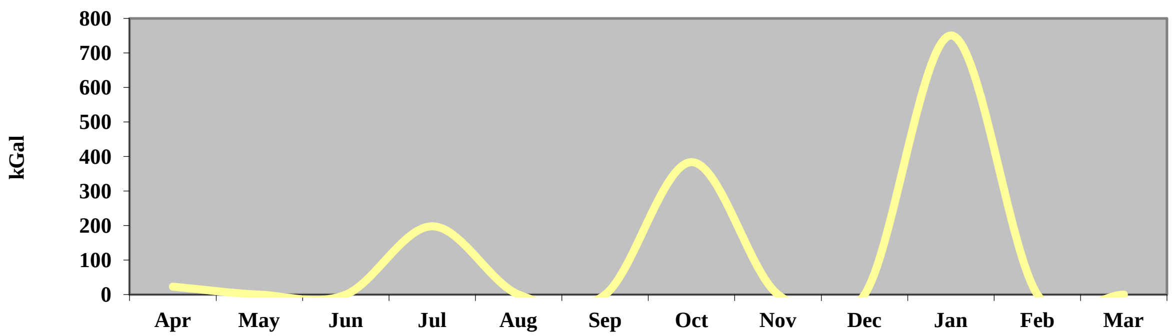
Actual Demand



Natural Gas Usage Detail



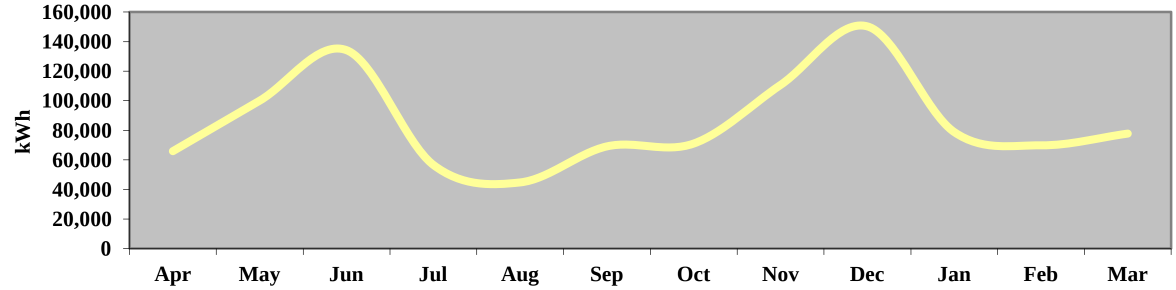
Water Usage Detail (kGals)
January - December 2013



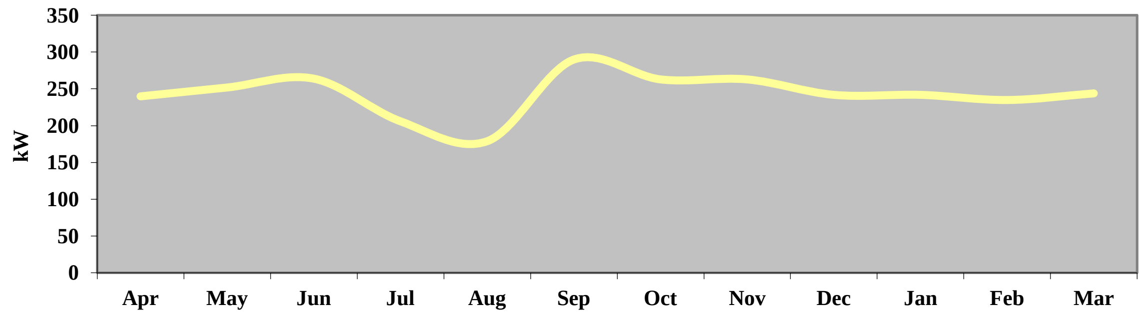
Monthly Usage Comparisons

Verona High

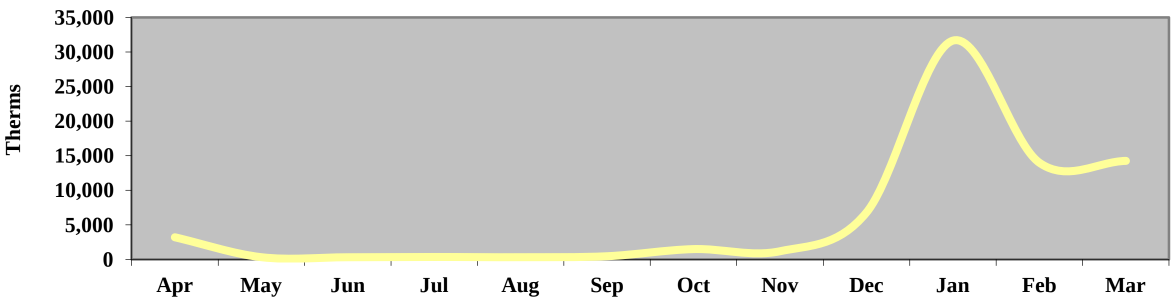
April 2013 - March 2014
Electric Usage Detail



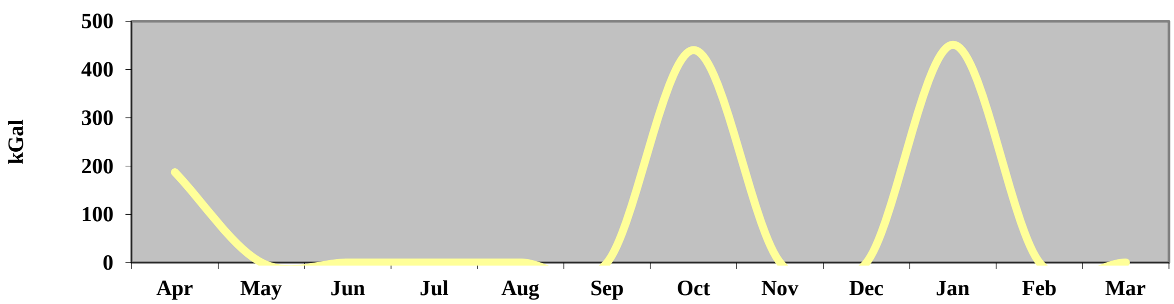
Actual Demand



Natural Gas Usage Detail



Water Usage Detail (kGals)
January - December 2013



SECTION C ENERGY CONSERVATION MEASURES (ECMS)

INTRODUCTION

The information used to develop this Section was obtained through the independent energy audit, building surveys to collect equipment information, interviews with operators and end users, and an understanding of the components to the systems at the sites. The information obtained includes nameplate data, equipment age, condition, the system's design and actual load, operational practices and schedules, and operations and maintenance history.

Honeywell has performed a review of the Energy Conservation Measures (ECMs) which would provide energy and operational cost savings to the Verona SD. This report aims to be an assessment of the feasibility and cost effectiveness of such measures, and an indication of the potential for their implementation. The ECMs listed below have been reviewed throughout your facilities for consideration within a complete Energy Savings Plan. What follows is a general description of the energy auditing process and a detailed description of the Energy Conservation Measures considered for your facilities.

ENERGY CONSERVATION MEASURES CONSIDERED AND REVIEWED

ECM	ECM Description	Recommended Project
1A	Lighting Upgrades (Includes Ceiling Tile Replacement at the HS)	✓
1B	Lighting Controls and Daylight Harvesting	✓
1C	Vending Misers	✓
1D	Plug Load Management	✓
1E	Install De-stratification Fans	✓
2A	Boiler Replacement	✓
2B	Install Boiler Burner Controller	✓
2C	Install Premium Efficiency Motors and VFDs	✓
2D	Domestic Hot Water Heater Replacement	✓
2E	Heat Pump Replacement	✓
2F	Window AC Unit Replacements with Split System	✓
2G	Walk-In Freezer/Cooler Controllers	✓
2H	Kitchen Hood Controllers	✓
2I	Steam Trap Replacement/Refurbishment	✓
3A	Building Management Control Systems	✓
3B	Demand Control Ventilation	✓
4A	Building Envelope Improvements	✓
4B	Roof Replacement	
5A	Combined Heat and Power	
6A	Computer Power Management	✓
7A	Renewable Energy – Solar Photovoltaic PPA	
8A	Water Conservation	✓
9A	Demand Response/Permanent Load Reduction	✓

Note: To see which Energy Conservation Measures are applicable for what buildings, refer to the respective Energy Conservation Measure write-up below. The color coded table on the top of the ECM write-up identifies the building and the applicability of each ECM.

OVERVIEW

Honeywell has closely evaluated and audited the Verona SD in order to develop the optimum mix of energy saving measures. These selected site-specific measures have been developed using the following process:

- Review Site Audits
- Engineering Team Site Visits
- Develop Measures
- Review Measures with Team

REJECT AND ACCEPT MEASURES BASED ON

- Alignment with Critical Success Factors (CSF)
- Value to the District
- Economic Financial Payback
- Equipment Service Life
- Effect on Current Space Conditions

In developing the proposed measures, the following considerations were critical:

- Reduction of space heating and cooling loads by performing a systems review, with complete consideration of current indoor environmental quality standards.
- Review and redesign lighting systems noting reductions in the internal heat gain in the affected spaces.
- Load reduction measures always precede optimization measures.

Bin weather data was used from a 15-year average reported from Newark, NJ. Ventilation rates, taken from ASHRAE published standard, were predicted by using the building's population multiplied by cfm/person during occupied hours.

Reasonable infiltration rates were assumed based on the building's fenestration conditions and expected values for typical school buildings. A reduced infiltration rate was assumed for the unoccupied hours. Envelope heat loss calculations assumed a reasonable heat transmission rate (U value) based on the construction of the buildings. Wall area and glass area were estimated by supplied drawings and field photographs.

Current efficiencies were derived from assumed and later to be measured boiler efficiencies, and assumed system losses due to thermal losses, distribution losses and loose operational control. The current assumed boiler system efficiencies were then applied to the calculated load and calibrated to last year's actual fuel consumption.

Demand Sensitive Operation

Review existing and proposed thermal loads. For example, the review process will facilitate the application of:

1. Optimized flow rates (steam, water, and air).
2. Optimized operation of equipment, matching current occupancy use profiles and considering both outside and indoor space temperatures.

Benefits of Mechanical Improvements

Listed below are some of the benefits that the School would reap from the mechanical portion of the measures:

1. Avoid costly repairs and replace equipment that would have to be replaced in the next five years.
2. Improved compliance with ASHRAE Ventilation Standards.
3. Ability to trend ventilation rates and ensure compliance through documentation.
4. Operating a more weather sensitive facility.
5. Allowing for a greater capability of central monitoring and troubleshooting via remote access.
6. Greater operating flexibility to reduce costs and optimize staff efficiency.

Indoor Air Quality

Implementation of new energy-related standards and practices has contributed to a degradation of indoor air quality. In fact, the quality of indoor air has been found to exceed the Environmental Protection Agency (EPA) standards for outdoor air in many homes, businesses, and factories.

The American Council of Governmental Industrial Hygienists (ACGIH) in their booklet "Threshold Limit Values" has published air quality standards for the industrial environment. No such standards currently exist for the residential, commercial, and institutional environments, although the ACGIH standards are typically and perhaps inappropriately used. The EPA has been working to develop residential and commercial standards for quite some time.

Recent studies indicate that for even the healthiest students, indoor air pollution can reduce the ability to learn. Honeywell has addressed this issue by focusing on the proper operation and replacement of the unit ventilators and air handler equipment which will assure indoor air quality standards are met.

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ECM 1A LIGHTING UPGRADES (INCLUDES CEILING TILE REPLACEMENT AT THE HS)

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
1A	Lighting Upgrades	✓	✓	✓	✓	✓	✓

Existing Conditions

Lighting throughout the schools is comprised mostly of tubular fluorescent recessed fixtures with 32 watt T-8 lamps and electronic ballasts. The fixtures come in different sizes including 1x4, 2x2, and 2x4 wrap-around and recessed models. Most of the large spaces in the schools, such as the multi-purpose rooms and gymnasiums, are served by High Intensity Discharge lamps including 250W and 400W metal halide fixtures. There are also a significant number of recessed down-light fixtures with 13W, 23W and 26W CFL bulbs. A limited quantity of regular incandescent and halogen, as well as incandescent PAR bulbs were also observed in some locations in the schools. This includes Auditorium and Stage lights, storage areas and restrooms in some schools.

Exterior lights consist of a mix of wall-pack and pole-head fixtures with mercury vapor, metal halide, and high pressure sodium bulbs. These bulbs come in a variety of sizes ranging from 50W up to 250W. Exterior Incandescent and CFL bulbs are used in recessed can-type canopy fixtures. The controls for the interior lights consist mostly of manual switches although there is a limited number of occupancy sensors observed in some locations in the schools. The light fixtures are powered by the building's electrical system.

250W MH Lamps in the White Gym.
Verona High School

2x2 Recessed fixtures in the cafeteria.
Brookdale Elementary School

Scope of Work

The purpose of the survey was to identify opportunities to improve the efficiency of the lighting system, while maintaining or where necessary, increasing the current light levels to code requirements. The proposed lighting system is based on the preliminary lighting system audit where existing lighting systems were analyzed and inventoried. The following scope of work is included in this proposal for interior lights:

- Replace standard 1x4' 32W 1-bulb T8 fixtures with 1x15W LED tube fixtures
- Replace standard 2x4' 32W 2-bulb T8 fixtures with 2 x15W LED tube fixtures
- Replace standard 2x4' 4-bulb 32W T8 fixtures with 4 x15W LED tube fixtures
- Replace standard 2x2' 2-bulb 32W T8 fixtures with 2 x15W LED tube fixtures
- Replace standard 2x2' 3-bulb 17W T8 fixtures with 3 x 8W LED tube fixtures
- Replace 42W CFL bulbs with 9W LED retrofit lights
- Replace 26W CFL pin bulbs with 13W LED replacement pin bulb
- Replace 70W MH, MV, and HPS fixtures with 26W slim LED fixtures

- Replace 160W MH, MV, and HPS fixtures with 50W LED fixtures
- Replace 250W MH, MV, and HPS high bay fixtures with 65W high bay LED fixtures
- Replace 400W MH, MV, and HPS high bay fixtures with 155W high bay LED fixtures
- Replace incandescent PAR and regular bulbs with LED retrofits
- Replace incandescent EXIT signs with LED signs

For exterior wall pack and pole head lights, the following scope of work is included:

- Replace 70W HID wall-pack outdoor fixtures with 18W LED flood wall pack fixtures
- Replace 150W HID wall-pack outdoor fixtures with 50W LED flood wall pack fixtures
- Replace 250W HID wall-pack outdoor fixtures with 78W LED wall pack fixtures

Verona SD will receive many benefits from the lighting system upgrade. They include the following:

- Long Life - LED bulbs and diodes have an outstanding operational life time expectation of up to 100,000 hours. This is 11 years of continuous operation, or 22 years of 50% operation. Operational savings in terms of bulb and ballast replacement are significant based on this technology.

- Energy Efficiency – Today's most efficient way of illumination and lighting has an estimated energy efficiency of 80%-90% when compared to traditional lighting and conventional light bulbs. This means that about 80% of the electrical energy is converted to light, while 20% is lost and converted into other forms of energy such as heat. Traditional incandescent light bulbs operate at 20% energy efficiency only, 80% of the electricity is lost as heat.

- Ecologically Friendly - LED lights are free of toxic chemicals. Most conventional fluorescent lighting bulbs contain a multitude of materials like mercury that are dangerous for the environment. LED lights contain no toxic materials and are 100% recyclable, and will help to reduce carbon footprint by up to a third. The long operational life time span mentioned above means also that one LED light bulb can save material and production of 25 incandescent light bulbs. A big step towards a greener future!

- Durable Quality - LEDs are extremely durable and built with sturdy components that are highly rugged and can withstand even the roughest conditions. Because LED lights are resistant to shock, vibrations and external impacts, they make great outdoor lighting systems for rough conditions and exposure to weather, wind, rain or even external vandalism, traffic related public exposure and athletic areas.

- Zero UV Emissions - LED illumination produces little infrared light and close to no UV emissions. Because of this, LED lighting is highly suitable not only for goods and materials that are sensitive to heat due to the benefit of little radiated heat emission, but also for illumination of UV sensitive objects or materials.

- Design Flexibility - LEDs can be combined in any shape to produce highly efficient illumination. Individual LEDs can be dimmed, resulting in a dynamic control of light, color and distribution. Well-designed LED illumination systems can achieve fantastic lighting effects, not only for the eye but also for the mood and the mind: LED mood illumination is already being used in airplanes, classrooms and many more locations and we can expect to see a lot more LED mood illumination in our daily lives within the next few years.

- Operational in Extremely Cold or Hot Temperatures - LEDs are ideal for operation under cold and low outdoor temperature settings. For fluorescent lamps, low temperatures may affect operation and present a challenge, but LED illumination operates well also in cold settings, such as for outdoor winter settings, freezer rooms etc.

- Light Dispersement – LEDs are designed to focus light and can be directed to a specific location without the use of an external reflector, achieving higher application efficiency than conventional lighting. Well-designed LED illumination systems are able to deliver light more efficiently to the desired location.

- Instant Lighting & Frequent Switching - LED lights brighten up immediately and when powered on, which has great advantages for infrastructure projects such as traffic and signal lights. Also, LED lights can be switched off and on frequently and without affecting the LED's lifetime or light emission. In contrast, traditional lighting may take several seconds to reach full brightness, and frequent on/off switching does drastically reduce operational life expectancy.

- Low-Voltage - A low-voltage power supply is sufficient for LED illumination. This makes it easy to use LED lighting also in outdoor settings, by connecting an external solar-energy source and is a big advantage when it comes to using LED technology in remote or rural areas.

Included with the lighting upgrades is the ceiling tile replacement in Verona High School. Currently some classrooms at the High School have newer drop ceilings while other classrooms have older, higher ceiling tiles which contain asbestos. The prolonged inhalation of asbestos fibers can cause serious illnesses therefore Honeywell recommends replacing the older ceiling tiles with new drop ceilings. The following ceilings will be replaced with lower drop ceilings:

Area
Classroom 10
Classroom 11
Classroom 12
Classroom 13
Classroom 15
Classroom 35
Classroom 37
Classroom 39
Classroom 45
Classroom 49
Faculty Cafeteria
Main Offices
Music Room
Nurses Office
Principals Office
Vice Principals Office

Table 1A.1: Areas with Asbestos Ceiling Tiles

Changes in Infrastructure

New lamps and ballasts will be installed as part of this ECM. Also, new drop ceilings will be installed as part of this ECM.

Customer Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage. A slight increase in heating energy is resultant from the reduced heat output of more efficient lamps.
Waste Production	All lamps and ballasts that are removed will be properly disposed.
Environmental Regulations	No environmental impact is expected.

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ECM 1B LIGHTING CONTROLS AND DAYLIGHT HARVESTING

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
1B	Lighting Controls and Daylight Harvesting	✓	✓	✓	✓	✓	✓

Existing Conditions

The purpose of the survey was to identify areas in which occupancy based lighting controls can be used to conserve lighting energy. The controls noted were local manual switches for interior and analog time clocks or photo-cells for exterior. A limited number of existing occupancy sensors was observed in some schools.

Auditorium Lights with Manual Light Switch
HB Whitehorne Middle School

Typical Lighting Occupancy Sensor

Proposed Solution

Honeywell is proposing to install a comprehensive occupancy sensor control system that will monitor occupancy and turn lights off when spaces are not occupied.

Occupancy sensors will be installed in classrooms, individual offices and storage rooms that do not have them already. The larger spaces will have multiple sensors that will automatically turn lights off when the spaces are unoccupied. Installing new wall switch or ceiling-mount occupancy sensor controls can save approximately 30 %(based on historical averages for this type of facility) in energy usage. These new sensors will contain the latest dual-sensor technology (passive infrared & ultrasonic activated). The ultrasonic aspect of the sensor will detect "minor" motion while the passive infrared aspect will detect "major" motion. Based on observation, there were lights on in some unoccupied rooms, further highlighting the need for and potential energy savings from this ECM.

The following are some of the typical room and area types that are part of this proposal and the products that are likely to be used:

- Private Offices – In most cases, sensors will be wall switch type. Sensors will be PIR or dual technology.
- Open Offices – Ceiling mounted sensors and/or corner mounted wide view sensors both with power packs. Sensors will be either Passive Infrared (PIR) or dual technology.
- Copy Rooms / Storage Closets / Kitchenettes / Break Rooms - Sensors also come with vandal resistant option for added durability.

- Restrooms – Restrooms with stalls will have ceiling or other remote mounted sensors with the dual technology option. Smaller private restrooms will usually have wall switch sensors.
- Hallways – Depending on the configuration of the hallways, the sensors will be a combination of ceiling mounted and corner mounted wide view sensors with power packs. Sensors will be either PIR or dual technology as needed.

Honeywell will control the load specified in the proposal and that occupancy sensors installed will control the lighting fixtures to the complete satisfaction of the occupants and the facilities team.

Potential Option for Day Lighting

Daylight harvesting is an effective lighting strategy that is becoming more common in new construction builds and can provide up to a 15% reduction in the buildings overall lighting load. The process involves utilizing ambient light from natural or other sources to supplement general lighting in interior spaces.

After accounting for the possible sunlight available throughout the building, lighting controls can be used that switch or dim the lights either manually or automatically in response to the daylight. Several factors impact the amount of ambient light available to be harvested, including window size, building orientation, latitude and longitude, and weather. Specific software integrates all of the relevant data, both general and site specific, to model buildings for savings potential from daylight harvesting. The systems we evaluate are high efficiency fixed output, high efficiency step dimming (100% to 50%) and high efficiency continuous dimming (100% to 5%).

Changes in Infrastructure

New sensors will be installed as part of this ECM.

Customer Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage.
Waste Production	None.
Environmental Regulations	No environmental impact is expected.

ECM 1C VENDING MISERS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
1C	Vending Misers			✓		✓	✓

The Verona SD had different plug loads such as vending machines at multiple school locations. As such, Honeywell has investigated the use of plug controllers for these areas.

Existing Conditions

Vending machines are located throughout your facilities offering soft drinks to occupants. A typical cold drink machine consumes over 5,000 kWh annually.

Verona SD – Vending Machines

Building	Type	Qty
F.N. Brown ES	Cold Beverage	1
H.B. Whitehorne MS	Cold Beverage	1
Verona HS	Cold Beverage	5

Table 1C.1 – Existing Vending Machines

Proposed Solution

During the site visit, Honeywell noted vending machines providing an opportunity for energy savings by shutting off non-critical loads during the non-occupied periods. To control the vending machines, Honeywell proposes to install a vending machine occupancy controller (VMOC) to manage the power consumption. Utilizing a Passive Infrared (PIR) Sensor, the VMOC completely powers down a vending machine when the area surrounding it is unoccupied. Once powered down, the VMOC will monitor the room's temperature and use this information to automatically re-power the vending machine at one to three hour intervals, independent of occupancy, to ensure proper vending product temperature control.

Vending Machine in the Cafeteria. Verona High School

Vending Machines in the Cafeteria. HB Whitehorne MS

The VMOC also monitors electrical current used by the vending machine. This ensures that the unit will never power down a vending machine while the compressor is running, so a high head pressure start never occurs. In addition, the current sensor ensures that every time the vending machine is powered up, the cooling cycle is run to completion before again powering down the vending machine. The Coca Cola Company and Pepsi Corporation approve the proposed controller for use on their machines.

Interface with Existing Equipment

All of the plug load control devices are easily installed. The vending machine controllers are installed separately from the machine, and implementation will occur during working hours. A period of three (3) weeks will be required to verify proper calibration of the sensors.

With respect to the vending machines in your facilities, Honeywell has estimated the number and types of vending machines based on our site tour. During the implementation phase, Honeywell will check with the vendor about the type and specification of the vending machines as it relates to any internal time clocks which may exist inside the machine. Should this be the case, the savings and cost will be adjusted accordingly.

Changes in Infrastructure

New vending machine controls will be installed as part of this ECM.

Customer Support and Coordination with Utilities

Minor coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage.
Waste Production	None.
Environmental Regulations	No environmental impact is expected.

ECM 1D PLUG LOAD MANAGEMENT VIA WI-FI

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
1D	Plug Load Management Via WIFI	✓	✓	✓	✓	✓	✓

Existing Conditions

A byproduct of the electronic devices such as printers, projectors, televisions, and window air conditioning units is their phantom load. Phantom load refers to energy that is used when a device is off. This includes energy used by TV's when they're in standby mode (i.e. when they can be turned on with a remote), and energy used by chargers or a laptop's AC adapter. Studies estimate that phantom load now accounts for 6% of all energy use.

With the increasing number of devices, many facilities managers must rely on people to remember to turn out the lights, or unplug their printers when not in use. These phantom loads

Proposed Solution

Home automation and control technologies have been around for years, and have the potential to reduce the energy used by a wide variety of devices. Plug load management via Wi-Fi provides a simple solution to the device control dilemma, by using an existing Wi-Fi network to program BERT® electrical plugs to a set schedule defined by the end user. These plugs are in essence a switch that stops all electrical power to the device, turning off equipment and eliminating phantom loads.

The Enterprise Application Program (EAP) is installed on one computer on the network, and is used to set schedules, group devices, and monitor activity. On/Off requests are sent through the existing network router using Wi-Fi. Each BERT plug contains a microchip and antenna that communicates with the enterprise application program on a periodic basis. The BERT enterprise application program uses SNMP (Simple Network Management Protocol) to monitor the activity of connected devices (plugs). When a BERT plug receives an "off" command, the module turns off all power supplied to the plug.

The benefits are energy savings and extended bulb life for the white board projectors. It is estimated that one (1) less bulb replacement will be required per year for each projector.

Energy Savings Methodology and Results

Installation of the outlet strips will reduce the operating hours of the connected peripheral devices reducing electrical consumption.

Changes in Infrastructure

Computers and peripherals will be connected new BERT plugs permitting peripheral operation to be coordinated with the computer to which they are connected.

Customer Support and Coordination

None.

Environmental Issues

Resource Use	Annual savings for student computers are based wattage difference between the two monitor types.
Waste Production	This measure will result in disposal of existing CRT monitors.
Environmental Regulations	No environmental impact is expected.

ECM 1E INSTALL DE-STRATIFICATION FANS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
1E	De-Stratification Fans	✓	✓	✓	✓	✓	✓

Existing Conditions

In high ceiling areas such as in a gymnasium and/or cafeteria, warm air stratifies close to the ceiling. Elevated levels of heat transfer through the high walls and roof causes elevated heat loss.

White Gym. Verona HS

New Gym. Lanning Avenue ES

Proposed Solution

In school gyms with 20+ foot ceiling heights, there is approximately a 15°F+ temperature difference between the floor and the ceiling. With higher ceilings it is even greater. That means to generate the heat necessary to maintain a comfortable 70°F temperature at the floor level, where student activities occur, the ceiling could be 85°F or higher.

De-stratification fans de-stratify the air to a zero to 3°F differential from floor to ceiling and wall to wall. This will allow HVAC systems to run for a shorter duration because of the absence of extreme temperatures to heat or cool, thus allowing the local thermostats to be satisfied for longer periods of time.

Systems Evaluation and Selection

Energy-efficient motor drives a near-silent fan that forces a column of hotter air from the ceiling area to the cooler floor below. As this column of warm air nears the floor, it begins to flare out in a circular pattern and rise again creating a torus. While doing so, it warms the cooler air it mixes with near the floor increasing the temperature of the air and floor where people live and work. Through a natural law of physics, this torus will continue to re-circulate air through the de-stratification fan suspended near the ceiling and continue mixing warmer air from the ceiling with cooler air near the floor until the ceiling and air temperatures are nearly equal.

As this happens, it will require less and less energy to comfortably heat the work area, allowing thermostats to be lowered and energy savings to be realized. Once started, the entire process of "thermal equalization" will take on average less than 24 hours.

Based on preliminary site investigation conducted by our staff, we propose to install the following as indicated in the table below:

School	Location	Qty	Type
Laning Avenue Elementary School	New Gym	4	Air Pear 45
Brookdale Avenue Elementary School	Gym	4	Air Pear 25

School	Location	Qty	Type
F.N. Brown Elementary School	Gym	4	Air Pear 15
Forest Avenue Elementary School	Audit - Gym	4	Air Pear 25
H.B. Whitehorne Middle School	Gym	6	Air Pear 25
Verona High School	White Gym	6	Air Pear 45
Verona High School	Maroon Gym	8	Air Pear 45

Table 1E.1 – Proposed De-stratification Fans

Scope of Work

Per De-stratification Fan:

- Shut off the main electric power to the area in which the unit(s) will be installed.
- Install new de-stratification fan and wiring.
- Re-energize.
- Inspect unit operation by performing electrical and harmonics testing.

Changes in Infrastructure

New de-stratification fans will be installed as part of this ECM.

Customer Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced thermal energy usage. A slight increase in electrical energy is resultant from the increase run time of the fan motors.
Waste Production	None.
Environmental Regulations	No environmental impact is expected.

ECM 2A BOILER REPLACEMENTS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2A	Boiler Replacements	✓					

Existing Conditions

In general, the boilers at the Verona SD have been well maintained which has resulted in additional years of operation.

Laning Avenue Elementary School is heated by four (4) natural gas hydronic boilers. Two (2) main 3,000 kBtu/hr "Weil McLain" cast iron sectional boilers produce heating hot water for the main building, and two (2) 400 kBtu/hr Munchkin high efficiency condensing boilers are used to provide heating hot water to the New Gym. The main boilers are located in the basement and are served by two 5 HP circulating pumps. The Munchkin Boilers are located in the crawl space of the 2007 addition and are served by 4 x ¾ Hp circulating pumps.

Laning Avenue ES – Boiler Plant

Laning Avenue ES – Boiler Plant

School	Manufacturer	Model	Qty	Manuf Year	Input (Each)	Equipment Type	Fuel
Laning Avenue School	Weil-McLain	1288	2	1998	3,000 MBH	Hot Water Boiler	Gas

Table 2A.1 – Existing Equipment

Proposed Solution

It is recommended that the boilers listed in Table 2A.1 be replaced with boilers operating at higher efficiency. The existing boilers to be replaced suffer from elevated stack losses as well as jacket losses (radiation losses) due to the age, deterioration of the heat transfer surfaces and obsolete design. New condensing hot water boilers have thermal efficiencies that range from 88% – 95% depending on the return hot water temperature from the heating loop. With proper design, it is typical to see thermal efficiencies of around 92%. Thermal efficiency is only one part of the equation that makes up the seasonal efficiency of a boiler. Compared to the existing boilers in these schools, the new boilers will provide an increase in boiler efficiency of anywhere between 10% to 15%.

Aerco Condensing Boilers

School	Manufacturer	Model	Qty	Input (Each)	Equipment Type	Fuel
Laning Avenue School	Aerco	Benchmark 15	2	1,500 MBH	Condensing Hot Water Boiler	Gas

Table 2A.2 – Proposed Boiler Equipment

Scope of Work

The following outlines the boiler replacement:

- Disconnect gas back to shutoff valve and electric back to source panel-board.
- Remove existing boilers
- Connect gas, heating hot water or steam appurtenances to new boilers.
- Terminate and power new boiler electric circuiting.
- Start up, commissioning and operator training.

Energy Savings Methodology and Results

In general, Honeywell uses the following approach to determine savings for this specific measure:

Existing Boiler Efficiency	= Existing Heat Production/ Existing Fuel Input
Proposed Boiler Efficiency	= Proposed Heat Production/ Proposed Fuel Input
Energy Savings $	= Heating Production (Proposed Efficiency – Existing Efficiency)

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the customer will determine final selections.
Equipment Identification	As part of the ECM design and approval process, specific product selection will be provided for your review and approval.

Changes in Infrastructure

New boiler will be installed in itemized locations; in addition, training for maintenance personnel will be required as well as on-going, annual preventive maintenance.

O&M Impact

The new boilers will decrease the O&M cost significantly for maintaining the boilers.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods. Continuity of service must be maintained for the customer.

Environmental Issues

Resource Use	Energy savings will result from greater combustion efficiency, reduced maintenance costs control and setback.
Waste Production	Existing boilers scheduled for removal will be disposed of properly.
Environmental Regulations	No environmental impact is expected; all regulations will be adhered to in accordance with EPA and local code requirements.

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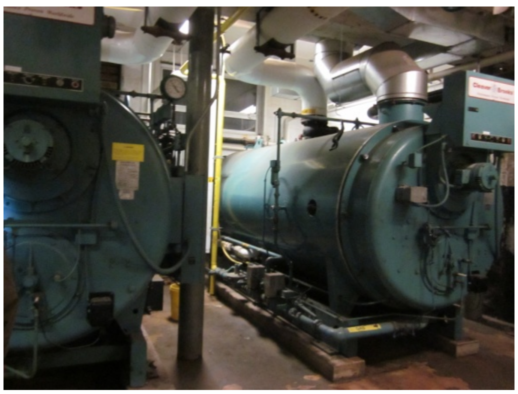
ECM 2B BOILER BURNER CONTROLS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2B	Boiler Burner Controls		✓	✓	✓	✓	

Existing Conditions

Honeywell has surveyed each building's heating and domestic hot water equipment and distribution systems to identify areas for boiler plant optimization. Currently, the existing boilers at all schools only have limited or no fuel / air ratio controls in place. Air to fuel ratio is controlled by a mechanical linkage between the fuel valve and the air damper.



HB Whitehorne M.S. – Boiler Burners

Brookdale Avenue ES – Boiler Burners

Proposed Solution

Typically, boilers are sized to accommodate the coldest days (approximately 5% of the year). During these periods of maximum demand, the burner is constantly on and the boiler is operating at maximum capacity. At all other times, the burner cycles on and off in order to maintain temperature or pressure in the boiler. It is during these periods of lesser demand, that the controller will monitor the boiler make up rate, and efficiently manage the firing of the boiler.

The length of the burner's off-cycle is the best measure of total heating demand or load. In other words, the load is directly related to the time it takes for water (or steam) in the boiler to drop from its high-limit temperature (or pressure) to its low-limit or "call" setting. When demand is high, these off-cycles are short and the on-cycles are longer. When demand is lower, off-cycles are longer and on-cycles are reduced.

The device, which is a microprocessor based computer, constantly monitors the demand on the boiler by assimilating all factors affecting a building's heating requirements, including occupancy, climate, wind chill, solar gain, type of building, and many others.

Proposed Systems and Scope of Work

Honeywell will retrofit the existing Burner Management System on boilers with Honeywell ControLinks™ linkage Fuel/Air Ratio Control system.

Honeywell ControLinks™ will integrate to the existing Burner Management Flame Safe Guard Controller (FSG) to monitor and control the burner fuel and air ratios to maintain proper combustion. The single actuator will be replaced with separate Direct Coupled Actuators (DCA) for air and fuel(s) and will be connected to the existing burner control.

This retrofit will provide a combustion curve and light-off points including minimum/maximum firing rate points resulting in a precise firing rate control over the entire firing rate of the burner. Combustion efficiency will be maximized throughout the combustion curve and will provide a fuel curve in order to achieve maximum efficiency.

Scope of Work

Honeywell ControLinks controllers will be installed on the following boiler burners:

School	Boiler Make	Burner Model	Qty	Boiler Output	Fuel
F.N. Brown E.S.	Cleaver Brooks	Lance	2	3,347	Nat. Gas
Forest Avenue E.S.	Cleaver Brooks	Lance	2	2008	Nat. Gas
H.B. Whitehorne M.S.	Cleaver Brooks	Lance	2	5021	Nat. Gas
Brookdale Avenue E.S.	Cleaver Brooks	Lance	2	2008	Nat. Gas

Table 2B.1 – Existing Boilers to be Installed with ControLinks

This retrofit will provide a combustion curve on the burner system and will provide light-off points as well as minimum/maximum firing rate points resulting in a precise firing rate control over the entire firing rate of the burner. Combustion efficiency will be maximized throughout the combustion curve and will provide fuel curves in order to achieve maximum efficiency.

Energy Savings Methodology and Results

The savings approach is based upon reducing the amount of time the boiler is on without reducing the heating response time or system capacity in response to warmer periods of the year and when demand for heating is low or non-existent. The relative savings is based upon the ratio of off time to burn time and the magnitude is between 10% and 15% of fuel used.

Honeywell ControLinks is a patented burner control unit. This unit eliminates mechanical linkages in the traditional burners and replaces the same with electronic equivalents. This eliminates the sluggish operation of the linkages and significantly decreases response time. The air to fuel ratio is therefore maintained accurately, resulting in fuel savings. Case studies have shown that fuel savings range from 4-8% - Honeywell uses 5% savings to be conservative.

Changes in Infrastructure

A new controller for each boiler will be installed and programmed. In addition to the controllers, training for maintenance personnel will be required.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment that may be utilized. Honeywell and the Customer will determine final selections.
Equipment Identification	As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from greater boiler load control.
Waste Production	This ECM will produce no waste by-products.

Environmental Regulations	No environmental impact is expected.

Utility Interruptions

Proper phasing procedures will minimize gas interruptions.

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ECM 2C PREMIUM EFFICIENCY MOTORS AND VFDS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2C	Premium Efficiency Motors and VFDs	✓				✓	

Existing Conditions

Honeywell has indentified standard efficiency electric motors on hot pumps as well as on the blower fans of your Air Handling Units. Energy savings can be obtained by installing Variable Frequency Drives on the standard efficiency motors.

5.0 Hp Hot Water Pumps. Laning ES

5 Hp Hot Water Pumps. HB Whitehorne MS School

The motors that were identified in the buildings are listed as follows:

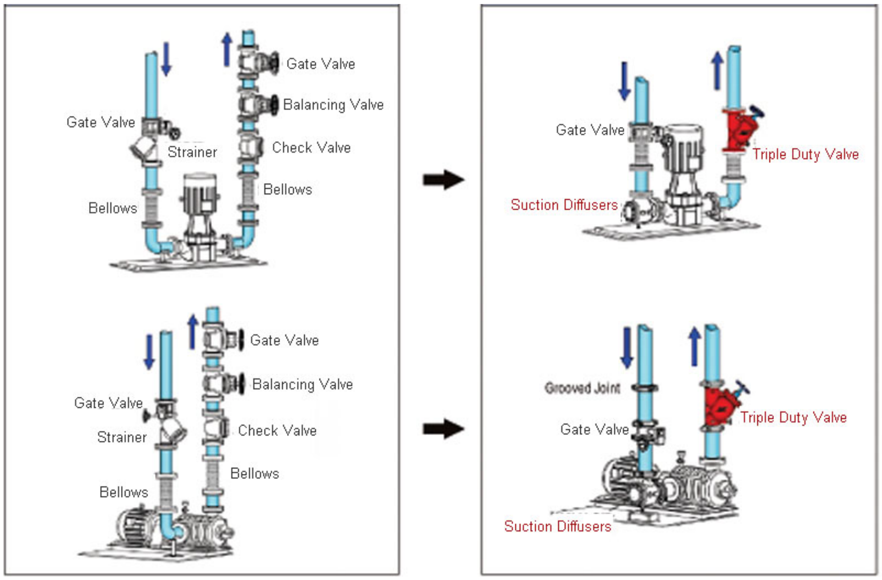
School	Equipment Label	Configuration	Qty	Motor HP	Replace Motor Y/N	Add VFD Y/N
H.B. Whitehorne Middle School	HWP-1.1	Primary	1	5.0	N	Y
H.B. Whitehorne Middle School	HWP-1.2	Standby	1	5.0	N	Y
H.B. Whitehorne Middle School	HWP-2.1	Primary	1	5.0	N	Y
H.B. Whitehorne Middle School	HWP-2.2	Standby	1	5.0	N	Y
Laning Avenue Elementary School	HWP-1	Primary	1	5.0	N	Y
Laning Avenue Elementary School	HWP-2	Standby	1	5.0	N	Y

Table 2C.1 – Existing Motors and Replacements

Proposed Solution

Honeywell proposes the installing VFDs on all above-mentioned single speed standard efficiency motors.

In addition, a new triple duty valve will be installed on Loop 1 at Whitehorne middle school. This new triple duty valve will provide all of the functions normally required on the discharge side of hydronic pump systems. The design combines three valves into one: a calibrated balance valve, a spring loaded check valve, and an isolation/shut-off valve. A diagram of a triple duty valve can be found below:



Scope of Work

1. Install VFDs on the pumps.
2. Install wiring and controls on the new VFDs.
3. Measure and verify the pre and post-retrofit voltage, amperage, and RPM.

Energy Savings Methodology and Results

The energy consumed by electric motors varies inversely to the cube of the motor speed. Variable speed drives reduce motor speed (in response to load) thus reducing energy consumption exponentially.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and Verona SD will determine final selections.
Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Changes in Infrastructure

New motors will be installed in place of the old motors. No expansion of the facilities will be necessary.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will also be required.

Environmental Issues

Resource Use	Energy savings will result from reducing electrical usage by operating higher efficiency motors for the same horsepower output. The equipment uses no other resources.
Waste Production	This measure will produce waste byproducts. Old motors shall be disposed of in accordance with all federal, state and local codes.
Environmental Regulations	No environmental impact is expected.

ECM 2D DOMESTIC HOT WATER REPLACEMENTS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2D	Domestic Hot Water Replacements		✓				

Existing Conditions

Brookdale Avenue ES has two (2) domestic water heaters, located in the boiler mechanical room. One is a 3,600 Watt, 40 gallon, electric water heater and the other is a 40 kBtu/hr 50 gallon natural gas water heater.

Electric DHW Heater. Brookdale Avenue ES

Electric DHW Heater. Brookdale Avenue ES

School	Location Served	Manufacturer	Model	Qty	Capacity	Fuel
Brookdale Avenue ES	Building	A.O. Smith	ECL 40	1	3.6 kW	Gas

Table 2D.1 – Existing Equipment

Possible Solution

Honeywell proposes replacing the existing electric DHW heater at the above school with highly efficient condensing DHW heater. New condensing DHW heaters have efficiencies between 92% - 94%. They provide better control with capabilities as night setback, temperature adjustments and demand control hot water.

School	Location Served	Manufacturer	Model	Qty	Input	Fuel
Brookdale Avenue ES	Building	AO Smith	HEBTX80	1	80 MBH	Gas

Table 2D.2 – Proposed Equipment

Scope of Work

The following outlines the domestic hot water heater replacement:

- Demolish and remove old water heaters
- Furnish and install 2 x condensing gas fired domestic hot water heaters as specified in the table above

- Install all required piping, controls, and breeching
- Install mixing valve
- Install circulators for building use and kitchen supply
- Disconnect hot water storage tank and abandon in place
- Test and commission

Energy Savings Methodology and Results

The savings are calculated from the domestic hot water heater efficiency differences.

Existing Equipment Efficiency	= Existing Boiler Efficiency + Existing Heat Exchanger Efficiency
Proposed Equipment Efficiency	= Efficiency of the New Domestic Hot Water Heater
Energy Savings	= DHW Load x (Existing Equipment Efficiency – New Equipment Efficiency)

Changes in Infrastructure

A new controller for each boiler will be installed and programmed. In addition to the controllers, training for maintenance personnel will be required.

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment that may be utilized. Honeywell and the Customer will determine final selections.
Equipment Identification	As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from improved thermal efficiency.
Waste Production	This ECM will produce no waste by-products.
Environmental Regulations	No environmental impact is expected.

Utility Interruptions

Proper phasing procedures will minimize gas interruptions.

ECM 2E Heat Pump Replacement

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2E	Heat Pump Replacement			✓			

Existing Conditions

The heat pump located in the computer room at F.N. Brown Elementary school is currently out of order. Replaceing this unit with a high efficienvcy unit will save energy costs over the long term and reduce repair costs that would otherwise be necessary to keep the old unit in operation.

Broken Heat Pump Unit. F.N. Brown ES

Existing						
School	Qty.	Make	Model	Location Served	Unit Tonnage	EER
F.N. Brown ES	1	American Air Filter	UAZQ5048BG69ZB5AL22GIB3	Computer Room	3	8

Table 2E.1 – Existing Unit to be Replaced

Proposed Solution

Honeywell proposes to install a Heat Pump Unit Ventilator in lieu of the current unit. The new unit will be installed at the same location as the existing unit and will be equipped with factory installed microprocessor controls that improve unit efficiency. The unit will also communicate with the building management system.

Proposed						
School	Qty.	Make	Model	Location Served	Unit Tonnage	EER
F.N. Brown ES	1	Daikin	UV001	Computer Room	3	10.5

Table 2E.2 – Proposed Unit

However, due to the current unit being relatively new, this ECM is not recommended. It is recommended that a new controller for the heat pump be installed that will allow the unit to operate more efficiently

Scope of Work

The following outlines the scope of work to install the VRV systems stated above:

- Remove window air conditioning units (as required)
- Install condensing units and fan coil units
- Install refrigerant and condensate piping
- Connect electric power
- Start up and commissioning of new units
- Maintenance operator(s) training

Energy Savings Methodology and Results

The savings approach is based on the energy efficiency between the existing and new units. The savings are generally calculated as:

Electric Energy savings	Existing unit energy consumption (kWh) – replacement unit energy consumption (kWh)
Thermal Energy savings	Existing unit energy consumption (kBtu) – replacement unit energy consumption (kBtu)

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the Customer will determine final selections.
Equipment Identification	Product cut sheets and specifications are available upon request. As part of the measure, design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the electrical tie-in will be required.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency units.
Environmental Regulations	No environmental impact is expected.

ECM 2F WINDOW AC UNIT REPLACEMENTS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2F	Window AC Unit Replacements	✓			✓		

Existing Conditions

During walkthroughs window air conditioning were indentified in the classrooms in some of the schools within the district. These units typically have 2 to 2.4 tons of capacity each. Tonnage of these units is based on space size they serve. The existing window air conditioning units range in condition from good to poor, and have an average Estimated Efficiency Ratio of 8. There is also limited temperature/occupancy control of these units, resulting in inefficient operation.

Window AC Unit in Classroom
Laning Ave ES

Window AC Unit in the Library
Forest Avenue ES

Existing						
School	Qty.	Make	Model	Location Served	Unit Tonnage	EER
Forest Avenue ES	1	Emerson	--	Library	2.0	9
Forest Avenue ES	1	Emerson	--	Classroom 11	2.0	9
Laning Avenue ES	1	Frigidaire	FRA2963T2	Classroom 126	2.4	8.5
Laning Avenue ES	0	--	--	Classroom 127	--	--
Laning Avenue ES	1	Frigidaire	FRA2963T2	Classroom 128	2.4	8.5
Laning Avenue ES	1	Frigidaire	FRA2963T2	Classroom 128	2.4	8.5

Table 2F.1 – Existing Window AC Units to be Replaced

Proposed Solution

Replacement of the existing window air conditioners with multi-split units or new variable Refrigerant Flow System will provide reliable service for many years to come. The new units will have higher efficiencies (EER >= 12), lower maintenance cost and may have an otion of being connected to the central BMS. The new units will be sized to provide cooling for the areas that are currently air conditioned, thus eliminating improper sizing and malfunction. The new units will save on operational costs, as well as, reduce energy consumption.

Proposed						
School	Qty.	Make	Model	Location Served	Unit Tonnage	SEER/IEER
Forest Avenue ES	1	Trane	4TTR6036B1000	Library	3.0	16.0
Forest Avenue ES	1	EMI	ZWHA30D00	Classroom 11	2.5	16.0
Laning Avenue ES	2	Trane	4TVX0018B100NB	Classroom 126	1.5	22.7
Laning Avenue ES	2	Trane	4TVX0018B100NB	Classroom 127	1.5	22.7
Laning Avenue ES	2	Trane	4TVX0018B100NB	Classroom 128	1.5	22.7
Laning Avenue ES	2	Trane	4TVX0018B100NB	Classroom 128	1.5	22.7

Table 2F.2 – Proposed

Energy Savings Methodology and Results

The savings approach is based on the energy efficiency between the existing and new units. The savings are generally calculated as:

Electric Energy Savings	Existing unit energy consumption (kWh) – replacement unit energy consumption (kWh)

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. Honeywell and the Customer will determine final selections.
Equipment Identification	Product cut sheets and specifications are available upon request. As part of the measure, design and approval process, specific product selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

None.

Environmental Issues

Resource Use	Energy savings will result from higher efficiency units.
Environmental Regulations	No environmental impact is expected.

ECM 2G WALK-IN COMPRESSOR CONTROLLERS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2G	Walk-In Compressor Controllers					✓	✓

Existing Conditions

In many refrigeration walk-in freezers and coolers, the compressor is oversized and cycles on/off frequently. This compressor cycling results in higher energy consumption and may reduce the life of the compressor.


Walk-In Freezer. HB Whitehorne MS


Walk-In Refrigerator/Freezer. Verona HS

School	Location	Walk-In Refrigerators	Walk-In Freezers
H.B. Whitehorne MS	Kitchen	-	1
Verona HS	Kitchen	1	-

Table 2G.1 – Existing Walk-In Refrig/Freezers to be Installed with Controllers

Proposed Solution

Honeywell will install a controller refrigeration sensor manufactured by Intellidyne at the above-mentioned schools to reduce the compressor cycles of the kitchen walk-in coolers and freezers. The installation of this ECM will have no negative impact on system operation or freezing of food products. By reducing the cycling, the sensor will improve operating efficiency and reduce the electric consumption by 10% to 20%.

This control enhancement will save energy through the reduced compressor cycling in the kitchen walk-in coolers and freezers and will extend the operating life of the compressor. Consequently, the compressor will not have to be replaced as often.

Intellidyne Sensor Features

- Automatic restart on power failure
- Surge protection incorporated into circuitry
- Fully compatible with all energy management systems
- UL listed
- Maintenance free

Intellidyne Sensor Benefits

- Patented process reduces air conditioning electric consumption typically 10% to 20%

- Increased savings without replacing or upgrading costly system components
- "State-of-the-art" microcomputer controller – LED indicators show operating modes
- Protects compressor against momentary power outages and short cycling
- Simple 15-minute installation by qualified installer
- No programming or follow-up visits required
- Maximum year-round efficiency
- Reduces maintenance and extends compressor life
- Fail-safe operation
- Guaranteed to save energy
- UL listed, "Energy Management Equipment"

Intellidyne's patented process determines the cooling demand and thermal characteristics of the entire air conditioning system by analyzing the compressor's cycle pattern, and dynamically modifies that cycle pattern to provide the required amount of cooling in the most efficient manner. This is accomplished in real-time by delaying the start of the next compressor "on" cycle, by an amount determined by the cooling demand analysis. These new patterns also result in less frequent and more efficient compressor cycles.

Energy Savings Methodology and Results

The energy savings for this ECM is realized by the reduction in run time of the compressors and fan motors in the freezers/refrigerators.

Changes in Infrastructure

None

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from the reduced electrical consumption of the compressor.
Waste Production	Any removed parts will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 2H KITCHEN HOOD CONTROLLERS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2H	Kitchen Hood Controllers					✓	✓

Existing Conditions

The kitchens in the Verona SD currently utilize a constant volume kitchen exhaust hood system. This system operates at full load, even when there is no activity in the kitchen. It also requires operating the exhaust fan at full load. This wastes both fan energy and heating energy. When the hood is not utilized, an opportunity exists to reduce airflow and conserve energy.

Kitchen Hood. HB Whitehorne MS

Kitchen Hood. Verona HS

Possible Solution

Honeywell recommends installing an automated DDC control system to control the hood exhaust fan, to ensure the optimal hood performance and to conserve energy. The system will include a new control panel and a set of temperature and optical smoke sensors mounted inside the ends of the hood.

School	Number of Hoods
H.B. Whitehorne MS	1
Verona HS	1

Table 2H.1 – Existing Kitchen Hoods to be installed with Controllers

Scope of Work

1. Install a temperature sensor in the hood to monitor temperature of the exhaust gas
2. Install a set of two photo sensors on the sides to monitor smoke density across the hood
3. Install a control panel with a small point controller and a set of relays in the kitchen close to the hood
4. Provide electric wiring from the new panel to the sensors, exhaust fan motor as well as to the closest electric panel for power supply
5. Provide connection to the BMS system for remote monitoring, control, and alarming. This system could also be stand-alone to save on cost.
6. Commission control components and sequences, and calibrate control loops.

Sequence of operation will enable the exhaust fans when either temperature or smoke density in the range hoods is above a pre-set value. Time delays between start and stop will be programmed to prevent motor short cycling. Schedule programming could be implemented as well.

Energy Savings Methodology and Results

The savings approach is based upon reducing the amount of conditioned air that is being exhausted when there is no cooking taking place.

Changes in Infrastructure

There will be improvements in HVAC equipment and controls for not operating fans continuously.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced energy.
Waste Production	Any removed parts will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 2I STEAM TRAP REPAIR/REPLACEMENT

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
2I	Steam Trap Replacement			✓		✓	

Existing Conditions

FN Brown Elementary School and HB Whitehorne Middle School use steam for space heating within their older sections. Based on the walkthrough and the provided building floor plans, it was estimated that the steam section within FN Brown School contains approximately 38 steam traps, while Whitehorne Middle School has about 20 steam traps. In general, the steam traps surveyed during site vistis were in fair condition.

When steam heats the building and transfers it's heat throughout the building it condenses back to water. Therefore, at each of these end uses, the condensate must be trapped and sent back to the boiler. When steam traps fail, the steam does not condense reducing the heat transfer causing unnecessary heat losses. The inspection and correction of the steam traps will reduce unnecessary losses. Traps are designed to drain only the condensate, and prevent live steam from entering the condensate return piping.

As the distribution system ages, the moving parts in the trap tend to get sluggish or fail altogether. This failure results in live steam entering the condensate return piping. The cumulative effect of this is to return the condensate above the flash point, resulting in steam and hence valuable heating energy loss at the boiler. This loss of energy can be minimized by a thorough survey to identify leaking traps by use of infrared temperature sensing instruments.

Float and T-static (F&T) Steam Trap on the AHU

F.N. Brown ES

T-static Steam Trap on the Unit Heater

H.B. Whitehorne MS

Bldg	Location	# of Steam Traps
F.N. Brown ES	Entire Building	38
H.B. Whitehorne MS	Steam Section of Building	20

Table 2I.1 – Existing Steam Traps

Proposed Solution

This ECM recommends retrofitting the traps per the following scope of work. The steam trap retrofit includes surveying all of the existing steam traps and engineering appropriate replacements. During construction, Honeywell will provide all materials, fittings, labor and supervision for the timely completion of the project. Schedule approximately 80 fittings will be used to re-pipe steam traps only when necessary. All existing strainers, isolation valves, check valves, and fittings in good repair will be reused.

Thermostatic steam traps will be completely replaced with new thermostatic trap bodies. F&T steam traps will include complete replacement with new steam traps manufactured by Barnes & Jones Inc or equal. Atmospheric vacuum breakers will be installed on the air handling unit coils where thermostatic traps are currently being used as release vacuum.

Energy Savings Methodology and Results

All mechanical steam traps lose some live steam, either through normal cycling, leaking through a closed trap, or failing in the open position. Various sources have stated that the loss through a properly operational trap may exceed ten lbs/hour, while the failed steam trap population ranges between 20-50% at any given time.

We have estimated the steam losses based on a conservative figure of 10% failed, 10% leaking steam trap population. Failure rates are based on what has been found in similar buildings elsewhere in and around New Jersey. In determining steam losses, the trap orifices and steam pressures have been grouped and averaged to create a simpler statistical basis.

Equipment Information

Material and Type	Steam Trap selection will be determined in conjunction with Verona SD
Material Identification	As part of the measure, design and approval process. Specific material selection will be provided for your review and approval.

Customer Support and Coordination with Utilities

Coordination of the trap installation.

Environmental Issues

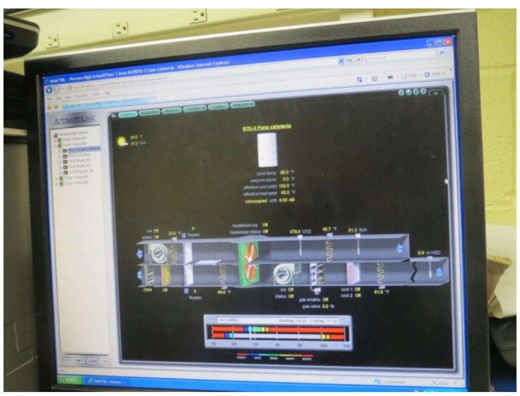
Resource Use	Energy savings will result the reduction of steam loss from malfunctioning traps resulting in lower fuel consumption. The equipment uses no other resources.
Environmental Regulations	Asbestos abatement may be required

ECM 3A BUILDING MANAGEMENT SYSTEM UPGRADES / PNEUMATIC TO DDC CONVERSION

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
3A	Building Management System Upgrades / Pneumatic to DDC	✓	✓	✓	✓	✓	

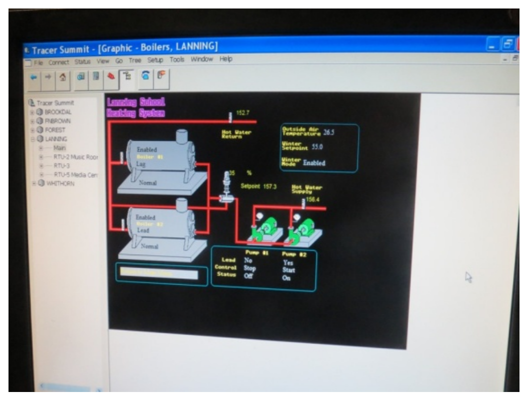
Existing Conditions

Verona High School has been retrofitted with an Automated Logic (ALC) Building Management System (BMS) in 2007 that monitors and controls a portion of the HVAC equipment. Unlike the other schools in the district, the control system at the High School is not as comprehensive and does not include the majority of the HVAC equipment. Spaces controlled by ALC include the Auditorium, Band Room, Cafeteria, and classrooms in the new addition. Equipment in the boiler room, HAC-1 serving inner offices, H&V units in the both Gymnasiums, exhaust fans, and most of the unit ventilators located in the classrooms are controlled by an outdated JCI pneumatic system or stand-alone pneumatic thermostats. This equipment relies on building staff, mechanical time clocks, pneumatic control panels and pneumatic actuators to operate. Exhaust fans, for example, are turned on and off by the maintenance staff and operate for many more hours than necessary. In addition, HAC-1 is controlled from a pneumatic control panel that limits the unit's functionality. Discussions with the school custodians reveled that most of the HVAC units not connected to the ALC system have no schedule and are currently running 24/7.



Snapshot of the Cafeteria Unit from ALC System

Verona High School



HW Graphics from Trane "Tracer"

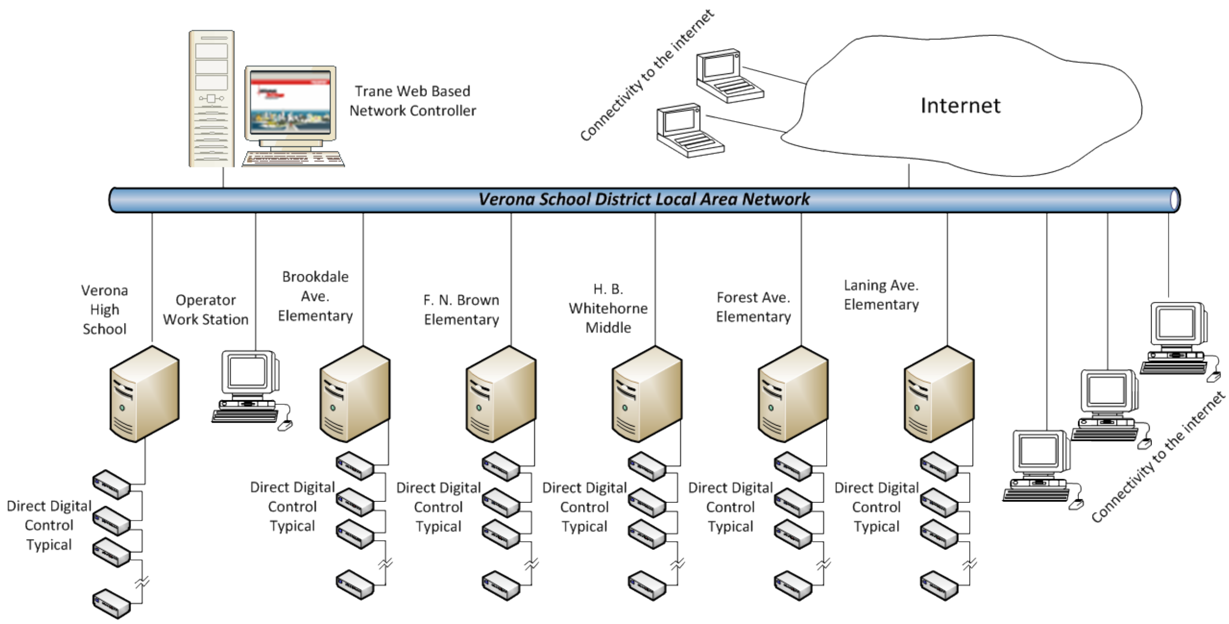
Laning ES

All of your other schools have a fully functional Trane "Tracer" BMS in place to manage operation of the HVAC units. The system was installed in 2007 and unlike the High School; these systems include all UVs, RTUs, AHUs, exhaust fans, pumps, boilers and other equipment. The only units not currently connected to the BMS are Cabinet Unit Hearts (CUH), steam unit heaters and Domestic Hot Water (DHW) heaters.

Building Management System – District Wide Architecture

Honeywell will provide district wide (excluding the High School) integration via an Open Protocol Building Management System platform (BMS) utilizing your existing Trane Tracer BMS. Honeywell will setup a BMS Server; this can be located anywhere in the district and will utilize the Districts existing LAN infrastructure. *The District's IT personnel will be required to provide IP addresses and individual CAT5 LAN connections to the Ethernet backbone.* The BMS server will act as a gathering point for collecting data, accessing point information, distributing alarms, trending and global scheduling. This will allow for one single point of access to all the Honeywell controlled buildings in the District via an installed station client from any PC either on campus or remotely with an internet connection. This technology can also be accessed wireless from any building with 802.11x capability.

Each building's system would be brought into the server system under our scope of work to allow for centralized access, monitoring, trending, scheduling and archiving. Users would access the system via any PC connected to the District's network or via the Internet or Wide Area Network.



Proposed District Wide Architecture

Where pneumatic controls and equipment are replaced with direct digital controls, Honeywell will integrate into and establish communication and control back to the Operator Work Station. Control strategies will be enhanced where possible, providing full control of all the equipment listed in the General scope of work and allowing for alarming, trending, and cost saving control strategies of all controlled equipment.

Scope of Work Summary

The following scope of work is included as part of this proposal:

1. *Implement Demand Controlled Ventilation* for all units serving Gyms, Auditoriums, and Cafeterias, with the exception of unit ventilators.

Equipment to be Included in this ECM

#	School	Unit	Qty	Location	Serves
1	H.B. Whitehorne Middle School	H&V -1-1	1	Gym	Gym
2	H.B. Whitehorne Middle School	H&V -1-2	1	Gym	Gym
3	H.B. Whitehorne Middle School	H&V -1-3	1	Gym	Gym
4	H.B. Whitehorne Middle School	H&V -1-4	1	Gym	Gym
5	H.B. Whitehorne Middle School	AHU-2-1	1	Auditorium	Auditorium
6	H.B. Whitehorne Middle School	AHU-2-2	1	Auditorium	Auditorium
7	H.B. Whitehorne Middle School	RTU-1	1	Cafeteria Annex Roof	Cafeteria Annex
8	F.N. Brown ES	H&V-1-1	1	Auditorium	Auditorium
9	F.N. Brown ES	H&V-1-2	1	Auditorium	Auditorium
10	F.N. Brown ES	AHU-3	1	Gym	Gym
11	Forest Avenue ES	H&V-1	1	Gym	Gym

#	School	Unit	Qty	Location	Serves
12	Forest Avenue ES	H&V-2	1	Gym	Gym
13	Laning Avenue ES	AHU-1	1	Multipurpose	Multipurpose
14	Laning Avenue ES	H&V-2-1	1	New Gymnasium	New Gymnasium
15	Laning Avenue ES	H&V-2-2	1	New Gymnasium	New Gymnasium
16	Laning Avenue ES	RTU-4	1	Media Center	Media Center
17	Brookdale Avenue ES	H&V -1-1	1	Gym	Gym

2. *Provide Direct Digital Controls to convert hot water heating loop to a Variable Primary Flow System at Whitehorne MS and Laning ES as indicated below. Provide the control and alarming of variable speed drives, VFDs, on the existing pump motors and differential pressure transmitters on the HW loops. BAS control as follows:*
   i. Pump speed
   ii. Pump VFD alarm
   iii. Heating water differential pressure sensors (Whitehorn-2, Laning-1)

3. *Install Local Programmable T-stats on the Wall- and Ceiling- Mounted CUHs in the Corridors and Vestibules*

Equipment to be Included in this ECM

#	School	Quantity	Serves
1	F.N. Brown Elementary School	6	Corridors
2	F.N. Brown Elementary School	6	Entrance Vestibules
3	Forest Avenue Elementary School	4	Corridors
4	Forest Avenue Elementary School	4	Entrance Vestibules
5	Brookdale Avenue Elementary School	8	Corridors
6	Brookdale Avenue Elementary School	4	Entrance Vestibules
7	H.B. Whitehorne Middle School	10	Corridors
8	H.B. Whitehorne Middle School	10	Entrance Vestibules
9	Laning Avenue Elementary School	5	Corridors
10	Laning Avenue Elementary School	7	Entrance Vestibules

4. *Install Local Programmable T-stats on the PTAC Units in the Copy Room, Teachers Room and Admin Offices in the Forest Avenue ES.*

5. *Implement programming associated with occupied/unoccupied scheduling of units during night and weekend hours at all schools except the high school.*

6. *Implement Occupied Standby Mode for classrooms for all schools except the high school.*

7. *Furnish and install a field mounted LON based DDC controller to control the existing computer room heat pump unit at F.N. Brown. The current unit has a factory mounted DDC controller that is problematic with regards to the LON profile and communication with the Trane BAS. This new controller will allow the unit to operate more efficiently.*

Energy Savings Methodology and Results

The energy savings for this ECM is realized in the buildings' HVAC equipment due to better control of the HVAC system, night set-back and set-up temperatures, start/stop etc.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced electric energy usage and better occupant comfort.
Waste Production	This measure will produce no waste by-products.
Environmental Regulations	No environmental impact is expected.

ECM 3B DEMAND CONTROL VENTILATION

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
3B	Demand Control Ventilation	✓	✓	✓	✓	✓	✓

Existing Conditions

The roof top and air handling units serving large one zone spaces such as auditoriums, gymnasiums and cafeterias are often designed for peak occupancy conditions to supply outside air to the space with return air from space being exhausted. Most of the time these spaces are not fully occupied, which increase energy demand for heating and cooling of excessive amount of outside air.

Auditorium DCV Opportunity
H.B. Whitehorne MS

Multipurpose Room DCV Opportunity
Laning ES

Proposed Solution

Honeywell will install CO_2 sensors at the below Verona SD locations (see table below for the locations). The CO_2 sensors will provide the control signal for the air handlers to optimize the quantity of fresh air required. The installation of CO_2 sensors will read the levels of CO_2 in the space and ensure that only the required outside air is supplied and heated to meet the minimum outdoor air requirements. This control strategy will reduce amount of outside air intake and thus reduce the heating energy used by the air handling units and electric energy used by the motors. Based on this fact, there is a reduced requirement for outside air to this space

School	Area Served	Number of Units	Motor Hp	CFM Total
H.B. Whitehorne Middle School	Gym	1	2	1,500
H.B. Whitehorne Middle School	Gym	1	5	5,000
H.B. Whitehorne Middle School	Gym	1	2	1,500
H.B. Whitehorne Middle School	Gym	1	2	1,500
H.B. Whitehorne Middle School	Auditorium	1	2	1,500
H.B. Whitehorne Middle School	Auditorium	1	2	1,500
F.N. Brown ES	Auditorium	1	2	1,500
F.N. Brown ES	Auditorium	1	2	2,200
F.N. Brown ES	Gym	1	2	2,200
Forest Avenue ES	Gym	1	3	3,000
Forest Avenue ES	Gym	1	2	1,500
Laning Avenue ES	Multipurpose	1	2	1,500

School	Area Served	Number of Units	Motor Hp	CFM Total
Laning Avenue ES	New Gymnasium	1	2	1,500
Laning Avenue ES	New Gymnasium	1	3	1,500
Brookdale Avenue ES	Gym	1	2	1,500
Brookdale Avenue ES	Gym	1	2	1,500

Table 3B.1 – Existing AHUs to be installed with CO_2 sensors

Energy Savings Methodology and Results

The savings approach is based upon reducing the amount of energy that needs to pre-heat or cool the outside air. The savings are generally calculated as:

Existing Heating BTU & Cost per BTU	= Metered Data from Existing meter readings
Cost of Existing Heating	= Average Site Data $/CCF or $/Gallon
Reduction in Heating/Cooling BTU	= Reduction in Outside air cfm x 1.08 x Delta T x Hours the fan is = Existing BTU x Cost per BTU
Cost of Proposed Heating/Cooling	
Energy Savings $	= Existing Heating Costs – Proposed Heating Costs

The baseline adjustment calculations are included with the energy calculations.

Changes in Infrastructure

None.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods.

Environmental Issues

Resource Use	Energy savings will result from reduced energy.
Waste Production	Any removed parts will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 4A BUILDING ENVELOPE IMPROVEMENTS

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
4A	Building Envelope Improvements	✓	✓	✓	✓	✓	✓

Existing Conditions

Typically, many schools have problems associated with the design and construction of their buildings. Your buildings avoid some of the inefficiency issues associated with more modern construction buildings. Plus, long-term stewardship of your buildings has helped avoid most of the problems often associated with maintenance issues. But there are several significant building envelope retrofit opportunities, which will provide cost savings and comfort improvements to your building occupants.

Verona SD buildings surveyed are masonry in construction. So the areas of concern deal with the openings in the "skin" that are mostly "built-in" during the original construction, created during a "retrofit period" and/or have deteriorated. Air leakage is defined as the "uncontrolled migration of conditioned air through the building envelope" caused by pressure differences due to wind, chimney (or stack) effect, and mechanical systems. It has been shown to represent the single largest source of heat loss or gain through the building envelopes of nearly all types of buildings. Our work has found 30% to 50% of heat loss attributable to air leakage in schools.

Air Gap Between the Classroom Windows
Verona HS

Air Gap Between the Exit Doors
Verona HS

Beyond representing significant energy savings potential, uncontrolled air leakage can affect occupancy comfort, air quality, the imbalance of mechanical systems, and the potential for compromised structural integrity of the building envelope from moisture migration. Control of air leakage involves the sealing of gaps, cracks and holes, using appropriate materials and systems to help create a continuous plane of "air-tightness" to completely encompass the building envelope. Part of this process also incorporates the need to "decouple" floor-to-floor, and to "compartmentalize" components of the building in order to equalize pressure differences. The buildings were inspected visually to identify both the location and severity of air leakage paths. Air leakage paths are detailed in the scope of work below. Floor plans will be used to mark locations of air sealing measures when completed.

Proposed Solution

Roof-Wall Joint

The buildings were found to require roof-wall joint air sealing. To address these problems we recommend using a high performance sealant. In some buildings, a two-component foam will be used. Any cantilevers off the buildings will be sealed with backer rod and sealant. Finally, the inside vestibule corners should be sealed with backer rod and sealant.

Windows and Doors

Most of your building doors require weather stripping and the installation of door sweeps to prevent air leakage. The operable windows in most of your buildings could present air leakage issues that require weather stripping with fuzz or gasket type materials.

Roof Penetrations

There are a number of roof top exhaust fans that require damper cleaning, lubrication, and inspection for proper operation and to seal the roof deck to prevent penetration. Some units may be deemed to be too oversized for this service. The fan final count by the inspector will indicate how many units could be easily serviced without requiring lifting equipment.

Some buildings have roof-top AHUs (air handling units) with ducts that may show air leakage. If there is leakage, these duct penetrations will be sealed with two-component polyurethane foam. Skylights will also be sealed. Sealant will be injected behind the drip cap to eliminate airflow.

Benefits

The sealing of your school buildings will allow for more efficient operation of the buildings by reducing heating and cooling losses throughout the year. In addition, the draftiness of the buildings, along with hot and cold spots, will be reduced as a result of this measure. A reduction in air infiltration will also minimize potential concerns for dirt infiltration or indoor air quality concerns.

Energy Savings Methodology and Results

The energy savings for this ECM are realized at the buildings' HVAC equipment. The improved building envelope will limit conditioned air infiltration through openings in the building air barrier. Less infiltration means less heating required by the heating system.

Changes in Infrastructure

Building envelopes will be improved with little or no noticeable changes.

Customer Support and Coordination with Utilities

Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced HVAC energy usage and better occupant comfort.
Waste Production	Some existing caulking and weather-stripping will be removed and disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 4B ROOF REPLACEMENT

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
4B	Spray Foam Insulated Roof				✓		

Existing Conditions

The heat loss and heat gains occurring due to low R-value of the existing roof insulation can be improved through repair with energy efficient roofing materials or applying a spray foam material. Additionally, roofs in poor condition can lead to water migration and building envelope problems.

During site visits it was learned that flat EPDM sections of the roofs in most of the schools within Verona SD have past their useful lives and must be replaced in the near future. Roofs contained problematic leakage areas, especially around perimeters and equipment curbing. Numerous leaks were identified coming into the building's interior spaces.

Proposed Solution

Honeywell does not recommend this ECM since the roof at Forest Avenue Elementary School was recently repaired. For future repairs, Honeywell proposes the installation of a new, energy efficient Spray Polyethylene Foam (SPF) roofing material over the traditional Ethylene Propylene Diene Monomer (EPDM) single ply roof at Forest Avenue ES. The Poly Spray Foam Roof is one monolithic, self flashing system with air barrier – which will amount to no loss of effective R-value.

Polyurethane Foam Roof – Honeywell Enovate Technology

Energy Efficiency

EPDM Single-ply roof with an initial R-Value of 18 will have a 15%+ loss in thermal resistance due to thermal shorts of steel fasteners. It will also have a 10% increase in thermal transmittance when using a single layer of insulation board. Finally, R-value and air permeability of a deck, insulation and membrane has a major impact on System R-value. This will equate to a final overall System R-value equal to approximately 2.42.

Durability

Single-ply EPDM roof will have a 45 mil water proofing layer, but will also have major fail points such as flashing, seams, fasteners and single-ply punctures. In contrast, the SPF roof will have a top coat plus SPF insulation (which is all water proofing), meaning even damaging the top coat will not create leakage.

Sustainability

Commercial buildings can have a maximum of two roofs in place. In traditional roofing, when a "third" roof is required, a partial or full tear-off is also required. This adds increased cost for tear-off, increased cost for disposal and a negative impact on the environment. With SPF roofing, the top coat is the only part that needs to be re-applied after the warranty period. There is no "tear-off" required or disposal concerns. A quality applied SPF roof should last the life of the building.

Energy Savings Methodology

Following approach is used to determine savings for this specific measure:

Existing Roof Efficiency	= Existing U + Existing Infiltration Rate
Proposed Roof Efficiency	= Proposed U + Proposed Infiltration Rate
Energy Savings (Btu)	= UAdTproposed – UAdTexisting

Winter Savings(Therms)	= Energy Savings/Boiler Eff./100,000
Summer Savings (Tons Cooling)	= Energy Savings/12,000 Btu/Ton

Interface with Building

The new roof will be constructed to match existing, maintaining contours of the existing building.

Energy Savings Methodology

The energy savings for this ECM are realized at the buildings' HVAC equipment. The improved roof will limit conditioned air infiltration through openings in the building air barrier. Less infiltration means less heating and cooling required by HVAC systems.

Changes in Infrastructure

A portion of the roof will be replaced.

Support and Coordination with Utilities

Coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Energy savings will result from reduced HVAC energy usage and better occupant comfort.
Waste Production	Existing roof materials will be removed and disposed of properly.
Environmental Regulations	No environmental impact is expected.

ECM 5A COGENERATION / ENERGY SECURITY

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
5A	Cogeneration / Energy Security						✓

Existing Conditions

Verona High School presents a good opportunity for a combined heat and power (CHP) system, due to the building's 200kW+ steady electric and thermal loads. The State of New Jersey heavy incentivizes cogeneration plants for the purposes of energy security and building efficiency. Best applications and paybacks for a cogeneration plant include facilities that can utilize the waste heat year round and have thermal loads that match the sizing of the plant.

Proposed Solution

Honeywell does not recommend this ECM due to its relatively long payback.

If this ECM was recommended, Honeywell recommends a 65kW CHP cogeneration plant solution for the High School that will produce electricity and utilize waste heat for the hot water heating loops and domestic hot water loop in the building. This ECM will satisfy the high electrical and thermal consumption of the building and provide robust backup generation to support critical loads including network security and allow you to operate this facility in island mode during grid disruptions. The cogeneration plant will be the primary heating source for the building. The new boilers included as part of this proposal will supplement the heating when the cogeneration units do not satisfy the heat requirements of the building and/or domestic hot water loops respectively. This arrangement is done to maximize cogeneration utilization and waste heat recovery from the units. The longer the cogeneration unit runs the more electricity it will produce.

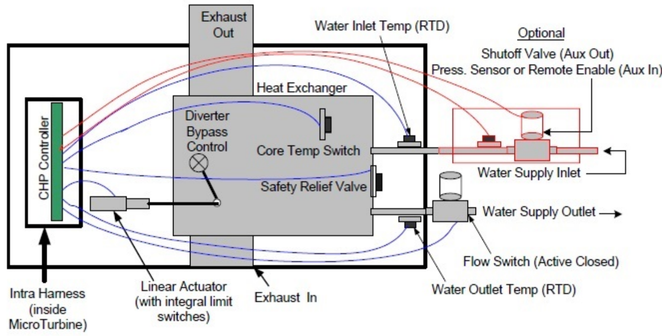
Building	Location	Make	Model	Qty	Capacity (Each)	Fuel
Verona High School	Outside	Capstone	C65-ICHP	1	65 kW	Gas

Table 5A.1 – Proposed Equipment

The cogeneration unit will be installed outside near the boiler plant and will be connected to the main electric switchgear and heating hot water loop. Note that the cogeneration unit may be implemented in conjunction with ECM 2A –"Boiler Replacement" or may be installed as a stand-alone measure on its own.

This cogeneration plant will help to improve efficiency in the building, create energy security, reduce greenhouse emissions, and leverage the other proposed ECMs to their fullest potential. This solution is customized to meet the unique needs of Verona High School, provide backup generation and ensure network security, reduce energy costs and help, promote your sustainability image. Since the unit is a synchronous generator, it does not require any excitation energy to produce electricity and therefore may be used for emergency back-up power. Also, the comprehensive third-party (ETL/IEEE/NYSIR/UL) certifications provide streamlined interconnection permitting with the local electric utility and are NJDEP Air Permit Exempt.

Typical Cogeneration Plant Setup



Cogeneration Diagram

Proposed Solution Benefits:

1) Reduce the building's utility spend
2) Reduce the building's electrical dependency
3) Provide back-up generation and energy security during grid disruptions
4) Offset existing hot water generation by boilers and improve overall thermal efficiency of the heating system
5) Reduction in buildings kW demand and demand charges from the utility

Equipment Information

Manufacturer and Type	Several quality and cost effective manufacturers are available. The following is an example of equipment being utilized. Honeywell and Verona SD will determine final selections. Capstone C65-ICHP, Electrical Output 65 kW, Thermal Output 400,000 Btu/hr
Equipment Identification	Product cut sheets and specifications for generally used are available upon request. As part of the measure design and approval process, specific product selection will be provided for your review and approval.

Energy Savings Methodology and Results

Savings are based on energy conversion of natural gas to electrical energy and a decrease in kW Demand

Changes in Infrastructure

The proposed generator would reside outside the building in a sound proof enclosure unless it is feasible to install the unit indoors.

Customer Support and Coordination with Utilities

Minor support will be required for the interruption of utilities for brief tie-in periods. The Parsippany- Troy Hills School District and Honeywell will decide the exact location of the cogeneration installation at the central utility plant.

Environmental Issues

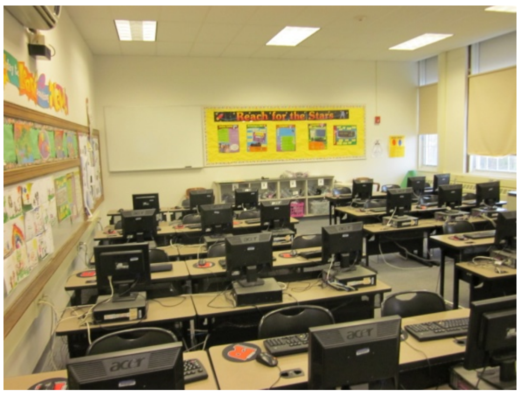
Resource Use	Reduction in electrical consumption and increase in natural gas consumption
Waste Production	This measure will produce combustion gas emissions.
Environmental Regulations	Aside from the environmental benefits from generating renewable energy no other environmental impact is expected.

ECM 6A COMPUTER POWER MANAGEMENT

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
6A	Computer Power Management	✓	✓	✓	✓	✓	✓

Existing Conditions

Information Technology (IT) is a major consumer of energy in school buildings and campuses. At more than 25 percent of total energy consumption energy efficient IT becomes less of a nice-to-have and more of a necessity. IT energy management can no longer be ignored as energy rates continue to rise and as IT demands continue to grow.



FN Brown ES – Computer Classroom

Forest Avenue ES – Computer Classroom

Proposed Solution

Honeywell proposes computer power management software *Surveyor* by Verdiem to manage PC consumption from phantom power, providing a detailed breakdown of usage by IT device type so as to allow energy managers to better plan, manage and optimize an organization's overall power consumption. Energy consumption of distributed IT devices can be reduced by up to 60%. Verdiem helps IT departments to accurately measure IT device energy consumption, enforce policies for greater energy efficiency, and optimize savings.

Verdiem allows a school to accelerate time-to-value with turnkey IT energy management solution VBOX. VBOX is a fully integrated software and hardware appliance for an easy and rapid roll-out. In many schools, it can take months to get a server purchased or a virtual machine provisioned to support a new software solution. Within days, a Verdiem VBOX can be implemented and deployed. Based on a standard 1u server, VBOX is pre-packaged and configured with all necessary components including Verdiem's best-in-class IT energy management solution.

Scope of Work

School	Computers
Laning Avenue Elementary School	47
Brookdale Avenue Elementary School	40
F.N. Brown Elementary School	48
Forest Avenue Elementary School	49
H.B. Whitehorne Middle School	206
Verona High School	245
Totals	615

Table 6A.1 – Approximate School Computer Counts

Energy Savings Methodology and Results

Annual savings for administrative and student computers are based on previous logging results for computers with similar usage types.

Changes in Infrastructure

VBOX server will be integrated into current IT network.

Customer Support and Coordination with Software

Support will be required for software deployment by IT department.

Environmental Issues

Resource Use	Annual savings for administrative and student computers are based on previous logging results for computers with similar usage types.
Waste Production	None.
Environmental Regulations	No environmental impact is expected.

ECM 7A RENEWABLE ENERGY – SOLAR PHOTOVOLTAIC PPA

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
7A	Renewable Energy – Solar Photovoltaic PPA						

Existing Conditions

Currently, there are no solar photovoltaic systems within Verona SD. Discussions with schools officials reveled that most of the roofs in the district have passed their useful lives and must be replaced in the near future. With the roofs in generally poor condition, there is no potential to install a roof mounted solar photovoltaic system, unless the roofs are repaired as part of the PV installation project.

While Honeywell recommends installation of a solar photovoltaic renewable energy system, it was determined based on discussions with Board and Staff members, energy audit information, etc that other facility needs were greater priorities for your ESIP project.

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ECM 8A Water Conservation

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
8A	Water Conservation	✓	✓	✓	✓	✓	✓

Existing Conditions

The use of water in schools has become more of a concern in recent years. Charges for potable water and sewage are now increasing at a rate greater than other utilities. Consequently, retrofits have been developed for different water fixtures found throughout the schools to reduce water consumption. The proposed new fixtures will provide generous savings without harming the functionality of the existing spaces. The enclosed design will standardize water systems utilized throughout the buildings while creating substantial water cost savings for the schools.

Honeywell has investigated the water use at each of these facilities, which has indicated that potential for further savings is obtainable. During a preliminary site walkthrough, most of the existing plumbing fixtures were identified at all six schools. The results of the walkthrough indicated that many of the existing domestic water fixtures do not comply with modern water conservation standards. In addition, maintenance is required to keep some of these aging devices in proper working order. FN Brown Elementary School was noted to have Low Flow sensor-operated water fixtures in the restrooms and is not included into this retrofit proposal.

Floor Mounted China Urinals with Gravity Tank
Verona HS

Conventional Wall Mounted China Urinals
HB Whitehorne MS

Proposed Actions

As part of this proposal, Honeywell has included the following preliminary scope of work.

Replace Water Closets

- Remove wall or floor mounted 3.5 gpf flush valve water closets and replace with 1.28 gpf flush valve water closets and all gravity type toilets with 1.0 pressure assisted water closets.
- Replace flush valve/component assembly on all water closets in this scope. Install new 1.28 gallons per flush valves
- Easy height, ADA fixtures shall be replaced like for like.
- Install water closets, level and stable, using shims if necessary.
- Install new flush valve and tube as level and straight as possible using existing conditions as acceptable goal.

Replace Urinals

- Remove existing urinal and replace with .125 gpf urinal
- Replace flush valve/component assembly on all urinals in this scope

- Replace the angle stop, and flush tube when necessary up to 10% of total fixtures to ensure proper operation of the new fixture.
- Install new flush valve and tube as level and straight as possible using existing conditions as acceptable goal.

Retrofit Urinal Flush Valves

- Replace urinal flush valves with new piston type manual flush valves to achieve 1.0 gpf or less.
- Existing china is to remain in place. Replace flush valve/component assembly on all urinals in this scope using more than 1.0 gpf.
- Replace the angle stop, and flush tube when necessary up to 10% of total fixtures to ensure proper operation of the new fixture.
- Install new flush valve and tube as level and straight as possible using existing conditions as acceptable goal.

Retrofit Faucet Aerators

- Bathroom Aerators: Remove existing aerators from contracted bathroom lavatory faucets and replace with 0.5 gpm flow rate aerators.
- Kitchen/Break Room Aerators: Remove existing aerators from contracted kitchen lavatory faucets and replace with 1.5 gpm flow rate aerators.

Retrofit Showers

- Replace existing showerheads with new 1.5 gpf showerheads.
- Remove old showerheads from site for proper disposal off site.

Water Savings Methodology and Results

This project will reduce the quantity of water consumed by sanitary water fixtures. Honeywell calculates water savings using the difference in measured baseline and post-installation flush volumes or flow rates for toilets, urinals, and faucets and the agreed upon number of uses per day. For purposes of analysis, all baseline toilets, urinals, and faucets found the in the building are grouped together. For each group of fixture type, the toilet and urinal consumption is measured in units of gallons per flush and faucets measured in gallons per minute creating a statistically valid sample of fixtures.

After implementation of this project, a statistically valid sample of each group of sanitary fixtures will be measured. All measurements will be a one-time measurement for the post-installation performance. Measurements will be done similar to those in the baseline measurements.

Frequency of Use	=	Number of users x % year-round occupancy x fixture uses/day/person
Water Savings (gal/yr)	=	*Frequency of Use x (Baseline – Estimated Flow Rate) (gpm or gpf per fixture) x days/year x % high-flow fixtures*
Sink Energy Savings (MMbtu/yr)	=	*Water Savings (gal/yr) x (Tmixed -Tcold) (°F) x (1 Btu/lb °F X 8.34 (lb/gal) x 1/boiler efficiency X 1 MMBtu/1,000,000Btu*
Cost Savings ($/yr)	=	*[Water Savings Toilets and Urinals + Water Savings Sinks] (kgal/yr) x [water rate + sewer rate] ($/kgal) + [(Sink Energy Savings (MMbtu/yr)] x Thermal Rate ($/MMbtu)]*

Changes in Infrastructure

New water fixtures and aerators will be installed as part of this measure

Customer Support and Coordination with Utilities

Minimal coordination efforts will be needed to reduce or limit impact to building occupants.

Environmental Issues

Resource Use	Water savings will result from lower water flows through new fixtures.
Waste Production	Old fixtures will be disposed of properly.
Environmental Regulations	No environmental impact is expected.

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ECM 9A DEMAND RESPONSE – PERMANENT LOAD SHED REDUCTION PROGRAM

ECM	ECM Description	Laning Avenue ES	Brookdale Avenue ES	F.N. Brown ES	Forest Avenue ES	H.B. Whitehorne MS	Verona HS
9A	Demand Response	✓	✓	✓	✓	✓	✓

Existing Conditions

Verona SD currently participates in the PJM Demand Response Program with Constellation through the Middlesex Regional Cooperative.

Proposed Solution

Honeywell proposes to continue to work with a PJM Regional Transmission Organization (RTO), CSR and participate in the Permanent Load Shed Reduction Program which will generate a four year revenue stream for the Verona SD. The PJM programs offer Verona SD the ability to respond to capacity emergencies when called upon by PJM, and benefit from permanent kW load reductions associated with implementing Energy Efficiency (EE) improvements. The permanent load shed reduction program incentivizes kW reducing measures, as some ECMs seen in this response. The payout is good for four years and is based upon what the PJM deems 'Permanent kW Shed', which consists mostly of equipment replacements that reduce kW demand.

The PJM Permanent Load Shed Program / Energy Efficiency Program

Energy efficiency measures consist of installing more efficient devices or implementing more efficient processes/systems that exceed then-current building codes or other relevant standards. An energy efficiency resource must achieve a permanent, continuous reduction in demand for electricity. Energy efficiency measures are fully implemented throughout the delivery year without any requirement of notice, dispatch, or operator intervention. An energy efficiency resource is one that reduced their demand for electricity through an energy efficiency measure that does not require any additional action by the consumer.

Energy Savings Methodology and Results

Revenue is generated through participation in the PJM DR program.

Changes in Infrastructure

None

Customer Support and Coordination with Utilities

Initiation of demand response curtailment will be required.

Environmental Issues

Resource Use	None.

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SECTION D TECHNICAL AND FINANCIAL SUMMARY

1. Recommended ESIP Project

	Recommended ESIP Project
Value of Project	**$3,178,471**
Term of Repayment	**15 Year**
Projected Savings Over Term	**$3,613,421**
Projected NJ Rebates & Incentives	**$459,129**
Projected Interest Rate	**3.00%**

Recommended Project Technical and Financial Summary Documents

Form II: Energy Conservation Measures (ECMs) Summary Form
Form III: Projected Annual Energy Savings Data Form
Form IV: Projected Annual Energy Savings Data Form in MMBTUs
Form V: ESCOs Proposed Final Project Cost Form
Form VI: ESCOs Preliminary Annual Cash Flow Analysis Form

Building by Building Simple Payback Summary

A simple payback summary broken down by building by ECM has been provided for Verona School District's use in reviewing available scope combinations and options.

Building By Building Simple Payback Summary (Hard Costs Only)

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FORM II: RECOMMENDED PROJECT - ENERGY CONSERVATION MEASURES (ECMS) SUMMARY FORM

FORM II

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ENERGY CONSERVATION MEASUREs (ECMs) SUMMARY FORM
VERONA PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **Honeywell International**

Proposed Preliminary Energy Savings Plan: ECMs (Base Project)	Estimated Installed Hard Costs (1) $	Estimated Annual Savings $	Estimated Simple Payback (years)
1A Lighting Upgrades (Includes Drop Down Ceiling Installation at the HS)	$ 949,883	$ 122,294	7.77
1B Lighting Controls and Daylight Harvesting	$ 77,520	$ 6,227	12.45
1C Vending Misers	$ 2,477	$ 599	4.13
1D Plug Load Management	$ 16,075	$ 2,569	6.26
1E Install De-stratification Fans	$ 84,941	$ 6,896	12.32
2A Boiler Replacement	$ 283,136	$ 5,930	47.74
2B Install Honeywell "Controlinks" Boiler Burner Controller	$ 141,568	$ 2,660	53.23
2C Install Premium Efficiency Motors and VFDs	$ 21,760	$ 3,038	7.16
2D Domestic Hot Water Heater Replacement	$ 17,696	$ 533	33.23
2E Heat Pump Replacement	$ 25,954	$ 1,030	25.19
2F Window AC Unit Replacements with Split System	$ 127,411	$ 477	266.93
2G Walk-In Freezer/Cooler Controllers	$ 2,831	$ 169	16.75
2H Kitchen Hood Controllers	$ 70,784	$ 2,769	25.56
2I Steam Trap Replacement/Refurbishment	$ 23,949	$ 5,368	4.46
3A Building Management Control Systems	$ 359,529	$ 38,458	9.35
3B Demand Control Ventilation	$ 37,162	$ 3,531	10.52
4A Building Envelope Improvements	$ 91,937	$ 19,535	4.71
6A Computer Power Management	$ 20,170	$ 6,048	3.33
8A Water Conservation	$ 71,531	$ 4,552	15.71
Add additional lines as needed* **Project Summary:**	$ 2,426,314	$ 232,688	10.43

Optional ECMs Considered, but not included with base project at this time	Estimated Installed Hard Costs (1) $	Estimated Annual Savings $	Estimated Simple Payback (years)
4B Roof Replacement	$ 254,822	$ 1,763	144.55
5A Combined Heat and Power	$ 332,023	$ 21,898	15.16
7A Renewable Energy – Solar Photovoltaic PPA	$ 1,445,174	$ 33,168	43.57
	$ -	$ -	-
	$ -	$ -	-

Add additional lines as needed*

(1) The total value of Hard Costs is defined in accordance with standard AIA definitions that include: Labor Costs, Subcontractor Costs, Cost of Materials & Equipment, Temporary Facilities and Related Items, and Miscellaneous Costs such as Permits, Bonds Taxes, Insurance, Mark-ups, Overhead, Profit, etc.

FORM III: RECOMMENDED PROJECT - PROJECTED ANNUAL ENERGY SAVINGS DATA FORM

FORM III

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP)
PROJECTED ANNUAL ENERGY SAVINGS DATA FORM
VERONA PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **Honeywell International**

The projected annual savings for each fuel type MUST be completed using the following format. Data should be given in the form of fuel units that appear in the utility bills.

Energy/Water	ESCO Developed Baseline (Units)	ESCO Developed Baseline (Costs $)	Proposed Annual Savings (Units)	Proposed Annual Savings (Costs $)
Electric Demand (KW)	7,799	$140,836	2,850	$49,137
Electric Energy (KWH)	2,328,115	$345,107	927,156	$82,909
Natural Gas (therms)	236,678	$210,324	65,703	$58,423
Fuel Oil (Gal)	0	$0	0	$0
Steam (Pounds)				
Water (gallons)				
Other (Specify Units)				
Other (Specify Units)				
Avoided Emissions (1)	Provide in Pounds (Lbs)			
NOX	8,986			
SO2	13,151			
CO2	1,866,298			

(1) ESCOs are to use the rates provided as part of this RFP to calculate Avoided Emissions. Calculation for all project energy savings and greenhouse gas reductions will be conducted in accordance with adopted NJBPU protocols

(2) "ESCOs Developed Baseline": Board's current annual usages and costs as determined by the proposing ESCO; based off Board's utility information as provided to proposing ESCO.

(3) "Proposed Annual Savings": ESCOs proposed annual savings resulting from the Board's implementation of the proposed ESP, as based upon "ESCOs Developed Baseline".

FORM IV: RECOMMENDED PROJECT - PROJECTED ANNUAL ENERGY SAVINGS DATA FORM IN MMBTUs

FORM IV

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP): PROJECTED ANNUAL ENERGY SAVINGS DATA FORM IN MMBTUs VERONA PUBLIC SCHOOLS ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **Honeywell International**

The projected annual energy savings for each fuel type MUST be completed using the following format. Data should be given in equivalent MMBTUs.

ENERGY	ESCO Developed Baseline	ESCO Proposed Savings Annual	Comments
Electric Energy (MMBTUs)	7,944	3,163	
Natural Gas (MMBTUs)	23,668	6,570	
Fuel Oil (MMBTUs)	0	0	
Steam (MMBTUs)			
Other (Specify) (MMBTUs)			
Other (Specify)			

NOTE: MMBTU Defined: A standard unit of measurement used to denote both the amount of heat energy in fuels and the ability of appliances and air conditioning systems to produce heating or cooling.

FORM V: RECOMMENDED PROJECT ESCO'S PROPOSAL PROJECT COST FORM

FORM V

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ESCOs PROPOSED FINAL PROJECT COST FORM FOR BASE CASE PROJECT
VERONA PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **HONEYWELL INTERNATIONAL**

PROPOSED CONSTRUCTION FEES

Fee Category	Fees (1) Dollar ($) Value	Percentage of Hard Costs
Estimated Value of Hard Costs (2):	$2,426,314.00	
Project Service Fees		
Investment Grade Energy Audit	$42,460.50	1.75%
Design Engineering Fees	$169,841.98	7.00%
Construction Management & Project Administration	$121,315.70	5.00%
System Commissioning	$18,197.36	0.75%
Equipment Initial Training Fees	$12,131.57	0.50%
ESCO Overhead	$266,894.54	11.00%
ESCO Profit	$121,315.70	5.00%
Project Service Fees Sub Total	$363,947.10	15.00%
TOTAL FINANCED PROJECT COSTS:	$3,178,471.34	31.00%
ESCO Termination Fee (To be paid only if the School decides not to proceed beyond the ESP)	$0.00	0.00%

PROPOSED ANNUAL SERVICE FEES

First Year Annual Service Fees	Fees (1) Dollar ($) Value	Percentage of Hard Costs
SAVINGS GUARANTEE (OPTION)	$0.00	0.00%
Measurement and Verification (Associated w/ Savings Guarantee Option)	$20,000.00	Flat Fee
ENERGY STAR™ Services (optional)	Included	0.00%
Post Construction Services (If applicable)	N/A	-
Performance Monitoring	Included	-
On-going Training Services	N/A	-
Verification Reports	Included	-
TOTAL FIRST YEAR ANNUAL SERVICES	$20,000.00	Flat Fee

NOTES:
(1) Fees should include all mark-ups, overhead, and profit. Figures stated as a range will NOT be accepted.
(2) The total value of Hard Costs is defined in accordance with standard AIA definitions that include:

Labor Costs, Subcontractor Costs, Cost of Materials and Equipment, Temporary Facilities and Related Items, and Miscellaneous Costs such as Permits, Bonds Taxes, Insurance, Mark-ups, Overhead and Profit, etc.
ESCO's proposed interest rate at the time of submission: 5% TO BE USED BY ALLRESPONDING ESCOs

*Annual Service only applies if customer accepts energy guarantee.

FORM VI: RECOMMENDED PROJECT ESCO'S PRELIMINARY ANNUAL CASH FLOW ANALYSIS FORM

FORM VI

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ESCO's PRELIMINARY ANNUAL CASH FLOW ANALYSIS FORM
VERONA PUBLIC SCHOOLS
ENERGY SAVING IMPROVEMENT PROGRAM

ESCO Name: **Honeywell International**

Note: Proposers must use the following assumptions in all financial calculations:
(a) The cost of all types of energy should be assumed to inflate at: **2.4%** gas, **2.2%** electric per year and
(b) If it is necessary to inflate any other costs, these costs should also be assumed to inflate at: **2.4%** per year (this general inflation factor should NOT include increases in energy costs reflected above in (a), and should be noted if used in any calculation).

1. Term of Agreement: **15** (Years) (Months)
2. Construction Period [(2)] (months): **12**
3. Cash Flow Analysis Format:

Project Cost [(1)]: **$ 3,178,471** Interest Rate to Be Used for Proposal Purpc **3.0%**

Year	Annual Energy Savings	Annual Operational Savings	Energy Rebates/Incentives	Total Annual Savings	Annual Project Costs	Board Costs	Annual Service Costs [(3)]	Net Cash-Flow to Client	Cumulative Cash Flow
Installation			$ 43,847	$ 43,847	$ -	$ -	$ -	$ 43,847	$ 43,847
1	$ 194,169	$ 38,519	$ 195,879	$ 428,567	$ (423,967)	$ (443,967)	$ (20,000)	$ 4,600	$ 48,447
2	$ 198,565	$ 39,443	$ 195,879	$ 433,887	$ (429,287)	$ (429,287)	$ -	$ 4,600	$ 53,047
3	$ 203,060	$ 38,497	$ 11,762	$ 253,319	$ (248,719)	$ (248,719)	$ -	$ 4,600	$ 57,647
4	$ 207,658	$ 37,573	$ 11,762	$ 256,993	$ (252,393)	$ (252,393)	$ -	$ 4,600	$ 62,247
5	$ 212,360	$ 36,671	$ -	$ 249,031	$ (244,431)	$ (244,431)	$ -	$ 4,600	$ 66,847
6	$ 217,168		$ -	$ 217,168	$ (212,568)	$ (212,568)	$ -	$ 4,600	$ 71,447
7	$ 222,086		$ -	$ 222,086	$ (217,486)	$ (217,486)	$ -	$ 4,600	$ 76,047
8	$ 227,115		$ -	$ 227,115	$ (222,515)	$ (222,515)	$ -	$ 4,600	$ 80,647
9	$ 232,258		$ -	$ 232,258	$ (227,658)	$ (227,658)	$ -	$ 4,600	$ 85,247
10	$ 237,518		$ -	$ 237,518	$ (232,918)	$ (232,918)	$ -	$ 4,600	$ 89,847
11	$ 242,897		$ -	$ 242,897	$ (238,297)	$ (238,297)	$ -	$ 4,600	$ 94,447
12	$ 248,399		$ -	$ 248,399	$ (243,799)	$ (243,799)	$ -	$ 4,600	$ 99,047
13	$ 254,025		$ -	$ 254,025	$ (249,425)	$ (249,425)	$ -	$ 4,600	$ 103,647
14	$ 259,778		$ -	$ 259,778	$ (255,178)	$ (255,178)	$ -	$ 4,600	$ 108,247
15	$ 265,663		$ -	$ 265,663	$ (261,640)	$ (261,640)	$ -	$ 4,023	$ 112,269
Totals	$ 3,422,718	$ 190,703	$ 459,129	$ 4,072,551	$ (3,960,281)	$ (3,980,281)	$ (20,000)	$ 112,269	$ 112,269

NOTES:
(1) Includes: Hard costs and project service fees defined in ESCO's PROPOSED "FORM V"
(2) No payments are made by VERONA PUBLIC SCHOOLS during the construction period.
(3) This figure should equal the value indicated on the ESCO's PROPOSED "FORM V". DO NOT include in the Financed Project Costs.

***Annual Service only applies if customer accepts energy guarantee.**

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3. Building by Building Simple Payback Summary (Hard Costs Only)

Building & ECM	kWh Savings ($)	kW Savings ($)	Natural Gas Savings ($)	Fuel Oil Savings ($)	Water Savings ($)	Annual Energy Cost Savings ($)	Annual Operational Savings ($)	Cost ($)	Simple Payback
Brookdale Avenue Elementary School	**$ 5,313**	**$ 4,233.9**	**$ 4,545**	**$ -**	**$ 19**	**$ 18,039**	**$ 3,928**	**$ 234,232**	**10.7**
1A - Lighting Upgrades (Includes Drop Down Ceiling Installation	$ 2,597	$ 4,233.9	$ (254)	$ -	$ -	$ 9,506	$ 2,928	$ 100,046	8.0
1B - Lighting Controls and Daylight Harvesting	$ 262	$ -	$ (26)	$ -	$ -	$ 236	$ -	$ 6,877	29.1
1C - Vending Misers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
1E - Install De-stratification Fans	$ (34)	$ -	$ 753	$ -	$ -	$ 719	$ -	$ 9,438	13.1
2A - Boiler Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2B - Install Honeywell "Controlinks" Boiler Burner Controller	$ -	$ -	$ 413	$ -	$ -	$ 413	$ -	$ 35,392	85.7
2C - Install Premium Efficiency Motors and VFDs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2D - Domestic Hot Water Heater Replacement	$ 1,120	$ -	$ (587)	$ -	$ -	$ 533	$ -	$ 17,696	33.2
3A - Building Management Control Systems	$ 331	$ -	$ 2,793	$ -	$ -	$ 4,124	$ 1,000	$ 50,674	9.9
3B - Demand Control Ventilation	$ 147	$ -	$ 58	$ -	$ -	$ 206	$ -	$ 3,539	17.2
4A - Building Envelope Improvements	$ 618	$ -	$ 1,389	$ -	$ -	$ 2,006	$ -	$ 8,959	4.5
4B - Roof Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
5A - Combined Heat and Power	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
6A - Computer Power Management	$ 272	$ -	$ -	$ -	$ -	$ 272	$ -	$ 1,271	4.7
7A - Renewable Energy – Solar Photovoltaic PPA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
8A - Water Conservation	$ -	$ -	$ 4	$ -	$ 19	$ 23	$ -	$ 340	14.8
9A - Demand Response/Permanent Load Reduction	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
F.N. Brown Elementary School	**$ 6,342**	**$ 7,104.6**	**$ 7,455**	**$ -**	**$ -**	**$ 24,962**	**$ 4,060**	**$ 198,336**	**6.8**
1A - Lighting Upgrades (Includes Drop Down Ceiling Installation	$ 3,892	$ 7,104.6	$ (286)	$ -	$ -	$ 13,770	$ 3,060	$ 74,363	4.4
1B - Lighting Controls and Daylight Harvesting	$ 636	$ -	$ (47)	$ -	$ -	$ 589	$ -	$ 10,731	18.2
1C - Vending Misers	$ 84	$ -	$ -	$ -	$ -	$ 84	$ -	$ 354	4.2
1E - Install De-stratification Fans	$ (22)	$ -	$ 372	$ -	$ -	$ 350	$ -	$ 9,438	26.9
2A - Boiler Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2B - Install Honeywell "Controlinks" Boiler Burner Controller	$ -	$ -	$ 733	$ -	$ -	$ 733	$ -	$ 35,392	48.3
2C - Install Premium Efficiency Motors and VFDs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2D - Domestic Hot Water Heater Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
3A - Building Management Control Systems	$ 413	$ -	$ 4,487	$ -	$ -	$ 5,900	$ 1,000	$ 52,026	7.5
3B - Demand Control Ventilation	$ 179	$ -	$ 119	$ -	$ -	$ 298	$ -	$ 5,309	17.8
4A - Building Envelope Improvements	$ 729	$ -	$ 2,078	$ -	$ -	$ 2,807	$ -	$ 9,198	3.3
4B - Roof Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
5A - Combined Heat and Power	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
6A - Computer Power Management	$ 430	$ -	$ -	$ -	$ -	$ 430	$ -	$ 1,525	3.5
7A - Renewable Energy – Solar Photovoltaic PPA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
8A - Water Conservation	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
9A - Demand Response/Permanent Load Reduction	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Forest Avenue Elementary School	**$ 3,387**	**$ 3,312.8**	**$ 8,206**	**$ -**	**$ 352**	**$ 19,090**	**$ 3,832**	**$ 437,327**	**19.1**
1A - Lighting Upgrades (Includes Drop Down Ceiling Installation	$ 1,832	$ 3,312.8	$ (190)	$ -	$ -	$ 7,787	$ 2,832	$ 73,816	7.0
1B - Lighting Controls and Daylight Harvesting	$ 314	$ -	$ (33)	$ -	$ -	$ 281	$ -	$ 8,099	28.8
1C - Vending Misers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
1E - Install De-stratification Fans	$ (30)	$ -	$ 757	$ -	$ -	$ 727	$ -	$ 9,438	13.0
2A - Boiler Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2B - Install Honeywell "Controlinks" Boiler Burner Controller	$ -	$ -	$ 443	$ -	$ -	$ 443	$ -	$ 35,392	79.9
2C - Install Premium Efficiency Motors and VFDs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2D - Domestic Hot Water Heater Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
3A - Building Management Control Systems	$ 355	$ -	$ 3,395	$ -	$ -	$ 4,750	$ 1,000	$ 37,033	6.4
3B - Demand Control Ventilation	$ 146	$ -	$ 54	$ -	$ -	$ 200	$ -	$ 3,539	17.7
4A - Building Envelope Improvements	$ 308	$ -	$ 2,085	$ -	$ -	$ 2,392	$ -	$ 6,548	2.7
4B - Roof Replacement	$ 170	$ -	$ 1,592	$ -	$ -	$ 1,763	$ -	$ 254,822	144.6
5A - Combined Heat and Power	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
6A - Computer Power Management	$ 292	$ -	$ -	$ -	$ -	$ 292	$ -	$ 1,556	5.3
7A - Renewable Energy – Solar Photovoltaic PPA	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
8A - Water Conservation	$ -	$ -	$ 102	$ -	$ 352	$ 454	$ -	$ 7,084	15.6
9A - Demand Response/Permanent Load Reduction	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-

Verona School District

District Wide Energy Savings Plan

Honeywell

Building & ECM	kWh Savings ($)	kW Savings ($)	Natural Gas Savings ($)	Fuel Oil Savings ($)	Water Savings ($)	Annual Energy Cost Savings ($)	Annual Operational Savings ($)	Cost ($)	Simple Payback
H.B. Whitehorne Middle School	**$ 38,919**	**$ 2,859.4**	**$ 8,424**	**$ -**	**$ 1,059**	**$ 55,847**	**$ 4,586**	**$ 946,063**	**15.7**
1A - Lighting Upgrades (Includes Drop Down Ceiling Installation	$ 17,885	$ 2,843.1	$ (1,012)	$ -	$ -	$ 22,302	$ 2,586	$ 244,043	9.8
1B - Lighting Controls and Daylight Harvesting	$ 1,505	$ -	$ (85)	$ -	$ -	$ 1,420	$ -	$ 11,935	8.4
1C - Vending Misers	$ 108	$ -	$ -	$ -	$ -	$ 108	$ -	$ 354	3.3
1E - Install De-stratification Fans	$ (87)	$ -	$ 1,290	$ -	$ -	$ 1,203	$ -	$ 14,157	11.8
2A - Boiler Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2B - Install Honeywell "Controlinks" Boiler Burner Controller	$ -	$ -	$ 1,071	$ -	$ -	$ 1,071	$ -	$ 35,392	33.1
2C - Install Premium Efficiency Motors and VFDs	$ 1,283	$ 16.3	$ -	$ -	$ -	$ 2,299	$ 1,000	$ 5,899	1.8
2D - Domestic Hot Water Heater Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
3A - Building Management Control Systems	$ 3,018	$ -	$ 2,145	$ -	$ -	$ 6,164	$ 1,000	$ 157,771	22.0
3B - Demand Control Ventilation	$ 631	$ -	$ 290	$ -	$ -	$ 921	$ -	$ 10,618	11.5
4A - Building Envelope Improvements	$ 1,101	$ -	$ 4,513	$ -	$ -	$ 5,614	$ -	$ 27,895	5.0
4B - Roof Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
5A - Combined Heat and Power	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
6A - Computer Power Management	$ 2,388	$ -	$ -	$ -	$ -	$ 2,388	$ -	$ 6,543	2.7
7A - Renewable Energy – Solar Photovoltaic PPA	$ 11,087	$ -	$ -	$ -	$ -	$ 11,087	$ -	$ 412,907	37.2
8A - Water Conservation	$ -	$ -	$ 212	$ -	$ 1,059	$ 1,271	$ -	$ 18,549	14.6
9A - Demand Response/Permanent Load Reduction	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Laning Avenue Elementary School	**$ 14,834**	**$ 1,511.2**	**$ 9,822**	**$ -**	**$ 239**	**$ 34,883**	**$ 8,478**	**$ 725,741**	**16.7**
1A - Lighting Upgrades (Includes Drop Down Ceiling Installation	$ 6,095	$ 1,480.8	$ (340)	$ -	$ -	$ 12,214	$ 4,978	$ 116,372	6.8
1B - Lighting Controls and Daylight Harvesting	$ 711	$ -	$ (40)	$ -	$ -	$ 671	$ -	$ 10,386	15.5
1C - Vending Misers	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
1E - Install De-stratification Fans	$ (73)	$ -	$ 897	$ -	$ -	$ 825	$ -	$ 9,438	11.4
2A - Boiler Replacement	$ -	$ -	$ 3,430	$ -	$ -	$ 5,930	$ 2,500	$ 283,136	33.6
2B - Install Honeywell "Controlinks" Boiler Burner Controller	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2C - Install Premium Efficiency Motors and VFDs	$ 709	$ 30.4	$ -	$ -	$ -	$ 739	$ -	$ 15,862	21.5
2D - Domestic Hot Water Heater Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
3A - Building Management Control Systems	$ 711	$ -	$ 4,175	$ -	$ -	$ 5,885	$ 1,000	$ 62,024	9.0
3B - Demand Control Ventilation	$ 276	$ -	$ 111	$ -	$ -	$ 387	$ -	$ 5,309	13.7
4A - Building Envelope Improvements	$ 461	$ -	$ 1,548	$ -	$ -	$ 2,009	$ -	$ 10,966	5.5
4B - Roof Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
5A - Combined Heat and Power	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
6A - Computer Power Management	$ 532	$ -	$ -	$ -	$ -	$ 532	$ -	$ 1,493	2.8
7A - Renewable Energy – Solar Photovoltaic PPA	$ 5,413	$ -	$ -	$ -	$ -	$ 5,413	$ -	$ 206,453	38.1
8A - Water Conservation	$ -	$ -	$ 40	$ -	$ 239	$ 279	$ -	$ 4,301	15.4
9A - Demand Response/Permanent Load Reduction	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Verona High School	**$ 71,707**	**$ 41,423.6**	**$ (2,985)**	**$ -**	**$ 2,031**	**$ 124,312**	**$ 12,135**	**$ 1,649,630**	**12.1**
1A - Lighting Upgrades (Includes Drop Down Ceiling Installation	$ 15,567	$ 30,115.0	$ (1,101)	$ -	$ -	$ 56,716	$ 12,135	$ 341,241	5.0
1B - Lighting Controls and Daylight Harvesting	$ 3,260	$ -	$ (230)	$ -	$ -	$ 3,029	$ -	$ 29,492	9.7
1C - Vending Misers	$ 407	$ -	$ -	$ -	$ -	$ 407	$ -	$ 1,770	4.3
1E - Install De-stratification Fans	$ (196)	$ -	$ 3,268	$ -	$ -	$ 3,072	$ -	$ 33,033	10.8
2A - Boiler Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2B - Install Honeywell "Controlinks" Boiler Burner Controller	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2C - Install Premium Efficiency Motors and VFDs	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
2D - Domestic Hot Water Heater Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
3A - Building Management Control Systems	$ 3,830	$ -	$ 7,804	$ -	$ -	$ 11,634	$ -	$ -	-
3B - Demand Control Ventilation	$ 1,214	$ -	$ 305	$ -	$ -	$ 1,519	$ -	$ 8,848	5.8
4A - Building Envelope Improvements	$ 875	$ -	$ 3,832	$ -	$ -	$ 4,707	$ -	$ 28,371	6.0
4B - Roof Replacement	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
5A - Combined Heat and Power	$ 27,948	$ 11,308.6	$ (17,358)	$ -	$ -	$ 21,898	$ -	$ 332,023	15.2
6A - Computer Power Management	$ 2,135	$ -	$ -	$ -	$ -	$ 2,135	$ -	$ 7,782	3.6
7A - Renewable Energy – Solar Photovoltaic PPA	$ 16,668	$ -	$ -	$ -	$ -	$ 16,668	$ -	$ 825,813	49.5
8A - Water Conservation	$ -	$ -	$ 495	$ -	$ 2,031	$ 2,526	$ -	$ 41,256	16.3
9A - Demand Response/Permanent Load Reduction	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	-
Project Total	**$ 140,502**	**$ 60,445.4**	**$ 35,467**	**$ -**	**$ 3,700**	**$ 277,133**	**$ 37,019**	**$ 4,191,329**	**13.3**

4. Utility and Other Rebates and Incentives

NJ Pay-for-Performance Program (P4P)

Honeywell has been certified as a Pay for Performance Program Partner to provide technical services under direct contract to you. Acting as your energy expert, Honeywell will develop an Energy Reduction Plan for each project with a whole-building technical component of a traditional energy audit, a financial plan for funding the energy efficient measures and a construction schedule for installation. This supports your ability to take a comprehensive, whole-building approach to saving energy in your existing facilities and earn incentives that are directly linked to your savings.

Eligibility

Existing commercial, industrial and institutional buildings with a peak demand over 100 kW for any of the preceding twelve months are eligible to participate including hotels and casinos, large office buildings, multi-family buildings, supermarkets, manufacturing facilities, schools, shopping malls and restaurants. Buildings that fall into the following five customer classes are not required to meet the 100kW demand in order to participate in the Program: hospitals, public colleges and universities, nonprofits, affordable multifamily housing, and local governmental entities. Your Energy Reduction Plan must define a comprehensive package of measures capable of reducing the existing energy consumption of your building by 15% or more to utilize the Pay Performance Program.

ENERGY STAR Portfolio Manager

Pay for Performance takes advantage of the ENERGY STAR Program with Portfolio Manager, EPA's interactive tool that allows facility managers to track and evaluate energy and water consumption across all of their buildings. The tool provides the opportunity to load in the characteristics and energy usage of your buildings and determine an energy performance benchmark score. You can then assess energy management goals over time, identify strategic opportunities for savings, and receive EPA recognition for superior energy performance.

Incentives

Incentives for the P4P program are based on the annual electric and natural gas savings produced by the Energy Conservation Measures. There are three incentives to the program; details are included in the follow page. The first incentive is distributed after a finalized project is selected and bid. This usually occurs shortly before construction starts or shortly thereafter. The second incentive is distributed a few months after construction is completed, while the third incentive is distributed usually thirteen to fourteen months after the second incentive - once a year of building usage, post-retrofit, is completed.

Incentives, Rebates and Grants Summary

Honeywell has a great deal of experience in applying for, and successfully securing, all available incentives, rebates and grants for our clients. We have been approved for over $5.7M of incentives on behalf of our New Jersey customers alone since the introduction of the Energy Savings Improvement Program legislation in 2009. The New Jersey programs employed included primarily the Office of Clean Energy's Pay for Performance and Cogeneration Incentives. A table of the incentive amounts on a per project basis is provided below.

Building	Rebate Amount
Elizabeth Schools	$934,209
Phillipsburg School District	$496,005
NH-Voorhees Regional HS District	$771,063
Bridgewater-Raritan Regional District	$1,313,470
Hanover Township School District	$343,139
Robbinsville Public School District	$529,092

Building	Rebate Amount
Camden County Technical Schools	$1,210,370
Town of Kearny	$145,002
Frankford School District	$50,657

In regard to the Verona Board of Education Project, Honeywell has determined that the District is eligible for $412,080 in total incentives between the P4P program rebates and grants. Additional Incentives are available through the PJM Demand program and are estimated in the final cash flow form VI.

Please refer to the tables on the following page for a breakdown of the Verona Board of Education incentive levels on a building by building basis for each type of incentive.

Recommended Project

	P4P			
Building	First Incentive	Second Incentive	Third Incentive	Total Incentive
Laning Avenue Elementary School	$ 5,000	$ 24,206	$ 24,206	$ 53,411
Brookdale Avenue Elementary School	$ 5,000	$ 15,363	$ 15,363	$ 35,726
F.N. Brown Elementary School	$ 5,000	$ 23,137	$ 23,137	$ 51,275
Forest Avenue Elementary School	$ 5,000	$ 16,210	$ 16,210	$ 37,421
H.B. Whitehorne Middle School	$ 11,822	$ 44,986	$ 44,986	$ 101,795
Verona High School	$ 12,025	$ 60,214	$ 60,214	$ 132,453
TOTALS	$ 43,847	$ 184,116	$ 184,116	$ 412,080

5. Financing the ESIP

In accordance with P.L.2012, c.55 an ESIP can be financed through energy savings obligations. The term refers to the two primary financing tools, debt and lease-purchase instruments. Each of these options is discussed below.

Energy savings obligations shall not be used to finance maintenance, guarantees, or the required third party verification of energy conservation measures guarantees. Energy saving obligations, however, may include the costs of an energy audit and the cost of verification of energy savings as part of adopting an energy savings plan or upon commissioning. While the audit and verification costs may be financed, they are not to be considered in the energy savings plan as a cost to be offset with savings.

In all cases, maturity schedules of lease-purchase agreements or energy savings obligations shall not exceed the estimated average useful life of the energy conservation measures.

An ESIP can also include installation of renewable energy facilities, such as solar panels. Under an energy savings plan, solar panels can be installed, and the reduced cost of energy reflected as savings.

The law also provides that the cost of energy saving obligations may be treated as an element of the local unit's utility budget, as it replaces energy costs.

Debt Issuance

The law specifically authorizes municipalities, school districts, counties, and fire districts to issue refunding bonds as a general obligation, backed with full faith and credit of the local unit to finance the ESIP. Because an ESIP does not effectively authorize new costs or taxpayer obligations, the refunding bond is appropriate, as it does not affect debt limits, or in the case of a board of education, require voter approval. The routine procedures for refunding bonds found in the Local Bond Law and Public School Bond Law would be followed for issuance of debt, along with any required Bond Anticipation Notes as authorized pursuant to law.

With regard to bonds for public schools, the Department of Education (DoE) has concluded that debt financed ESIP projects are not covered by State aid for debt service or a "Section 15 EFFCA Grant" as there is no new local debt being authorized.

Tax-Exempt Lease Purchase Financing

The tax-exempt lease is a common form of financing for ESIP projects. Tax-exempt leasing is a tool that meets the basic objectives of debt, spreading the cost of financing over the life of an asset, while avoiding constitutional or statutory limitations on issuing public debt. If structured properly, by including non-appropriation language in the financing documents, the tax-exempt lease will not be considered debt for state law purposes but will be considered debt for federal income tax purposes. Thus for federal purposes, the interest component of the lease payment is tax-exempt.

Under the New Jersey Energy Savings Improvement Program (ESIP), the District may authorize a lease purchase agreement between the District and a financier. Ownership of the equipment or improved facilities will pass to the District when all the lease payments have been made. There are legal expenses and other minimal closing costs associated with this type of structure. The lease purchase agreement may not exceed 15 years (commencing upon completion of the construction work), or 20 years where a combined heat and power or cogeneration plant is included in the project. The primary benefits of a lease are lower rates and the acquisition of essential use property without creating debt.

Under a lease there is typically a single investor. The lease may have non-appropriation language that allows the District to access low tax exempt rates. Some previous customers have chosen to remove the non-appropriation language which has resulted in lower competitive rates.

Repayment of the lease payments is tailored to meet the requirements of the Verona School District. Payments are typically scheduled to commence after the construction is complete and acceptance of the project has been received by the District. Typically, payment terms are structured so there is no up-front capital expense to the District and payments are aligned within your cash flow and fiscal limits.

Certificates of Participation (COP's)

Certificates of Participation are another form of a lease purchase agreement with the differentiating factor being that there are multiple investors participating in the purchase of the lease. COP's require financial disclosure and are typically utilized on higher value projects where one investor doesn't have the capacity to hold a high value lease for a single customer.

Energy Savings Obligations

Energy Savings Obligations can be issued as refunding bonds in accordance with the requirements of N.J.S.A *40A:11-4.6(c)(3)*. These bonds may be funded through appropriation for the utility services in the annual budget of the contract unit and may be issued as refunding bonds pursuant to N.J.S.40A:2-52 et seq., including the issuance of bond anticipation notes as may be necessary, provided that all such bonds and notes mature within the periods authorized for such energy savings obligations. Energy savings obligations may be issued either through the contracting unit or another public agency authorized to undertake financing on behalf of the unit but does not require bond referendum.

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SECTION E MEASUREMENT & VERIFICATION AND MAINTENANCE PLAN

1. Baseline

The purpose for establishing a baseline for an energy performance project is to accurately predict what the energy consumption and costs would have been as if the energy project was never completed. The baseline can then be used to measure the improvement in efficiency and determine the overall energy savings of the project. Since the energy consumption of all facilities is somewhat effected by variable weather conditions, a baseline for heating and cooling systems is typically dependent on degree-days or outside temperature. A baseline also needs to incorporate changes in facility use, such as a change in hours of operation or increased levels of outside air. Once again, if these changes would have occurred in the absence of the energy project, they should be incorporated into the project's baseline.

Honeywell will calculate the baseline based on the systems and operating conditions as they currently exist. Honeywell finds baseline development most accurate if specific measurements are taken on equipment over a period of time (early in the audit phase) to determine actual kW, kWh, oil and gas consumption, cfm, gpm, hours of use, etc. A summary of some of the methods, which will be used by Honeywell to establish baselines and support, calculated savings are listed below.

1. Spot measurements of electrical loads such as lighting, fan and pump motors, chillers, electric heat, etc.
2. Measurement of equipment operating hours using electric data recorders.
3. Measurement of existing operating conditions using data recorders for space temperature and humidity, air handler temperatures (mixed, return, cooling and heating coil discharges), and space occupancy using lighting loggers.
4. Spot measurement for boiler efficiencies, water use.
5. Running measurements of chiller operation, including simultaneous measurement of input kWh or steam flow, and chilled water supply and return temperatures and flow (gpm).
6. Records of operating conditions from building management systems and utility-grade meters.

The data from the above is used to calculate existing energy use, which is then reconciled with current facility utility bills, and adjusted as required to provide a mutually agreed baseline.

To provide valid savings evaluations, Honeywell's maintains a significant inventory of metering equipment utilized by its auditors and Energy Engineers to ascertain critical data about the operation of the facility.

Typically, Honeywell's auditors use the following equipment for their onsite measurements:

1. Recording and instantaneous power and harmonic analyzers.
2. Data loggers for pressures, temperatures, flow rates, humidity and CO_2.
3. Lighting level and recording profile/run-hour and occupancy meters.
4. Multimeters, hand held kW meters.
5. Combustion analyzers.
6. Ultrasonic flow meters.
7. Infrared thermometers

The ECMs installed in many projects allow for energy savings to be identified by direct metering or a combination of metering and calculations with accepted assumptions. In the case of lighting, for example, it is relatively easy to meter representative samples of unique fixture types, both before and after a retrofit, to determine the power consumption difference in Watts. When multiplied by the quantity of each fixture type, the total connected load reduction can be derived. In combination with run time assumptions, or meters, the electrical reduction can be accurately determined. Where possible, direct measurement of ECMs during construction (before and after the retrofit) coupled with energy savings calculations is a method the Honeywell finds to be very accurate and cost-effective.

Due to the nature of some ECMs, or when a combination of ECMs is installed, individual (discrete) metering may not be either possible or able to fully document a baseline and calculate savings. Many of these situations can be handled by combining results from metering along with either engineering-based calculations or output from nationally recognized building simulation programs such as DOE II, ASEAM, TRACE or HAP. This method would be used for ECMs such as night setback, and where no other ECMs have significant interaction with the setback measure.

Formulas exercised in energy savings calculations follow the laws of physics, and many are included in the ASHRAE Handbook of Fundamentals. However, such calculations (i.e. equipment operation profiles) must be tempered by experience, past retrofit practice, and expectations of future operating conditions to arrive at achievable values in practice. Honeywell always reviews each and every project, in detail, for the anticipated savings and never hesitates to reduce the anticipated energy calculations where experience dictates necessary. The final result is a coupled project where the final savings are equal to or greater than anticipated.

Calculating the units of energy saved is a critical measure of energy efficiency improvements, but it does not indicate the actual dollars saved. To do this, Honeywell and the Township of Hillsborough BOE will establish the base rates that will act as "floor" rates in calculating the savings. These are usually the rates that are in effect at the time of the start of the contract or rates used for audit estimated savings.

2. Adjustment to Baseline Methodology[1]

Honeywell's methodology for establishing and adjusting the baseline is determined by the characteristics of the facility, the conservation technology being installed, the technology being replaced, the type of measurement and verification the Township of Hillsborough BOE requires and the needs of the District for future changes in facility use.

The purpose of this flexible approach is to make the most accurate possible measurement of the changes in energy uses that are specifically attributable to Honeywell installed ECMs. This creates the ability over the life of the contract to continue measuring only savings achieved by Honeywell and leaves the Township of Hillsborough BOE free to make future changes to the building or systems without affecting the savings agreement. It also necessitates fewer provisions for making adjustments to the baseline.

Modifications to the energy baseline or savings will be made for any of the following:

1. Changes in the number of days in the annual review cycle.
2. Changes in the square footage of the facilities.
3. Changes in the operational schedules of the facilities.
4. Changes in facility indoor temperatures.
5. Significant changes in climate.
6. Significant changes in the amount of equipment or lighting utilized in the facility.

Examples of situations where the baseline needs to be adjusted are: i) changes in the amount of space being air conditioned, ii) changes in auxiliary systems (towers, pumps, etc.) and iii) changes in occupancy or schedule. If the baseline conditions for these factors are not well documented it becomes difficult, if not impossible, to properly adjust them when they change and require changes to payment calculations. To compensate for any addition and deletion of buildings and impact on the baseline model, Honeywell will use sound technical methodologies to adjust the baseline. An example would be to add or delete building energy impact via the calculated cooling load in tons as a percentage of the existing campus tonnage baseline or use indices like W/ft^2 and Btu/ft^2 to calculate the energy consumption of the building and then add or subtract the energy usage to or from the baseline energy consumption.

3. Energy Savings Calculations

In calculating energy savings, Honeywell's highly experienced audit staff uses onsite surveys and measurements, National Oceanic and Atmospheric Administration weather data, detailed discussions with the client's operations and maintenance personnel and engineers, utility records, and other sources to ensure accurate energy, water and O&M savings.

Typically, the following data is gathered:

[1] The energy baseline modifications shall use commonly accepted energy engineering methods that are mutually agreeable to both Honeywell and customer. Should agreement on these methods, including the climate adjustments, not be reached between Honeywell and customer, both parties could appeal to an independent engineering.

1. Local weather data.
2. Utility bills and sub-metered consumption trends.
3. Utility rate structure.
4. Facility use and occupancy data.
5. Internal equipment loads.
6. Interviews of operations and maintenance staff and management.
7. Building construction, age, use and layout.
8. Schematics of energy and water distribution systems.
9. Identification and inventory of HVAC equipment.
10. Identification and inventory of process equipment.
11. Design, configuration and operating characteristics of HVAC systems.
12. Design, configuration and operating characteristics of process systems.
13. Control strategies and sequences of operation for HVAC and other process equipment.
14. Identification and count of all lighting fixtures and determination of power consumption for each type.
15. Identification and inventory of lighting control methods.
16. Measurement of foot-candle levels at sample locations.
17. Power quality and harmonics, power factor.
18. Indoor air quality issues.

Calculating the units of energy saved is a critical measure of energy efficiency improvements, but it does not indicate the actual dollars saved. To do this, Honeywell and the Township of Hillsborough BOE will establish the base rates that will act as "floor" rates in calculating the savings. These are usually the rates that are in effect at the time of the start of the contract or rates used for audit estimated savings.

The equation below will be used to calculate the annual savings in dollars.

$$AnnualSavings(\$) = \sum_{m=1}^{12}\{\left(Rate_{kWh,Base} \times kWh_{Saved,m}\right) + (Rate_{fuel\ Oil,\ Base} \times Fuel\ Oil_{Saved,\ gal,\ m}) + (Rate_{Steam,\ Base} \times Steam_{Saved,\ klbs,\ m}) + (Rate_{NG} \times NG_{Saved,\ MCF,\ m})\} + Agreed(\$)$$

where:

$Rate_{kWh,Base}$= defined base rate for kWh consumption
$kWh_{Saved,m}$= calculated kWh savings for month *m*

$Rate_{Fuel\ Oil,\ Base}$= defined base rate for fuel Oil savings (XX/gal.)
$Fuel\ Oil_{Saved,m}$= calculated chilled water savings in gal. for month *m*

$Rate_{Steam,Base}$= defined base rate for steam consumption ($XX/MMBtu.)
$Steam_{Saved,m}$= calculated Steam savings in MMBtu. for month *m*

$Rate_{NG,Base}$= defined base rate for natural gas consumption ($XX/Therm)
$NG_{Saved,m}$= calculated natural gas savings in Therms for month *m*

Agreed($)= Annual savings in dollars (water, sewer, maintenance, etc.)

Honeywell assigns dollar values to the true incremental value of savings for energy and water. In other words, we do not combine for example, demand and consumptions numbers so that there is an average value to savings. Honeywell looks at each incremental rate to units saved to properly determine the value (dollar) to the Township of Hillsborough BOE or “real bill reductions”. As noted in the RFP energy escalation rates will be established in accordance with New Jersey Board of Public Utility guidelines.

Based on this, Honeywell will review all utility bills (hourly data), tariffs, special contracts and commodity contracts to develop the incremental value (costs) of each utility.

The O&M savings is typically a function of existing the Verona School District’s budgets (labor & direct costs), maintenance contracts and operations (supplier) contracts. Honeywell will analyze the information to provide a conservative savings representation for the Verona School District’s review and acceptance. The information will include all calculations and assumptions.

4. Measurement & Verification

The purpose of performing any monitoring and verification is to establish an agreed upon process that provides the customer both a level of satisfaction that the improvements have been delivered and ongoing information as to their operation and performance. Additionally, this effort will be used to assess the actual dollars of savings versus the guarantee level.

It is essential for the success of this program that Honeywell and the Township of Hillsborough BOE agree on a mutually acceptable methodology for measuring and verifying energy savings that are attributable to the energy conservation measures (ECMs) Honeywell installs. This M&V plan provides the procedures to document the energy and cost savings of each of the proposed ECMs.

The plan for monitoring and verifying energy savings for the proposed ECMs is based on the methods described in the *International Performance Measurement and Verification Protocol (IPMVP)*[2]. Our approach to M&V is directly consistent with, and in compliance with, the IPMVP. This protocol provides a framework for the most widely accepted and used M&V methods by the industry.

Engineering calculations of energy and cost savings for the project are based on operating parameters (such as weather, temperature settings, run hours, occupancy patterns, and space usage) and equipment performance characteristics. The M&V plan uses the operating parameters established in the baseline for all savings calculations during the term of the project. The intent of the M&V plan is to verify that the ECMs installed by Honeywell will provide the expected energy savings. Therefore, Honeywell will collect data and relative information during the post-retrofit period to demonstrate that the installed equipment is performing at expected levels. It is assumed that the Township of Hillsborough BOE will continue to be a dynamic institution adding or renovating buildings and desiring to retain the right to set comfort and operating characteristics. To accommodate this, Honeywell will develop its M&V plan in a way that allows the District to adapt to the demands of future campus growth and changes without the need for the Township of Hillsborough BOE and Honeywell to negotiate energy baseline adjustments.

Our typical M&V plan will utilize broadband Internet access to the appropriate Township of Hillsborough BOE control interfaces to both confirm operating status and to download trend data to verify proper equipment maintenance.

One year after the commencement date of the ECMs, Honeywell will submit a report verifying and calculating the energy and cost savings for the first year. This report will be submitted for facility review and approval. For the remaining contract term, Honeywell will provide annual reports. These reports will include results of inspections of the installed equipment/systems, energy and cost savings, and recommendations to provide optimum energy performance.

The following table lists the information concerning typical M&V equipment used:

Instrument	Make
Power Multimeter	Fluke 39
Light Meter	Osram or Phillips
Portable Temperature/Humidity Multimeter	TSI
Retractable Insertion Vortex Flow meter	Hydro-Flow Model 3100
BTU Meter	Hydro-Flow BTU-121 BTU/Energy Measurement System
KW/KWH Transducers	Veris Industries (H6000 SERIES)

All permanent measurement equipment will be purchased new with a calibration certificate from the manufacturer. The power multi-meter and the TSI multi-meter will be calibrated annually before using them in the annual inspection.

General Approach to M&V

Energy and water savings are determined by comparing the energy and water use associated with a facility or certain systems within a facility before and after the installation of an ECM or other measure. The "before" case is the baseline. The "after" case is the post-installation or performance period. Baseline and post-installation energy use measurements or estimates can be

[2] www.ipmvp.org.

constructed using the methods associated with M&V options A, B, C, and D, as described in the IPMVP. The challenge of M&V is to balance M&V costs, accuracy, and repeatability with the value of the ECM(s) or systems being evaluated, and to increase the potential for greater savings by careful monitoring and reporting.

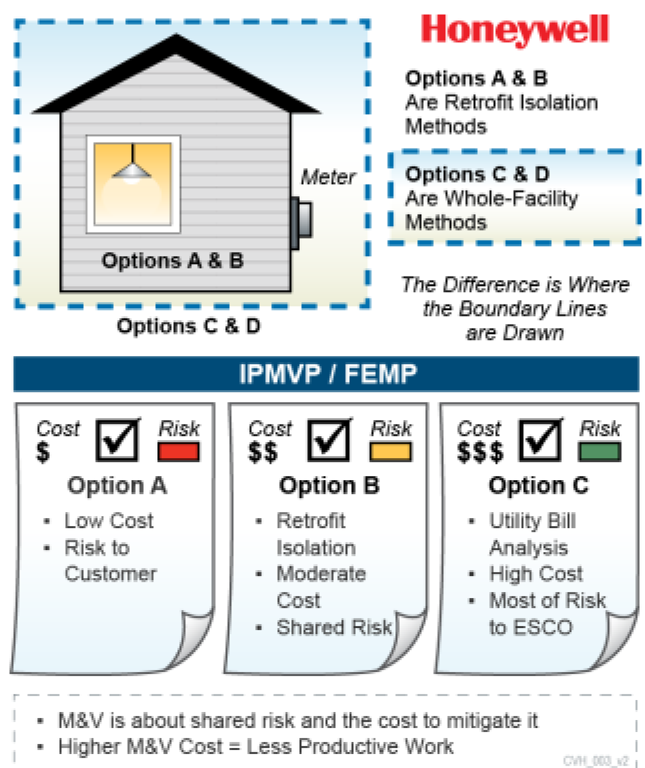
M&V Options

The IPMVP guidelines classify the M&V procedures into four categories, Options A, B, C and D. As shown in the table below, these options differ in their approach to the level of complexity of the M&V procedures.

M&V Option	Performance Verification Techniques
Option A Verifying that the measure has the potential to perform and to generate savings.	Engineering calculations before and after installation spot measurements and use of EMS data points with stipulated values.
Option B Verifying that the measure has the potential to perform and verifying actual performance by end use.	Engineering calculations with metering and monitoring strategy throughout term of the contract
Option C Verifying that the measure has the potential to perform and verifying actual performance (whole building analysis.)	Utility meter billing analysis-using techniques from simple comparison to multivariable regression analysis.
Option D Verifying actual performance and savings through simulation of facility components and/or the whole facility	Calibrated energy simulation/modeling; calibrated with hourly or monthly utility billing data and/or end-use metering.

Option A is appropriate for ECMs that have energy use that can be readily quantified, such as the use of high efficiency lighting fixtures, high efficiency constant speed motors, and other standard engineering calculations.

Option B is appropriate for ECMs that require periodic or on-going measurements to quantify energy use; such as the use of variable frequency drives on pump or fan motors.



Option C is used for ECMs for which the energy use or energy savings cannot be measured directly, such as building envelope modifications. Option C is based on the use of utility meters to quantify building energy use.

Option D is used for ECMs for which the energy use or energy savings cannot be measured directly, or savings for individual ECMs are heavily interdependent. Calibrated building simulation is used to separate the energy savings attributable to each ECM.

In general,

ECM Energy Savings = Baseline Energy Use - Post-Installation Energy Use

And

Energy Cost savings ($) = Total Energy Savings x Contractual Energy Rates

Exceptions to this simple equation are as follows:

Projects where an on/off M&V method is used. For example, after a new energy management system is installed, control features are turned off for a set period of time to recreate baseline conditions. Thus, savings are determined after installation by comparing energy use with and without the control features activated.

Since energy use at a facility is rarely, if ever, constant, another way to define M&V is as a comparison of a facility's post-installation energy use with its usage if the ECM or system had not been installed. This takes into account situations in which baseline energy use must be adjusted to account for changing conditions, such as changes in facility operation, occupancy, or use or external factors such as weather.

Post-Retrofit M&V Activities

There are two components associated with M&V of performance contract projects:

1. Verifying the potential of the ECM to generate savings also stated as confirming that the proper equipment/systems were installed, are performing to specification and have the potential to generate the predicted savings.
2. Determining/verify energy savings achieved by the installed ECM(s).

Verifying the Potential to Generate Savings

Verifying baseline and post-installation conditions involves inspections (or observations), spot measurements, and/or commissioning activities. Commissioning includes the following activities:

- Documentation of ECM or system design assumptions
- Documentation of the ECM or system design intent for use by contractors, agencies and operators
- Functional performance testing and documentation necessary for evaluating the ECM or system for acceptance
- Adjusting the ECM or system to meet actual needs within the capability of the system

Post-Installation Verification

Post-installation M&V verification will be conducted by both Honeywell and the Client to ensure that the proper equipment/systems that were installed are operating correctly and have the potential to generate the predicted savings. Verification methods may include surveys, inspections, and/or spot or short-term metering.

Regular Interval Post-Installation Verification

At least annually, Honeywell will verify that the installed equipment/systems have been properly maintained, continue to operate correctly, and continue to have the potential to generate the predicted savings. Savings report for all the installed ECMs will be submitted each year after the acceptance date of the work performed by Honeywell.

Computation of Energy Savings

After the ECMs are installed, energy and cost savings will be determined annually by Honeywell in accordance with an agreed-upon M&V approach, as defined in a project-specific M&V plan.

Construction/Interim Savings

Construction or Interim savings are usually measured by using the same methodology as described in the detail M&V plan for each ECM. The start and the completion time for each ECM must be agreed to between Honeywell and the Verona School District.

Electricity and thermal savings from the ECMs where no detailed long-term data is required to be collected will be stipulated and will be based on the starting and the final completion dates and verification of the operation of the ECMs. For other ECMs where long-term data collection is required by the M&V plan, data will be used to calculate the savings using the same equations as described in the detail plan. For example, to calculate electricity savings for the installation of a VFD, the kW is spot measured at a set speed for selected motors through a sampling plan. The measured kW is subtracted from the baseline kW to calculating the savings. Thermal savings are tied to the electrical savings in the manner described in the detail M&V plan. The results are extrapolated to cover all the VFDs installed by Honeywell.

The savings for each of the monitored VFD is calculated on an interval basis as follows:

$kW_{Saved} = (kW_{Base} – kW_{Spot\ Measured})$

kWh_{Saved} = Estimated operating hours during the interim period * kW_{Saved}

The total kWh savings is the sum of the kWh_{Saved} for all the installed VFDs.

5. Site Specific M&V Plan

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
ECM 1A - Lighting Upgrades	Upgrade Lighting systems: Re-lamp/Re-ballast T-8 to LED New Fixtures Incandescent to LED Metal Halide and Sodium Vapor to LED High Bays	Option A: Pre and Post measurements Line by Line scope and engineering calculations	Pre M&V: Measurement of KW for 5% sample fixtures in each category Data log usage hours Data Log occupancy schedules Update Line by Line scope with measured KW and usage hours Post M&V: Measurement of KW for 5% sample fixtures in each category Usage Hours to remain same Occupancy schedules to remain same Energy Savings : Update Line by Line scope with measured KW and usage hours and compare to pre retrofit calculated savings
ECM 1C – Vending Misers	Install Vending machine energy management devices	Option A: Pre and Post measurements Line by Line scope and engineering calculations	Pre M&V: Measurement of KW for 5% sample machines in each category Data log usage hours Data Log occupancy schedules Update Line by Line scope with measured KW and usage hours Post M&V: Measurement of KW for 5% sample machines in each category Usage Hours to remain same Energy Savings scope with measured KW and usage hours and compare to pre retrofit calculated savings
ECM 1D – Plug Load Management via Wi-Fi	Install Plug load management System Using District Wi-Fi	Option A Engineering calculations based on decreased consumption	Pre M&V: Measure typical computer usage Post M&V: Measure typical computer usage once software is installed Verify savings with engineering calculations
ECM 1E - De-Stratification Fans	Install De-Stratification fans in Gymnasiums , Cafeterias and Auditoriums to minimize stratification of hot air and maintain hot air flow below the fan level	Option C: Fuel Savings Utility Bill Comparison for all fuel related measures	Pre M&V: Verify parameters used in engineering calculations with equipment name plate data and savings assumptions Post M&V: Fuel: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 2A –	Replace boilers in select	Option C:	Pre M&V:

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
Boiler Upgrades	locations in kind to handle base load	Utility Bill Comparison for all fuel related measures	Baseline annual fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform combustion efficiency test on boilers Post M&V: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform efficiency test on replaced boilers to insure operating conditions are maintained
ECM 2B - Boiler Burner Controls	Install new boiler burner controls on existing units	Option C Utility Bill Comparison for all fuel related measures	Pre M&V: Baseline annual fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Post M&V: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 2C - Premium Efficiency Motors and VFDs	Install Variable Frequency Drives on hot water and chilled water pumps to operate the pump motors in response to the system load. Replace antiquated motors with new premium efficiency motors	Option A: Engineering calculations for variable frequency drives following pump affinity laws. Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement motors	Pre M&V: Verify manufacturer provided data for the pump performance data and motor efficiencies. Post M&V: Obtain trend data for VFD operation from the BMS system to verify baseline calculation assumptions on system loads Verify efficiency of new motors Verify manufacturer provided data for new chiller efficiency (kW/ton) – verify the new equipment and controls are installed and commissioned as recommended by manufacturer
ECM 2D – Domestic Hot Water Replacement	Replace existing domestic hot water heater with condensing natural gas domestic hot water heater	Option C: Utility Bill Comparison for all fuel related measures	Pre M&V: Baseline annual fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform combustion efficiency test on boilers Post M&V: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform efficiency test on replaced boilers to insure operating conditions are maintained
ECM 2E - Heat Pump Replacement	Replace antiquated Heat Pump with high efficiency equivalent	Option A Electric energy savings - Engineering calculations based on programmed parameters. Option C: Fuel Savings	Pre M&V: Verify existing operating parameters match the baseline calculation assumptions Post M&V: Verify that systems are installed as specified and controls are programmed to match the savings assumptions Electric Energy:

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
		Utility Bill Comparison for all fuel related measures	Verify savings based on programmed parameters and engineering calculations Fuel: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 2F – Window AC Unit Replacements	Replace antiquated Window AC Units with new high efficiency Split System models	Option A: Engineering calculations based on nameplate and manufacturer supplied data for the existing and replacement Window Unit	Pre M&V: Verify manufacturer provided data for existing unit efficiency (SEER) Post M&V: Verify manufacturer provided data for new condensing AC unit (SEER) – verify the new equipment and controls are installed and commissioned as recommended by manufacturer
ECM 2G – Walk-In Freezer/Cooler Controllers	Install control device on walk-in freezer and refrigerator evaporators to shut down the fan motor when the compressor is off on duty cycle	Option A: Stipulated Engineering calculations based on case studies for the Intellidyne control	Pre M&V: None Post M&V: Savings stipulated based on engineering calculations for the term of contract
ECM 2H - Kitchen Hood Controls	Install control devices on the Kitchen hoods to control exhaust air in response to the cooking load. Replace fan motors with new premium efficiency motors and VFD drives	Option A: Engineering calculations for variable frequency drives following affinity laws. Engineering calculations based on nameplate, manufacturer supplied data and operating hours for the existing and replacement motors	Pre M&V: Verify manufacturer provided data for the motor performance data and motor efficiencies. Post M&V: Obtain trend data for VFD operation from the BMS system to verify baseline calculation assumptions on system loads Verify efficiency of new motors
ECM 2I – Steam Trap Replacement	Replace failed steam traps throughout steam buildings	Option C: Utility Bill Comparison for all fuel related measures	Pre M&V: Baseline annual fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Post M&V: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 3A - Building Management System Upgrades / Pneumatic to DDC	Upgrade Building Management Systems to DDC and integrate all systems to a central platform such that the systems may be monitored and controlled	Option A: Electric energy savings - Engineering calculations based on programmed parameters. Option C: Fuel Savings Utility Bill Comparison for all fuel	Pre M&V: Verify existing operating parameters match the baseline calculation assumptions Post M&V: Verify that systems are installed as specified and controls are programmed to match the savings assumptions Electric Energy: Verify savings based on programmed parameters and engineering calculations

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
Conversion	as programmed to maintain global settings such as night set back , optimum stop-start etc	related measures	Fuel: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 3B - Demand Control Ventilation	Install Demand Control Ventilations System with Carbon Di Oxide sensors installed to modulate the outdoor air intake for air handling system based on space occupancy variations	Option A: Electric energy savings - Engineering calculations based on industry standards Option C: Fuel Savings Utility Bill Comparison for all fuel related measures	Pre M&V: Verify parameters used in engineering calculations with equipment name plate data and savings assumptions Post M&V: Verify that systems are installed as specified and controls are programmed to match the savings assumptions Electric Energy: Verify savings based on verified parameters and engineering calculations Fuel: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 4A - Building Envelope Improvements	Install weather stripping on doors, seal roof wall joints and roof penetrations	Option A: Electric energy savings - Engineering calculations based on programmed parameters. Option C: Fuel Savings Utility Bill Comparison for all fuel related measures	Pre M&V: Verify parameters used in engineering calculations with site conditions Post M&V: Fuel: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 4B – Spray Foam Insulated Roof	Install foam spray roof to increase the R-Value of the existing roof and seal exterior leaks	Option A: Electric energy savings Engineering calculations based on the difference in the R-Values of the old and new windows Option C: Fuel Savings Utility Bill Comparison for all fuel related measures	Pre M&V: Validate of replaced square footage Post M&V: Validate R-values of roof replaced against manufacturer specifications Electric Energy: Post retrofit verification data applied against engineering calculations and contractual utility rates Fuel: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days
ECM 5A – Cogeneration	Install Cogeneration units and tie into existing heating and domestic hot water system.	Option A Engineering calculations based on nameplate and manufacturer supplied data for the cogeneration	Pre M&V: Baseline annual fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform combustion efficiency test on boilers

ECM # and Name	Summary of ECM	Measurement and Verification Methodology / Recommendation	Description of M&V – Pre and Post Process
		units and - engineering calculations based on programmed parameters. Option C Utility Bill Comparison for all fuel related measures	Verify parameters used in engineering calculations with site conditions Post M&V: Compare post installation M&V fuel cost based on fuel billing data and Metrix tuned to normalize to heating degree days Perform efficiency test on replaced boilers to insure operating conditions are maintained
ECM 6A - Computer Power Management	Install computer management software to decrease power consumption	Option A: Engineering calculations based on decreased consumption	Pre M&V: Measure typical computer usage Post M&V: Measure typical computer usage once software is installed Verify savings with engineering calculations
ECM 7A - Solar Photovoltaic PPA	Install Solar Energy arrays at designated schools energy (green energy)	Option A - Engineering calculations based on decreased consumption	Pre M&V: None Post M&V: Savings measured and recorded by dedicated meter installed for the system
ECM 8A – Water Conservation	Replace regular water fixtures with Low Flow water saving fixtures	Option A: Engineering calculations based on decreased consumption	Pre M&V: Detailed fixture count. Baseline water usage from the utility bills. Student population and school schedules provided by the District. Flow (gpm or gpf) field measurements. Post M&V: Detail fixture count. Occupancy and usage equal baseline hours for fixtures. Flow (gpm or gpf) from sample measurements, manufacturer data/published flow tables. One-time visual inspection of physical condition on a sample of fixtures. Check replacement inventory, interview staff for maintenance and operational problems.
ECM 9A - Permanent Load Reduction	Participate in utility demand response program	Option A : Stipulated Savings based on incentives offered by Utility (ISO)	Pre M&V: None Post M&V: Savings stipulated based on incentives offered by Utility (ISO)

6. Guarantee of Savings

The approach that Honeywell utilizes in this asset management program includes two key components: a *performance guarantee* and *financial savings*. Honeywell guarantees the District that all installations and work performed are subject to final inspection and the District's acceptance. This procedure ensures all work will be to the level of quality the District expects.

Honeywell also guarantees it will meet the objectives mutually defined with the District. Honeywell takes its commitment to partner with Verona School District for the life of the contract seriously, and looks forward to a successful, long-term partnership.

Honeywell considers the guarantee to be the cornerstone of our service to you. To be considered a *performance contract* an energy guarantee is an optional component under the New Jersey Energy Savings Improvement Program (ESIP) legislation. The basis of an energy performance contract is that the majority of risk is shifted from the District to the ESCO. The strength of the Guarantee is only as good as the Company backing it and their financial solvency. With over $37 Billion in assets, Honeywell has the financial strength and background to support the District for the long term.

<u>Savings Guarantee:</u> With the understanding that Verona School District must maintain fiscal health and accountability, Honeywell can financially guarantee the results of its programs and clearly support this obligation with the commitment to regular review of program results and reconciliation. Honeywell's financial strength and stability give it the ability to extend a <u>FIRST-PARTY GUARANTEE</u> to Verona School District. A first party guarantee eliminates the risk on the District and places it directly onto Honeywell. This differs from some other ESCO's who provide a third-party guarantee, which insulates them from the owner through the use of insurance instruments.

If at the end of any year the program has not met or exceeded the guaranteed savings for that year, Honeywell will refund the difference between the guaranteed amount and what was actually saved.

For all equipment covered by the Energy Savings Guarantee, Verona School District shall be responsible for on-going maintenance and component replacement in accordance with manufacturer's standards. The customer will also be responsible for operating the equipment in accordance with manufacturer's specifications.

Honeywell will develop savings methodologies that follow current industry practice, such as outlined by the New Jersey Board of Public Utilities (BPU) and Federal Energy Management Program's (FEMP) M&V Guidelines: Measurement and Verification for Federal Energy Projects. References to M&V protocols from the International Performance Measurement and Verification Protocol (IPMVP), ASHRAE Guideline 14 and the Air-Conditioning Refrigeration Institute (ARI) are used to further qualify the M&V plan.

As stated above, under the New Jersey ESIP legislation acceptance of a performance guarantee is optional at Verona School District sole discretion. In the same way, the duration of the guarantee is also optional. Many of Honeywell's New Jersey customers have elected to keep the guarantee in force for less than the total performance periods, i.e. three (3) to five (5) years. Others have elected to accept a one (1) year guarantee, while reserving the option to renew for additional years after they have had the opportunity to review the track record of actual savings results. Obviously, this a very customer specific decision based on the risk management culture of each unique organization. The key point is that Honeywell is flexible with regard to the structure and duration of the guarantee. The final terms will be discussed and defined as part of our co-authored ESIP project.

Solely for informational purposes, it is worth noting that if the District does elect to accept a guarantee, New Jersey ESIP law requires that the District contract with a third-party independent firm to verify that the energy savings are realized. In order to preserve the independent status of this contractor these costs are required to be incurred directly by the District.

The RFP requires that the cost of the guarantee be identified during this response phase. Honeywell develops and implements every project with the same high level of detail and confidence and therefore will always provide a Savings Guarantee at no additional cost. However, if the District opts to accept the Savings Guarantee, an annual cost of $15,000 (Fifteen Thousand Dollars) will be applicable to account for on-going Honeywell service costs incurred during the measurement and verification of the savings.

All guarantees require that the owner maintain the system in accordance with the manufacturer's specifications. Regardless of guarantee acceptance, ongoing maintenance as recommended by the BPU, Honeywell and / or manufacturer specifications is required to achieve the projected energy savings. Maintenance should also include a periodic verification of the system to make sure the maintenance is properly conducted and the system is meeting the original specifications and design.

7. Recommended Preventive Maintenance Services

A Comprehensive Portfolio, a Customized Approach.

Honeywell offers a uniquely comprehensive portfolio of services – one of the most extensive in the industry. As part of the Energy Savings Plan, we recommend the following services for consideration to ensure achievement of the Energy Savings outlined in this plan

According to the NJ ESIP program, all services are required to be bid by the school district for services as desired. Based on Honeywell's vast service organization, we are uniquely qualified to develop design specification for the public bidding according to NJ Law.

Honeywell strongly believes that the long-term success of any conservation program is equally dependent upon the appropriate application of energy savings technologies, as well as solid fundamental maintenance and support. One of the primary contributors to energy waste and premature physical plant deterioration is the lack of operations, personnel training and equipment maintenance.

Honeywell recommends routine maintenance on the following systems throughout the district for the duration of an energy guarantee of savings

Maintenance, Repair and Retrofit Services:

- Mechanical Systems
- Building Automation Systems
- Temperature Control Systems
- Air Filtration

Honeywell will work with the School District to evaluate current maintenance practices and procedures. This information will be the basis of a preventive maintenance and performance management plan designed to maximize building operating efficiencies, extend the useful life of your equipment and support the designed Energy Savings Plan.

At a minimum, we recommend the following tasks be performed on a quarterly basis with the district wide Building Management System.

System Support Services

1. Review recent mechanical system operation and issues with customer primary contact, on a monthly basis.
2. Review online automation system operation and event history logs and provide summary status to the customer primary contact. Identify systemic or commonly re-occurring events.
3. Check with customer primary contact and logbook to verify that all software programs are operating correctly.
4. Identify issues and prioritize maintenance requests as required.
5. Provide technical support services for trouble shooting and problem solving as required during scheduled visits.
6. Provide ongoing system review and operations training support; including two semi-annual lunches and learn sessions.
7. Establish dedicated, site-specific emergency stock of spare parts to ensure prompt replacement of critical components. These will be stored in a secure location with controlled access.

Configuration Management

1. Update documentation and software archives with any minor changes to software made during maintenance work.
2. Verify and record operating systems and databases.
3. Record system software revisions and update levels.

4. Archive software in designated offsite Honeywell storage facility, on an annual basis.
5. Provide offline software imaging for disaster recovery procedures, updated on a regular basis.

Front End / PC Service
1. Verify operation of personal computer and software:
2. Check for PC errors on boot up
3. Check for Windows errors on boot up
4. Check for software operations and performance, responsiveness of system, speed of software
5. Routinely backup system files, on an annual basis:
6. Trend data, alarm information and operator activity data
7. Custom graphics and other information
8. Ensure disaster recovery procedures are updated with current files
9. Clean drives and PC housing, on an annual basis:
10. Open PC and remove dust and dirt from fans and surfaces
11. Open PC interface assemblies and remove dust and dirt
12. Clean and verify operation of monitors.
13. Verify printer operation, check ribbon or ink.
14. Initiate and check log printing functions.
15. Verify modem operation (if applicable).
16. Review IVR schedule for alarms and review (if applicable).

TEMPERATURE CONTROLS

UNIT VENTS

Services Performed
Annual Inspection

1. Inspect motor and lubricate.
2. Lubricate fan bearings.
3. Inspect coil(s) for leaks.
4. Vacuum interior.
5. Test operation of unit controls.

PUMPS

Services Performed
Preseason Inspection

1. Tighten loose nuts and bolts.
2. Check motor mounts and vibration pads.
3. Inspect electrical connections and contactors.

Seasonal Start-up

1. Lubricate pump and motor bearings per manufacturer's recommendations.
2. Visually check pump alignment and coupling.
3. Check motor operating conditions.
4. Inspect mechanical seals or pump packing.
5. Check hand valves.

Mid-season Inspection

1. Lubricate pump and motor bearings as required.
2. Inspect mechanical seals or pump packing.

3. Ascertain proper functioning.

Seasonal Shut-down

1. Switch off pump.
2. Verify position of hand valves.
3. Note repairs required during shut-down.

PACKAGED AIR-CONDITIONING SYSTEMS

Services Performed
Preseason Inspection

1. Energize crankcase heater.
2. Lubricate fan and motor bearings per manufacturer's recommendations.
3. Check belts and sheaves. Adjust as required.
4. Lubricate and adjust dampers and linkages.
5. Check condensate pan.

Seasonal Start-up

1. Check crankcase heater operation.
2. Check compressor oil level.
3. Inspect electrical connections, contactors, relays, operating and safety controls.
4. Start compressor and check operating conditions. Adjust as required.
5. Check refrigerant charge.
6. Check motor operating conditions.
7. Inspect and calibrate temperature, safety and operational controls, as required.
8. Secure unit panels.
9. Pressure wash all evaporator and condenser coils (if applicable)
10. Log all operating data.

Mid-season Inspection

1. Lubricate fan and motor bearings per manufacturer's recommendations.
2. Check belts and sheaves. Adjust as required.
3. Check condensate pan and drain.
4. Check operating conditions. Adjust as required.
5. Log all operating data.

Seasonal Shut-down *

1. Shut down per manufacturer's recommendations.

* If no Shut-down is required then (2) Mid-season Inspections are performed

BOILERS

Services Performed
Preseason Inspection

1. Inspect fireside of boiler and record condition.
2. Brush and vacuum soot and dirt from flues (not chimneys) and combustion chamber.
3. Inspect firebrick and refractory for defects.
4. Visually inspect boiler pressure vessel for possible leaks and record condition.

5. Disassemble, inspect and clean low-water cutoff.
6. Check hand valves and automatic feed equipment. Repack and adjust as required.
7. Inspect, clean and lubricate the burner and combustion control equipment.
8. Reassemble boiler.
9. Check burner sequence of operation and combustion air equipment.
10. Check fuel piping for leaks and proper support.
11. Review manufacturer's recommendations for boiler and burner start-up.
12. Check fuel supply.
13. Check auxiliary equipment operation.

Seasonal Start-up

1. Inspect burner, boiler and controls prior to start-up.
2. Start burner and check operating controls.
3. Test safety controls and pressure relief valve.
4. Perform combustion analysis.
5. Make required control adjustments.
6. Log all operating conditions.
7. Review operating procedures and owner's log with boiler operator.

Mid-season Inspection

1. Review operator's log.
2. Check system operation.
3. Perform combustion analysis.
4. Make required control adjustments.
5. Log all operating conditions.
6. Review operating procedures and log with boiler operator.

Seasonal Shut-down

1. Review operator's log.
2. Note repairs required.

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SECTION F DESIGN APPROACH

In accordance with the ESIP PL 2012, c.55 as part of the implementation process, an agreement between your school district and Honeywell will determine the energy conservation measures (ECM's) to be implemented. The services of a NJ Licensed Engineering firm and / or Architectural firm shall then be secured in order to properly comply with local building codes, compliance issues and NJ Public contracts law. Specifications will be designed and developed to exact standards as recommended by Honeywell in order to achieve all savings outlined in this Energy Savings Plan (ESP). Once specifications are completed, Honeywell will publicly solicit contractors capable of meeting the requirements of the specification for each trade. However, even before the completion of the bidding process, Honeywell project management will be engaged in order to maintain the overall project schedule and ensure the school district's expectations are met. An overview of these activities and functions are detailed below.

1. Safety Management Plan

All of Honeywell's Project Management Plans Begin with Safety. By integrating health, safety and environmental considerations into all aspects of our business, we protect our customers, our people and the environment, achieve sustainable growth and accelerated productivity, drive compliance with all applicable regulations and develop the technologies that expand the sustainable capacity of our world. Our health, safety and environment management systems reflect our values and help us meet our customer's needs and our business objectives.

Honeywell's Safety Management Plan is provided in Appendix 5.

2. Project Management Process

A Honeywell Project Management Plan defines plans and controls the tasks that must be completed for your project. But more than task administration, our project management process oversees the efficient allocation of resources to complete those tasks.

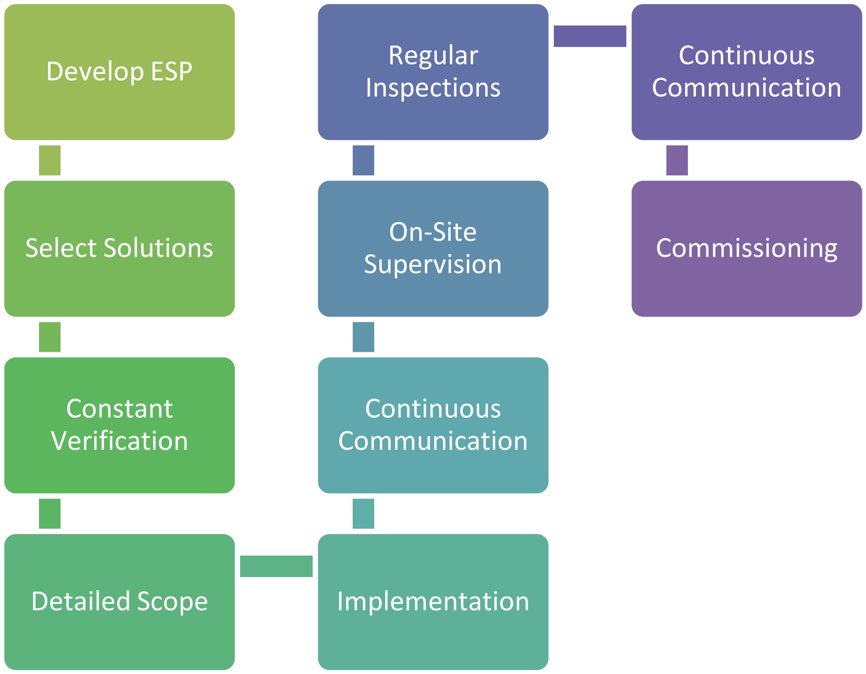
Each project and each customer's requirements are unique. At Honeywell we address customer needs through a formal communication process. This begins by designating one of our project managers to be responsible for keeping the customer abreast of the status of the project.

As the facilities improvements portion of the partnership begins, the Project Manager serves as a single focal point of responsibility for all aspects of the partnership. The Project Manager monitors labor, material, and project modifications related to the Verona School District/Honeywell partnership and makes changes to ensure achievement of performance requirements in the facilities modernization component. The Project Manager regularly reviews the on-going process of the project with the customers.

The Project Manager will develop and maintain effective on-going contact with the School District and all other project participants to resolve issues and update project status.

There are several challenges in this position. The Project Manager must staff the project and create a work force capable of handling the technologies associated with the project (pneumatic or electric/electronic controls, mechanical systems, etc.), and plan for and use these personnel to achieve optimum results focused on occupant comfort and guarantee requirements.

The project management process applies technical knowledge, people and communication skills, and management talent in an on-site, pro-active manner to ensure that our contract commitments are met on time, within budget, and at the quality you expect.



3. Construction Management

Prior to any work in the buildings, our Project Manager will sit down with your administrative and building staff to outline the energy conservation upgrades that we will be installing in their building. We will discuss proper contractor protocol of checking in and out of the buildings on a daily basis, wearing identifiable shirts, identification badges, and checking in with your facilities staff. We will coordinate certain projects for different times of the day so we do not interrupt the building and learning environments. Our staff will work a combination of first and second shifts to accomplish the pre-set implementation schedule.

Communication is the key success factor in any construction management plan, and our project manager will be the key focal point during the installation process.

Our team will prevent schedule slippages by continuously tracking the location of all equipment and components required for the project. We make sure all equipment and components will be delivered on time prior to the scheduled date of delivery. Our thorough survey, evaluation and analysis of existing conditions, performed prior to the commencement of construction, will also prevent schedule slippages.

Honeywell is required to subcontract various portions of our projects to contractors. Within the Verona School District project, all subcontractors will be selected in accordance with New Jersey public contracts law. Typical areas that are subcontracted are as follows:

- Electrical Installation
- Lighting Retrofits
- HVAC Installation (depends upon the project size and scope)
- Associated General Contracting specialty items to support the project etc., (ceilings, windows, concrete, structural steel, roofing, demolition and removal of equipment, painting and rigging)

Where possible under New Jersey public contracts law, Honeywell uses the following guidelines in hiring subcontractors to perform work on our projects.

- Local Presence in the Community (Customer Recommendations)
- Firm's Qualifications and WBE/MBE Status
- Firm's Financial Stability
- Ability to perform the work within the project timeline

- Price
- Ability to provide service on the equipment or materials installed over a long period of time.

Approval of subcontractors that Honeywell proposes to use lies with the Verona School District.

4. Commissioning

Honeywell provides full commissioning of energy conservation measures (ECM's) as part of our responsibility on this project. We will customize this process based on the complexity of ECMs. Specifically, Honeywell will be responsible for start-up and commissioning of the new equipment and systems to be installed during the project. This will include verifying that the installed equipment meets specifications, is installed and started up in accordance with manufacturer's recommendations, and operates as intended. A commissioning plan will be prepared that describes the functional tests to be performed on the equipment and the acceptance criteria.

Prior to customer acceptance of the project, Honeywell submits the final commissioning report containing signed acceptance sheets for each ECM. Signed acceptance sheets are obtained upon demonstrating the functionality of each ECM to a school appointed representative.

Additionally, Honeywell provides training for facility operators and personnel as needed when each ECM is completed and placed into service. All training is documented in the final commissioning report.

Subsequent to the completion of the Honeywell commissioning effort, in accordance with New Jersey ESIP legislation, the Verona School District will be required to secure the services of a 3rd party independent firm in order to verify that the new equipment and systems meet the standards set forth in the Energy Savings Plan. In order to maintain the independence of this review, these costs must be born directly by the District. However, at the option of the District, these services can be financed as a portion of the total project cost.

5. Installation Standards

When Honeywell designs a solution, we take into account current and future operations. For any upgrades we install, we follow building codes/standards, which dictate certain standards for energy or building improvements. Listed in tables following this section are standards for building design. During the life of the agreement, there is a partnership approach to maintaining these standards for reasons of comfort and reliability. For lighting our standard is to meet or exceed Department of Education light levels requirements, achieving the relevant standards wherever possible.

In the case of fluorescent lighting upgrades, we recommend that a group re-lamping of lamps be done approximately five years after the initial installation depending upon run times. Your building facility staff, on an as needed basis, can complete normal routine maintenance of lamps and ballasts. This maintains the quality of the lighting levels, and color rendering qualities of the lamps.

Space temperatures will be set by the energy management system and local building controls, and will be maintained on an annual basis. Flexibility will be maintained to regulate space temperatures as required to accommodate building occupant needs.

Your facility staff and building personnel will operate the energy management system with ongoing training and support from Honeywell. Therefore, both the District and Honeywell will maintain the standards of comfort. The comfort standards will be maintained throughout the life of the agreement through sound maintenance planning and services recommended as part of this ESP.

With regard to ventilation, Honeywell will upgrade ventilation to meet current standards in those areas where our scope of work involves upgrades to or replacement of systems providing building ventilation. We generally will not upgrade ventilation in those areas where our work doesn't involve the upgrade or replacement of systems or equipment providing ventilation to a building or facility.

Heating and Cooling Standards

Heating Temperatures	Cooling Temperatures	Unoccupied Temperatures
70-72° F	72-74° F	58-62° F

Lighting Standards

Recommended Light Levels	
Task Area	Foot-candles
Corridors/Stairways/Restrooms	10-20
Storage Rooms	10-50
Conference Rooms	50-55
General Offices	50-100
Drafting/Accounting	70
Areas with VDTs	75
Classrooms	50-55
Cafeterias	50
Gymnasiums	30-50

Honeywell uses a variety of in-house labor as well as subcontractors to install the energy conservation measures. We have on staff trained professionals in fire, security, energy management systems, all temperature control systems, and HVAC. However, according to the ESIP law, all trades will be publicly bid except for specific controls applications. Listed below is a sampling of some of the disciplines that would apply to the District:

Improvements	Honeywell	Subcontractor
Engineering Design/Analysis	X	
Technical Audit	X	
Construction Administration/Management	X	
On-Site Construction Supervision	X	
Installation of Energy Management System	X	X
Manufacturer of Energy Management Equipment	X	X
Installation of HVAC/Mechanical Equipment		X
Installation of Renewable Technology		X
Installation of Building Envelope		X
Energy Supply Management Analysis/Implementation	X	
Installation of Boilers		X
Maintenance of Energy Management Equipment	X	X
Manufacturer/Installation of Temperature Controls	X	X
Monitoring/Verification Guarantee	X	
Training of Owner Staff	X	
Financial Responsibility for Energy Guarantees	X	

Hazardous Waste Disposal or Recycling

Honeywell disposes of all PCB ballasts or mercury containing materials removed as part of the project per EPA guidelines. Honeywell will complete all of the required paperwork on behalf of the District. Honeywell will work with the School District to review your hazardous material reports, and will identify the areas where work will be completed so that the District can contract to have any necessary material abatement completed.

Honeywell can help schedule or coordinate waste removal, but does not contract for, or assume responsibility for, the abatement work. Honeywell also has the capabilities to assist the District in working with the EPA under compliance management issues. We also develop and manufacture automated systems to track and report a wide variety of environmental factors.

6. Implementation Schedule

Attached please find a sample schedule for construction and completion of Project Scenario No. 2, which includes the most extensive list of recommended ECMs.

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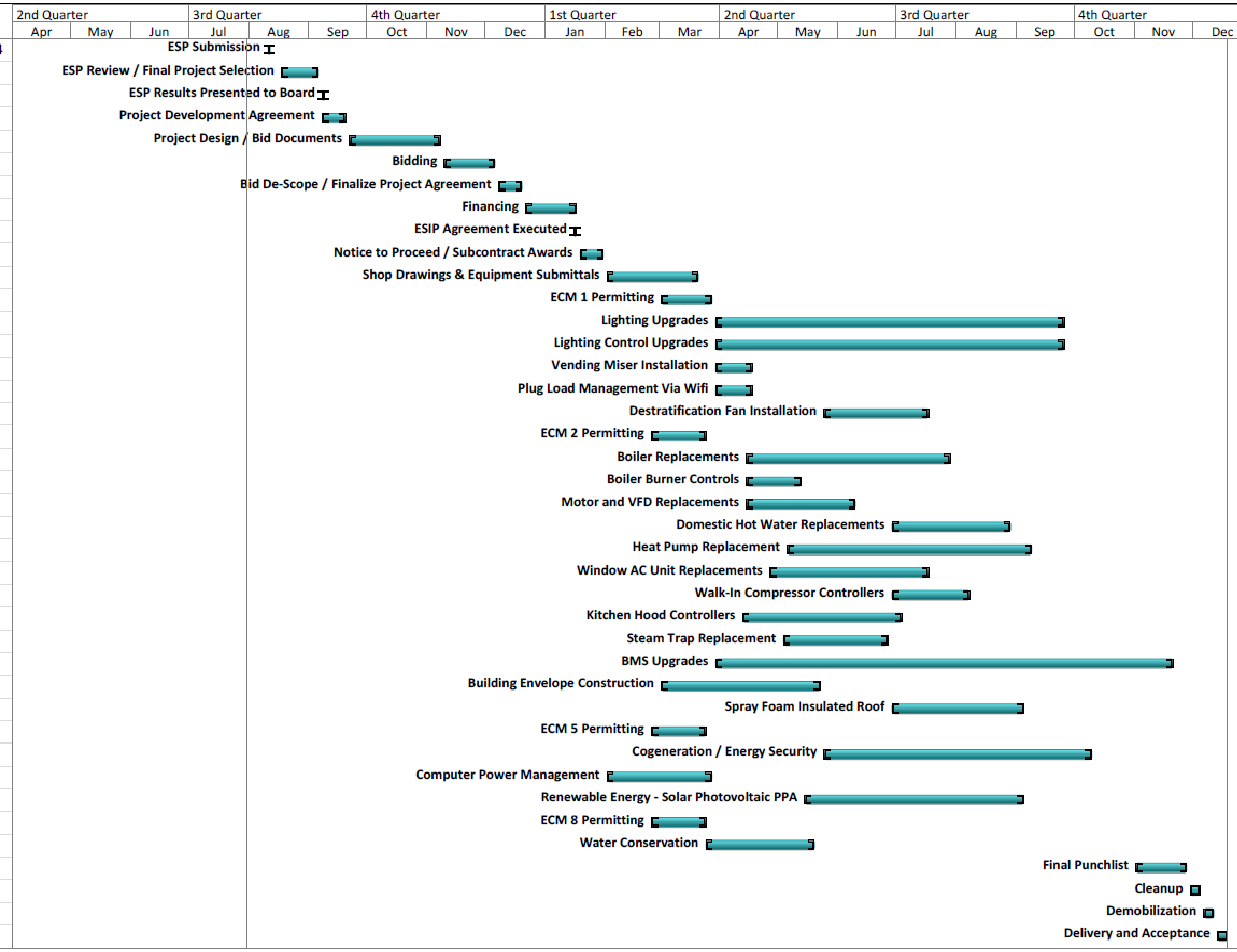
Verona ESIP Project
Installation Schedule

ID	Task Mode	Task Name	Start	Finish
1		ESP Submission	Mon 8/11/14	Mon 8/11/14
2		ESP Review / Final Project Selection	Mon 8/18/14	Fri 9/5/14
3		ESP Results Presented to Board	Mon 9/8/14	Mon 9/8/14
4		Project Development Agreement	Mon 9/8/14	Fri 9/19/14
5		Project Design / Bid Documents	Mon 9/22/14	Fri 11/7/14
6		Bidding	Mon 11/10/14	Fri 12/5/14
7		Bid De-Scope / Finalize Project Agreement	Mon 12/8/14	Fri 12/19/14
8		Financing	Mon 12/22/14	Fri 1/16/15
9		ESIP Agreement Executed	Fri 1/16/15	Fri 1/16/15
10		Notice to Proceed / Subcontract Awards	Mon 1/19/15	Fri 1/30/15
11		Shop Drawings & Equipment Submittals	Mon 2/2/15	Fri 3/20/15
12		ECM 1 Permitting	Mon 3/2/15	Fri 3/27/15
13		Lighting Upgrades	Mon 3/30/15	Fri 9/25/15
14		Lighting Control Upgrades	Mon 3/30/15	Fri 9/25/15
15		Vending Miser Installation	Mon 3/30/15	Fri 4/17/15
16		Plug Load Management Via Wifi	Mon 3/30/15	Fri 4/17/15
17		Destratification Fan Installation	Mon 5/25/15	Fri 7/17/15
18		ECM 2 Permitting	Wed 2/25/15	Tue 3/24/15
19		Boiler Replacements	Wed 4/15/15	Tue 7/28/15
20		Boiler Burner Controls	Wed 4/15/15	Tue 5/12/15
21		Motor and VFD Replacements	Wed 4/15/15	Tue 6/9/15
22		Domestic Hot Water Replacements	Mon 6/29/15	Fri 8/28/15
23		Heat Pump Replacement	Wed 5/6/15	Tue 9/8/15
24		Window AC Unit Replacements	Mon 4/27/15	Fri 7/17/15
25		Walk-In Compressor Controllers	Mon 6/29/15	Fri 8/7/15
26		Kitchen Hood Controllers	Mon 4/13/15	Fri 7/3/15
27		Steam Trap Replacement	Mon 5/4/15	Fri 6/26/15
28		BMS Upgrades	Mon 3/30/15	Fri 11/20/15
29		Building Envelope Construction	Mon 3/2/15	Fri 5/22/15
30		Spray Foam Insulated Roof	Mon 6/29/15	Fri 9/4/15
31		ECM 5 Permitting	Wed 2/25/15	Tue 3/24/15
32		Cogeneration / Energy Security	Mon 5/25/15	Fri 10/9/15
33		Computer Power Management	Mon 2/2/15	Fri 3/27/15
34		Renewable Energy - Solar Photovoltaic PPA	Fri 5/15/15	Fri 9/4/15
35		ECM 8 Permitting	Wed 2/25/15	Tue 3/24/15
36		Water Conservation	Wed 3/25/15	Tue 5/19/15
37		Final Punchlist	Mon 11/2/15	Fri 11/27/15
38		Cleanup	Mon 11/30/15	Fri 12/4/15
39		Demobilization	Mon 12/7/15	Fri 12/11/15
40		Delivery and Acceptance	Mon 12/14/15	Fri 12/18/15



Project: Verona ESP
Date: Thu 7/31/14

Task | Split | Milestone | Summary | Project Summary | External Tasks | External Milestone | Inactive Task | Inactive Milestone | Inactive Summary | Manual Task | Duration-only | Manual Summary Rollup | Manual Summary | Start-only | Finish-only | Deadline | Progress

Page 1

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APPENDIX 1 INDEPENDENT ENERGY AUDITS

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VERONA SCHOOL DISTRICT
FINAL LGEA REPORT

PREPARED UNDER THE GUIDELINES OF THE STATE OF NEW JERSEY
LOCAL GOVERNMENT ENERGY AUDIT PROGRAM

Dome-Tech, Inc.

AUGUST 2013

510 Thornall Street, Suite 170
Edison, NJ 08837
732-590-0122
Fax 732-590-0129

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www.dome-tech.com

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VERONA SCHOOL DISTRICT
ENERGY AUDIT REPORT

TABLE OF CONTENTS

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August 22, 2013

Mr. Paul McDevitt
Director of Facilities
Verona Board of Education
121 Fairview Avenue
Verona, NJ 07044

Re: EXECUTIVE SUMMARY FOR VERONA BOARD OF EDUCATION
STATE OF NEW JERSEY LOCAL GOVERNMENT ENERGY AUDIT – DRAFT REPORT
OUR PROJECT NUMBER D13110

Dear Mr. McDevitt:

Dome-Tech was retained by the Verona Board of Education, as a pre-qualified participant in the Local Government Energy Audit Program, to perform an energy audit. The objectives of the energy audit were to evaluate the District's energy consumption, establish baselines for energy efficiency, and identify opportunities to reduce the amount of energy used and/or its cost.

The scope of the audit is standardized under the Program, and consisted of the following:

- Benchmarking historic energy consumption utilizing EPA Energy Star's Portfolio Manager
- Characterizing building use, occupancy, size, and construction
- Providing a detailed equipment list including estimated service life and efficiency
- Identifying and quantifying Energy Conservation Measures (ECMs)
- Evaluating the economic viability of various renewable/distributed energy technologies
- Performing a utility tariff analysis and assessing savings potential from energy procurement strategies
- Providing the method of analyses

Based upon data received for the twelve (12) month period September 2011 – August 2012, for the facilities included in this study, the District had an annual expenditure of:

- Electricity: approximately 2,095,000 kWh at a total cost of approximately $339,000
- Natural Gas: approximately 170,500 therms at a total cost of approximately $174,000

The following buildings were evaluated under this study:

Facility Name	Total Floor Area
Laning Avenue Elementary School	46,477
Brookdale Avenue Elementary School	37,972
F.N. Brown Elementary School	38,985
Forest Avenue Elementary School	27,750
H.B. Whitehorne Middle School	118,224
Verona High School	120,245

Please refer to Section 2 of this report for a detailed list of identified Energy Conservation Measures (ECMs), along with a summary of their preliminary economics (estimated project cost, estimated annual energy savings, applicable rebate(s), etc.). In this report, all identified ECMs are ranked and presented according to their simple payback; however, please note that the Master ECM Table can also be sorted by building, by measure type, etc.

If all identified ECMs were to be implemented, they would provide the following estimated benefits to the Verona's Schools:

- Total annual electrical savings: approximately 615,000 kilowatt-hours of electric consumption; 29% of baseline
- Total annual natural gas savings: approximately 15,100 therms of natural gas consumption; 9% of baseline
- Total annual cost savings: approximately $115,000 of utility cost; 22% of baseline
- Total annual CO_2 emissions reduction: 292 tons
- Total net estimated implementation cost: approximately $1,109,000
- Total net simple payback: 9.6 years

A summary of the projects that are recommended for implementation includes the following: piping insulation, weather stripping, replacing electric water heaters with gas, installing a computer power management system, replacing CRT screens with flat screens, lighting upgrades, and various building envelope improvements.

Distributed/Renewable Energy Systems were also reviewed with the following conclusions:

- Dome-Tech considered three (3) different types of wind turbine technologies that consisted of both building-mounted and traditional ground-mounted variety. Should the District decide to pursue a wind turbine project, Dome-Tech recommends commissioning a more detailed study.
- Roof-mounted photovoltaic systems ranging in size from 39 kW dc at F.N. Brown Elementary School to 309 kW dc at the Verona High School (681 kW dc total) could provide approximately 13% to 99% of each building's annual energy usage (36% of total energy usage for the entire district). Should the District decide to pursue a solar project, Dome-Tech recommends commissioning a more detailed study.
- CHP (Combined Heat and Power), Fuel Cells, and Micro-turbines were also considered and not recommended for any of the buildings due to a lack of significant year-round thermal loads.

The District's data was entered into the US EPA *ENERGY STAR's Portfolio Manager* Database program. Buildings with scores of 75 or higher may qualify for the *ENERGY STAR* Building Label.

Regarding the procurement of utilities, Dome-Tech understands that the District's facilities in this study are served by seven (7) electric accounts behind Public Service Electric and Gas and six (6) natural gas accounts behind Public Service Electric and Gas. All electricity and natural gas accounts are served by a third-party, retail energy supplier.

During the development of this audit, Dome-Tech was assisted by facility personnel, who were both knowledgeable and very helpful to our efforts. We would like to acknowledge and thank those individuals including Paul McDevitt, Jim Lewis, and Vincent Mafucci.

Sincerely,

John Bohadel, CEM, LEED AP
Senior Energy Engineer

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ECM LIST

VERONA SCHOOL DISTRICT
ECM Sorted by Payback

ECM #	Energy Conservation Measures (ECM)	Buildings	Energy Savings		Gross Installation Costs*	Rebates/ Incentive	Avoided Cost	Net Implementation Costs	Annual Energy Cost Savings	Annual Oper. Cost Savings	Total Annual Cost Savings	Measure Life	Gross Implementation Costs: Pay Back (Gross)	Gross Implementation Costs: Internal Rate of Return (IRR) (Gross)	Gross Implementation Costs: Lifecycle Savings (NPV) (Gross)	Net Implementation Costs: Pay Back (Net)	Net Implementation Costs: Internal Rate of Return (IRR) (Net)	Net Implementation Costs: Lifecycle Savings (NPV) (Net)	CO2 Savings
			kWh	Therms								Yrs	Yrs			Yrs			Tons
1	PC Power Management	Brookdale Elementary School	12,000	0	$810	$0	$0	$810	$1,860	$0	$1,860	10	0.4	230%	$15,056	0.4	230%	$15,056	4
1	PC Power Management	FN Brown	16,500	0	$1,080	$0	$0	$1,080	$2,840	$0	$2,840	10	0.4	263%	$23,146	0.4	263%	$23,146	5
1	PC Power Management	Forest Elementary School	18,000	0	$1,170	$0	$0	$1,170	$2,730	$0	$2,730	10	0.4	233%	$22,117	0.4	233%	$22,117	6
1	PC Power Management	HB Whitehorne Middle School	49,700	0	$3,320	$0	$0	$3,320	$7,500	$0	$7,500	10	0.4	226%	$60,657	0.4	226%	$60,657	16
1	PC Power Management	Laning Avenue School	18,000	0	$1,170	$0	$0	$1,170	$2,780	$0	$2,780	10	0.4	238%	$22,544	0.4	238%	$22,544	6
1	PC Power Management	Verona High School	69,300	0	$4,660	$0	$0	$4,660	$11,800	$0	$11,800	10	0.4	253%	$95,996	0.4	253%	$95,996	23
2	Insulate Piping	FN Brown	0	170	$230	$0	$0	$230	$180	$0	$180	15	1.3	78%	$1,919	1.3	78%	$1,919	1
2	Insulate Piping	Verona High School	0	420	$870	$0	$0	$870	$400	$0	$400	15	2.2	46%	$3,905	2.2	46%	$3,905	2
3	Vending Machine Controls	HB Whitehorne Middle School	1,960	0	$680	$0	$0	$680	$300	$0	$300	10	2.3	43%	$1,879	2.3	43%	$1,879	0.6
3	Vending Machine Controls	Verona High School	9,810	0	$3,400	$0	$0	$3,400	$1,670	$0	$1,670	10	2.0	48%	$10,845	2.0	48%	$10,845	3
3	Vending Machine Controls	F.N. Brown Elementary	3,920	0	$1,360	$0	$0	$1,360	$670	$0	$670	10	2.0	48%	$4,355	2.0	48%	$4,355	1.3
4	Steam Trap Repair Program	FN Brown	0	1,180	$3,010	$0	$0	$3,010	$1,220	$0	$1,220	5	2.5	29%	$2,577	2.5	29%	$2,577	7
4	Steam Trap Repair Program	HB Whitehorne Middle School	0	2,500	$6,620	$0	$0	$6,620	$2,610	$0	$2,610	5	2.5	28%	$5,333	2.5	28%	$5,333	15
5	Replace Elec. DHW with NatGas	Brookdale Elementary School	4,790	-260	$2,210	$130	$0	$2,080	$430	$0	$430	15	5.1	18%	$2,923	4.8	19%	$3,053	0
5	Replace Elec. DHW with NatGas	Laning Avenue School	10,600	-610	$2,140	$130	$0	$2,010	$980	$0	$980	15	2.2	46%	$9,559	2.1	49%	$9,689	0
6	Change CRT's to Flatscreens	Brookdale Elementary School	400	0	$300	$0	$0	$300	$60	$0	$60	10	5.0	15%	$212	5.0	15%	$212	0.1
6	Change CRT's to Flatscreens	FN Brown	400	0	$300	$0	$0	$300	$70	$0	$70	10	4.3	19%	$297	4.3	19%	$297	0.1
6	Change CRT's to Flatscreens	Forest Elementary School	300	0	$230	$0	$0	$230	$50	$0	$50	10	4.6	17%	$197	4.6	17%	$197	0.1
6	Change CRT's to Flatscreens	Laning Avenue School	100	0	$80	$0	$0	$80	$20	$0	$20	10	4.0	21%	$91	4.0	21%	$91	0.0
6	Change CRT's to Flatscreens	HB Whitehorne Middle School	200	0	$150	$0	$0	$150	$30	$0	$30	10	5.0	15%	$106	5.0	15%	$106	0.1
7	Lighting Upgrade	Brookdale Elementary School	40,600	0	$47,400	$5,710	$0	$41,600	$6,290	$0	$6,290	15	7.5	10%	$27,690	6.6	13%	$33,490	13
7	Lighting Upgrade	FN Brown	44,900	0	$58,400	$6,100	$0	$52,300	$7,710	$0	$7,710	15	7.6	10%	$33,641	6.8	12%	$39,741	15
7	Lighting Upgrade	Forest Elementary School	40,500	0	$50,900	$5,460	$0	$45,400	$6,140	$0	$6,140	15	8.3	9%	$22,399	7.4	10%	$27,899	13
7	Lighting Upgrade	HB Whitehorne Middle School	36,200	0	$46,700	$5,600	$0	$41,100	$5,580	$0	$5,580	15	8.4	8%	$19,914	7.4	11%	$25,514	12
7	Lighting Upgrade	Laning Avenue School	67,600	0	$67,800	$8,110	$0	$59,700	$10,200	$0	$10,200	15	6.6	12%	$53,967	5.9	15%	$62,067	22
7	Lighting Upgrade	Verona High School	164,000	0	$170,000	$20,300	$0	$150,000	$27,800	$0	$27,800	15	6.1	14%	$161,875	5.4	17%	$181,875	54

VERONA SCHOOL DISTRICT
ECM Sorted by Payback

ECM #	Energy Conservation Measures (ECM)	Buildings	Energy Savings kWh	Energy Savings Therms	Gross Installation Costs*	Rebates/ Incentive	Avoided Cost	Net Implementation Costs	Annual Energy Cost Savings	Annual Oper. Cost Savings	Total Annual Cost Savings	Measure Life Yrs	Gross Implementation Costs: Pay Back (Gross) Yrs	Gross Implementation Costs: Internal Rate of Return (IRR) (Gross)	Gross Implementation Costs: Lifecycle Savings (NPV) (Gross)	Net Implementation Costs: Pay Back (Net) Yrs	Net Implementation Costs: Internal Rate of Return (IRR) (Net)	Net Implementation Costs: Lifecycle Savings (NPV) (Net)	CO2 Savings Tons
8	Door Weatherstripping	FN Brown	0	70	$470	$0	$0	$470	$70	$0	$70	15	6.7	12%	$366	6.7	12%	$366	0.4
8	Door Weatherstripping	Laning Avenue School	0	20	$240	$0	$0	$240	$20	$0	$20	15	12.0	3%	-$1	12.0	3%	-$1	0.1
8	Door Weatherstripping	Verona High School	0	0	$80	$0	$0	$80	$0	$0	$4	15	18.7	-3%	-$29	18.7	-3%	-$29	0.0
8	Door Weatherstripping	HB Whitehorne Middle School	0	70	$470	$0	$0	$470	$70	$0	$70	15	6.7	12%	$366	6.7	12%	$366	0.4
9	Demand Controlled Ventilation	Laning Avenue School	0	800	$13,200	$0	$0	$13,200	$820	$0	$820	15	16.1	-1%	-$3,411	16.1	-1%	-$3,411	5
9	Demand Controlled Ventilation	Brookdale Elementary School	320	300	$10,800	$0	$0	$10,800	$360	$0	$360	15	30.0	-8%	-$6,502	30.0	-8%	-$6,502	2
9	Demand Controlled Ventilation	FN Brown	0	670	$13,200	$0	$0	$13,200	$680	$0	$680	15	19.4	-3%	-$5,082	19.4	-3%	-$5,082	4
9	Demand Controlled Ventilation	Forest Elementary School	0	280	$7,870	$0	$0	$7,870	$280	$0	$280	15	28.1	-7%	-$4,527	28.1	-7%	-$4,527	2
9	Demand Controlled Ventilation	HB Whitehorne Middle School	0	530	$15,000	$0	$0	$15,000	$540	$0	$540	15	27.8	-7%	-$8,554	27.8	-7%	-$8,554	3
9	Demand Controlled Ventilation	Verona High School	690	1,430	$18,100	$0	$0	$18,100	$1,570	$0	$1,570	15	11.5	3%	$643	11.5	3%	$643	9
10	Replace Window ACs with Splits	FN Brown	520	50	$12,500	$120	$0	$12,400	$140	$0	$140	15	89.3	-17%	-$10,829	88.6	-17%	-$10,729	0.5
10	Replace Window ACs with Splits	Forest Elementary School	3,790	20	$11,200	$280	$0	$10,900	$680	$0	$680	15	16.5	-1%	-$3,082	16.0	-1%	-$2,782	1
10	Replace Window ACs with Splits	Laning Avenue School	250	20	$6,870	$80	$0	$6,790	$60	$0	$60	15	114.5	-19%	-$6,154	113.2	-19%	-$6,074	0.2
11	Change to Modular Condensing Boilers	Brookdale Elementary School	0	790	$344,000	$10,500	$216,000	$118,000	$920	$0	$920	25	373.9	-15%	-$327,980	128.3	-10%	-$101,980	5
11	Change to Modular Condensing Boilers	Forest Elementary School	0	970	$344,000	$10,500	$216,000	$118,000	$1,100	$0	$1,100	25	312.7	-14%	-$324,846	107.3	-9%	-$98,846	6
11	Change to Modular Condensing Boilers	Laning Avenue School	0	1,830	$344,000	$10,500	$247,000	$86,500	$1,870	$0	$1,870	25	184.0	-12%	-$311,437	46.3	-4%	-$53,937	11
11	Change to Modular Condensing Boilers	Verona High School	0	3,860	$572,000	$18,400	$299,000	$255,000	$3,670	$0	$3,670	25	155.9	-11%	-$508,094	69.5	-7%	-$191,094	23
	TOTALS		615,000	15,100	$2,190,000	$102,000	$978,000	$1,109,000	$115,000	$0	$115,000	16	19.0	0.0	-$713,328	9.6	7%	$367,672	292

Notes:

1. KW - Where Zero (0) values are shown in the table there is no demand reduction for this measure.
2. Rebates- Where Zero (0) values are shown in the table we could not find any rebates of other financial incentives that are currently available for this measure.
3. Gross Installation Cost is the cost of installing equipment recommended by the ECM.
4. Avoided Cost is the cost of replacing equipment at end of service life with like and kind equipment.
5. Net Implementaion Cost is the Gross Installation Cost less any Rebate/Incentive and any Avoided Cost. In the case of equipment that is being replaced regardless, Net Implementation Cost represents the incremental cost incurred by upgrading to equipment that produces more energy s

VERONA SCHOOL DISTRICT
FINAL LGEA REPORT

PREPARED UNDER THE GUIDELINES OF THE STATE OF NEW JERSEY LOCAL GOVERNMENT ENERGY AUDIT PROGRAM

Dome-Tech, Inc.

AUGUST 2013

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Table of Contents

Energy Audit Purpose & Scope

Purpose:

- The objectives of the energy audit are to evaluate each site's energy consumption, establish baselines for energy efficiency and identify opportunities to reduce the amount of energy used and/or its cost.

Scope:

I. Historic Energy Consumption: Benchmark energy use using Energy Star Portfolio Manager

II. Facility Description: Characterize building usage, occupancy, size and construction.

III. Equipment Inventory: Detailed equipment list including useful life and efficiency.

IV. Energy Conservation Measures: Identify and evaluate opportunities for cost savings and economic returns.

V. Renewable/Distributed Energy Measures: Evaluate economic viability of various renewable/distributed energy technologies.

VI. Energy Purchasing and Procurement Strategies: Perform utility tariff analysis and assess potential for savings from energy procurement strategies.

VII. Method of Analysis: Appendices

Dome-Tech, Inc.

Historic Energy Consumption

Utility Usage and Costs Summary

Time-period: Annual

Buildings	Electric - PSE&G / DIRECT ENERGY			
	Account Number(s)	Annual Consumption kWh	Annual Cost	$ / kWh
Laning Avenue Elementary School	67 228 723 00	246,840	$37,279.66	$0.151
Brookdale Avenue Elementary School	67 174 764 00	151,520	$23,457.65	$0.155
F.N. Brown Elementary School - COMBINED	66 627 422 01	232,247	$39,900.33	$0.172
Forest Avenue Elementary School	67 075 835 06	137,440	$20,842.49	$0.152
H.B. Whitehorne Middle School	42 003 725 09	528,300	$81,501.77	$0.154
Verona High School - COMBINED	42 005 408 00	798,601	$135,735.74	$0.170
	TOTAL	**2,094,948**	**$338,717.64**	**$0.162**

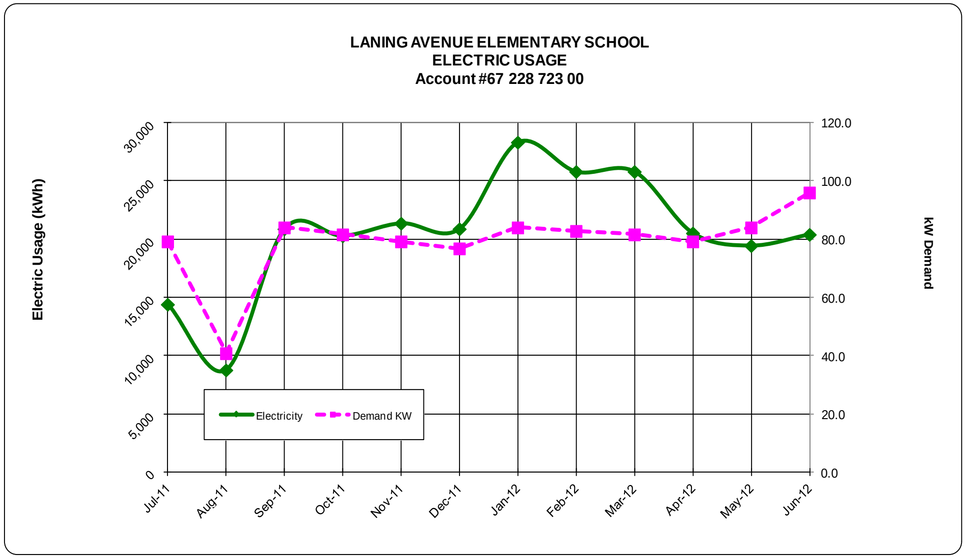
Buildings	Natural Gas - PSE&G / HESS CORP / COMPASS ENERGY			
	Account Number(s)	Annual Consumption Therms	Annual Cost	$ / Therms
Laning Avenue Elementary School	67 228 723 00	24,532	$25,130.97	$1.024
Brookdale Avenue Elementary School	67 174 764 00	10,398	$12,162.85	$1.170
F.N. Brown Elementary School	66 627 422 01	26,045	$26,873.33	$1.032
Forest Avenue Elementary School	67 075 835 06	12,523	$14,161.65	$1.131
H.B. Whitehorne Middle School	65 057 318 06	38,851	$40,582.82	$1.045
Verona High School	42 005 408 00	58,107	$55,224.52	$0.950
	TOTAL	**170,456**	**$174,136.13**	**$1.022**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: Jun. 2011 – May. 2012

Facility Name	Laning Avenue Elementary School		
Address	18 Laning Road		
	Verona, NJ		
Account#	67 228 723 00	- PSE&G	
	1113218	- Direct Energy	
Meter#	9193787	PoD ID:	000009784430245193



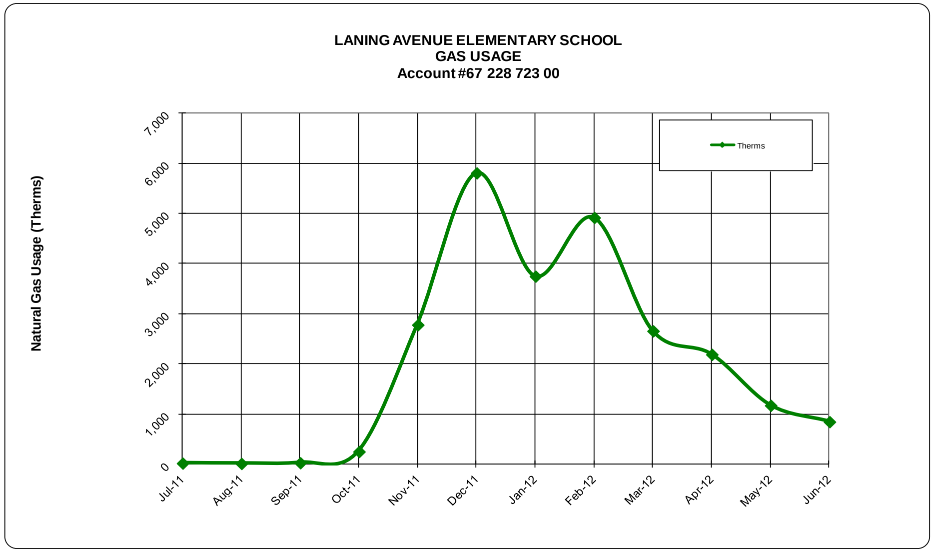
Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G Delivery Cost	DIRECT ENERGY Supplier Cost	$/kWh
Electricity	kWh	6/27/2011	7/27/2011	79.2	14,400	$1,485.24	$1,819.93	$0.23
Electricity	kWh	7/27/2011	8/25/2011	40.8	8,760	$827.29	$1,006.98	$0.21
Electricity	kWh	8/25/2011	9/27/2011	84.0	20,880	$1,805.54	$2,038.32	$0.18
Electricity	kWh	9/27/2011	10/25/2011	81.6	20,280	$981.49	$1,847.03	$0.14
Electricity	kWh	10/25/2011	11/22/2011	79.2	21,360	$1,013.96	$1,952.44	$0.14
Electricity	kWh	11/23/2011	12/27/2011	76.8	20,880	$990.87	$1,586.26	$0.12
Electricity	kWh	12/27/2011	1/26/2012	84.0	28,320	$1,266.77	$2,492.16	$0.13
Electricity	kWh	1/26/2012	2/27/2012	82.8	25,800	$1,182.36	$2,270.40	$0.13
Electricity	kWh	2/27/2012	3/28/2012	81.6	25,800	$1,177.27	$2,270.40	$0.13
Electricity	kWh	3/28/2012	4/27/2012	79.2	20,520	$997.83	$1,805.76	$0.14
Electricity	kWh	4/27/2012	5/26/2012	84.0	19,440	$983.53	$1,710.72	$0.14
Electricity	kWh	5/26/2012	6/26/2012	96.0	20,400	$1,971.91	$1,795.20	$0.18
		TOTALS/AVERAGE		**79.1**	**246,840**	**$14,684.06**	**$22,595.60**	**$0.151**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name Laning Avenue Elementary School
Address 18 Laning Road
Verona, NJ
Account# 67 228 723 00 - PSE&G
356872 /356956 - HESS
Meter# 3164433 PoD ID: PG000009784429445193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G Delivery Cost	HESS CORP / COMPASS ENERGY* Supply Cost	$/Therm
Natural Gas	Therms	6/27/2011	7/27/2011	29	$101.82	$21.70	$4.199
Natural Gas	Therms	7/27/2011	8/25/2011	23	$102.84	$16.95	$5.225
Natural Gas	Therms	8/25/2011	9/27/2011	37	$104.91	$23.59	$3.459
Natural Gas	Therms	9/27/2011	10/25/2011	261	$137.59	$163.71	$1.153
Natural Gas	Therms	10/25/2011	11/22/2011	2,788	$1,350.92	$1,893.22	$1.164
Natural Gas	Therms	11/23/2011	12/27/2011	5,813	$1,926.39	$3,949.17	$1.011
Natural Gas	Therms	12/27/2011	1/26/2012	3,755	$1,524.80	$2,551.71	$1.086
Natural Gas	Therms	1/26/2012	2/27/2012	4,925	$1,742.49	$3,346.27	$1.033
Natural Gas	Therms	2/27/2012	3/28/2012	2,665	$1,207.85	$1,811.32	$1.133
Natural Gas	Therms	3/28/2012	4/27/2012	2,197	$356.64	$1,010.12	$0.622
Natural Gas	Therms	4/27/2012	5/26/2012	1,182	$258.77	$648.27	$0.768
Natural Gas	Therms	5/26/2012	6/26/2012	856	$220.80	$659.12	$1.028
		TOTALS/AVERAGE		24,532	$9,035.82	$16,095.15	$1.024

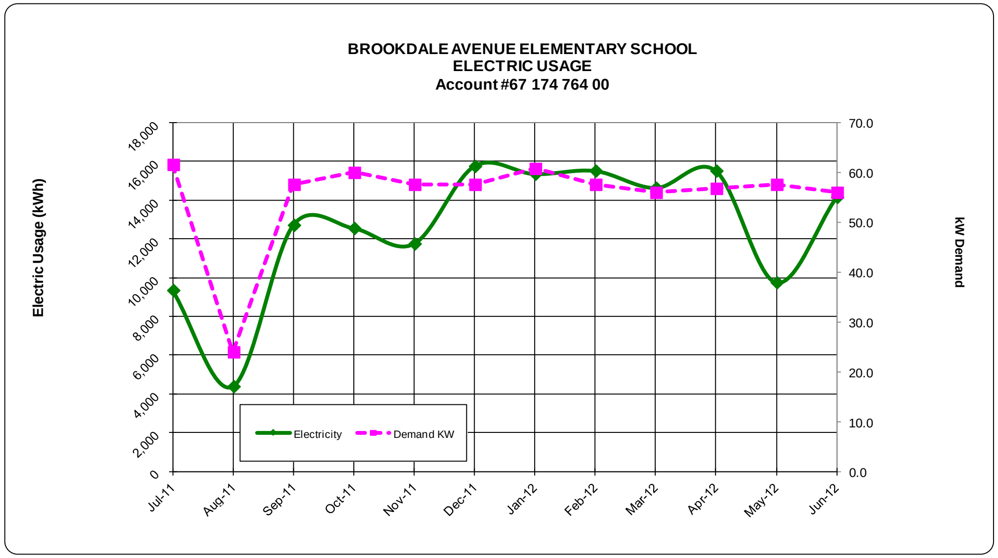
* Supply company changed in September 2011

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name Brookdale Avenue Elementary School
Address 14 Brookdale Court
Verona, NJ
Account# 67 174 764 00 - PSE&G
1113220 - Direct Energy
Meter# 9193164 PoD ID: PE000010271298145193



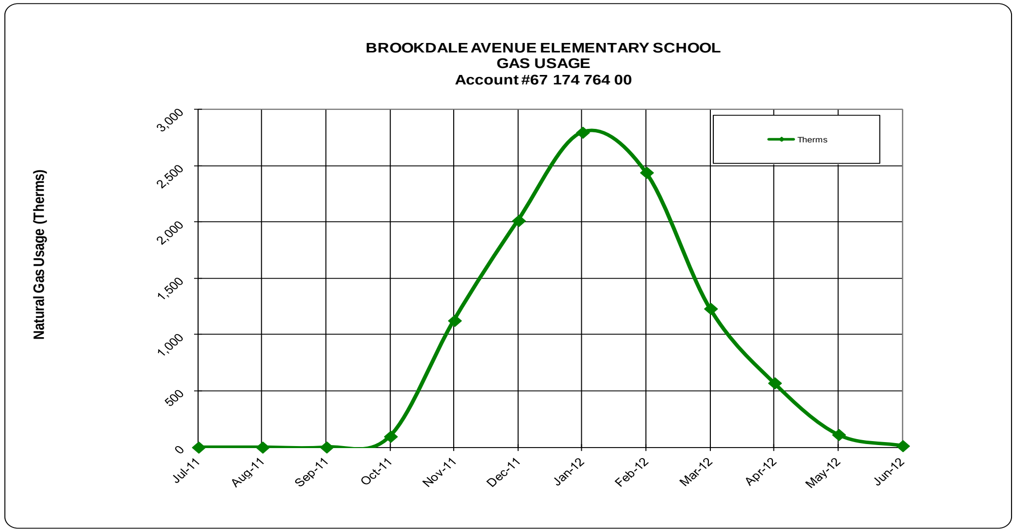
						PSE&G	DIRECT ENERGY	
Energy Type	**Energy Unit**	**Start Date**	**End Date**	**Demand KW**	**KWH**	**Delivery Cost**	**Supplier Cost**	**$/kWh**
Electricity	kWh	6/27/2011	7/27/2011	61.6	9,360	$1,087.48	$1,185.04	$0.24
Electricity	kWh	7/27/2011	8/25/2011	24.0	4,400	$460.14	$539.83	$0.23
Electricity	kWh	8/25/2011	9/26/2011	57.6	12,720	$1,179.40	$1,256.31	$0.19
Electricity	kWh	9/26/2011	10/25/2011	60.0	12,560	$649.63	$1,176.27	$0.15
Electricity	kWh	10/25/2011	11/23/2011	57.6	11,760	$619.49	$1,110.93	$0.15
Electricity	kWh	11/23/2011	12/27/2011	57.6	15,760	$747.40	$1,194.38	$0.12
Electricity	kWh	12/27/2011	1/26/2012	60.8	15,360	$753.63	$1,351.68	$0.14
Electricity	kWh	1/26/2012	2/27/2012	57.6	15,520	$746.01	$1,365.76	$0.14
Electricity	kWh	2/27/2012	3/28/2012	56.0	14,640	$711.02	$1,288.32	$0.14
Electricity	kWh	3/27/2012	4/26/2012	56.8	15,520	$742.61	$1,385.08	$0.14
Electricity	kWh	4/26/2012	5/25/2012	57.6	9,760	$561.32	$858.88	$0.15
Electricity	kWh	5/25/2012	6/26/2012	56.0	14,160	$1,240.96	$1,246.08	$0.18
		TOTALS/AVERAGE		**55.3**	**151,520**	**$9,499.09**	**$13,958.56**	**$0.155**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name Brookdale Avenue Elementary School
Address 14 Brookdale Court
Verona, NJ
Account# 67 174 764 00 - PSE&G
356872 / 494200 - HESS
Meter# 3274994 PoD ID: PG000010271297345193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G Delivery Cost	HESS CORP / COMPASS ENERGY* Supply Cost	$/Therm
Natural Gas	Therms	6/27/2011	7/27/2011	0	$97.59	$0.00	$0.000
Natural Gas	Therms	7/27/2011	8/25/2011	0	$99.50	$0.00	$0.000
Natural Gas	Therms	8/25/2011	9/26/2011	1	$99.65	$0.67	$94.820
Natural Gas	Therms	9/26/2011	10/25/2011	96	$113.54	$60.33	$1.805
Natural Gas	Therms	10/25/2011	11/23/2011	1,125	$745.69	$764.17	$1.342
Natural Gas	Therms	11/23/2011	12/27/2011	2,012	$914.58	$1,367.24	$1.134
Natural Gas	Therms	12/27/2011	1/26/2012	2,796	$1,030.25	$1,899.77	$1.048
Natural Gas	Therms	1/26/2012	2/27/2012	2,440	$962.32	$1,657.76	$1.074
Natural Gas	Therms	2/27/2012	3/28/2012	1,231	$735.55	$836.74	$1.277
Natural Gas	Therms	3/27/2012	4/26/2012	571	$180.41	$260.53	$0.772
Natural Gas	Therms	4/26/2012	5/25/2012	112	$115.40	$59.92	$1.563
Natural Gas	Therms	5/25/2012	6/26/2012	13	$101.32	$59.92	$12.606
		TOTALS/AVERAGE		**10,398**	**$5,195.80**	**$6,967.05**	**$1.170**

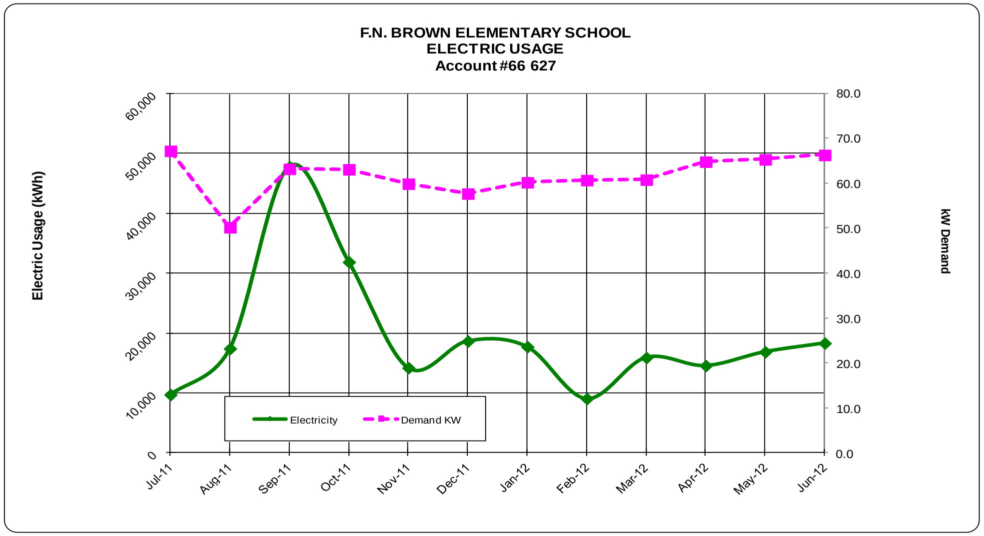
* Supply company changed in September 2011

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name	F.N. Brown Elementary School		
Address	125 Grove Avenue		
	Verona, NJ		
Account#	66 627 422 01	- PSE&G	
	1113216	- Direct Energy	
Meter#	614000456	PoD ID: PE000008822094245193	



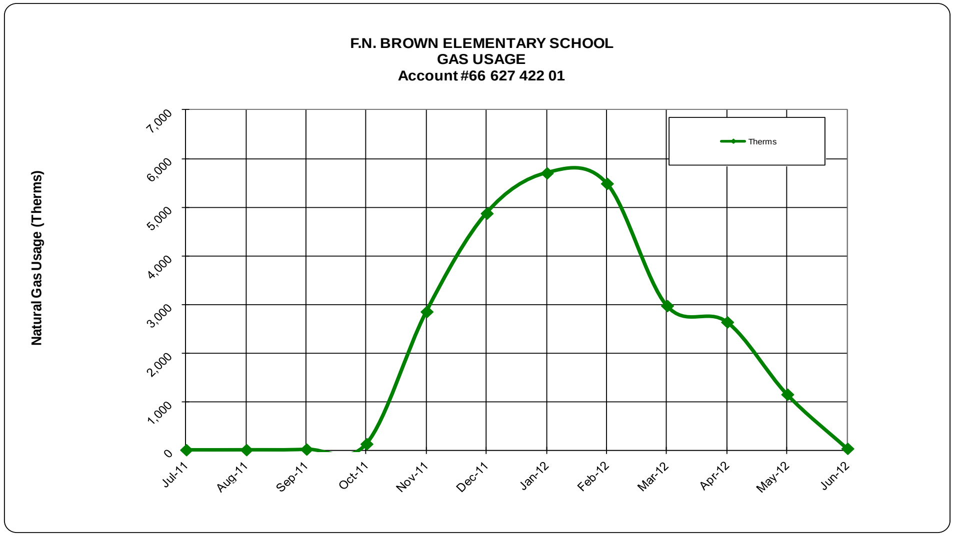
						PSE&G	DIRECT ENERGY	
Energy Type	**Energy Unit**	**Start Date**	**End Date**	**Demand KW**	**KWH**	**Delivery Cost**	**Supplier Cost**	**$/kWh**
Electricity	kWh	6/28/2011	7/28/2011	67.2	9,748	$1,173.55	$1,385.10	$0.26
Electricity	kWh	7/28/2011	8/26/2011	50.2	17,437	$1,271.56	$2,152.38	$0.20
Electricity	kWh	8/26/2011	9/27/2011	63.2	47,753	$2,568.33	$4,758.40	$0.15
Electricity	kWh	9/27/2011	10/26/2011	63.1	31,875	$2,148.59	$3,695.94	$0.18
Electricity	kWh	10/26/2011	11/28/2011	59.9	14,227	$711.87	$1,615.45	$0.16
Electricity	kWh	11/28/2011	12/28/2011	57.7	18,667	$844.26	$1,959.35	$0.15
Electricity	kWh	12/28/2011	1/17/2012	60.2	17,737	$831.74	$1,963.00	$0.16
Electricity	kWh	1/27/2012	2/28/2012	60.7	9,083	$557.14	$1,289.61	$0.20
Electricity	kWh	2/28/2012	3/28/2012	60.8	15,921	$776.80	$1,763.48	$0.16
Electricity	kWh	3/28/2012	4/27/2012	64.8	14,588	$750.99	$1,660.18	$0.17
Electricity	kWh	4/27/2012	5/29/2012	65.3	16,879	$826.58	$1,836.46	$0.16
Electricity	kWh	5/29/2012	6/27/2012	66.3	18,332	$1,537.42	$1,822.15	$0.18
		TOTALS/AVERAGE		**61.6**	**232,247**	**$13,998.83**	**$25,901.50**	**$0.172**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name	F.N. Brown Elementary School	
Address	125 Grove Avenue	
	Verona, NJ	
Account#	66 627 422 01	- PSE&G
	356872 / 356960	- HESS CORP
Meter#	combined	PoD ID: PG000008822093445193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G Delivery Cost	HESS CORP / COMPASS ENERGY* Supply Cost	$/Therm
Natural Gas	Therms	6/28/2011	7/28/2011	26	$101.37	$18.99	$4.664
Natural Gas	Therms	7/28/2011	8/26/2011	27	$103.42	$19.80	$4.582
Natural Gas	Therms	8/26/2011	9/27/2011	38	$105.08	$24.33	$3.378
Natural Gas	Therms	9/27/2011	10/26/2011	148	$220.64	$69.00	$1.951
Natural Gas	Therms	10/26/2011	11/28/2011	2,864	$1,506.64	$1,944.94	$1.205
Natural Gas	Therms	11/28/2011	12/28/2011	4,883	$1,891.33	$3,317.32	$1.067
Natural Gas	Therms	12/28/2011	1/17/2012	5,710	$1,931.88	$3,879.85	$1.018
Natural Gas	Therms	1/27/2012	2/28/2012	5,495	$1,842.72	$3,733.69	$1.015
Natural Gas	Therms	2/28/2012	3/28/2012	2,985	$1,372.09	$2,028.78	$1.139
Natural Gas	Therms	3/28/2012	4/27/2012	2,649	$400.24	$1,215.80	$0.610
Natural Gas	Therms	4/27/2012	5/29/2012	1,166	$364.25	$332.31	$0.597
Natural Gas	Therms	5/29/2012	6/27/2012	53	$107.05	$341.81	$8.435
		TOTALS/AVERAGE		**26,045**	**$9,946.71**	**$16,926.62**	**$1.032**

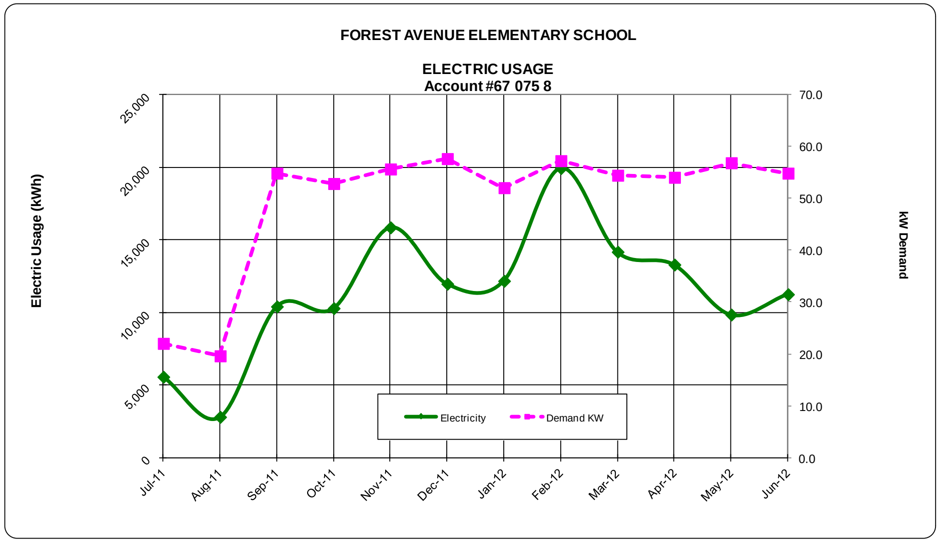
* Supply company changed in September 2011

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name	Forest Avenue Elementary School	
Address	118 Forest Avenue	
	Verona, NJ	
Account#	67 075 835 06	- PSE&G
	1113219	- Direct Energy
Meter#	728001728	PoD ID: PE000010038745545193



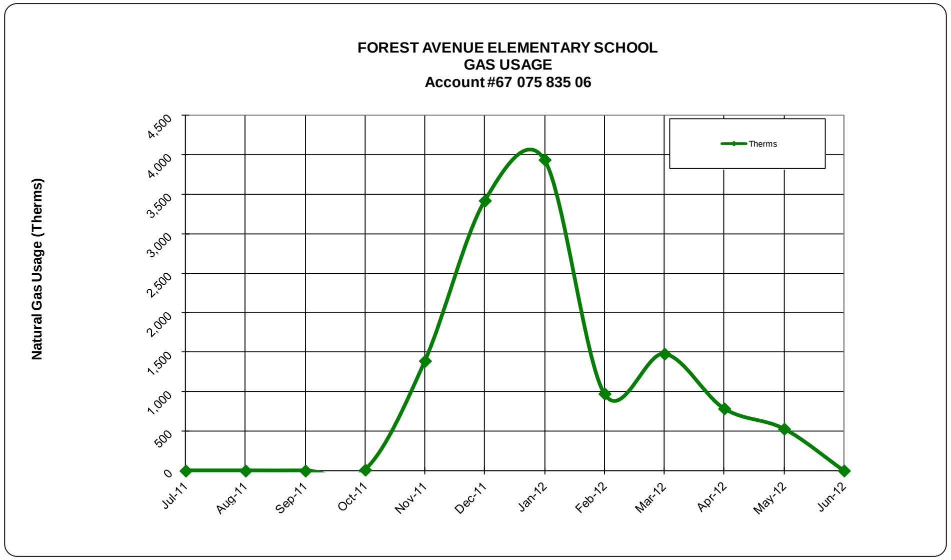
Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G Delivery Cost	DIRECT ENERGY Supplier Cost	$/kWh
Electricity	kWh	6/28/2011	7/28/2011	22.0	5,560	$474.15	$716.55	$0.21
Electricity	kWh	7/28/2011	8/26/2011	19.6	2,800	$346.77	$368.67	$0.26
Electricity	kWh	8/26/2011	9/27/2011	54.8	10,400	$1,058.33	$1,028.17	$0.20
Electricity	kWh	9/27/2011	10/26/2011	52.8	10,280	$548.13	$963.09	$0.15
Electricity	kWh	10/26/2011	11/28/2011	55.6	15,840	$740.21	$1,402.18	$0.14
Electricity	kWh	11/28/2011	12/28/2011	57.6	11,960	$627.08	$921.00	$0.13
Electricity	kWh	12/28/2011	1/17/2012	52.0	12,160	$614.07	$1,070.08	$0.14
Electricity	kWh	1/27/2012	2/28/2012	57.2	19,920	$885.37	$1,769.01	$0.13
Electricity	kWh	2/28/2012	3/28/2012	54.4	14,160	$688.85	$1,246.08	$0.14
Electricity	kWh	3/28/2012	4/27/2012	54.0	13,280	$658.94	$1,187.33	$0.14
Electricity	kWh	4/27/2012	5/29/2012	56.8	9,840	$560.50	$865.92	$0.14
Electricity	kWh	5/29/2012	6/27/2012	54.8	11,240	$1,112.89	$989.12	$0.19
		TOTALS/AVERAGE		**49.3**	**137,440**	**$8,315.29**	**$12,527.20**	**$0.152**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name Forest Avenue Elementary School
Address 118 Forest Avenue
Verona, NJ
Account# 67 075 835 06 - PSE&G
356872 / 356961 - HESS CORP
Meter# 2344823 PoD ID: PG000010038744845193



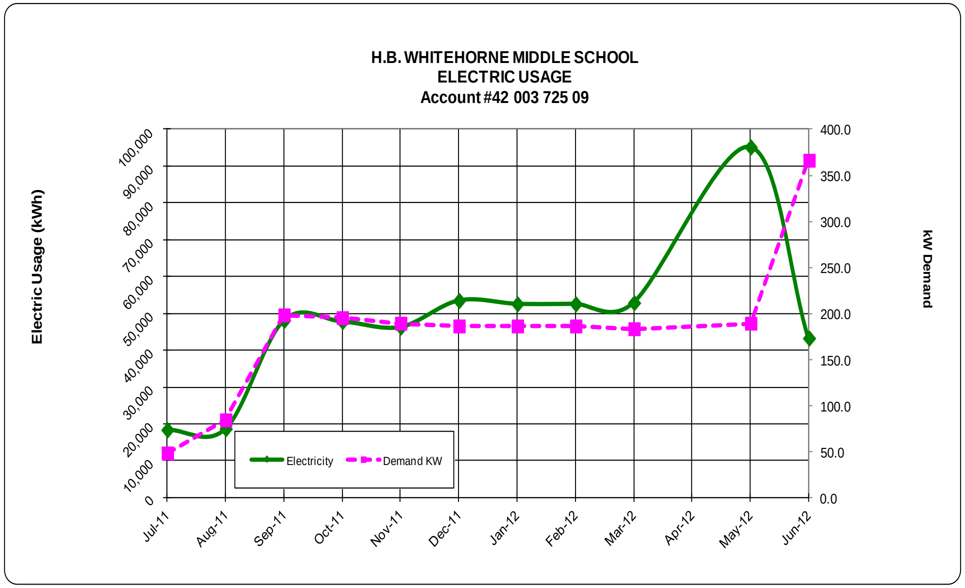
Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G Delivery Cost	HESS CORP / COMPASS ENERGY* Supply Cost	$/Therm
Natural Gas	Therms	6/28/2011	7/28/2011	0	$97.65	$0.00	#DIV/0!
Natural Gas	Therms	7/28/2011	8/26/2011	0	$99.50	$0.00	#DIV/0!
Natural Gas	Therms	8/26/2011	9/27/2011	0	$99.50	$0.00	#DIV/0!
Natural Gas	Therms	9/27/2011	10/26/2011	12	$101.20	$7.29	$9.316
Natural Gas	Therms	10/26/2011	11/28/2011	1,390	$896.92	$943.89	$1.324
Natural Gas	Therms	11/28/2011	12/28/2011	3,418	$1,283.27	$2,321.93	$1.055
Natural Gas	Therms	12/28/2011	1/17/2012	3,934	$1,306.41	$2,673.25	$1.012
Natural Gas	Therms	1/27/2012	2/28/2012	974	$664.17	$662.01	$1.361
Natural Gas	Therms	2/28/2012	3/28/2012	1,478	$759.94	$1,004.81	$1.194
Natural Gas	Therms	3/28/2012	4/27/2012	786	$210.96	$361.08	$0.727
Natural Gas	Therms	4/27/2012	5/29/2012	529	$274.04	$147.09	$0.795
Natural Gas	Therms	5/29/2012	6/27/2012	1	$99.65	$147.09	$231.463
		TOTALS/AVERAGE		**12,523**	**$5,893**	**$8,268**	**$1.131**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name H.B. Whitehorne Middle School
Address 600 Bloomfield Avenue
Verona, NJ
Account# 42 003 725 09 - PSEG
1113217 - Direct Energy
Meter# 778017642 PoD ID: PE000009065729765391



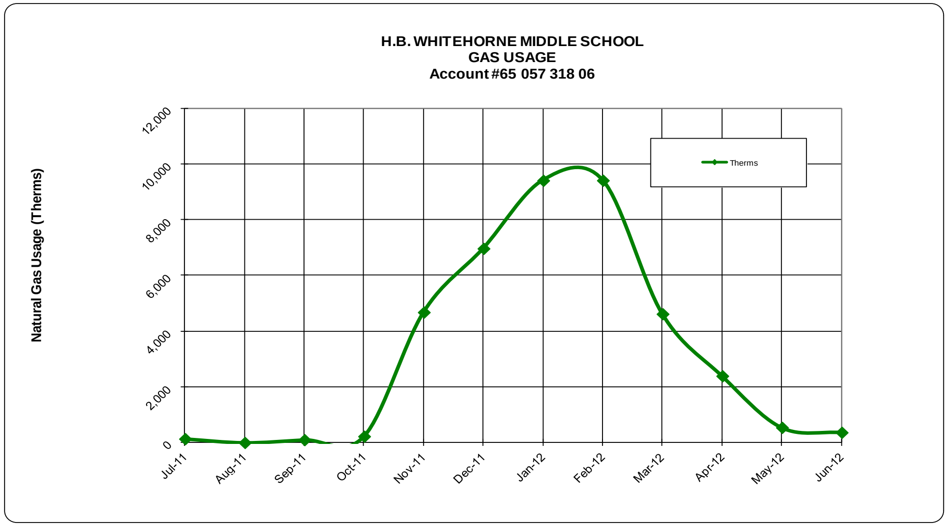
Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G Delivery Cost	DIRECT ENERGY Supplier Cost	$/kWh
Electricity	kWh	6/28/2011	7/28/2011	48.0	18,300	$1,428.10	$2,341.09	$0.21
Electricity	kWh	7/28/2011	8/26/2011	84.0	18,600	$1,876.17	$2,261.55	$0.22
Electricity	kWh	8/26/2011	9/27/2011	198.0	48,000	$4,012.62	$4,826.80	$0.18
Electricity	kWh	9/27/2011	10/26/2011	195.0	47,700	$2,351.69	$4,618.64	$0.15
Electricity	kWh	10/26/2011	11/28/2011	189.0	46,200	$2,311.21	$4,529.00	$0.15
Electricity	kWh	11/28/2011	12/28/2011	186.0	53,400	$2,502.33	$4,084.25	$0.12
Electricity	kWh	12/28/2011	1/17/2012	186.0	52,500	$2,504.42	$4,620.00	$0.14
Electricity	kWh	1/27/2012	2/28/2012	186.0	52,500	$2,507.11	$4,689.30	$0.14
Electricity	kWh	2/28/2012	3/28/2012	183.0	52,800	$2,505.08	$4,646.40	$0.14
Electricity	kWh	3/28/2012	5/29/2012	189.0	95,100	$4,757.20	$8,368.80	$0.14
Electricity	kWh	5/29/2012	6/27/2012	366.0	43,200	$5,958.41	$3,801.60	$0.23
		TOTALS/AVERAGE		**182.7**	**528,300**	**$32,714.34**	**$48,787.43**	**$0.154**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name H.B. Whitehorne Middle School
Address 600 Bloomfield Avenue
Verona, NJ
Account# 65 057 318 06 - PSE&G
356872 / 356958 - HESS CORP
Meter# 3166068 PoD ID: PG000008094271312448



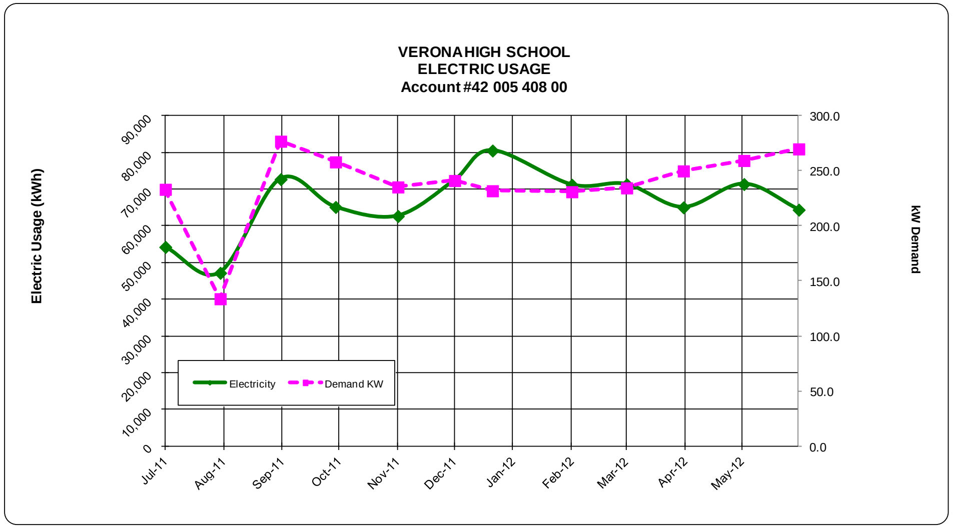
Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G Delivery Cost	HESS CORP / COMPASS ENERGY* Supply Cost	$/Therm
Natural Gas	Therms	6/28/2011	7/28/2011	137	$117.37	$101.19	$1.592
Natural Gas	Therms	7/28/2011	8/26/2011	0	$99.50	$0.00	#DIV/0!
Natural Gas	Therms	8/26/2011	9/27/2011	102	$114.31	$64.54	$1.760
Natural Gas	Therms	9/27/2011	10/26/2011	226	$132.49	$141.79	$1.211
Natural Gas	Therms	10/26/2011	11/28/2011	4,679	$2,306.22	$3,177.40	$1.172
Natural Gas	Therms	11/28/2011	12/28/2011	6,966	$2,742.44	$4,732.46	$1.073
Natural Gas	Therms	12/28/2011	1/17/2012	9,408	$3,154.59	$6,393.07	$1.015
Natural Gas	Therms	1/27/2012	2/28/2012	9,412	$3,110.69	$6,395.22	$1.010
Natural Gas	Therms	2/28/2012	3/28/2012	4,619	$2,212.35	$3,139.13	$1.159
Natural Gas	Therms	3/28/2012	4/27/2012	2,393	$375.55	$1,099.25	$0.616
Natural Gas	Therms	4/27/2012	5/29/2012	543	$176.45	$297.44	$0.873
Natural Gas	Therms	5/29/2012	6/27/2012	366	$151.33	$348.04	$1.366
		TOTALS/AVERAGE		**38,851**	**$14,693**	**$25,890**	**$1.045**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name	Verona High School - ***COMBINED***	
Address	151 Fairview Avenue	
	Verona, NJ	
Account#	42 005 408 00	- PSE&G
	1113222	- Direct Energy
Meter#	126408067	PoD ID: PE000011746289545193



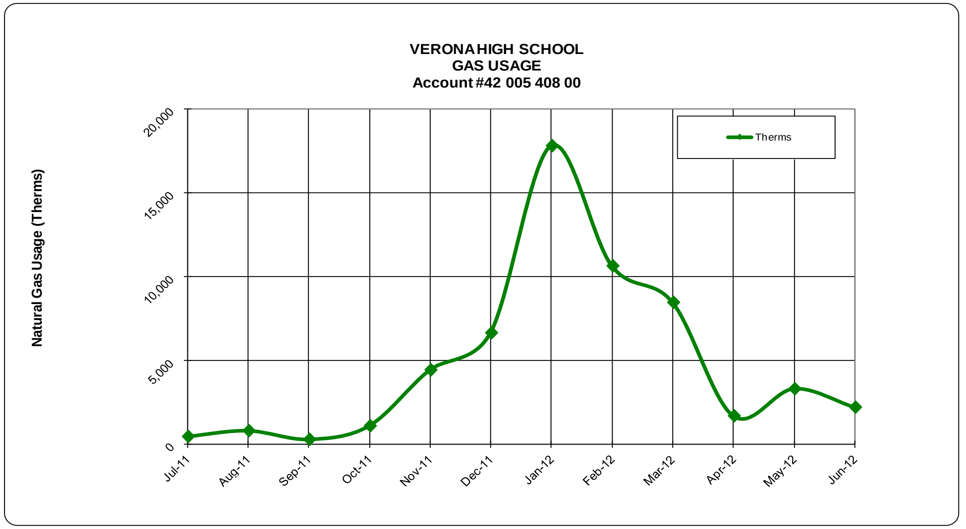
Energy Type	Energy Unit	Start Date	End Date	Demand KW	KWH	PSE&G Delivery Cost	DIRECT ENERGY Supplier Cost	$/kWh
Electricity	kWh	6/28/2011	7/28/2011	233.3	54,288	$4,551.22	$6,929.57	$0.21
Electricity	kWh	7/28/2011	8/26/2011	133.9	47,229	$3,241.97	$6,456.17	$0.21
Electricity	kWh	8/26/2011	9/27/2011	277.0	72,758	$5,510.33	$8,582.66	$0.19
Electricity	kWh	9/27/2011	10/26/2011	258.2	65,181	$3,048.39	$7,296.93	$0.16
Electricity	kWh	10/26/2011	11/28/2011	235.5	62,710	$2,931.55	$6,915.83	$0.16
Electricity	kWh	11/28/2011	12/28/2011	241.3	72,368	$3,221.48	$7,738.94	$0.15
Electricity	kWh	12/28/2011	1/17/2012	232.0	80,558	$3,457.42	$8,729.85	$0.15
Electricity	kWh	1/27/2012	2/28/2012	231.1	71,230	$3,195.42	$8,349.59	$0.16
Electricity	kWh	2/28/2012	3/28/2012	234.6	71,336	$3,210.45	$7,912.83	$0.16
Electricity	kWh	3/28/2012	4/27/2012	250.0	65,076	$3,088.16	$7,400.71	$0.16
Electricity	kWh	4/27/2012	5/29/2012	259.5	71,426	$3,299.47	$7,918.63	$0.16
Electricity	kWh	5/29/2012	6/27/2012	270.0	64,441	$5,451.21	$7,296.96	$0.20
		TOTALS/AVERAGE		**238.0**	**798,601**	**$44,207.07**	**$91,528.67**	**$0.170**

Historic Energy Consumption (cont'd)

Utility Usage and Costs Summary

Time-period: June 2011 – May 2012

Facility Name	Verona High School	
Address	151 Fairview Avenue	
	Verona, NJ	
Account#	42 005 408 00	- PSE&G
	356872 / 356957	- HESS CORP
Meter#	1639191	PoD ID: PG000011746288745193



Energy Type	Energy Unit	Start Date	End Date	Therms	PSE&G Delivery Cost	HESS CORP / COMPASS ENERGY* Supply Cost	$/Therm
Natural Gas	Therms	6/28/2011	7/28/2011	488	$167.78	$359.82	$1.081
Natural Gas	Therms	7/28/2011	8/26/2011	834	$220.98	$614.58	$1.002
Natural Gas	Therms	8/26/2011	9/27/2011	318	$145.89	$202.17	$1.093
Natural Gas	Therms	9/27/2011	10/26/2011	1,123	$257.60	$703.41	$0.856
Natural Gas	Therms	10/26/2011	11/28/2011	4,456	$1,645.95	$2,213.44	$0.866
Natural Gas	Therms	11/28/2011	12/28/2011	6,666	$2,776.69	$4,528.66	$1.096
Natural Gas	Therms	12/28/2011	1/17/2012	17,809	$4,797.50	$12,101.40	$0.949
Natural Gas	Therms	1/27/2012	2/28/2012	10,651	$3,177.35	$7,237.20	$0.978
Natural Gas	Therms	2/28/2012	3/28/2012	8,479	$2,554.64	$5,762.25	$0.981
Natural Gas	Therms	3/28/2012	4/27/2012	1,719	$310.55	$790.73	$0.641
Natural Gas	Therms	4/27/2012	5/29/2012	3,332	$466.06	$1,824.97	$0.688
Natural Gas	Therms	5/29/2012	6/27/2012	2,232	$360.02	$2,004.88	$1.059
		TOTALS/AVERAGE		58,107	$16,881.01	$38,343.51	$0.950

* Supply company changed in September 2011

Energy Star Portfolio

Energy Star Scores

- An *Energy Star* Score is calculated to establish a facility-specific energy intensity baseline.
- *Energy Star* can be used to compare energy consumption to other similar facilities and to gauge the success of energy conservation and cost containment efforts.
- Buildings with an *Energy Star* rating/score of 75, or above, are eligible to apply for an official *Energy Star* Building label.

Facility Name	Total Floor Area (sq ft)	*Energy Star* Score	Eligible to Apply for *Energy Star*	Current Site Energy Intensity (kBtu/sq ft)	Current Site Electric Energy Intensity (kBtu/sq ft)	Current Site Natural Gas Energy Intensity (kBtu/sq ft)	Current Source Energy Intensity (kBtu/sq ft)
Brookdale Avenue School	37,972	70	N/A	41	14	27	71.1
F.N. Brown School	38,985	7	N/A	87	20	67	133.7
Forest Avenue School	27,750	43	N/A	62	17	45	100.2
H.B. Whitehorne Middle School	118,224	**81**	**YES**	48	15	33	82.2
Laning Avenue School	46,477	18	N/A	71	18	53	111.9
Verona High School	120,245	64	N/A	71	23	48	121.4

- Note that natural gas fuel consumption at the F.N. Brown Elementary School is much greater, on a per square foot basis, than at any of the District's other schools.
- Possible reasons for increased heating energy consumption are: the school's age and construction, age of boilers, and losses through steam traps.

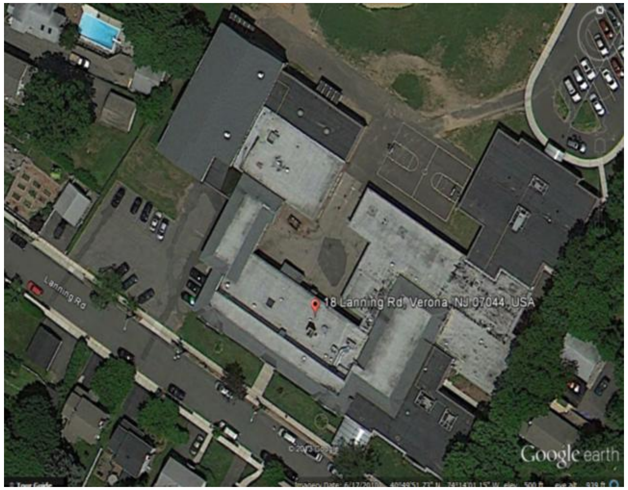
Energy Star Portfolio (cont'd)

Portfolio Manager Sign-In

- An account has been created for Verona School District in Portfolio Manager. You should have received an email to notify you of the generation of this account and shared access with Dome-Tech. Please use this to read your facility information. We would ask that you refrain from altering the sign-in information until after the report is finalized.
- Your building's information is currently shared as read only. When the report is finalized, the shared access will be changed so that you can use/edit the information as needed.
- Website link to sign-in: https://www.energystar.gov/istar/pmpam/index.cfm?fuseaction=login.Login
    - Username: VeronaSD
    - Password: **DTVerona1**
    - Email for account: pmcdevitt@veronaschools.org
    - Security Verification Question: What is your birth city?
      Answer: ***Verona***

Facility Information

Building Name: **Laning Avenue Elementary School**



Address:	18 Laning Avenue Verona, NJ 07044
Gross Floor Area:	46,477 sq ft
Year Built:	1911, renovated 1950s, 1998, 2007
# Occupants:	Students: 214 Staff: 49
Building Usage:	Elementary School, K-4

Construction Features:

Façade:	Single story brick façade, in good condition.
Roof Type:	30% pitched roof with asphalt shingles. 70% flat roof, metal deck, built up, ballasted with grey river rock
Windows:	Covering approximately 25% of façade, double pane windows, operable. Good condition
Exterior Doors:	13 steel & glass double doors, 3 steel & glass single doors. Mostly in good condition.

Facility Information (cont'd)

Major Mechanical Systems – Laning Avenue Elementary School

Air Handlers / AC Systems / Ventilation Systems

The school's Media Center, Computer Room, Music Room, Main Office, Nurses office, and preschool office are conditioned by roof top air handling units (RTUs) which use direct expansion (DX) cooling and natural gas heating. A heating only natural gas fired RTU serves the preschool wing. A heating and ventilation unit, located in the attic, has been retrofitted with a duct mounted DX coil, and serves the Café/Auditorium. Most classrooms (except those in the 2007 section), are conditioned by unit ventilators. The unit ventilators were installed as part of the school's the 1998 retrofit.

Rooftop unit serving the Media Center

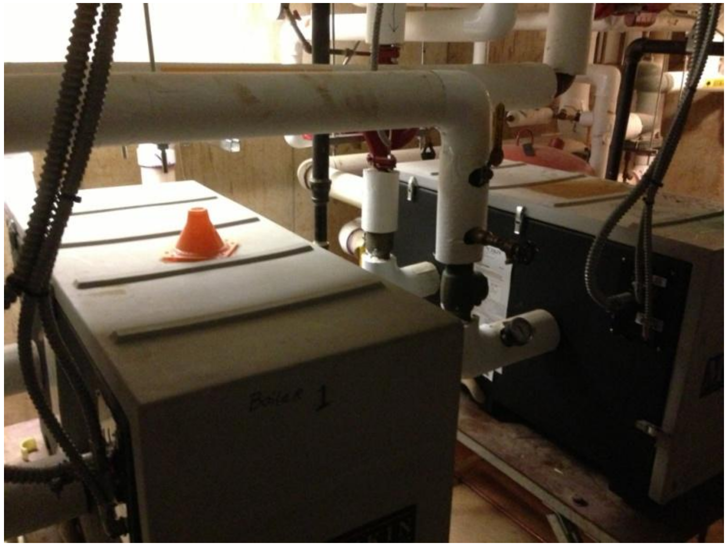
Facility Information (cont'd)

Major Mechanical Systems – Laning Avenue Elementary School

Boilers

The school is heated by four (4) natural gas boilers. Two (2) main 300 MBH cast iron sectional boilers produce heating hot water for the radiant heating systems, and two (2) 3.9 MBH Munchkin Boilers are used to provide heating hot water to the new gym. The main boilers are located in the basement and are served by two 5 HP circulating pumps. The Munchkin Boilers are located in the crawl space of the 2007 addition and are served by four ¾ HP circulating pumps. (two supply pumps and two return pumps).

300 MBH Boiler



3.9 MBH Munchkin Boilers

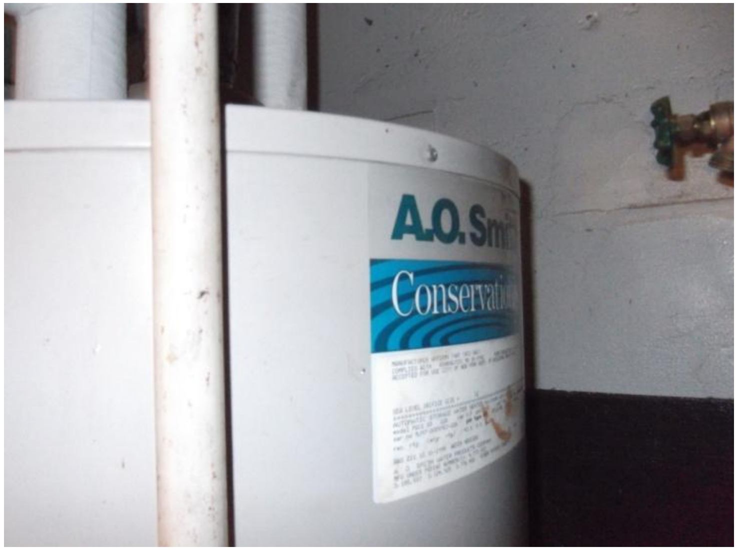
Facility Information (cont'd)

Major Mechanical Systems – Laning Avenue Elementary School

Domestic Hot Water

Domestic hot water is provided by two (2) domestic water heaters. One water heater is electric powered, and one is a natural gas fired. Both are located in the basement mechanical room.

HW#2, Electric Water Heater



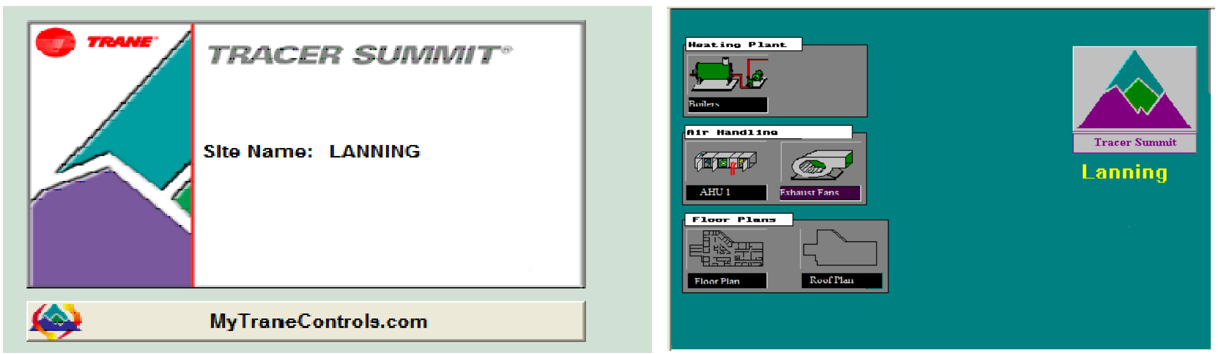
HW#1, Natural Gas Water Heater

Facility Information (cont'd)

Major Electrical Systems – Laning Avenue Elementary School

Controls

Most of the school's HVAC equipment is monitored and controlled by a Trane Tracer® Building Management System (BMS). The system is functioning properly



Home Screen s for Laning Avenue BMS

Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. Compact fluorescent bulbs are used in a few areas (rest rooms, lobby, and main office).

The gym and multi-purpose room are lit by metal halide high bay lighting fixtures.

Exterior lighting fixtures use high pressure sodium and compact fluorescent lamps.

Facility Information (cont'd)

Building Name: Brookdale Elementary School

Address:	14 Brookdale Court Verona, New Jersey 07044
Gross Floor Area:	37,972 sq ft
Year Built:	1927, Additions 1998
# Occupants:	Students: 115 Staff: 15
Building Usage:	Elementary School, K-4

Construction Features:

Façade:	Two story brick façade, in good condition.
Roof Type:	Flat roof, metal deck, built up, ballasted with grey river rock
Windows:	Covering approximately 50% of façade, double pane, double hung windows, operable.
Exterior Doors:	4 steel & glass double doors, 3 steel double doors, and 4 steel and glass single doors. 1 Steel roll-up door. All in good condition.

Facility Information (cont'd)

Major Mechanical Systems – Brookdale Elementary School

Air Handlers / AC Systems / Ventilation Systems

The school's faculty room, main office, principal's office, nurses office, and the media center are conditioned by roof top air handling units (RTUs) which use direct expansion (DX) cooling and natural gas fired heating. Heating only natural gas fired RTU's serve the 2nd floor new addition classrooms, the cafeteria, and the new addition basement area. The gym is served by two (2) ceiling hung heating and ventilation units with hot water heating coils.

Classrooms (other than those in the new addition served by rooftop units) are served by unit ventilators with hot water coils. The SGI and Music rooms contain unit ventilators that contain hot water heating coils as well as DX cooling coils. All equipment, other than stand-alone cabinet unit heaters in the hallways, is controlled by a building management system.

Boilers

Two (2) 2,511,000 Btuh natural gas-fired Cleaver Brooks fire tube boilers produce heating hot water for the radiant hot water system, unit heaters and the air handlers. Two (2) 2HP pumps are used for heating hot water distribution. Two (2) additional ¾HP inline pumps distribute heating hot water to the new addition.

RTU#1 serving top floor class rooms

Fire tube hot water boiler

Heating hot water pumps

Facility Information (cont'd)

Major Mechanical Systems – Brookdale Elementary School

Domestic Hot Water

The school's domestic hot water is provided by two (2) domestic water heaters, located in the boiler mechanical room. One is a 3,600 Watt, 40 gallon, electric water heater and the other is a 40,000 BTU, 50 gallon, natural gas water heater.

Gas-fired water heater (left) and
electric water heater (right)

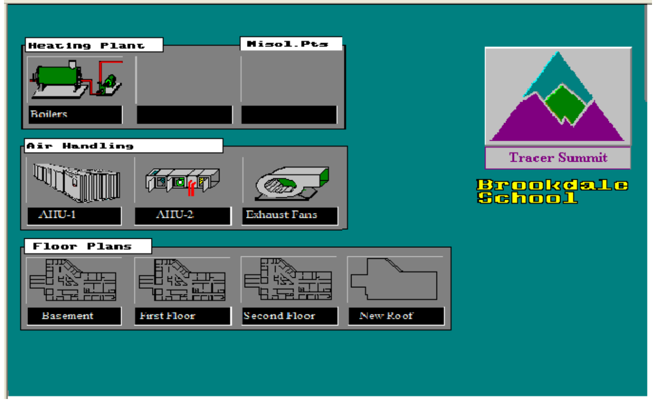
Dome-Tech, Inc.

Facility Information (cont'd)

Major Electrical Systems – Brookdale Elementary School

Controls

Most of the school's HVAC equipment is monitored and controlled by a Trane Tracer® Building Management System (BMS). The system is functioning properly



BMS home Screen

Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few compact fluorescent bulbs are used in the media center.
The gym is lit by metal halide high bay lighting fixtures.
Exterior lighting fixtures use high pressure sodium and compact fluorescent lamps.

Facility Information (cont'd)

Building Name: F.N. Brown Elementary School

Address:	125 Grove Avenue Verona, New Jersey 07044
Gross Floor Area:	38,985 sq ft
Year Built:	1930s, Additions 1963
# Occupants:	Students: 192 Staff: 21
Building Usage:	Elementary School, K-4

Construction Features:

Façade:	Two story brick façade, in good condition.
Roof Type:	70% pitched roof with asphalt shingles. 30% flat roof, metal deck, built up, ballasted with grey river rock
Windows:	Covering approximately 50% of façade, double pane, double hung windows, operable.
Exterior Doors:	10 steel & glass double doors, 4 steel double doors, and 4 steel or steel and glass and glass single doors. 1 Steel roll-up door. Most are in good condition, with some requiring either weather stripping replacement or door replacement due to rust.

Facility Information (cont'd)

Major Mechanical Systems – F.N. Brown Elementary School

Air Handlers / AC Systems / Ventilation Systems

Most of the school is conditioned by unit ventilators, equipped with steam heating coils. Three (3) steam heated air handling units are also used. Two (2) of these units serve the auditorium and one (1) serves the gym.

Mechanical cooling is available in some rooms (Music Room, OT/PT, Child Study, SGI, Faculty Room, Principal's Office, Teachers Work Room, Main Office, Computer Lab, Nurses Office and Library Office,), using split system direct refrigeration (DX) units. The DX condensing units are located in the front of the building and serve either ductless, wall mounted evaporators or ceiling mounted fan coil units, or unit. A few packaged unit ventilators also contain DX cooling. Most equipment, other than stand-alone cabinet unit heaters in the hallways, is controlled by a building management system.

Condensing unit serving OT/PT

Ductless evaporator unit (typ.)

Condensing unit serving the faculty room

Dome-Tech, Inc.

Facility Information (cont'd)

Major Mechanical Systems – F.N. Brown Elementary School

Boilers

Two (2) Cleaver Brooks, natural gas fired 4,184,000 Btu fire tube boilers provide steam for the steam unit ventilators, unit heaters and air handlers. A small shell and tube heat exchanger is used to convert steam to heating hot water for the hydronic unit ventilators. Two (2) ½ HP pumps distribute the heating hot water to unit ventilators(approximately eight (8)) ; located in recently renovated lower level classrooms.

Fire tube steam boiler

Domestic Water Heater

Heating hot water pumps

Domestic Hot Water

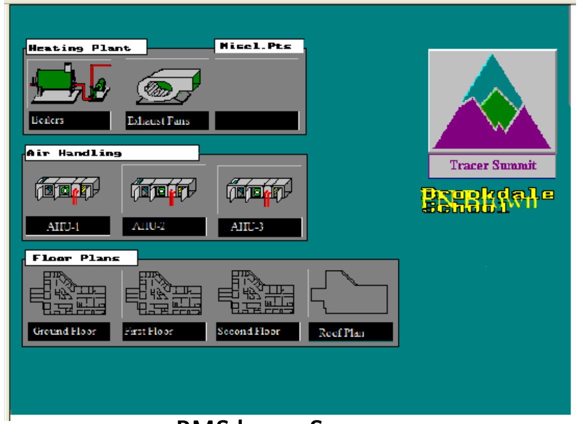
One (1) natural gas fired 48 gallon, 65,000 BTU domestic water heater provides domestic hot water.

Facility Information (cont'd)

Major Electrical Systems – F.N. Brown Elementary School

Controls

The School has been retrofitted with a Trane Tracer® Building Management System that monitors and controls most HVAC equipment throughout the building. The system is functioning properly



BMS home Screen

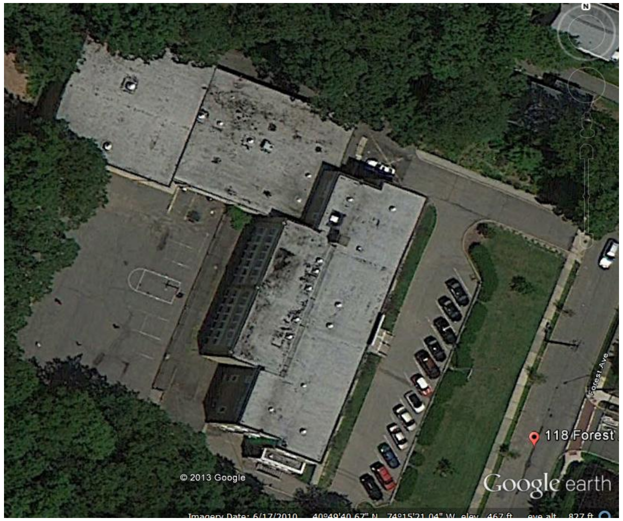
Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. Compact fluorescent bulbs are used in the auditorium and miscellaneous areas.
The gym is lit by new linear fluorescent high bay lighting fixtures which use T5 high output lamps.
Exterior lighting fixtures use high pressure sodium and compact fluorescent lamps.

Facility Information (cont'd)



Building Name: Forest Avenue Elementary School

Address:	118 Forest Avenue Verona, New Jersey 07044
Gross Floor Area:	27,750 sq ft
Year Built:	1930s, Addition circa 1960s
# Occupants:	Students: 208 Staff: 17
Building Usage:	Elementary School, K-4

Construction Features:

Façade:	Two story brick façade, in good condition.
Roof Type:	Flat roof, metal deck, built up, ballasted with grey river rock
Windows:	Covering approximately 50% of façade, double pane, double hung windows, operable. Good Condition
Exterior Doors:	4 steel & glass double doors and 3 steel or steel & glass single doors. 1 Steel roll-up door. All in good condition.

Dome-Tech, Inc.

Facility Information (cont'd)

Major Mechanical Systems – Forest Avenue Elementary School

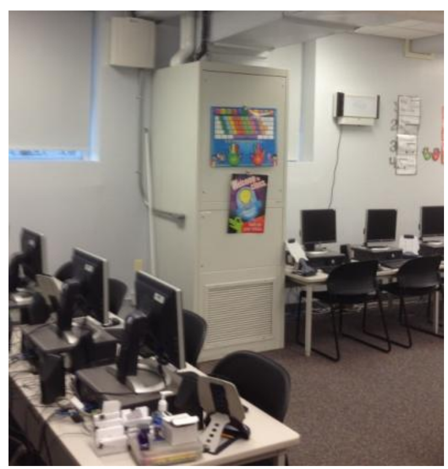
Air Handlers / AC Systems / Ventilation Systems

The main office and nurses office are conditioned by roof top air handling units (RTU) which use direct expansion (DX) cooling. The gym is served by two (2) ceiling hung heating and ventilation units with hot water heating coils. Classrooms are served by unit ventilators which use hot water coils. Unit ventilators serving the computer room and classroom #3 are equipped with DX cooling coils. A window air conditioner is used to cool the library. Most equipment, other than stand-alone cabinet unit heaters in the hallways, is controlled by a building management system.

Boilers

Two (2) natural gas fired Cleaver Brooks, 2,511,000 Btuh fire tube boilers provide heating hot water for the radiant hot water system, unit heaters and air handlers. Two (2) 3HP pumps and two (2) 1½HP pumps are used for heating hot water circulation through the boilers and for distribution throughout the building.

RTU serving main office



Computer room unit ventilator

Fire tube heating hot water boiler

Facility Information (cont'd)

Major Mechanical Systems – Forest Avenue Elementary School

Domestic Hot Water

Domestic hot water is provided by a gas fired 50 gallon, 40,000 BTU domestic water heater.

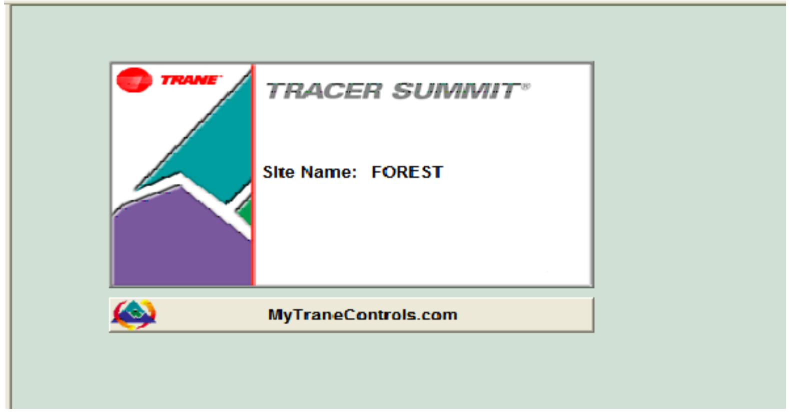
Domestic Water Heater

Facility Information (cont'd)

Major Electrical Systems – Forest Avenue Elementary School

Controls

The School has been retrofitted with a Trane Tracer® Building Management System that monitors and controls most HVAC equipment throughout the building. The system is functioning properly



BMS home Screen

Utility Power

Electricity enters the facility as a 120/208VAC Wye service from the utility and is used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few compact fluorescent bulbs are used in storage closets.
The gym is lit by linear fluorescent fixtures, which use T8 lamps.
Exterior lighting fixtures use metal halide lamps.

Facility Information (cont'd)

Building Name: H.B. Whitehorne Middle School

Address: 600 Bloomfield Avenue, Verona, New Jersey 07044

Gross Floor Area: 118,224 sq ft

Year Built: 1920, Additions -Late 1920s, 1967, 2007

Occupants: Students: 623, Staff: 65

Building Usage: Grades 5 - 8

Construction Features:

Façade: Two story brick façade, in good condition.

Roof Type: 45% pitched roof with asphalt shingles. 55% flat roof, metal deck, built up, ballasted with grey river rock

Windows: Covering approximately 50% of façade, double pane, double hung windows, operable. Windows installed 1998 and many no longer open correctly. Good condition, but some of the operable windows are difficult to open.

Exterior Doors: 11 steel & glass double doors, 4 steel double doors, and 7 steel or steel & glass and glass single doors. Most are in good condition, with some requiring either weather stripping replacement or door replacement due to rust.

Facility Information (cont'd)

Major Mechanical Systems – H.B. Whitehorne Middle School

Air Handlers / AC Systems / Ventilation Systems

The new computer lab, the core offices, science labs and the media center are served by roof top air handling units (RTUs) using direct expansion (DX) cooling and natural gas heating. A heating only natural gas fired RTU serves the new cafeteria. Ceiling hung air handling units that utilize DX cooling serve the faculty room, guidance offices, the main office, the music room and two (2) classrooms. Six (6) additional heating and ventilation units serve the old gym area and the auditorium. Most other classrooms are served by unit ventilators using either hot water heating coils (1967 and 2007 additions only) or steam heating coils. The old computer room is served by unit ventilators and a ductless split DX cooling system.

RTU#5 serving Media Center

Auditorium AHU (1 of 2)

Unit ventilators serving cafeteria (3)

Facility Information (cont'd)

Major Mechanical Systems – H.B. Whitehorne Middle School

Boilers

Two (2) natural gas fired Cleaver Brooks, 6,277,000 BTU fire tube boilers provide steam for the steam unit ventilators, unit heaters and radiant heating. Two (2) shell and tube heat exchangers are used to convert steam to heating hot water. One of the heat exchangers serves the 1967 addition and the other serves the 2007 addition. Each utilizes a set of 5HP pumps to distribute water to terminal units.

Steam to heating hot water heat exchanger (1 of 2)

Fire tube steam boiler

Heating hot water pumps for 1967 section of building

Facility Information (cont'd)

Major Mechanical Systems – H.B. Whitehorne Middle School

Domestic Hot Water

Domestic hot water is provided by two (2) natural gas fired 76,000 Btuh domestic water heaters with 75 gallon tanks.

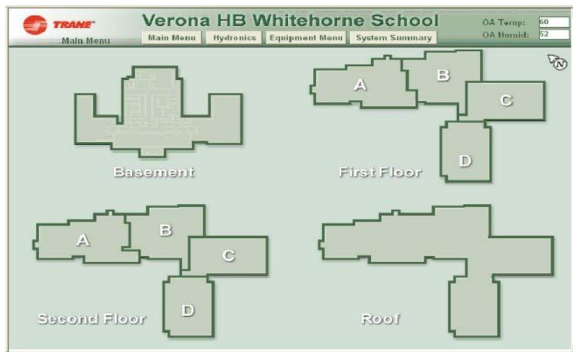
Natural gas fired domestic hot water heaters

Facility Information (cont'd)

Major Electrical Systems – H.B. Whitehorne Middle School

Controls

The School has been retrofitted with a Trane Tracer® Building Management System that monitors and controls most HVAC equipment throughout the building. The system is functioning properly



BMS home Screen

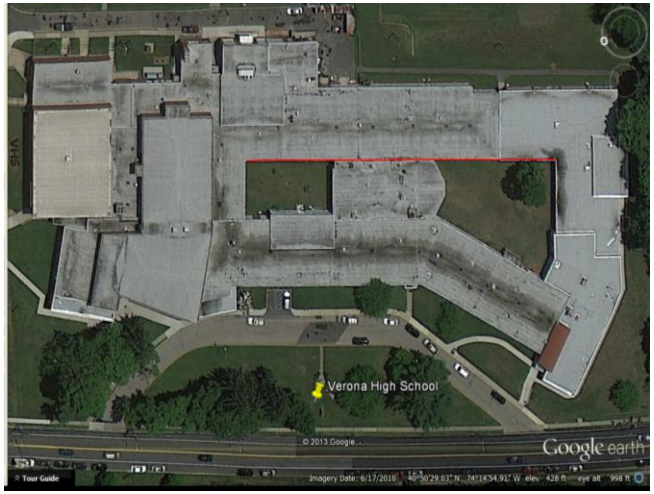
Utility Power

Electricity enters the facility from two (2) services. Both services are 120/208VAC Wye and are used for lighting and equipment power.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few fixtures use older, less efficient T12 lamps and magnetic ballasts. A few compact fluorescent and incandescent bulbs are used in various areas.
The gym is lit by metal halide high bay lighting fixtures.
Exterior lighting fixtures use metal halide lamps.

Facility Information (cont'd)



Building Name:	**Verona High School**
Address:	120 Fairview Avenue Verona, New Jersey 07044
Gross Floor Area:	120,224 sq ft
Year Built:	1956, Additions 1975, 2007
# Occupants:	Students: 604 Staff: 89
Building Usage:	Grades 9 - 12

Construction Features:

Façade:	Two story brick façade, in good condition.
Roof Type:	Flat roof, metal deck, built up, ballasted with grey river rock
Windows:	Covering approximately 50% of façade, double pane, double hung windows, operable. Good Condition
Exterior Doors:	7 steel & glass double doors, 9 steel double doors, and 5 steel & glass single doors, and 4 steel single doors. 2 roll-up doors. Most in good condition, some require weather stripping replacement.

Facility Information (cont'd)

Major Mechanical Systems – Verona High School

Air Handlers / AC Systems / Ventilation Systems

Roof top air handling units (RTUs) utilizing direct expansion (DX) cooling and natural gas heating supply air to the Board Offices and Special Services Rooms, Café, and Inner Offices. The old gym is served by two (2) hot water heating only air handling units (AHUs) located in the penthouse mechanical rooms. The new gym is served by two (2) heating hot water only ceiling hung AHUs, and the Auditorium is served by an air handler located in the second penthouses. Most rooms contain heating only unit ventilators, but some rooms also contain ductless split, direct expansion cooling units. These include the Graphics Room, Guidance Offices, Student Activities Room, and classrooms 12, 14, 18, 26 and 30.

Boilers

Two (2) natural gas fired Cleaver Brooks, 5,230,000 Btuh fire tube boilers provide heating hot water for the radiant hot water system, unit heaters and the air handlers. Three (3) 7.5HP constant speed primary pumps and one (1) 3HP standby pump are used for heating hot water distribution.

Fire tube heating hot water boiler

Facility Information (cont'd)

Major Mechanical Systems – Verona High School

Domestic Hot Water

Domestic hot water is provided by two (2) natural gas fired domestic water heaters, located in the boiler mechanical room. Only one- an 85 gallon, 500,000 Btuh unit- is currently operational. The other 80 gallon, 750,000 Btuh unit is currently offline and requires replacement.

Natural gas fired domestic hot water heaters

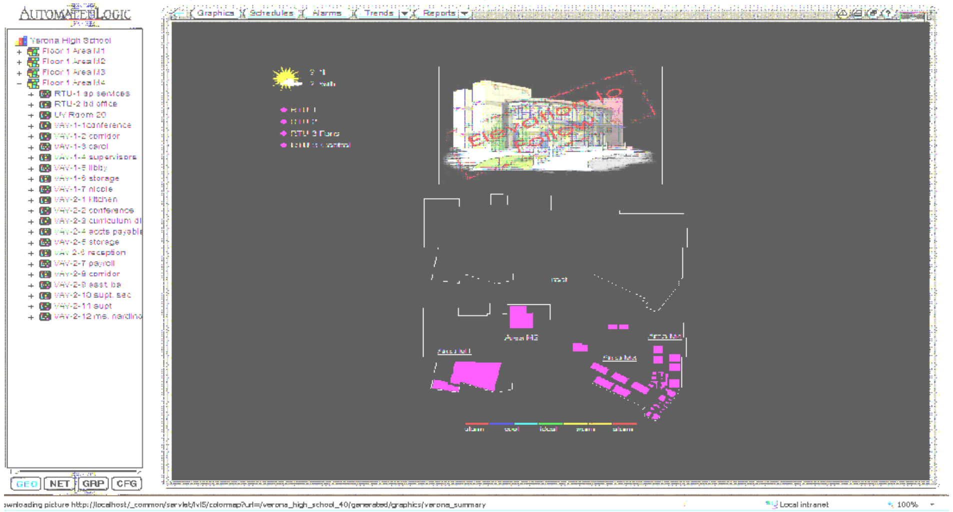
Facility Information (cont'd)

Major Electrical Systems – Verona High School

Controls

The School has been retrofitted with an Automated Logic Building Management System (BMS) that monitors and controls HVAC equipment. Unlike the other schools in the District, the control upgrade is not as comprehensive and does not include the majority of the HVAC equipment. The portion of the building that is controlled by the BMS is functioning properly.

The boiler room equipment, HAC-1 serving inner offices, gym H&V units, exhaust fans, and many classroom unit ventilators are not controlled by the Automated Logic System. These pieces of equipment rely on building staff, mechanical time clocks, pneumatic control panels and pneumatic actuators to operate. Exhaust fans, for example, are turned on and off by the maintenance staff and operate for many more hours than necessary. In addition, HAC-1 is controlled from a pneumatic control panel that limits the units functionality.



BMS home Screen

Facility Information (cont'd)

Major Electrical Systems – Verona High School (cont'd)

Utility Power

The facility is served by two (2) electrical services. The original service is 120/208VAC and the main disconnect is located in the boiler mechanical room. The second service is provided from the utility company at 480VAC. The service enters the facility as a 120/208VAC Wye from a facility owned 480–120/208VAC pad-mounted transformer located at the back of the school.

Lighting

Most of the school's interior is illuminated by linear fluorescent lighting fixtures, using 32 Watt T-8 lamps and electronic ballasts. A few fixtures use older, less efficient T12 lamps and magnetic ballasts. Compact fluorescent bulbs are used in the auditorium.

The gyms are lit by metal halide high bay lighting fixtures.

Exterior lighting fixtures use metal halide and high pressure sodium lamps.

Greenhouse Gas Emission Reduction

Implementation of all identified ECMs will yield:

- 615,000 kilowatt-hours of annual avoided electric usage.
- 15,100 therms of annual avoided natural gas usage.
- This equates to the following ***annual*** reductions:

- 292 tons of CO_2;

-OR-

- 50 Cars removed from road;

-OR-

- 80 Acres of trees planted annually

The Energy Information Administration (EIA) estimates that power plants in the state of New Jersey emits 0.666 lbs CO_2 per kWh generated.

The Environmental Protection Agency (EPA) estimates that one car emits 11,560 lbs CO_2 per year.

The EPA estimates that reducing CO_2 emissions by 7,333 pounds is equivalent to planting an acre of trees.

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Energy Conservation Measures (ECMs) Notes and Assumptions

- The average CO_2 emission rate from power plants serving the facilities within this report was obtained from the Environmental Protection Agency's (EPA) eGRID2007 report. It is stated that power plants within the state of NJ emit 0.66 lbs of CO_2 per kWh generated.
  - *The EPA estimates that burning one therm of natural gas emits 11.708 lbs CO_2.*
  - *The EPA estimates that one car emits 11,560 lbs CO_2 per year.*
  - *The EPA estimates that reducing CO_2 emissions by 7,333 lbs is equivalent to planting an acre of trees.*
- The following utility prices calculated from the utility bills provided were used within this study:

School	$ / kWh	$ / Therms
Laning Avenue Elementary School	$ 0.15	$ 1.02
Brookdale Avenue Elementary School	$ 0.15	$ 1.17
F.N. Brown Elementary School	$ 0.17	$ 1.03
Forest Avenue Elementary School	$ 0.15	$ 1.13
H.B. Whitehorne Middle School	$ 0.15	$ 1.04
Verona High School	$ 0.17	$ 0.95
Averaged Costs	***$ 0.16***	***$ 1.06***

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ECM #1: Computer Power Management

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	$1,860	$2,840	$2,730	$7,500	$2,780	$11,800	**$29,510**
Gross Estimated Implementation Cost[1]:	$810	$1,080	$1,170	$3,320	$1,170	$4,660	**$12,210**
Approx. NJ Smart Start Rebate[2]:	$0	$0	$0	$0	$0	$0	**$0**
Net Estimated Implementation Cost:	$810	$1,080	$1,170	$3,320	$1,170	$4,660	**$12,210**
Simple Payback (years):	0.4	0.4	0.4	0.4	0.4	0.4	**0.4**
Annual Avoided CO_2 Emissions (tons):	4	5	6	16	6	23	**61**

[1] Cost estimates based on RSMeans cost estimating data.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

Dome-Tech observed, and staff indicate, that at night and on weekends many personal computers are left "on" in a screen saver- mode. Computer screen savers were originally developed to prevent the permanent etching of patterns on older monochrome monitors. In this mode, both the computer and monitor consume the same amount of energy as the computer in regular operation, which is approximately 75W for the computer and monitor.

Recommended Measure

Dome-Tech recommends installing a school district wide computer power management system (such as Verdiem *Surveyor* software). This software would place the computers into a standby/sleep mode during periods of inactivity. In this mode, the computer and monitor will draw between 1 and 3 Watts each. This would significantly reduce the computers' electrical energy consumption.

The computers will "wake up" instantaneously when the mouse or button on the keyboard is touched, causing no interruption during daytime use. When the computers "wake up," all active files and programs will be available as before entering the standby/sleep mode, ensuring no data will be lost.

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ECM #2: Insulate Piping

	F.N. Brown School	Verona High School	TOTAL
Estimated Annual Savings:	$180	$400	**$2,440**
Gross Estimated Implementation Cost[1]:	$230	$870	**$1,910**
Approx. NJ Smart Start Rebate[2]:	$0	$0	**$0**
Net Estimated Implementation Cost:	$230	$870	**$1,910**
Simple Payback (years):	1.3	2.2	**0.8**
Annual Avoided CO_2 Emissions (tons):	1	2	**7**

[1] Cost estimates based on RSMeans cost estimating data.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

Approximately 75 feet of bare, uninsulated heating hot water (HHW) supply and return piping was found at Verona High School, at the two (2) penthouse air handling units.

Approximately 20 feet of bare, uninsulated low pressure condensate (LPC) piping was found at F.N. Brown Elementary School, near the condensate return station in the boiler room.

Recommended Measure

Insulate HHW and LPC piping to reduce heat losses.

ECM #3: Install Vending Machine Controls

	F.N. Brown School	H.B. Whitehorne M.S.	Verona High School	TOTAL
Estimated Annual Savings:	$670	$300	$1,670	**$2,640**
Gross Estimated Implementation Cost[1]:	$1,360	$680	$3,400	**$5,440**
Approx. NJ Smart Start Rebate[2]:	$0	$0	$0	**$0**
Net Estimated Implementation Cost:	$1,360	$680	$3,400	**$5,440**
Simple Payback (years):	2.0	2.3	2.0	**2.1**
Annual Avoided CO_2 Emissions (tons):	1.3	0.6	3	**5.2**

[1] Cost estimates based on published retail costs.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

There are two (2) beverage vending machines are located at F.N. Brown Elementary School, five (5) machines at Verona High School, and one (1) machine at H.B. Whitehorne Middle School. These machines are plugged in and cooling their contents 24/7.

Recommended Measures

- Install vending machine occupancy control devices for each vending machine.
- These devices reduce electrical energy consumption by turning off the unit's lights and managing compressor cooling cycles when the surrounding area is vacant. They automatically re-powers the cooling system at one to three hour intervals, independent of sales, to ensure that the product stays cold.
- The microcontroller will never power down the machine while the compressor is running, eliminating compressor short-cycling. In addition, when the machine is powered up, the cooling cycle is allowed to finish before again powering down (which reduces compressor wear and tear).
- This measure can be implemented by the operations staff.
- This ECM is not expected to reduce the building(s)' electrical demand.

ECM #4: Steam Trap Maintenance Program

	F.N. Brown School	H.B. Whitehorne Middle School	TOTAL
Estimated Annual Savings:	$1,220	$2,610	**$3,830**
Gross Estimated Implementation Cost[1]:	$3,010	$6,620	**$9,630**
Approx. NJ Smart Start Rebate[2]:	$0	$0	**$0**
Net Estimated Implementation Cost:	$3,010	$6,620	**$9,630**
Simple Payback (years):	2.5	2.5	**2.5**
Annual Avoided CO_2 Emissions (tons):	7	15	**22**

[1] Cost estimates based on RSMeans cost estimating data.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

H.B Whitehorne Middle School and F.N. Brown Elementary School use low pressure steam for heating. Interviews with building maintenance staff indicate that all steam traps were replaced during the 1998 renovations, but have not been tested since then. Currently, there is no steam trap testing and maintenance program in place at H.B Whitehorne Middle School and F.N. Brown Elementary School.

The U.S. Department of Energy estimates that in steam systems that have not been maintained for 3 to 5 years, between 15% to 30% of the installed steam traps may have failed—thus allowing live steam to escape into the condensate return system. In systems with a regularly scheduled maintenance program, leaking traps should account for less than 5% of the trap population. (Dome Tech assumed 10% trap failure rate for calculations)

Recommended Measure

Implement an annual steam trap maintenance program to reduce or eliminate energy loss associated with steam trap failure.

ECM #5: Replace Electric Hot Water Heaters

	Brookdale E.S.	Laning Avenue School	TOTAL
Estimated Annual Savings:	$430	$980	**$1,410**
Gross Estimated Implementation Cost[1]:	$2,210	$2,140	**$4,350**
Approx. NJ Smart Start Rebate[2]:	$0	$0	**$0**
Net Estimated Implementation Cost:	$2,210	$2,140	**$4,350**
Simple Payback (years):	4.8	2.1	**3.1**
Annual Avoided CO_2 Emissions (tons):	0	0	**0**

[1] Cost estimates based on RSMeans cost estimating data.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

Laning Avenue School and Brookdale Elementary School are each served by an electric domestic hot water heater, that operates in conjunction with a natural gas hot water heater.

Based on the District's current energy rates, it is approximately three-and-a-half times more expensive to generate domestic hot water using electricity, versus natural gas.

Recommended Measure

- Replace the electric hot water heaters with natural gas hot water heaters.
- The cost estimate includes new gas fired water heaters, gas piping, and flue modification.

ECM #6: Replace CRT Monitors w/Flat Screen

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	TOTAL
Estimated Annual Savings:	$60	$70	$50	$30	$20	**$230**
Gross Estimated Implementation Cost[1]:	$300	$300	$230	$150	$80	**$1,060**
Approx. NJ Smart Start Rebate[2]:	$0	$0	$0	$0	$0	**$0**
Net Estimated Implementation Cost:	$300	$300	$230	$150	$80	**$1,060**
Simple Payback (years):	5.0	4.3	4.6	5.0	4.0	**4.6**
Annual Avoided CO_2 Emissions (tons):	0.1	0.1	0.1	0.1	0.0	**0.5**

[1] Cost estimates based on published retail costs.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

While most of the District's personal computers use modern Liquid Crystal Display (LCD) flat screen monitors, older, inefficient Cathode Ray Tube (CRT) computer monitors are utilized in each of the schools.

- *Brookdale E.S.:* 4 CRTs
- *FN Brown:* 4 CRTs
- *Forest E.S.:* 3 CRTs
- *HB Whitehorne MS:* 2 CRTs
- *Laning Avenue School:* 1 CRT

Recommended Measures

- Replace the remaining CRT monitors with LCD flat screen monitors.
- LCD monitors consume approximately one quarter of the energy of CRT monitors.

ECM #7: Lighting Upgrade

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	$6,290	$7,710	$6,140	$5,580	$10,200	$27,800	**$63,720**
Gross Estimated Implementation Cost[1]:	$47,400	$58,400	$50,900	$46,700	$67,800	$170,000	**$441,200**
Approx. NJ Smart Start Rebate[2]:	$5,710	$6,100	$5,460	$5,600	$8,110	$20,300	**$51,280**
Net Estimated Implementation Cost:	$41,600	$52,300	$45,400	$41,100	$59,700	$150,000	**$390,100**
Simple Payback (years):	6.6	6.8	7.4	7.4	5.9	5.4	**6.2**
Annual Avoided CO_2 Emissions (tons):	13	15	13	12	22	54	**130**

1 Cost estimates based on actual costs of similar comprehensive lighting projects; see room-by-room surveys in Appendix for details

Observations/Issues

Dome-Tech, performed a room-by-room lighting audit of all six buildings. Audit findings and recommendations are summarized below:

Interior Lighting

- General Linear Fluorescent Lighting:
  - The vast majority of linear fluorescent light fixtures in the District's schools use higher efficiency 32 Watt T-8 lamps with electronic ballasts.
  - Only a handful of areas use older, inefficient T12 lamps with magnetic ballasts.
- Screw in bulbs:
  - Located in miscellaneous areas (storage, closets, mechanical spaces, etc.).
  - Most areas lit with screw-in compact fluorescent lamps.
  - A few areas use incandescent light bulbs
- High Bay Lighting:
  - High bay areas (gyms, multipurpose rooms, auditoriums) use metal halide fixtures and linear fluorescent fixtures (with both T8 and T5 lamps).

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ECM #7: Lighting Upgrade (cont'd)

Exterior Lighting

- Schools use mercury vapor, high pressure sodium, metal halide, and compact lamps for exterior lighting.

Recommended Measures

Interior Lighting

- Re-lamp and re-ballast linear fluorescent fixtures from 4ft 32W T8 lamps with standard ballasts- to 28W T8 lamps with high efficiency, low power ballasts.
- Due to marginal measured light levels, the addition of specular reflectors is recommended for linear fluorescent fixtures in classrooms at FN Brown and Forest Ave Elementary Schools.
  - Note that lighting fixture mock-ups, and/or a more detailed lighting design study may be required to ensure that the proposed retrofits meet required classroom light levels.
- Replace screw-in incandescent lamps with compact fluorescent lamps.
- Replace metal halide high bay lighting with new induction fixtures

Exterior Lighting

- Replace mercury vapor, high pressure sodium, and metal halide exterior lighting with induction lighting. This will reduce electrical energy consumption by nearly 50% and provide approximately equal lighting output. Additionally, induction lamps operate for approximately 100,000 hours, which is up to five (5) times longer than existing metal halide lamps.

Occupancy Sensors

- Install dual technology occupancy sensors to control lights in classrooms, offices, rest rooms, libraries, cafeterias, and multi purpose rooms.

A complete room-by-room lighting survey of each school is included in the Appendix.

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ECM #8: Door Weather Stripping

	F.N. Brown School	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	$70	$70	$20	$4	**$164**
Gross Estimated Implementation Cost[1]:	$470	$470	$240	$80	**$1,260**
Approx. NJ Smart Start Rebate[2]:	$0	$0	$0	$0	**$0**
Net Estimated Implementation Cost:	$470	$470	$240	$80	**$1,260**
Simple Payback (years):	6.7	6.7	12.0	18.7	**7.7**
Annual Avoided CO_2 Emissions (tons):	0.4	0.4	0.1	0.0	**0.9**

[1] Cost estimates based on RSMeans cost estimating data.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

Doors at multiple schools are inadequately sealed. This implies that either weather stripping requires replacement or that the door's bottom brushes are missing, worn, or damaged.

Recommended Measures

Replace door seals to reduce air infiltration which will reduce conditioning costs and increase occupant comfort.

	F.N. Brown School	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Door Weather Stripping To Be Replaced	6	6	3	1	**16**

ECM #9: Demand Controlled Ventilation

	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Savings:	$360	$680	$280	$540	$820	$1,570	**$4,250**
Gross Estimated Implementation Cost[1]:	$10,800	$13,200	$7,870	$15,000	$13,200	$18,100	**$78,170**
Approx. NJ Smart Start Rebate[2]:	$0	$0	$0	$0	$0	$0	**$0**
Net Estimated Implementation Cost:	$10,800	$13,200	$7,870	$15,000	$13,200	$18,100	**$78,170**
Simple Payback (years):	30.0	19.4	28.1	27.8	16.1	11.5	**18.4**
Annual Avoided CO_2 Emissions (tons):	2	4	2	3	5	9	**24**

[1] Cost estimates based on RSMeans cost estimating data.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

Building codes require that a minimum amount of fresh air be provided to ensure adequate air quality. To comply, ventilation systems often operate at a fixed rate based on an assumed occupancy (e.g., 20 CFM/person multiplied by the maximum design occupancy). Since maximum design occupancy is rarely achieved throughout the entire day, this results in excessive fresh air volumes, which require costly and unnecessary conditioning.

Note that the savings presented in the table above are based on an *adjusted baseline* (see O&M section of this report). Air handling units throughout the school district currently operate with no ventilation outside air. The minimum outside air percentage is often programmed in the building management systems (BMS) as 0%. While many of the units do take advantage of free cooling when outside air conditions permit, their fresh air dampers are completely closed during the heating season. Operating in this manner reduces energy consumption at the expense of building indoor air quality (IAQ). A lack of fresh air in a facility can adversely affect air quality by raising CO_2 concentrations, creating “sick building syndrome”.

ECM #9: Demand Controlled Ventilation (cont'd)

Recommended Measures

- Demand-controlled ventilation (DCV) controls the amount of outside air being supplied based upon the CO_2 levels generated by building occupants. DCV should be added to any space that is ventilated by a large quantity of outdoor air, and/or where occupancy varies dramatically (gymnasiums and libraries).
- Because CO_2 levels correlate directly with the number of people in an occupied zone, CO_2 sensors are used to control ventilation rate of outside air supplied to each zone. Reducing the amount of outdoor air supplied to a zone reduces the energy required to heat and cool that air, while space conditions are kept in compliance with building codes and standards, such as the ASHRAE Indoor Air Quality Standard.
- Dome-Tech recommends adding DCV control sequences, including CO_2 sensors, related hardware, and controls programming. This will allow air handling units to provide the correct outside air ventilation rates for any particular occupancy level.
- Dome-Tech also recommends testing CO_2 sensor calibrations, per the manufacturer's calibration schedule.
- The chart below indicates the RTUs/areas where the control sequence should be installed:

School	Area/ AHU to Install DCV
Brookdale Avenue School	Gym / Café AHUs (2) and Media Center RTU
F.N. Brown School	Gym / Café AHU and Auditorium AHUs (2)
Forest Avenue School	Gym AHUs (2)
H.B. Whitehorne Middle School	1967 Gym AHUs (4), Other Gym/ Auditorium AHUs (2), New Café RTU, Computer Room RTU and Media Center RTU
Laning Avenue School	Gym 1 AHUs (2), Café / Auditorium attic-hung AHU
Verona High School	Old Gym AHUs in penthouses (2), New Gym AHUs (2), Auditorium RTU and Cafeteria RTU

ECM #10: Replace Window ACs w/ DX Split

	F.N. Brown School	Forest E.S.	Laning Avenue School	TOTAL
Estimated Annual Savings:	$140	$680	$60	**$880**
Gross Estimated Implementation Cost[1]:	$12,500	$11,200	$6,870	**$30,570**
Approx. NJ Smart Start Rebate[2]:	$120	$280	$80	**$480**
Net Estimated Implementation Cost:	$12,400	$10,900	$6,790	**$30,090**
Simple Payback (years):	88.6	16.0	113.2	**34.2**
Annual Avoided CO_2 Emissions (tons):	0.5	1	0.2	**2.0**

[1] Cost estimates based on RSMeans cost estimating data.
[2] No prescriptive New Jersey Smart Start rebates are available for this measure.

Observations/Issues

There are window air conditioning units located in various schools. The use of window air conditioners results in air infiltration simply by the nature of their installation method. They also are less efficient than alternative cooling methods.

Recommended Measures

Replace window air conditioning units with ductless split air conditioning systems similar to those that are installed throughout the District. The Seasonal Energy Efficiency Ratio (SEER) of typical window AC units is limited to approximately 10 SEER, while comparably sized split AC units range from 14-16 SEER or greater.

- *FN Brown: 2 units (includes spot cooler in Music Tech Room & Kitchen Unit)*
- *Forest E.S.: 1 unit (Library AC)*
- *Laning Avenue School: 1 unit (Special Instruction Room)*

ECM #11: Replace Boilers with High Efficiency Modulating Condensing Boilers

- Several of the Verona Schools are equipped with older fire tube, heating hot water or boilers.
- For the most part, these boilers are old and are nearing or past the end of the equipment service life (ASHRAE states the service life of similar equipment to be 25 years).
- The ages, sizes, types and configurations of the boilers do not lend themselves to efficient operation. Generally, as boilers approach the end of their service life, the efficiency degrades and the boiler must consume more fuel in order to produce the same rated output. In addition, there is a direct correlation between risk of equipment failure (tube breaks & meltdown, shell cracks, furnace surface area failure) and equipment age.
- If the existing boilers could be replaced by high efficiency, modulating or modular condensing boilers, savings will be realized in two ways.
  - Modulating boilers, usually 1,000 MBH or smaller, employ multiple burners to meet the heating load. Each burner operates independently, eliminating the “all on/all off” operation of single burner boilers. As building loads increase only those burners necessary to meet the load are fired. This allows each burner to run at optimal efficiency. Modular boilers operate under the same principal but for larger installations. In this case multiple boilers are used rather than multiple burners. Modular boilers usually are employed in 1500, 2000 or 3000 MBH sizes.
  - Condensing boilers recover energy from the exhaust gas thus allowing efficiencies of 90% and above.
- When a boiler is both a modulating/modular type and a condensing type, extremely high efficiencies can be realized.

Forest E.S. Boiler

ECM #11: Replace Boilers with High Efficiency Modulating Condensing Boilers (cont'd)

The high first cost of a new boiler system may preclude this ECM from being justified by economics alone at some of the facilities; however, reliability issues warrant consideration of these projects as part of a long-term capital improvement plan. The ECM table details the economics at each site

	Brookdale E.S	**Forest**	**Laning E.S.**	**Verona HS**	**TOTAL**
Estimated Annual Savings:	$920	$1,100	$1,870	$3,670	**$7,560**
Gross Estimated Implementation Cost[1]:	$344,000	$344,000	$344,000	$572,000	**$1,604,000**
NJ Smart Start Rebate[2]:	$10,500	$10,500	$10,500	$18,400	**$49,900**
Avoided Cost (Like and Kind Replacement): *	$216,000	$216,000	$247,000	$299,000	**$978,000**
Net Estimated Incremental Implementation Cost:	$118,000	$118,000	$86,500	$255,000	**$577,500**
Estimated Simple Payback (years): *(Incremental and without Avoided Costs)*	128.3	107.3	46.3	69.5	**76.4**
Annual Avoided CO_2 Emissions (tons):	5	6	11	23	**44**

NOTE 1: The presented economics should be used for planning purposes only. If the client decides to proceed with any boiler replacement project, these economics should be refined with an investment grade analysis.

* = Avoided Cost: Cost of Like and Kind replacement..

O&M: Supply Correct Outside Air Ventilation

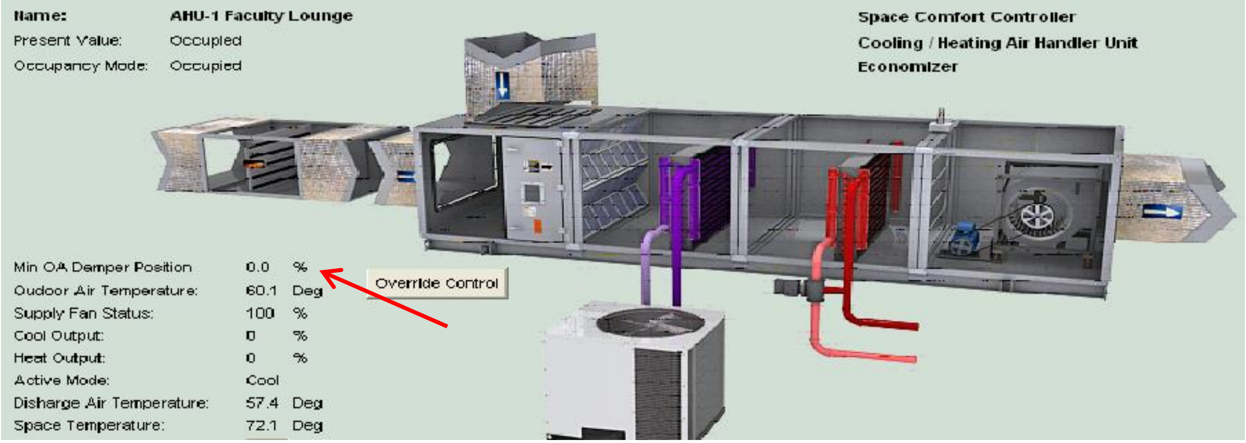
	Brookdale E.S.	F.N. Brown School	Forest E.S.	H.B. Whitehorne M.S.	Laning Avenue School	Verona High School	TOTAL
Estimated Annual Energy ***Penalty***:	$740	$1,250	$690	$2,500	$2,080	$3,060	**$10,320**

- ## Observations/Issues

Many of the school district's air handling units operate without ventilation air. The minimum outside air percentage is often programmed in the building management systems (BMS) as 0%. While many of the units do take advantage of free cooling when outside air conditions permit, their fresh air dampers are completely closed during the heating season.

Also, areas at Brookdale Avenue Elementary School are inadequately ventilated because some unit ventilators have their outside air intakes covered with either Plexiglas or plywood in an attempt to prevent freezing coils.

A lack of fresh air in a facility can adversely affects air quality by raising CO_2 concentrations, creating "sick building syndrome".



Example screenshot of unit operating w/ 0% outside air (typ.)

O&M: Supply Correct Outside Air Ventilation (cont'd)

Recommended Measures

- Re-program BMS for all air handling units to utilize minimum design outside air percentages (typically ~20% of total airflow).
- Remove Plexiglas/plywood from the inlets of unit ventilators at Brookdale. Install freeze-stats to open the heating valves and start heating pump to circulate water, to prevent coil damage during freezing conditions.
- Increasing ventilation rates will increase energy consumption (estimated energy cost penalty shown above), but will satisfy building code requirements and improve air quality.
- Much of the energy penalty associated with this issue can be offset by implementing demand controlled ventilation (see ECM#8)

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O&M: Brookdale Elementary School

- **Observations/Issues**
  Unit vent intakes are covered (due to past coil freezing issues).

  Operation in this manner does not provide adequate ventilation to the building.

- **Recommended Measures**
  Remove Plexiglas and plywood over unit vent OA intakes.

- **Observations/Issues**
  Small amount of bare uninsulated DHW piping observed at Brookdale Elementary, directly above water heater

- **Recommended Measures**
  Insulate DHW piping ~8ft of ¾" directly above water heater

O&M: F.N. Brown Elementary School

- **Observations/Issues**
  FNB utilizes many DX split units. Units are approximately 10 years old and half-way through their useful lives.

- **Recommended Measures**
  Consider 2 pipe VRV system at end of equipment useful life.

F.N. Brown School

O&M: Forest Avenue Elementary School

- **Observations/Issues**
  Three urinals are controlled by door switch and solenoid valve. Solenoid valve leaks.

- **Recommended Measures**
  Replace with auto flush valves.

- **Observations/Issues**
  AHU's in Gym/ Auditorium have extremely dirty coils.

- **Recommended Measures**
  Clean coil with water based neutral-pH coil cleaning solution.

Forest Avenue School

O&M: Forest Avenue Elementary School (cont'd)

- **Observations/Issues**
  Art room is too hot due to a blocked exhaust grill located in closet.

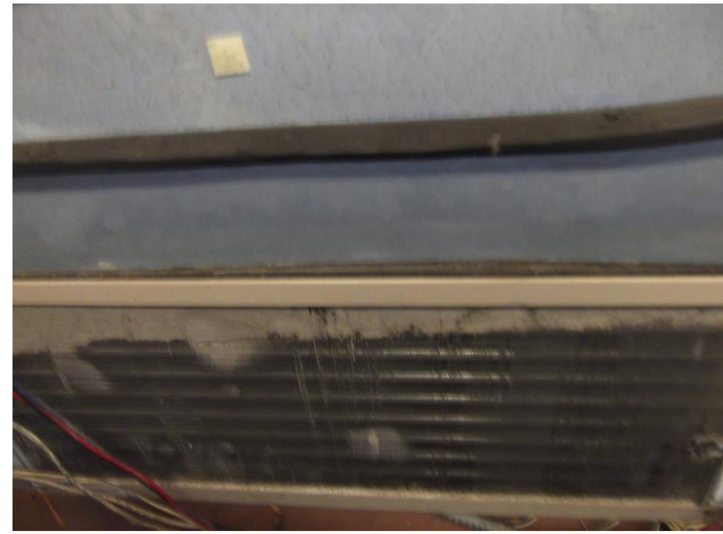
- **Recommended Measures**
  Relocate exhaust grill to the center of the room to allow air circulation and reduce overheating.

Forest Avenue School

O&M: Laning Avenue Elementary School

- **Observations/Issues**
  PTAC unit in Faculty Room 117 has dirty coil. (This building is clean)

- **Recommended Measures**
  Clean coil with water based neutral-pH coil cleaning solution.



Room 117 PTAC Coil

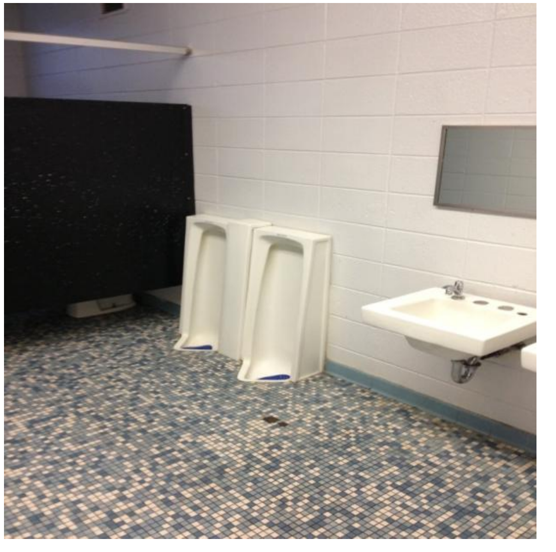
O&M: H.B. Whitehorne Middle School

- **Observations/Issues**
  Discharge grilles on Café unit vents are dirty.

- **Recommended Measures**
  Clean unit vents.

- **Observations/Issues**
  Floor mounted urinals flush by way of solenoid valve and timer located in the crawlspace behind the wall.

- **Recommended Measures**
  Replace w/ auto flush valves to conserve water.



H.B. Whitehorne Middle School

O&M: H.B. Whitehorne Middle School (cont'd)

- **Observations/Issues**
  New water heater installed with PEX piping has not been insulated.

- **Recommended Measures**
  Insulate ¾" domestic hot water piping. ~10ft.

- **Observations/Issues**
  Walk-in freezer evaporator coil is frozen.

- **Recommended Measures**
  Install defrost cycle.

H.B. Whitehorne Middle School

O&M: H.B. Whitehorne Middle School (cont'd)

- **Observations/Issues**
  Small domestic hot water pumps (1/12 HP) are energized 24/7.

- **Recommended Measures**
  Install aquastat and operate recirculation pumps based on loop temp.

- **Observations/Issues**
  Approximately 10 feet of refrigerant piping on roof (to UV-22 condenser) has damaged insulation.

- **Recommended Measures**
  Reinsulate to improve system efficiency and increase system output.

H.B. Whitehorne Middle School

O&M: Verona High School

- **Observations/Issues**
  Door Switch flushes 4 urinal simultaneously.

- **Recommended Measures**
  Replace w/ auto flush urinals.

- **Observations/Issues**
  Exhaust fans are manually turned on at 6am and off at 11pm. Building occupancy varies and there are classes/ events after regular hours.

- **Recommended Measures**
  Determine an optimum time to shut off exhaust fans that does not disrupt afterschool activities.

Verona High School

Dome-Tech, Inc.

O&M: Verona High School (cont'd)

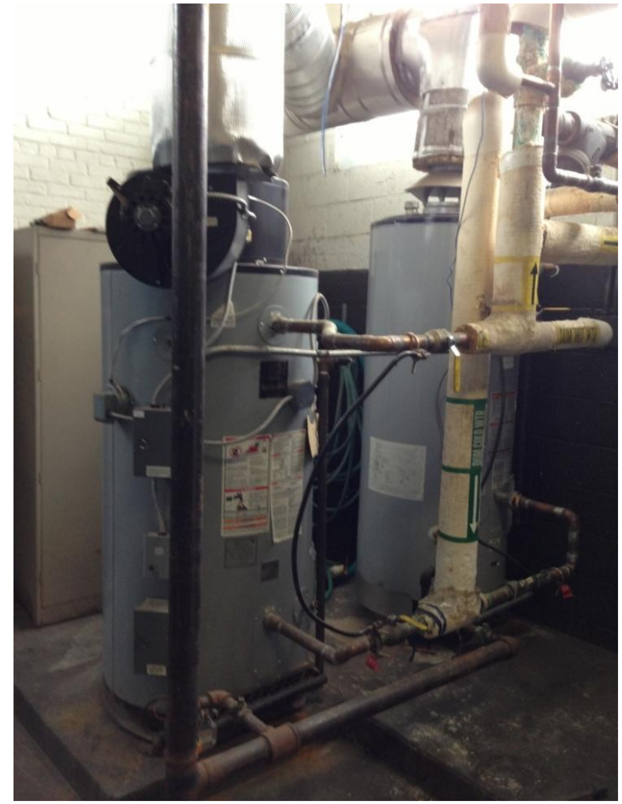
- **Observations/Issues**

  Domestic Water setpoint is at 160°F.

  Setpoint was noted while one water heater was offline and may have been raised to satisfy building demands while second unit is being replaced.

- **Recommended Measures**

  Reduce setpoints to 120-125°F after completion.



Verona High School

O&M: Verona High School (cont'd)

- **Observations/Issues**
  Boiler Reset functions are no longer functioning properly. Boiler temp setpoint is adjusted by staff periodically.

- **Recommended Measures**
  Automatic reset function should be restored. (Because setpoint is being adjusted, proper reset savings are difficult to quantify).

- **Observations/Issues**
  RTU-3 serving the café utilizes an enthalpy heat recovery wheel., which is dirty.

- **Recommended Measures**
  Clean heat wheel to optimize heat recovery.

Verona High School

O&M: Verona High School (cont'd)

- **Observations/Issues**
  HS utilizes many DX split units. Units are approx 10yrs old and ½ way through useful life.

- **Recommended Measures**
  Consider 2- pipe VRV system at end of useful life.

Verona High School

O&M: Verona High School (cont'd)

➢ **Observations/Issues**
HHW pumps have rusted flex connectors (2).

➢ **Recommended Measures**
Replace prior to failure.

Verona High School

Dome-Tech, Inc.

Renewable/Distributed Energy Measures

- **Distributed Generation & Renewable Energy**

Distributed Generation (on-site generation) generates electricity from many small energy sources. These sources can be renewable (solar/wind/ geothermal) or can be small scale power generation technologies (CHP, fuel cells, microturbines).

Renewable energy is energy generated from natural resources (sunlight, wind, and underground geothermal heat) which are naturally replenished.

Renewable Energy Technologies: Wind

Wind turbines generate electricity by harnessing a wind stream's kinetic energy as it spins the turbine airfoils. As with most renewable energy sources, wind energy is subject to intermittent performance due to the unpredictability of wind resources.

NJ Wind Speed

As previously stated, wind speed is critical to the successful wind turbine installation. According to average wind data from NASA's Surface Meteorology and Solar Energy records, the average annual wind speed for the Verona area is **5.8 meters per second** at 50 meters above the surface of the earth. Ideal wind speeds for a successful project should average over **6 meters per second**.

For the Verona School District, Dome-Tech considered three (3) types of wind turbine technologies; building integrated wind turbines (1 kW each) and traditional ground mounted wind turbines (5 kW & 50 kW).

Building Integrated Wind Turbines
Model: AeroVironment AVX1000
Height: 8.5′
Rotor Diameter: 6′
Weight: 130 lbs.
Cut-In Wind Speed: 2.2 m/s
Maximum Generating Capacity: 1 kW

5 kW Ground Mount
Model: WES5 Tulipo
Height: 40′
Rotor Diameter: 16′
Weight: 1,900 lbs.
Cut-In Wind Speed: 3.0 m/s
Maximum Generating Capacity: 5.2 kW

50 kW Ground Mount
Model: Entegrity EW50
Height: 102′
Rotor Diameter: 50′
Weight: 21,000 lbs.
Cut-In Wind Speed: 4.0 m/s
Maximum Generating Capacity: 50 kW

Renewable Energy Technologies: Wind (cont'd)

The project economics and wind turbine pros and cons are presented in the following tables:

Wind Turbine Economics

	Building Integrated	Ground Mount 5 kW	Ground Mount 50 kW
Gross Installation Cost Estimate	$325,000	$312,000	$250,000
Number of Units	50	10	1
Net Installation Cost Estimate	$325,000	$312,000	$250,000
Annual Energy Savings	$6,308	$9,956	$18,780
Simple Payback	51.5 yrs.	31.3 yrs.	13.3 yrs.
System Capacity	50 kW	52 kW	50 kW
Annual Avoided Energy Use	37,108 kWh	58,567 kWh	110,472 kWh
Annual CO2 Emisions, tons	13	20	39
% of Annual Electric Use*	4.6%	7.3%	13.8%
Verona High School:	798,601	kWh/year annual consumption	

Wind Turbine Pros & Cons

Pros	Cons
➢Annual reduction in energy spend and use can be potentially reduced by $18,780 (2.5% reduction). ➢Typical equipment life span is 15-30 years. ➢Reduction of annual greenhouse gas emissions by 39 tons per year. ➢A wind turbine project could be incorporated into science and other curriculums to raise student awareness of energy alternatives. ➢High visible "green" project.	➢Payback period is at least 13.3 years. ➢Average area wind speed is just below minimum requirements. ➢Prone to lighting strikes. ➢Bird collisions are likely, but may be reduced with avian guard (building integrate only). ➢Zoning may be an issue. Check with local zoning regulations. ➢Wind turbines do create noise, although below 50 dB (a typical car ride is over 80 dB).

Due to an average annual wind speed of 5.8 meters/sec, which is slightly below the minimum required wind speed of 6.0 meters/sec, Dome-Tech does not recommend installation of a wind turbine.

The New Jersey State Clean Energy Program does not currently provide rebates for small wind system projects.

Solar Photovoltaic

Sunlight can be converted into electricity using photovoltaics (PV).

A solar cell or photovoltaic cell is a device that converts sunlight directly into electricity.

Photons in sunlight hit the solar panel and are absorbed by semiconducting materials, such as silicon. Electrons are knocked loose from their atoms, allowing them to flow through the material to produce electricity.

Solar cells are often electrically connected and encapsulated as a module, in series, creating an additive voltage. The modules are connected in an array. The power output of an array is measured in watts or kilowatts, and typical energy needs are measured in kilowatt-hours.

This system application can be considered for potential placement on additional buildings or areas such as parking lots, in overhead mounting.

Renewable Energy Technologies: Solar Photovoltaic (cont'd)

Building	BROOKDALE AVENUE ELEMENTARY SCHOOL	LANING AVENUE ELEMENTARY SCHOOL	F.N. BROWN ELEMENTARY SCHOOL	FOREST AVENUE ELEMENTARY SCHOOL	H.B. WHITEHORNE MIDDLE SCHOOL	VERONA HIGH SCHOOL	TOTALS
Site Energy Use (kWh):	329,200	329,200	329,200	329,200	329,200	329,200	1,975,200 kw dc
Location to Install Panels:	roof	roof	roof	roof	roof	roof	roof
Assumptions							
System Capacity, kw-dc (maximum utilization of roof space)	40 kw dc	127 kw dc	39 kw dc	61 kw dc	104 kw dc	309 kw dc	681 kw dc
Annual Electric Generation, kwhrs of AC electricity produced	42,666 kwh	134,058 kwh	41,454 kwh	63,999 kwh	109,695 kwh	325,449 kwh	717,321 kw dc
Total Annual Facility Electric Use, kwhrs	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	1,975,200 kw dc
% of Total Annual Usage	13%	41%	13%	19%	33%	99%	36%
All-In Cost of Electric Year 1	$0.155 / kwh	$0.151 / kwh	$0.172 / kwh	$0.152 / kwh	$0.154 / kwh	$0.170 / kwh	$0.159 / kwh
Annual Electric Cost Savings	$6,605	$20,247	$7,122	$9,705	$16,923	$55,316	115,917 kw dc
Estimated SREC Value (Year 1):	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC
Estimated Year 1 SREC Revenue:	$4,247	$13,343	$4,126	$6,370	$10,918	$32,392	71,395 kw dc
Environmental Impact							
Equivalent Annual CO2 Emission Reduction (tons per year)[1]	14 tons/yr	44 tons/yr	14 tons/yr	21 tons/yr	36 tons/yr	107 tons/yr	237 tons/yr
Equivalent Cars Removed From Road Annually[2]	2	8	2	4	6	19	7
Equivalent Acres of Trees Planted Annually[3]	4	12	4	6	10	29	65
Financial Results							
System Installed Cost	$222,640	$699,545	$216,315	$333,960	$572,413	$1,698,263	$3,743,135
Simple Payback	20.0	20.4	18.2	20.3	20.0	18.3	19.5
IRR (25 Years)	1.7%	1.5%	2.4%	1.5%	1.7%	2.4%	1.9%
Net Present Value (25 yrs, 4% discount rate)	($47,364)	($158,731)	($32,275)	($75,003)	($122,938)	($265,040)	($701,350)

Solar Photo Voltaic System

- **Non-Financial Benefits of Solar PV**

  The implementation of solar PV projects at the Verona schools would place your facilities at the forefront of renewable energy utilization. This allows the Verona School District the opportunity to not only gain experience with this energy technology, but also to win recognition as an environmentally sensitive, socially conscience institution. Additionally, these projects could be incorporated into science education and additional curriculums to raise awareness of current energy alternatives to the younger generations.

Renewable Energy Technologies: CHP/Cogeneration

- **CHP** (combined heat and power) or cogeneration is the use of a heat engine to simultaneously generate both electricity and useful heat.
- **Fuel Cells** are electrochemical conversion devices that operate by catalysis, separation the protons and the electrons of the reactant fuel, and forcing the electrons to travel through a circuit to produce electricity. The catalyst is typically a platinum group metal or alloy. Another catalytic process takes the electrons back in, combining them with the protons and oxidant, producing waste products (usually water and carbon dioxide).
- **Microturbines** are rotary engines that extract energy from a flow of combustion gas. They can be used with absorption chillers to provide cooling through waste heat rather than electricity. Microturbines are best suited for facilities with year-round thermal and/or cooling loads.
- Not recommended for Verona Schools, due to the lack of year-round thermal load.

Retail Energy Purchasing: Recommendations and Resources

Electric

- For the period studied, Verona School District was utilizing Direct Energy as a Third Party Supplier for electricity at all schools at a fixed rate of $0.088 per kWh starting in Jan 2012. Direct Energy contracts were not provided to Dome-Tech therefore further details about the term of contract were unknown.

- Dome-Tech recommends the District evaluate their current contract with Direct Energy. All schools utilized a third party supplier at fixed rate but for an undetermined period of time. Based on information received, these accounts were locked into a new fixed price contract in early 2012 that may have already ended.

Natural Gas

- For the period studied, the District was utilizing Hess Corp. as a Third Party Supplier for natural gas at a fixed rate of $0.68 per therm in the summer period and a variable floating rate in the winter period. The Hess contract began in September 2011 and the previous supplier was Compass Energy. Supplier contracts and invoices were not provided therefore Dome-Tech was unable to include further contract details in this report.

- If the District is seeking budget certainty or would like to reduce their market exposure for Natural Gas, the District should consider a fixed price contract with a supplier. Further details are outlined in the following sections.

Energy Purchasing Co-Operatives

- Many public entities participate in various energy aggregation buying groups. Sometimes, an entity will have multiple options to choose from. These might include purchasing through a County co-operative, or purchasing through a trade-type association like ACES. It is likely that Verona School District currently participates in ACES. Co-operative purchasing may not necessarily provide you with the lowest rates; however, there is often substantial volume, and it can represent a good alternative for entities with limited energy consumption who can have a difficult time getting energy suppliers to respond to them on a direct, singular basis.

Retail Energy Purchasing: Recommendations and Resources

- To learn more about energy deregulation, visit the New Jersey Board of Public Utilities website: www.bpu.state.nj.us
- For more information about the retail energy supply companies that are licensed and registered to serve customers in New Jersey, please visit the following website for more information: http://www.bpu.state.nj.us/bpu/commercial/shopping.html
- Provided below is a list of NJ BPU-licensed retail energy suppliers:

Company	Electricity	Natural Gas	Website
Hess	X	X	hess.com
Sprague	X	X	spragueenergy.com
UGI	X	X	ugienergyservices.com
South Jersey Energy	X	X	southjerseyenergy.com
Direct	X	X	directenergy.com
Global	X	X	globalp.com
Liberty	X		libertypowercorp.com
Reliant / NRG	X		reliant.com
First Energy	X		fes.com
ConEd Solutions	X		conedsolutions.com
Constellation / Exelon	X	X	newenergy.com
Glacial	X		glacialenergy.com
Integrys	X		integrysenergy.com
Suez	X		suezenergyresources.com
Sempra	X		semprasolutions.com
Woodruff		X	woodruffenergy.com
NextEra	X		mxenergy.com
Hudson		X	hudsonenergyservices.com
Great Eastern		X	greateasterngas.com

**Note: Not every Supplier serves customers in all utility territories within New Jersey. Refer to the BPU website for current supplier list.*

Utility Tariff and Rate Review: Electricity

- **<u>Accounts and Rate Class</u>:** The District has six facilities included in this study and each school has it's own electric account. All accounts are served by Public Service Electric & Gas under rate classes General Lighting and Power (GLP) or Large Power and Lighting (LPL-S) and Direct Energy as a third party supplier.

  Note: F.N. Brown Elementary and Verona High School appear to have multiple combined meters but their own account numbers.

- **<u>Electric Consumption and Cost</u>:** Based on the one-year period studied, the total annual electric expenditure for is about $338,000 and the total annual consumption is about 2,094,000 kilowatt-hours (kWh).

- **<u>Average/Effective Rate per kWh</u>:** For the one year period studied, the District's average monthly cost per kilowatt-hour ranged from 15.1¢/kWh to 17.1¢/kWh, inclusive of utility delivery charges. The District's overall, average cost per kilowatt-hour during this period was 16.2¢/kWh.

  - *Note that these average electric rates are "all–inclusive"; that is, they include all supply service (generation and commodity-related) charges, as well as all delivery service charges. The supply service charges typically represent the majority (60-80%) of the total monthly bill. It is the supply portion of your bill that is deregulated, which is discussed on subsequent slides in this section.*

Utility Tariff and Rate Review: Natural Gas

- **<u>Accounts and Rate Class</u>**: The District has six facilities included in this study each with it's own natural gas account. All accounts are served by Public Service Electric & Gas under rate class Large Volume Gas (LVG) and Hess Corp. as the Third Party Supplier.

- **<u>Natural Gas Consumption and Cost</u>**: Based on the one-year period studied, the total annual natural gas expenditure for the District is about $174,000 and the total annual consumption is about 170,000 therms. Natural Gas is used mostly in the winter period for heating purposes.

- **<u>Average/Effective Rate per Therm</u>**: For the one year period studied, the District's overall, average cost was $1.022 per therm.
  - *Note that these average electric rates are "all–inclusive"; that is, they include all supply service (generation and commodity-related) charges, as well as all delivery service charges. The supply service charges typically represent the majority (60-80%) of the total monthly bill. It is the supply portion of your bill that is deregulated, which is discussed on subsequent slides in this section.*

Utility Deregulation in New Jersey: Background and Retail Energy Purchasing

- **Electric Accounts**:
  - In August 2003, per the Electric Discount and Energy Competition Act [N.J.S.A. 48:3-49], the State of New Jersey deregulated its electric marketplace thus making it possible for customers to shop for a third-party (someone other than the utility) supplier of retail electricity.
  - Per this process, every single electric account for every customer in New Jersey was placed into one of two categories: "BGS-FP" or "BGS-CIEP". BGS-FP stands for Basic Generation Service-Fixed Price; BGS-CIEP stands for Basic Generation Service-Commercial and Industrial Energy Pricing.
  - At its first pass, this categorization of accounts was based on rate class. The largest electric accounts in the State (those served under a Primary or a Transmission-level rate class) were moved into BGS-CIEP pricing. All other accounts (the vast majority of accounts in the State of New Jersey, including residential) were placed in the BGS-FP category, receiving default electric supply service from the utility.
  - The New Jersey Board of Public Utilities (NJBPU) has continued to move new large energy users from the BGS-FP category into the BGS-CIEP category by lowering the demand (kW) threshold for electric accounts receiving Secondary service. Originally, this threshold started at 1,500kW; now, it has come down to 750 kW. So, if an account's "peak load contribution" (as assigned by the utility) is less than 750 kW, then that facility/account is in the BGS-FP category. If you are unsure, you may contact Dome-tech for assistance.

Utility Deregulation in New Jersey: Background and Retail Energy Purchasing (cont'd)

- There are at least 3 important differentiating factors to note about each rate category:
  1. The rate structure for BGS-FP accounts is different than the rate structure for BGS-CIEP accounts.
  2. The "do-nothing" option (i.e., what happens when you don't shop for retail energy) varies.
  3. The decision about whether, and why, to shop for a retail provider varies.

- **BGS-FP: Secondary (small to medium) Electric Accounts**:
  - BGS-FP rate schedules for all utilities are set, and re-set, each year. Per the results of our State's BGS Auction process, held each February, new utility default rates go into effect every year on June 1st. The BGS-FP rates become each customer's default rates, and they dictate a customer's "Price to Compare" (benchmark) for shopping purposes. To learn more about the BGS Auction process, please go to www.bgs-auction.com.
  - A customer's decision about whether to buy energy from a retail energy supplier is, therefore, predominantly dependent upon whether a supplier can offer rates that are lower than the utility's (default) Price to Compare.

- **BGS-CIEP: Primary (large) Electric Accounts:**
  - The BGS-CIEP category is quite different. These accounts pay an hourly market rate for energy when they do not switch to a retail provider.
  - For BGS-CIEP accounts, the process of setting forth a buying strategy can be complex, which is why many public entities seek professional assistance when shopping for energy.
  - For more information concerning hourly electric market prices for our region, please refer to www.pjm.com.

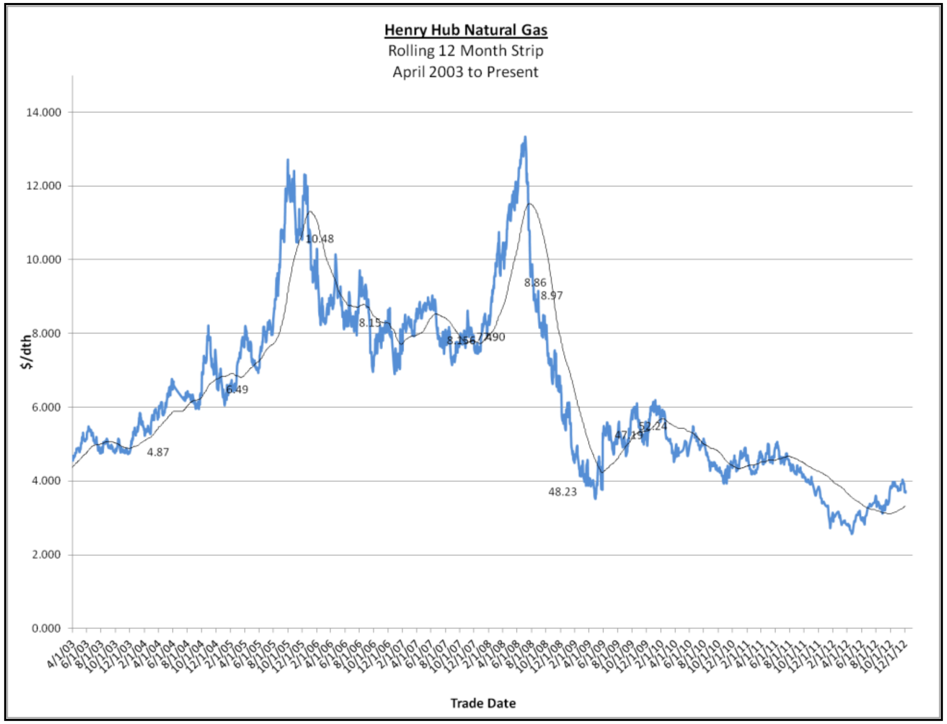
Utility Deregulation in New Jersey: Background and Retail Energy Purchasing (cont'd)

- **Natural Gas Accounts:**
  - The natural gas market in New Jersey is also deregulated. Most customers that remain with the utility for natural gas service pay rates that are market-based and that fluctuate on a monthly basis. While natural gas is a commodity that is exceptionally volatile and that is traded minute-by-minute during open trading sessions, market rates are "settled" monthly, 3 business days prior to the subsequent month (this is called the "prompt month"). Customers that do not shop for a natural gas supplier will typically pay this monthly settlement rate to the utility, plus other costs that are necessary to bring gas from Louisiana (The "Henry Hub") up to New Jersey (at the "City Gate") and ultimately to your facility.
  - For additional information about natural gas trading and current market futures rates for various commodities, you can refer to www.nymex.com.
  - A customer's decision about whether to buy natural gas from a retail supplier is typically dependent upon whether a customer seeks budget certainty and/or longer-term rate stability. Customers can secure longer-term fixed prices by enlisting a retail natural gas supplier. Many larger natural gas customers also seek the assistance of a professional consultant to assist in their procurement process.

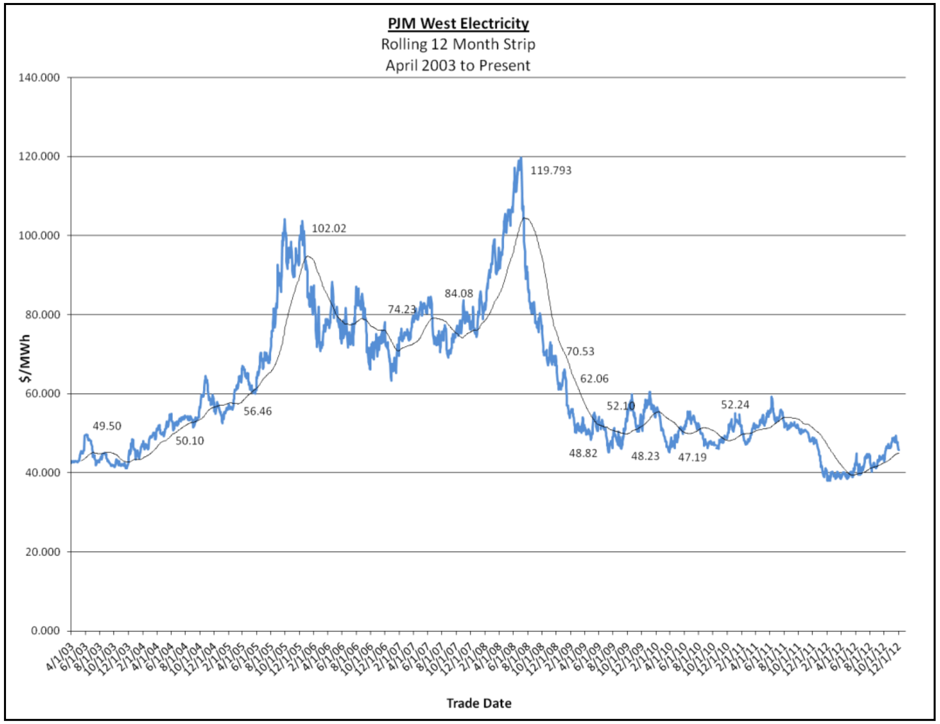
Historical Energy Futures Settlement Prices

Below please find graphs that show the last ten years' worth of market settlement prices for both natural gas and electricity. Each of these graphs shows the average closing prices of a rolling 12-month period of energy futures prices. The graphs are representative of the commodity, alone; they do not include any of the additional components (capacity, transmission, ancillary services, etc.) that comprise a retail energy price. They are meant to provide an indication of the level of pricing that a particular customer might expect to see, but the graphs do not account for the specific load profile of any individual energy user.

Natural Gas



Electricity



Potential Project Funding Sources

Through the NJ Clean Energy Program, the New Jersey Board of Public Utilities currently offers a variety of subsidies or rebates for many of the project types outlined in this report. More detailed information can be found at: www.njcleanenergy.com

NJ Smart Start Buildings – Equipment Rebates noted in ECMs where available.
Equipment Rebates: Water Heaters, Lighting, Lighting Controls/Sensors, Chillers, Boilers, Heat Pumps, Air Conditioners, Energy Management, Systems/Building Controls, Motor-ASDs/VSDs, Custom/Others.
http://www.njcleanenergy.com/commercial-industrial/programs/nj-smartstart-buildings/nj-smartstart-buildings

Pay for Performance Program – Performance-Based Incentives for installations. Provides incentives of up to $0.11/ kWh and $1.25/therm saved; up to 25% of total project cost. A minimum reduction target of 15% compared to baseline must be achieved. Energy modeling of building and systems and energy reduction plan is required (incentives provided to pay for part of study costs).
http://www.njcleanenergy.com/commercial-industrial/programs/pay-performance/existing-buildings

Energy Savings Improvement Program (ESIP) – Public entities can contract with energy saving companies (ESCO) in up to 20-year lease purchases enabling public entities to implement energy conservation measures at their facilities, and pay for the costs using the value of energy savings that result from the improvements. A "Do It Yourself" approach allows the public entity to contract with an engineering firm(s) to develop an Energy Savings Plan, develop plans and specs, oversee construction, commissioning, etc. (No ESCO is needed for the Do It Yourself approach).
http://www.njcleanenergy.com/commercial-industrial/programs/energy-savings-improvement-program

Potential Project Funding Sources (cont'd)

Direct Install Program – NJ Clean Energy makes the investment in energy efficiency upgrades by initially covering 70% of the cost to install the recommended energy efficiency measures (up to $75,000 per project). If eligible, the entity will pay ONLY 30% of the total cost to install the energy efficiency measures.
http://www.njcleanenergy.com/commercial-industrial/programs/direct-install

We encourage you to contact the program directly for further information

Steps to Participate for Buildings

1. **CONTACT THE PARTICIPATING CONTRACTOR IN YOUR AREA**
   Identify the contractor assigned and trained to provide Direct Install services in the county where your project is located. Using the contact information provided, call or email the Participating Contractor to discuss your project. The contractor will schedule an Energy Assessment and work with you to complete the Program Application and Participation Agreement. If you're unable to contact the Participating Contractor or have questions, you may contact us at 866-NJSMART or send an e-mail to DirectInstall@trcsolutions.com..

2. **REVIEW RESULTS**
   After the Energy Assessment, the contractor will review results with you, including what measures qualify and your share of the project cost.

3. **DECIDE TO MOVE FORWARD**
   You will sign a Scope of Work document to proceed with implementation of qualifying measures.

4. **ARRANGE INSTALLATION**
   You and the Participating Contractor will set a convenient start date for the installation.

5. **CONFIRM INSTALLATION**
   Once the Participating Contractor completes the installation, you accept the work by signing a Project Completion Form. A program representative will approve the project as complete.

6. **COMPLETE TRANSACTION**
   You pay the Participating Contractor your share of the project cost and the program pays its share.

Next Steps

- **The following projects should be considered for implementation:**
  - ***Piping Insulation***
  - ***PC Power Management***
  - ***Implement a Steam Trap Repair Program***
  - ***Replace Electric Water Heaters with Gas***
  - ***Replace CRT Screens with Flat Screen Monitors***
  - ***Lighting Upgrades***

  Note that additional "Phase 2" engineering may be required to further develop these projects, to bring them to bidding and implementation.

- **Consider applying for Pay-For-Performance Program**

- **Continue with ESIP process**

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PORTFOLIO MANAGER / ENERGY STAR

ENERGY STAR® Statement of Energy Performance

70

ENERGY STAR® Score[1]

Verona - Brookdale Avenue School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 37,972
Built: 1928

For Year Ending: June 30, 2012
Date Generated: August 22, 2013

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Verona - Brookdale Avenue School 14 Brookdale Court Verona, New Jersey 07044	___________________ , _____ (____)____-______	____ ________ , _____ (____)____-______ ___________________

Property ID: 3551278

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
40.9 kBtu/ft²

Source EUI
71.1 kBtu/ft²

Annual Energy by Fuel	
Electric - Grid (kBtu)	512,728 (33%)
Natural Gas (kBtu)	1,039,700 (67%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	49.8
National Median Source EUI (kBtu/ft²)	86.6
% Diff from National Median Source EUI	-18%
Annual Emissions	
Greenhouse Gas Emissions (MtCO2e/year)	120

Signature & Stamp of Verifying Professional

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

Signature: _________________________Date: ____________

Licensed Professional

____ ________
, _____
(____)____-______
____

Professional Engineer Stamp
(if applicable)

ENERGY STAR® Statement of Energy Performance

7

ENERGY STAR® Score[1]

Verona - F.N. Brown School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 38,985
Built: 1932

For Year Ending: June 30, 2012
Date Generated: August 22, 2013

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Verona - F.N. Brown School 125 Grove Avenue Verona, New Jersey 07044	__________________ , _____ (____)____-______	____ ________ , _____ (____)____-______ __________________

Property ID: 3551293

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
87 kBtu/ft²

Source EUI
133.7 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	2,604,140 (77%)
Electric - Grid (kBtu)	789,101 (23%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	53.5
National Median Source EUI (kBtu/ft²)	82.2
% Diff from National Median Source EUI	63%

Annual Emissions

Greenhouse Gas Emissions (MtCO2e/year)	238

Signature & Stamp of Verifying Professional

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

Signature: _________________________Date: ____________

Licensed Professional

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(____)____-______
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Professional Engineer Stamp
(if applicable)

ENERGY STAR® Statement of Energy Performance

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43

ENERGY STAR® Score[1]

Verona - Forest Avenue School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 27,750
Built: 1928

For Year Ending: June 30, 2012
Date Generated: August 22, 2013

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Verona - Forest Avenue School 118 Forest Avenue Verona, New Jersey 07044	__________________ , _____ (____)____-______	____ ________ , _____ (____)____-______ __________________

Property ID: 3551295

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
62 kBtu/ft²

Source EUI
100.2 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	1,252,200 (73%)
Electric - Grid (kBtu)	467,048 (27%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	58.7
National Median Source EUI (kBtu/ft²)	94.9
% Diff from National Median Source EUI	6%

Annual Emissions

Greenhouse Gas Emissions (MtCO2e/year)	126

Signature & Stamp of Verifying Professional

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

Signature: ________________________Date: ____________

Licensed Professional

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Professional Engineer Stamp
(if applicable)

ENERGY STAR® Statement of Energy Performance

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81

ENERGY STAR® Score[1]

Verona - H.B. Whitehorne

Primary Property Function: K-12 School
Gross Floor Area (ft²): 118,224
Built: 1922

For Year Ending: June 30, 2012
Date Generated: August 22, 2013

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Verona - H.B. Whitehorne	_________________	____ ________
600 Bloomfield Avenue	, _____	, _____
Verona, New Jersey 07044	(____)____-______	(____)____-______
		_________________

Property ID: 3551272

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
48 kBtu/ft²

Source EUI
82.2 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	3,883,730 (68%)
Electric - Grid (kBtu)	1,796,316 (32%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	66.7
National Median Source EUI (kBtu/ft²)	114.2
% Diff from National Median Source EUI	-28%

Annual Emissions

Greenhouse Gas Emissions ($MtCO2e$/year)	434

Signature & Stamp of Verifying Professional

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

Signature: ______________________Date: ___________

Licensed Professional

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(____)____-______
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Professional Engineer Stamp
(if applicable)

ENERGY STAR® Statement of Energy Performance

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18

ENERGY STAR® Score[1]

Verona - Laning Avenue School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 46,477
Built: 1911

For Year Ending: June 30, 2012
Date Generated: August 22, 2013

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Verona - Laning Avenue School 18 Laning Road Verona, New Jersey 07044	___________________ , _____ (____)____-______	____ ________ , _____ (____)____-______ ___________________

Property ID: 3551274

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
70.8 kBtu/ft²

Source EUI
111.9 kBtu/ft²

Annual Energy by Fuel

Natural Gas (kBtu)	2,452,713 (75%)
Electric - Grid (kBtu)	835,667 (25%)

National Median Comparison

National Median Site EUI (kBtu/ft²)	52.4
National Median Source EUI (kBtu/ft²)	82.8
% Diff from National Median Source EUI	35%

Annual Emissions

Greenhouse Gas Emissions (MtCO2e/year)	236

Signature & Stamp of Verifying Professional

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

Signature: _________________________Date: ____________

Licensed Professional

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(____)____-______
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Professional Engineer Stamp
(if applicable)

ENERGY STAR® Statement of Energy Performance

64

ENERGY STAR® Score[1]

Verona - Verona High School

Primary Property Function: K-12 School
Gross Floor Area (ft²): 120,245
Built: 1956

For Year Ending: June 30, 2012
Date Generated: August 22, 2013

1. The ENERGY STAR score is a 1-100 assessment of a building's energy efficiency as compared with similar buildings nationwide, adjusting for climate and business activity.

Property & Contact Information

Property Address	Property Owner	Primary Contact
Verona - Verona High School 151 Fairview Avenue Verona, New Jersey 07044	___________________ , _____ (____)____-______	____ ________ , _____ (____)____-______ ___________________

Property ID: 3551223

Energy Consumption and Energy Use Intensity (EUI)

Site EUI
70.8 kBtu/ft²

Source EUI
121.4 kBtu/ft²

Annual Energy by Fuel	
Natural Gas (kBtu)	5,805,820 (68%)
Electric - Grid (kBtu)	2,705,689 (32%)

National Median Comparison	
National Median Site EUI (kBtu/ft²)	80.5
National Median Source EUI (kBtu/ft²)	138.1
% Diff from National Median Source EUI	-12%
Annual Emissions	
Greenhouse Gas Emissions (MtCO2e/year)	651

Signature & Stamp of Verifying Professional

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

Signature: _________________________Date: ____________

Licensed Professional

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, _____
(____)____-______
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Professional Engineer Stamp
(if applicable)

Dome-Tech, Inc.

www.dome-tech.com

510 Thornall Street, Suite 170
Edison, NJ 08837

Tel: 732.590.0122
Fax: 732.590.0129

EQUIPMENT INVENTORY LISTS

VERONA SCHOOL DISTRICT
Brookdale Avenue School

EQUIPMENT LIST

Fans														
Bldg	**Tag#**	**Location**	**Area Serving**	**Equipment**	**Quantity**	**Mfg**	**Model**	**Fuel**	**CFM**	**Output Btuh**	**Age**	**Estimated Service Life**	**Efficiency**	**Notes**
Brookdale	EF#1	Roof		Exhaust Fan		Cook	135ace				1998	20		
Brookdale	EF#4	Roof		Exhaust Fan		Cook	90acem				1998	20		
Brookdale	EF#2	Roof		Exhaust Fan		Cook	1203cb				1998	20		
Brookdale	EF#4	Roof		Exhaust Fan		Cook	150c2e				1998	20		
Brookdale	EF#5	Roof		Exhaust Fan		Cook	150c4b				1998	20		
Brookdale	EF#6	Roof		Exhaust Fan		Cook	150c2e				1998	20		
Brookdale	EF#7	Roof		Exhaust Fan		Cook	180c4b				1998	20		
Brookdale	EF#3	Roof		Exhaust Fan		Dayton					1998	20		
Brookdale	EF#3	Roof		Exhaust Fan		CaptiveAir	du50hfa				1998	20		
Brookdale	EF#8	Roof		Exhaust Fan		Cook	150c2e				1998	20		
Brookdale	EF#12	Roof	gym	Exhaust Fan		Cook					1998	20		
Brookdale	EF#13	Roof	stage	Exhaust Fan		Cook					1998	20		

Ventilators															
Bldg	**Tag#**	**Location**	**Area Serving**	**Equipment**	**Mfgr**	**Model**	**Quantity**	**GPM**	**Head ft**	**HP**	**Efficiency**	**Motor RPM**	**VFD?**	**Age**	**Estimated Service Life**
Brookdale	CH	Corridors / Stairs / Boys BR / Gym	Corridors / Stairs / Boys BR / Gym	Cabinet Unit Heaters	Trane		~7						No	1998	20
Brookdale	uv#1	art room	art room &	Unit Vent w/ DX	MagicAire		1						No	1998	20
Brookdale	uv#10	rm 8	rm 8	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#11	rm 7	rm 7	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#12	rm 6	rm 6	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#13	computer rm	computer rm	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#2	ldtc 113	ldtc 113	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#3	sgi 112	sgi 112	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#5	kindergarten	kindergarten	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#8	rm 2	rm 2	Unit Ventilator	MagicAire		1						No	1998	20
Brookdale	uv#9	rm 1	rm 1	Unit Ventilator	MagicAire		1						No	1998	20

VAVs															
Bldg	**Tag#**	**Location**	**Area Serving**	**Equipment**	**Mfgr**	**Model**	**Quantity**	**GPM**	**Head ft**	**HP**	**Efficiency**	**Motor RPM**	**VFD?**	**Age**	**Estimated Service Life**
Brookdale	vav#1	Ceiling	media 201	VAV Box			1							1998	20
Brookdale	vav#2	Ceiling	computer room	VAV Box			1							1998	20
Brookdale	vav#3	Ceiling	corridor 208	VAV Box			1							1998	20
Brookdale	vav#4	Ceiling	girls toilet	VAV Box			1							1998	20
Brookdale	vav#5	Ceiling	media office	VAV Box			1							1998	20
Brookdale	vav#6	Ceiling	media center	VAV Box			1							1998	20
Brookdale	vav#10	Ceiling	rm 302	VAV Box			1							1998	20
Brookdale	vav#11	Ceiling	boys toilet 308	VAV Box			1							1998	20
Brookdale	vav#12	Ceiling	corridor 301	VAV Box			1							1998	20
Brookdale	vav#7	Ceiling	sgi 306	VAV Box			1							1998	20
Brookdale	vav#8	Ceiling	lld 304	VAV Box			1							1998	20
Brookdale	vav#9	Ceiling	rm 303	VAV Box			1							1998	20

EQUIPMENT LIST

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
FN Brown		Boiler Room	Steam Heat & HX	Boiler	Cleaver Brooks	CB700 100 015	2	nat ga	4,184,000		1998	30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown		Boiler Room	HHW System (HX)	HHW Pump	B&G		ITT	M3154T	2			0.5 , 1phase			NO	1998	20

Heat Exchangers

Bldg	Tag#	Location	Area Serving	Equipment	Type	Make	Model	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown	HX	Boiler Room	Lower Level Fan Coils & FinTube	Heat Exchanger	Shell & Tube										24

Air Handling Units - AHUs

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Cooling Capacity (Tons)	Cooling Technology	Heating Technology	Heating Capacity (MBH)	Heating GPM	Supply Air CFM	Static Pressure w.c.	Fan HP	Age	Estimated Service Life	Efficiency	Controls	Notes:
FN Brown	AHU-1,2	Auditorium	Auditorium	AHU	Trane		2		na	Steam						1998	20			
FN Brown	AHU--1	Gym	Gym	AHU	Trane		1		na	Steam					2	1998	20			

Condensing Units

Bldg	Tag#	Location	Area Serving	Equipment	Type	Mfg	Quantity	Model	Tons	kW/Ton	Refrigerant	VFD?	Estimated Service Life
FN Brown	SAC01	OUTSIDE	Library Office	COND	Scroll	Mitsubishi	1	Slim - PU18EK1	1.5	12A COMP	R22	1998	20
FN Brown	SAC02	OUTSIDE	Nurses Office	COND	Scroll	EMI	1	S1CA8000		5.4A COMF	R22	1998	20
FN Brown	SAC03	OUTSIDE	Computer Lab	COND	Scroll	EMI	1	S1CA4000		8A COMP,	R22	1998	20
FN Brown	SAC04	OUTSIDE	Main Office	COND	Scroll	EMI	1	S1CA4000		8A COMP,	R22	1998	20
FN Brown	SAC05	OUTSIDE	Teachers Work Room	COND	Scroll	YORK	1	AFFINITY, CZB02411A	2	12.8A COM	R410	1998	20
FN Brown	SAC06	OUTSIDE	Principal's Office	COND	Scroll	Freidrich	1	MR24C3E	2	9.6A COMF	R22	1998	20
FN Brown	SAC07	OUTSIDE	Faculty Room	COND	Scroll	Mitsubishi	1	Slim - mu24wn	2	16A COMP	R22	1998	20
FN Brown	SAC08	OUTSIDE	MUSIC	COND	Scroll	TRANE	1	XB13, 2TT13304ZA1000AA		15.4A COM	R22	1998	20
FN Brown	SAC09	OUTSIDE	CHILD STUDY	COND	Scroll	YORK	1	AFFINITY, CZB01811A	1.5	10.3A COM	R410	1998	20
FN Brown	SAC10	OUTSIDE	OT/PT	COND	Scroll	YORK	1	AFFINITY, CZB01811A	1.5	10.3A COM	R410	1998	20
FN Brown	SAC11	OUTSIDE	SGI	COND	Scroll	YORK	1	AFFINITY, CZB01811A	1.5	10.3A COM	R410	1998	20

Domestic Hot Water

Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	Fuel	Gal	Btuh Input	# of elements	Age	Estimated Service Life	Notes
FN Brown		Boiler Room	Domestic Hot Water	Water Heater	1	BRADFORD WHITE	Defender M2XR504T6FBN	Natural Gas	48 gal	65,000		1998	20	

Fans

Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	HP	CFM	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
FN Brown	Ef#1	Roof	work room	Exhaust Fan	Cook						1998	20		
FN Brown	EF#10	Auditorium Balcony	Auditorium	Exhaust Fan	1	Cook	21CS0NB	0.50				20		
FN Brown	EF#11	Auditorium Balcony	Auditorium	Exhaust Fan	1	Cook	21CS0NB	0.50				20		
FN Brown	Ef#14	Roof		Exhaust Fan	1	Cook	270cpv				1998	20		
FN Brown	Ef#15	Roof	attic	Exhaust Fan	1	Cook	165cpv				1998	20		
FN Brown	Ef#2	Roof	attic child study	Exhaust Fan	1	Cook	120cpv				1998	20		
FN Brown	EF#3	Café	Café	Exhaust Fan	1	Cook	120son10d					20		
FN Brown	Ef#4	Roof	cafeteria 011	Exhaust Fan	1	Cook					1998	20		
FN Brown	Ef#6	Roof	annex	Exhaust Fan	1	Cook					1998	20		
FN Brown	Ef#7	Roof	breezeway direct drive	Exhaust Fan	1	Cook					1998	20		
FN Brown	Ef#8	Roof	stage	Exhaust Fan	1	Cook					1998	20		
FN Brown	EF#9	Auditorium Balcony	Auditorium	Exhaust Fan	1	Cook	21CS0NB	0.50				20		

Ventilators

Bldg	Tag#	Location	Area Serving	Equipment	Mfgr	Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown	FCU	Art Storage	Art Storage	FCU w/ Dx	Envirotech	HPE08	1							1998	20
FN Brown	UV	RmA2	RmA2	Unit Ventilator	Trane		1							1998	20
FN Brown	UV	RmA3	RmA3	Unit Ventilator	Trane		1							1998	20
FN Brown	UV	Café#2	Café#2	Unit Vent	Trane		2							1998	20
FN Brown	AC	Kitchen	Kitchen	Window AC	(old)		1							1998	20
FN Brown	FCU	B-8 SGI	B-8 SGI	FCU w/ Dx	Envirotech		1							1998	20
FN Brown	FCU	Physical Therapy	Physical Therapy	FCU w/ Dx	Envirotech		1							1998	20
FN Brown	FCU	Boys BR	Boys BR	FCU	Envirotech		1							1998	20
FN Brown	FCU	North Stair Tower	North Stair Tower	Cabinet Unit Heater	Envirotech		1							1998	20
FN Brown	FCU	Child Study	Study	FCU w/ Dx	Envirotech	HPE06	1							1998	20
FN Brown	FCU	Rm B9	Rm B9	FCU w/ Dx	Envirotech	HPE06	1							1998	20
FN Brown	FCU	Rm B8	Rm B8	FCU w/ Dx	Envirotech	HPE06	1							1998	20
FN Brown	FCU	Teachers Work Room	Teachers Work Room	FCU w/ Dx	Envirotech	HPE08	1							1998	20
FN Brown	UV#2/UV#14?	Computer Room	Computer Room	Trane UV w/ Dx	Envirotech		1							1998	20
FN Brown	UV	Principals Office	Principals Office	Trane UV w/ Dx	Trane	PTEC0901G8A	1							1998	20
FN Brown	UV	Conference Room	Conference Room	Trane UV w/ Dx	Trane	PTEC0901G8A	1							1998	20
FN Brown	UV#19	ROOM #11	ROOM #11	Unit Ventilator	trane	uvb125	1							1998	20
FN Brown	UV#20	ROOM #13	ROOM #13	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#21	ROOM #15	ROOM #15	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#22	ROOM #16	ROOM #16	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#17	ROOM #17	ROOM #17	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#18	ROOM #18	ROOM #18	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#3	ROOM #10 resource room	ROOM #10 resource room	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#11	main office a/c	main office a/c	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#12	room #7 2nd grades	room #7 2nd grades	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#1	room b7 007 music a/c	room b7 007 music a/c	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#01	cafeteria	cafeteria	Unit Ventilator	Trane	vuv100	1							1998	20
FN Brown	UV#02	cafeteria 013 right	cafeteria 013 right	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#03	cafeteria 011 left	cafeteria 011 left	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#04	cafeteria 011 right	cafeteria 011 right	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#13	room #6 2nd grades	room #6 2nd grades	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#12	room #7 2nd grades	room #7 2nd grades	Unit Ventilator	Trane		1							1998	20
FN Brown	UV#15	room#1 media center & a/c	room#1 media center & a/c	Unit Ventilator	Trane		1							1998	20
FN Brown	CHs	Corridors / Stairs / Bathrooms	Corridors / Stairs / Bathrooms	Cabinet Heaters			~11							1998	20

Split Units

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	GPM	Head ft	Tons	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
FN Brown	SAC12	Rm A2	Rm A2	Evaporator	Freidrich	MW24CBE									
FN Brown		Main Office	Main Office	Evaporator	EMI										
FN Brown		Nurses Office	Nurses Office	Evaporator	EMI										
FN Brown		Principals Room	Principals Office	Evaporator	Freidrich										

EQUIPMENT LIST

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
Forest		Boiler Room	HHW System	Boiler	Cleaver Brooks	CB 700 060 030	2	nat ga	2,511,000		1998	30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Forest		Boiler Room	HHW System	HHW Pumps	TACO	FE1507E	Baldor	M3154T	4			1.5	79.5			1998	20

Air Handling Units - AHUs

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Cooling Capacity (Tons)	Cooling Technology	Heating Technology	Heating Capacity (MBH)	Heating GPM	Supply Air CFM	Static Pressure w.c.	Fan HP	Age	Estimated Service Life	Efficiency	Controls	Notes:
Forest	RTU	Roof		RTU	Trane	tcc024f100bd	1		DX	Natural Gas							15			
Forest	AHU-1,2	Gym	Gym	AHU	Trane	MCAA06GAR0AB A000…	2	na	na	HHW							20			

EQUIPMENT LIST

Condensing Units

Bldg	Tag#	Location	Area Serving	Equipment	Type	Mfg	Quantity	Model	Tons	kW/Ton	Refrigerant	VFD?	Age
Forest	SAC#1	Roof	Computer Room	Condensing Unit		Carrier	1						
Forest	SAC#2	Roof	Music Room	Condensing Unit		Carrier	1						

Domestic Hot Water

Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	Fuel	Gal	Btuh Input	# of elements	Age	Estimated Service Life	Notes
Forest		Boiler Room	Domestic Hot Water	Water Heater	1	Bradford White	MI5036FBN	Natural Gas	50	40,000			20	

SOUTH PLAINFIELD
FRANKLIN ELEMENTARY SCHOOL

EQUIPMENT LIST

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
HBW MS	Boiler 1 & 2	Boiler Room	Steam Heating	Fire-Tube Boiler	CLEAVER BROOKS	CB7001500015	2	nat ga	6277000		1998	30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
HBW MS			HHW LOOP1	HHW Pump	GOULD	#3756	Baldor Reliance		2			5	87.5%		NO		20
HBW MS			HHW LOOP2	HHW Pump	CRANE		Marathon		2			5	87.5%		NO		20

Heat Exchangers

Bldg	Tag#	Location	Area Serving	Equipment	Type	Make	Model	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
HBW MS	HX-1	Boiler Room	HHW LOOP2	Heat Exchanger	SHELL & TUBE	THRUSH									24
	HX-2	Boiler Room	HHW LOOP1	Heat Exchanger	SHELL & TUBE	THRUSH									24

Boilers

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	Fuel	Heating Input Btuh	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
Laning	Boiler 1 & 2	Boiler Room	HHW	Cast Iron Sectional	Weil McLain	128P	2	nat ga	3,753,000	3,000,000		30		

Heating Hot Water Pumps

Bldg	Tag#	Location	Area Serving	Equipment	Pump Mfg	Pump Model	Motor Mfg	Motor Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Laning	HWP	Boiler Rm	HHW System	HHW Pump	2	Baldor	M32-18T			5	81.5%		NO	1998	20		20

Fans

Bldg	Tag#	Location	Area Serving	Equipment	Quantity	Mfg	Model	Fuel	CFM	Output Btuh	Age	Estimated Service Life	Efficiency	Notes
Verona HS	RF	Fan Rm 2	Auditorium	Return Fan for HAC#3	1				8000		2007	20		Axial Fan
Verona HS	EF-1	Roof	Main Office	Exhaust Fan	1	Cook	18-1					20		
Verona HS	EF-2	Roof	West Wing	Exhaust Fan	1	Cook	01M					20		
Verona HS	EF-3	Roof	East Wing	Exhaust Fan	1	Cook	1225ACEB					20		
Verona HS	EF-4	Roof	Board Office	Exhaust Fan	1	Cook	120ACE					20		
Verona HS	EF-5	Roof	Toilet	Exhaust Fan	1	Cook						20		
Verona HS	EF-6	Roof	Science	Exhaust Fan	1	Cook						20		
Verona HS	EF-7	Roof	Old Gym Boys	Exhaust Fan	1	Cook						20		
Verona HS	EF-8	Roof		Exhaust Fan	1	Cook						20		
Verona HS	EF-9	Roof	Home Economics	Exhaust Fan	1	Cook	16510d					20		
Verona HS	EF-10	Roof	Faculty Toilets	Exhaust Fan	1	Cook						20		
Verona HS	EF-11	Roof	Inner Offices	Exhaust Fan	1	Cook						20		
Verona HS	EF-12	Roof	Teachers Work Room	Exhaust Fan	1	Dayton	4YC72					20		
Verona HS	EF-13	Roof	Ticket Booth	Exhaust Fan	1	Cook						20		
Verona HS	EF-14	Roof	Ice Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-15	Roof	Kitchen Toilet	Exhaust Fan	1	Cook						20		
Verona HS	EF-16	Roof	Kitchen Storage	Exhaust Fan	1	Cook	1195 ACEB					20		
Verona HS	EF-17	Roof	Library	Exhaust Fan	1	Cook						20		
Verona HS	EF-18	Roof	Girls Locker	Exhaust Fan	1	Cook						20		
Verona HS	EF-19	Roof	Old Gym Corridor	Exhaust Fan	1	Cook						20		
Verona HS	EF-20	Roof	Dish Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-21	Roof	Dish Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-22	Roof	Fromt Hood	Exhaust Fan	1	Cook						20		
Verona HS	EF-23	Roof	Team Room	Exhaust Fan	1	Cook						20		
Verona HS	EF-24	Roof	Corridor	Exhaust Fan	1	Cook						20		
Verona HS	EF-25	Roof	Large Hood	Exhaust Fan	1	Cook						20		
Verona HS	EF-26	Roof	Girls Locker	Exhaust Fan	1	Cook	225ACEB					20		
Verona HS	EF-27	Roof	Coaches Office	Exhaust Fan	1	Cook	245R3B					20		
Verona HS	EF-28	Roof	Graphics	Exhaust Fan	1	Cook						20		
Verona HS	EF-29	Roof	Darkroom	Exhaust Fan	1	Cook						20		
Verona HS	EF-30	Roof	Math Wing Toilet	Exhaust Fan	1	Cook						20		
Verona HS	EF-31	Roof	Old Gym	Exhaust Fan	1	Cook						20		
Verona HS	EF-32	Roof	New Gym	Exhaust Fan	1	Cook						20		
Verona HS	EF-33	Roof	Stage	Exhaust Fan	1	Cook						20		
Verona HS	Fume Hood 1	Roof	Science	Hood Exhaust	1	Airmaster	ardk10500x-01					20		
Verona HS	Fume Hood 2	Roof	Science	Hood Exhaust	1	Cook	120ucv					20		

Ventilators

Bldg	Tag#	Location	Area Serving	Equipment	Mfgr	Model	Quantity	GPM	Head ft	HP	Efficiency	Motor RPM	VFD?	Age	Estimated Service Life
Verona HS	-	Boys Locker Room	Boys Locker Room	Unit Vent	Trane	-	2								20
Verona HS	-	Boys New Gym Locker Room	Boys New Gym Locker Room	Unit Vent	Trane	-	2								20
Verona HS	-	Boys Sports Locker Room	Boys Sports Locker Room	Unit Vent	Trane	-	1								20
Verona HS	-	Corridors	Corridors	Ceiling	-	-	12								20
Verona HS	-	Faculty Dining	Faculty Dining	Unit Vent	Nesbit	-	1								20
Verona HS	-	Music Room	Music Room	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 10	Rm 10	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 11	Rm 11	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 12	Rm 12	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 13	Rm 13	Unit Vent	Trane	-	1								20
Verona HS	-	Rm 15	Rm 15	Unit Vent	Nesbit	-	1								20
Verona HS	-	Rm 18	Rm 18 Science	Unit Vent	-	-	1								20
Verona HS	-	RM 20	RM 20	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 22	RM 22	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	Rm 23	Rm 23	Unit Vent	Airedale	Sentinel	1								20
Verona HS	-	RM 24	RM 24	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 25	RM 25	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 26	RM 26	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 27	RM 27	Unit Vent	Carrier	40uvf3	1			1/5					20
Verona HS	-	RM 28	RM 28	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 29	RM 29	Unit Vent	-	-	1								20
Verona HS	-	RM 30	RM 30	Unit Vent	-	-	1								20
Verona HS	-	RM 31	RM 31	Unit Vent	-	-	1								20
Verona HS	-	RM 32	RM 32	Unit Vent	-	-	1								20
Verona HS	-	RM 33	RM 33	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 34	RM 34	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 35	RM 35	Unit Vent	-	-	1								20
Verona HS	-	RM 36	RM 36	Unit Vent	-	-	1								20
Verona HS	-	RM 37	RM 37	Unit Vent	-	-	1								20
Verona HS	-	RM 38	RM 38	Unit Vent	-	-	1								20
Verona HS	-	RM 39	RM 39	Unit Vent	-	-	1								20
Verona HS	-	RM 40	RM 40	Unit Vent	-	-	1								20
Verona HS	-	RM 41	RM 41	Unit Vent	-	-	1								20
Verona HS	-	RM 43	RM 43	Unit Vent	-	-	1								20
Verona HS	-	Rm 45	Rm 45	Ceiling Mntd	Carrier	24abr324a	1								20
Verona HS	-	RM 47	RM 47	Ceiling Mntd	Carrier	24abr324a	1								20
Verona HS	-	Rm 49	Rm 49	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 51	RM 51	Unit Vent	-	-	1								20
Verona HS	-	RM 53	RM 53	Unit Vent	-	-	1								20
Verona HS	-	Rm 53	Rm 53	Unit Vent	Nesbit	-	1								20
Verona HS	-	RM 55	RM 55	Unit Vent	Nesbit	-	1								20
Verona HS	-	STORAGE	STORAGE	Unit Vent	-	-	1								20
Verona HS	-	Woodshop	Woodshop	Unit Vent	Nesbit	-	1								20

Split Units

Bldg	Tag#	Location	Area Serving	Equipment	Mfg	Model	Quantity	GPM	Head	HP	Efficien	Motor RPM	VFD?	Age	Estimated
Verona HS	-	Main Office	Main Office	Evaporator	Sanyo	-	1								15
Verona HS	-	Server Room	Server Room	Evaporator	Sanyo	-	1								15
Verona HS	-	Rm 12	Rm 12	Evaporator	Goodman	WMC24-1A	1								15
Verona HS	-	Rm 10	Rm 10 Computer Room	Evaporator	Goodman	-	1								15
Verona HS	-	Nurses Office	Nurses Office	Evaporator	Goodman	-	1							10 yrs old	15
Verona HS	-	Vice Principal	Vice Principal	Evaporator	Freidrich	-	1								15
Verona HS	-	Teachers Copy Room	Teachers Copy Room	Evaporator	Freidrich	-	1								15
Verona HS	-	Computer Room	Computer Rm	Evaporator	Panasonic	CS-	1								15
Verona HS	-	Rm 49	Rm 49	Evaporator	Freidrich	-	1								15
Verona HS	-	Computer Room	Computer	Evaporator	Goodman	-	2								15
Verona HS	-	Rm 39	Rm 39	Evaporator	Freidrich	-	1								15
Verona HS	-	Rm 34	Rm 34	Evaporator	Freidrich	-	1								15
Verona HS	-	Rm 26	Rm 26	Evaporator	Mitsubishi	Slim	2								15
Verona HS	-	Rm 45	Rm 45	Ceiling Mntd	Carrier	24abr324a	1								15
Verona HS	-	RM 47	RM 47	Ceiling Mntd	Carrier	24abr324a	1								15
Verona HS	-	Faculty Dining	Faculty Dining	Evaporator	Freidrich	-	1								15
Verona HS	-	Board Office	Board Office	Evaporator	Sanyo	KS2472	1								15
Verona HS	-	Music Office	Music Office	Evaporator	Haier	HSU12XC7	1								15
Verona HS	SAC-6	Library	Library	Evaporator	Trane	-	1								15
Verona HS	SAC-4	Conference Room	Conference	Evaporator	Carrier	38hdfo24-	1								15

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LIGHTING INVENTORY LISTS

LIGHTING RETROFIT SUMMARY FOR:
Brookdale Avenue
14 Brookdale Avenue

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS						FINANCIAL					
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS $ FIXT.	ANNUAL SAVINGS $ SENSORS	ANNUAL SAVINGS $ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE $	**FIXTURES** TOTAL (INSTALLED) COST $	**SENSORS** TOTAL (INSTALLED) COST $	**MATERIAL** TOTAL (INSTALLED) COST $	SIMPLE PAYBACK NET OF REBATE (YEARS)
Brookdale Avenue	**37,972**	**431**	**42,176**	**68,051**	**1.11**	**431**	**27,301**	**34,141**	**0.72**	**14,875**	**33,910**	**6,690**	**$5,250**	**$1,036**	**$6,285**	**11.2**	**$5,710**	**$34,390**	**$12,962**	**$47,353**	**6.6**

12%	**PERCENTAGE OF REBATES IN TOTAL INSTALLED COST**
50%	**PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE**
45%	**EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**
23%	**PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL

CUSTOMER: Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:	
FACILITY: Brookdale Avenue	37,972	5/6/2013	

SPACE DESCRIPTION / EXISTING FIXTURES / REPLACEMENT FIXTURES

LINE (1)	PRINT NUMBER (2)	SPACE DESCRIPTION (3)	PRE FIXTURE DESCRIPTION (4)	PRE FIXT. QTY (5)	PRE WATTS / FIXT. (6)	PRE TOTAL WATTS / LINE (7)	DEFAULT ANNUAL HOURS 2610 (8)	PRE ANNUAL KWH (9)	PRE AVERAGE LIGHT LEVEL FOOT CANDLES (10)	PROPOSED FIXTURE DESCRIPTION (11)	POST FIXT. QTY (12)	POST WATTS / FIXT. (13)	ANNUAL HOURS SAVED (14)	SENSOR TYPE (15)	QTY SENSORS / LINE (16)	POST TOTAL WATTS / LINE (17)	ANNUAL HOURS 2610 (18)	POST ANNUAL KWH (19)	POST ANNUAL KWH WITH OCC SENSOR (20)
1	N/A	WORK ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	2,070	546		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63	724.5	Wall	1	189	1,346	391	254
2	N/A	FACULTY REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,070	120		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42	1035	Wall	1	42	1,035	87	43
3	N/A	FACULTY ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	2,070	729		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63	724.5	Ceiling	1	252	1,346	522	339
4	N/A	FACULTY ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	724.5	Ceiling	1	84	1,346	174	113
5	N/A	CLASSROOM 2	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	14	112	1,568	1,530	2,399	65 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	14	42	306	Ceiling	1	588	1,224	900	720
6	N/A	CLASSROOM 2 REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42	252	Wall	1	42	108	15	5
7	N/A	CLASSROOM STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15
8	N/A	CLASSROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617
9	N/A	MAIN OFFICE RECEPTION	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	58	348	2,070	720		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	6	28				168	2,070	348	348
10	N/A	PRINCIPAL OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	4	58	232	2,070	480		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	4	28	724.5	Wall	1	112	1,346	232	151
11	N/A	NURSE OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	58	348	2,070	720		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	6	28	724.5	Wall	1	168	1,346	348	226
12	N/A	NURSE REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,070	120		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42	1035	Wall	1	42	1,035	87	43
13	N/A	CLASSROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617
14	N/A	CUSTODIAN CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15
15	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Ceiling	1	84	1,035	174	87
16	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	32	32	2,070	66		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	1	22	1035	Ceiling		22	1,035	46	23
17	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Ceiling	1	84	1,035	174	87
18	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	2	32	64	2,070	132		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	2	22	1035	Ceiling		44	1,035	91	46
19	N/A	MEDIA CENTER	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	58	116	2,610	303	73 FC	Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	2	28	522	Ceiling	1	56	2,088	146	117
20	N/A	MEDIA CENTER	Downlight Fixture w/ (1) 26W Quad CFL & Electronic Ballast	8	26	208	2,610	543		None	8	26	522	Ceiling	1	208	2,088	543	434
21	N/A	MEDIA CENTER	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	16	88	1,408	2,610	3,675		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	16	63	522	Ceiling	1	1,008	2,088	2,631	2,105
22	N/A	COMPUTER ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	10	88	880	1,530	1,346		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	10	63	306	Ceiling	1	630	1,224	964	771
23	N/A	MEDIA OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	1,530	269		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	306	Wall	1	126	1,224	193	154
24	N/A	SGI #2	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	1,530	343		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42	306	Wall	1	84	1,224	129	103
25	N/A	STORAGE/ ELECTRICAL	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	88	88	360	32		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	1	63				63	360	23	23
26	N/A	SGI #3	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	1,530	808		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63	306	Wall	1	378	1,224	578	463
27	N/A	SGI FOYER	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303	27 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219
28	N/A	SGI FOYER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18
29	N/A	CLASSROOM 9	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	88	968	1,530	1,481	69 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	11	63	306	Ceiling	1	693	1,224	1,060	848
30	N/A	CLASSROOM 8	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	10	88	880	1,530	1,346		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	10	63	306	Ceiling	1	630	1,224	964	771
31	N/A	BOYS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall	1	84	1,035	174	87
32	N/A	BOYS REST ROOM	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	32	32	2,070	66		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Normal-Power High Efficiency Ballast	1	25				25	2,070	52	52
33	N/A	CUSTODIAN CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15
34	N/A	SECOND FLOOR HALL, ADDITION	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548
35	N/A	SECOND FLOOR HALL, ADDITION	Exit Sign w/ LED	3	2	6	8,760	53		None	3	2				6	8,760	53	53
36	N/A	CLASSROOM 7	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617
37	N/A	CLASSROOM 7 STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1	112	112	360	40		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	360	15	15
38	N/A	CLASSROOM 6	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056	86 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617
39	N/A	CLASSROOM 6 STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30
40	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30
41	N/A	CLASSROOM 5	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	5	112	560	1,530	857		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	5	42	306	Ceiling	1	210	1,224	321	257
42	N/A	CLASSROOM 5 STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1	112	112	360	40		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	360	15	15
43	N/A	CLASSROOM 4	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617

ENERGY ANALYSIS / COST ANALYSIS / REBATES

LINE (1)	WATTS SAVED / FIXT. (21)	TOTAL WATTS SAVED / LINE (22)	ANNUAL HOURS SAVED (23)	ANNUAL KWH SAVED FROM FIXT. (24)	ANNUAL KWH SAVED WITH OCC (25)	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.155 (26)	TOTAL FIXTURE COST (MATERIAL PLUS LABOR) (27)	TOTAL SENSOR COST (MATERIAL PLUS LABOR) (28)	TOTAL INSTALLED COST AFTER INCENTIVES (29)	TOTAL FIXTURES REBATE PER LINE (53)	TOTAL SENSORS REBATE PER LINE (54)	TOTAL REBATE / LINE (55)
1	25	75	725	155	137	$45	$228	$215	$393	$30	$20	$50
2	16	16	1,035	33	43	$12	$68	$215	$273	$10	$0	$10
3	25	100	725	207	183	$60	$304	$363	$593	$40	$35	$75
4	16	32	725	66	61	$20	$137	$363	$480	$20	$0	$20
5	70	980	306	1,499	180	$260	$1,411	$363	$1,529	$210	$35	$245
6	16	16	252	6	11	$3	$68	$215	$273	$10	$0	$10
7	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
8	70	840	306	1,285	154	$223	$1,209	$363	$1,357	$180	$35	$215
9	30	180	0	373	0	$58	$363	$0	$303	$60	$0	$60
10	30	120	725	248	81	$51	$242	$215	$416	$40	$0	$40
11	30	180	725	373	122	$77	$363	$215	$517	$60	$0	$60
12	16	16	1,035	33	43	$12	$68	$215	$273	$10	$0	$10
13	70	840	306	1,285	154	$223	$1,209	$363	$1,357	$180	$35	$215
14	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
15	16	32	1,035	66	87	$24	$137	$363	$480	$20	$0	$20
16	10	10	1,035	21	23	$7	$51	$0	$41	$10	$0	$10
17	16	32	1,035	66	87	$24	$137	$363	$480	$20	$0	$20
18	10	20	1,035	41	46	$13	$101	$0	$81	$20	$0	$20
19	30	60	522	157	29	$29	$121	$363	$464	$20	$0	$20
20	0	0	522	0	109	$17	$0	$363	$328	$0	$35	$35
21	25	400	522	1,044	526	$243	$1,217	$363	$1,385	$160	$35	$195
22	25	250	306	383	193	$89	$761	$363	$989	$100	$35	$135
23	25	50	306	77	39	$18	$152	$215	$347	$20	$0	$20
24	70	140	306	214	26	$37	$202	$215	$386	$30	$0	$30
25	25	25	0	9	0	$1	$76	$0	$66	$10	$0	$10
26	25	150	306	230	116	$53	$456	$215	$591	$60	$20	$80
27	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
28	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
29	25	275	306	421	212	$98	$837	$363	$1,055	$110	$35	$145
30	25	250	306	383	193	$89	$761	$363	$989	$100	$35	$135
31	16	32	1,035	66	87	$24	$137	$215	$331	$20	$0	$20
32	7	7	0	14	0	$2	$25	$0	$15	$10	$0	$10
33	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
34	16	80	0	209	0	$32	$341	$0	$291	$50	$0	$50
35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
36	70	840	306	1,285	154	$223	$1,209	$363	$1,357	$180	$35	$215
37	70	70	0	25	0	$4	$101	$0	$86	$15	$0	$15
38	70	840	306	1,285	154	$223	$1,209	$363	$1,357	$180	$35	$215
39	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
40	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
41	70	350	306	536	64	$93	$504	$363	$757	$75	$35	$110
42	70	70	0	25	0	$4	$101	$0	$86	$15	$0	$15
43	70	840	306	1,285	154	$223	$1,209	$363	$1,357	$180	$35	$215

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL

CUSTOMER: Verona Schools

FACILITY: Brookdale Avenue

FACILITY SQ. FT. 37,972

DATE OF AUDIT: 5/6/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES									
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR
44	N/A	CLASSROOM 4 STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1	112	112	360	40		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	360	15	15
45	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Ceiling	1	84	1,035	174	87
46	N/A	COPY ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1	112	112	2,070	232		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	2,070	87	87
47	N/A	SECOND FLOOR HALL, OLD SCHOOL	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	9	58	522	2,610	1,362		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	9	42				378	2,610	987	987
48	N/A	SECOND FLOOR HALL, OLD SCHOOL	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35
49	N/A	STAIRWELL A, OLD SCHOOL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,610	908		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42				252	2,610	658	658
50	N/A	STAIRWELL B, OLD SCHOOL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,610	908		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42				252	2,610	658	658
51	N/A	STAIRWELL, BY MEDIA CENTER	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110
52	N/A	STAIRWELL, BY MEDIA CENTER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548
53	N/A	CAFETERIA	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	20	58	1,160	2,610	3,028	46 FC	Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	20	28	522	Ceiling	3	560	2,088	1,462	1,169
54	N/A	CAFETERIA	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35
55	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Ceiling	1	84	1,035	174	87
56	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,070	174	174
57	N/A	KITCHEN	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,070	174	174
58	N/A	CUSTODIAN CLOSET	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15
59	N/A	CAFETERIA ENTRANCE STAIRS	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	5	28				140	2,610	365	365
60	N/A	DISPLAY CASES	3' Fixture w/ (1) F30T12/25w Lamps & (1) Energy Efficient Magnetic Ballast	2	38	76	360	27		Relamp & Reballast w/ (1) F25T8 Lamps & (1) 1/25 Elec. Normal-Power High Efficiency Ballast	2	23				46	360	17	17
61	N/A	ELEVATOR ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15
62	N/A	ELEVATOR	4' Industrial Hood w/ (4) F25T8 Lamps & (1) Electronic Ballast	1	85	85	8,760	745		None	1	85				85	8,760	745	745
63	N/A	BOYS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall	1	84	1,035	174	87
64	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	32	32	2,070	66		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	1	22				22	2,070	46	46
65	N/A	BASEMENT HALL, ADDITION	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	2,610	606		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	2,610	438	438
66	N/A	BASEMENT HALL, ADDITION	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18
67	N/A	BOILER ROOM	4' Industrial Hood w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	2,610	689		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	2,610	493	493
68	N/A	BOILER ROOM	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219
69	N/A	BOILER OFFICE	4' Industrial Hood w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	2,610	689		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	2,610	493	493
70	N/A	STAGE	4' Industrial Hood w/ (3) FO32T8 Lamps & (1) Electronic Ballast	7	88	616	360	222	71 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	7	63				441	360	159	159
71	N/A	STAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30
72	N/A	STAGE	Incandescent Fixture w/ (1) 150w Incandescent Lamp	52	150	7,800	360	2,808		None	52	150				7,800	360	2,808	2,808
73	N/A	GYM	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	21	295	6,195	2,610	16,169	29 FC	New Fixture w/ (1) 165w ICETRON Induction Lamp & Induction Ballast Universal Voltage	21	175	522	Ceiling	3	3,675	2,088	9,592	7,673
74	N/A	GYM	Exit Sign w/ LED	3	2	6	8,760	53		None	3	2				6	8,760	53	53
75	N/A	MUSIC ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	1,530	1,212		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	306	Ceiling	1	567	1,224	868	694
76	N/A	MUISIC ROOM STORAGE	Compact Fluorescent Fixture w/ 14w CFL & Magnetic Ballast	1	16	16	360	6		None	1	16				16	360	6	6
77	N/A	STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30
78	N/A	SGI #1	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	2,070	546		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63	724.5	Wall	1	189	1,346	391	254
79	N/A	STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	360	127		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63				252	360	91	91
80	N/A	ART ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616	56 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925
81	N/A	SERVER CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15
82	N/A	STORAGE (OLD REST ROOM)	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	360	63		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42				126	360	45	45
83	N/A	CLASSROOM ACROSS FROM GYM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	16	112	1,792	1,530	2,742		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	16	42	306	Ceiling	1	672	1,224	1,028	823
84	N/A	CLASSROOM ACROSS FROM GYM	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18
85	N/A	CLASSROOM REST ROOM	Compact Fluorescent Fixture w/ 14w CFL & Magnetic Ballast	1	16	16	360	6		None	1	16	252	Wall	1	16	108	6	2
86	N/A	CLASSROOM STORAGE	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1	112	112	360	40		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	360	15	15

	ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.155	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
44	70	70	0	25	0	$4	$101	$0	$86	$15	$0	$15
45	16	32	1,035	66	87	$24	$137	$363	$480	$20	$0	$20
46	70	70	0	145	0	$22	$101	$0	$86	$15	$0	$15
47	16	144	0	376	0	$58	$614	$0	$524	$90	$0	$90
48	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
49	16	96	0	251	0	$39	$410	$0	$350	$60	$0	$60
50	16	96	0	251	0	$39	$410	$0	$350	$60	$0	$60
51	16	16	0	42	0	$6	$68	$0	$58	$10	$0	$10
52	16	80	0	209	0	$32	$341	$0	$291	$50	$0	$50
53	30	600	522	1,566	292	$288	$1,209	$1,090	$1,994	$200	$105	$305
54	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
55	16	32	1,035	66	87	$24	$137	$363	$480	$20	$0	$20
56	16	32	0	66	0	$10	$137	$0	$117	$20	$0	$20
57	16	32	0	66	0	$10	$137	$0	$117	$20	$0	$20
58	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
59	30	150	0	392	0	$61	$302	$0	$252	$50	$0	$50
60	15	30	0	11	0	$2	$0	$0	$0	$0	$0	$0
61	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
62	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
63	16	32	1,035	66	87	$24	$137	$215	$331	$20	$0	$20
64	10	10	0	21	0	$3	$51	$0	$41	$10	$0	$10
65	16	64	0	167	0	$26	$273	$0	$233	$40	$0	$40
66	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
67	25	75	0	196	0	$30	$228	$0	$198	$30	$0	$30
68	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
69	25	75	0	196	0	$30	$228	$0	$198	$30	$0	$30
70	25	175	0	63	0	$10	$532	$0	$462	$70	$0	$70
71	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
72	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
73	120	2,520	522	6,577	1,918	$1,315	$8,054	$1,090	$7,989	$1,050	$105	$1,155
74	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
75	25	225	306	344	174	$80	$684	$363	$923	$90	$35	$125
76	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
77	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
78	25	75	725	155	137	$45	$228	$215	$393	$30	$20	$50
79	25	100	0	36	0	$6	$304	$0	$264	$40	$0	$40
80	25	300	306	459	231	$107	$913	$363	$1,121	$120	$35	$155
81	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
82	16	48	0	17	0	$3	$205	$0	$175	$30	$0	$30
83	70	1,120	306	1,714	206	$297	$1,612	$363	$1,700	$240	$35	$275
84	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
85	0	0	252	0	4	$1	$0	$215	$215	$0	$0	$0
86	70	70	0	25	0	$4	$101	$0	$86	$15	$0	$15

LIGHTING RETROFIT SUMMARY FOR:
FN Brown
125 Grove Avenue

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS						FINANCIAL					
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS $ FIXT.	ANNUAL SAVINGS $ SENSORS	ANNUAL SAVINGS $ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE $	**FIXTURES** TOTAL (INSTALLED) COST $	**SENSORS** TOTAL (INSTALLED) COST $	**MATERIAL** TOTAL (INSTALLED) COST $	SIMPLE PAYBACK NET OF REBATE (YEARS)
FN Brown	**38,985**	**626**	**42,114**	**76,298**	**1.08**	**626**	**28,079**	**40,861**	**0.72**	**14,035**	**35,437**	**9,452**	**$6,088**	**$1,624**	**$7,712**	**11.7**	**$6,095**	**$39,706**	**$18,658**	**$58,364**	**6.8**

10%	**PERCENTAGE OF REBATES IN TOTAL INSTALLED COST**
54%	**PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE**
33%	**EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**
18%	**PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT.	DATE OF AUDIT:	CUSTOMER	Verona Schools
	38,985	5/6/2013	FACILITY:	FN Brown

SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.172	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
1	2	3	4	5	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	53	54	55
1	N/A	1A OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	84	1,346	174	113	16	32	725	66	61	$22	$137	$215	$331	$20	$0	$20
2	N/A	MEDIA CENTER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,346	1,391	904	16	256	725	530	487	$175	$1,612	$363	$1,780	$160	$35	$195
3	N/A	MEDIA CENTER OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	84	1,346	174	113	16	32	725	66	61	$22	$137	$215	$331	$20	$0	$20
4	N/A	MEDIA CENTER REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	108	15	5	16	16	252	6	11	$3	$68	$215	$273	$10	$0	$10
5	N/A	MEDIA CENTER	Exit Sign w/ LED Emergency Lights	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
6	N/A	STAIRWELL- MEDIA CENTER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
7	N/A	BOYS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	3	Wall	1	84	1,035	174	87	30	90	1,035	186	87	$47	$181	$215	$366	$30	$0	$30
8	N/A	CUSTODIAN CLOSET		0			0	360	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
9	N/A	COMPUTER LAB	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$119	$913	$363	$1,121	$120	$35	$155
10	N/A	COMPUTER LAB- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
11	N/A	NURSE'S OFFICE	2'x2' Troffer w/ (3) FB32T8 1-5/8"-U Lamps & (1) Electronic Ballast	5	Wall	1	195	1,346	404	262	48	240	725	497	141	$110	$254	$215	$398	$50	$20	$70
12	N/A	NURSE'S OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Wall	0	56	1,346	116	75	30	60	725	124	41	$28	$121	$0	$101	$20	$0	$20
13	N/A	NURSE'S REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	$13	$68	$215	$273	$10	$0	$10
14	N/A	MAIN OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4			252	2,070	522	522	25	100	0	207	0	$36	$304	$0	$264	$40	$0	$40
15	N/A	MAIN OFFICE	2'x2' Troffer w/ (3) FB32T8 1-5/8"-U Lamps & (1) Electronic Ballast	2			78	2,070	161	161	48	96	0	199	0	$34	$101	$0	$81	$20	$0	$20
16	N/A	MAIN OFFICE	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	3			78	2,070	161	161	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
17	N/A	SMALL CONFERENCE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
18	N/A	PRINCIPAL' S OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
19	N/A	FACULTY RM CORRIDOR	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2			56	2,610	146	146	30	60	0	157	0	$27	$121	$0	$101	$20	$0	$20
20	N/A	FACULTY RM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	63	1,346	130	85	25	25	725	52	46	$17	$76	$215	$281	$10	$0	$10
21	N/A	FACULTY RM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	Wall	0	252	1,346	522	339	16	96	725	199	183	$66	$410	$0	$350	$60	$0	$60
22	N/A	CONFERENCE RM	2'x2' Troffer w/ (3) FB32T8 3"-U Lamps & (1) Electronic Ballast	5	Wall	1	255	1,346	528	343	37	185	725	383	185	$98	$488	$215	$632	$50	$20	$70
23	N/A	CLASSROOM 7	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	$103	$1,612	$363	$1,780	$160	$35	$195
24	N/A	CLASSROOM 7- TEACHER STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
25	N/A	CLASSROOM 6	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,530	771	771	16	192	0	294	0	$50	$1,209	$363	$1,417	$120	$35	$155
26	N/A	CLASSROOM 6- TEACHER STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
27	N/A	GIRLS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Ceiling	1	56	1,035	116	58	30	60	1,035	124	58	$31	$121	$363	$464	$20	$0	$20
28	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Ceiling	0	42	1,035	87	43	16	16	1,035	33	43	$13	$68	$0	$58	$10	$0	$10

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT.	DATE OF AUDIT:	CUSTOMER	Verona Schools
	38,985	5/6/2013	FACILITY:	FN Brown

SPACE DESCRIPTION			EXISTING FIXTURES			REPLACEMENT FIXTURES					ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.172	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
29	N/A	LOBBY CHANDELIER	Fixture w/ 23w Screw-In CFL	6			138	2,610	360	360	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
30	N/A	AUDITORIUM LOBBY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	$14	$137	$0	$117	$20	$0	$20
31	N/A	OFFICE 8	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,346	87	57	16	16	725	33	30	$11	$68	$215	$273	$10	$0	$10
32	N/A	AUDITORIUM	Fixture w/ 23w Screw-In CFL	64	Ceiling	3	1,472	1,224	2,252	1,802	0	0	306	0	450	$77	$0	$1,090	$985	$0	$105	$105
33	N/A	AUDITORIUM	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
34	N/A	STAIRWELL- LEFT SIDE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	$14	$137	$0	$117	$20	$0	$20
35	N/A	STAIRWELL- LEFT SIDE	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
36	N/A	STAIRWELL- RIGHT SIDE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	$14	$137	$0	$117	$20	$0	$20
37	N/A	STAIRWELL- RIGHT SIDE	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
38	N/A	STORAGE BELOW AUDITORIUM		0			0	2,610	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
39	N/A	STAGE		0			0	2,070	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
40	N/A	MECHANICAL ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
41	N/A	MECHANICAL ROOM 2	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
42	N/A	MECH RM HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	$14	$137	$0	$117	$20	$0	$20
43	N/A	MECH RM HALL	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
44	N/A	LOWER STAGE		0			0	2,610	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
45	N/A	GYM	New 2'x4' Pendent Mounted Box w/ (4) F54T5HO Lamps & (2) 2/54 T5 Elec. HO Ballasts	12	Ceiling	3	2,904	1,224	4,443	3,554	0	0	306	0	889	$153	$0	$1,090	$985	$0	$105	$105
46	N/A	GYM	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
47	N/A	GYM HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,610	219	219	16	32	0	84	0	$14	$137	$0	$117	$20	$0	$20
48	N/A	GYM STAIRS	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5			210	2,610	548	548	16	80	0	209	0	$36	$341	$0	$291	$50	$0	$50
49	N/A	PHYSICAL THERAPY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	6	Wall	1	252	1,346	522	339	70	420	725	869	183	$181	$605	$215	$709	$90	$20	$110
50	N/A	B-8 SGI ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	3	Wall	1	126	1,346	261	170	70	210	725	435	91	$90	$302	$215	$472	$45	$0	$45
51	N/A	B-7 MUSIC CLASSROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$247	$1,209	$363	$1,357	$180	$35	$215
52	N/A	B-7 MUSIC CLASSROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Ceiling	0	56	1,224	86	69	30	60	306	92	17	$19	$121	$0	$101	$20	$0	$20
53	N/A	CAFETERIA #1	4' Fixture w/ (3) FO32T8 Lamps & (1) Electronic Ballast	8	Ceiling	1	504	1,346	1,043	678	25	200	725	414	365	$134	$608	$363	$857	$80	$35	$115
54	N/A	CAFETERIA #1	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	3	Ceiling	1	84	1,346	174	113	30	90	725	186	61	$42	$181	$363	$515	$30	$0	$30
55	N/A	CAFETERIA #1	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
56	N/A	CAFETERIA #1	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	6	Ceiling	1	156	1,346	323	210	0	0	725	0	113	$19	$0	$363	$363	$0	$0	$0

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT.	DATE OF AUDIT:	CUSTOMER FACILITY:	Verona Schools FN Brown
	38,985	5/6/2013		

SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.172	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
57	N/A	KITCHEN	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4			252	2,070	522	522	25	100	0	207	0	$36	$304	$0	$264	$40	$0	$40
58	N/A	CAFETERIA #2	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	6	Ceiling	1	156	1,346	323	210	0	0	725	0	113	$19	$0	$363	$363	$0	$0	$0
59	N/A	CAFETERIA #2	4' Fixture w/ (3) FO32T8 Lamps & (1) Electronic Ballast	18	Ceiling	1	1,134	1,346	2,347	1,526	25	450	725	932	822	$301	$1,369	$363	$1,517	$180	$35	$215
60	N/A	CAFETERIA #2	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	4	Ceiling	1	112	1,346	232	151	30	120	725	248	81	$57	$242	$363	$565	$40	$0	$40
61	N/A	CAFETERIA #2	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
62	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	6			252	2,610	658	658	70	420	0	1,096	0	$188	$605	$0	$515	$90	$0	$90
63	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
64	N/A	BOILER ROOM- STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
65	N/A	GIRLS REST ROOM- ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	$13	$68	$215	$273	$10	$0	$10
66	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Ceiling	1	84	1,035	174	87	16	32	1,035	66	87	$26	$137	$363	$480	$20	$0	$20
67	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	Ceiling	0	22	1,035	46	23	10	10	1,035	21	23	$7	$51	$0	$41	$10	$0	$10
68	N/A	FACULTY REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	$13	$68	$215	$273	$10	$0	$10
69	N/A	ART STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4			252	360	91	91	25	100	0	36	0	$6	$304	$0	$264	$40	$0	$40
70	N/A	TEACHERS WORK RM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	7	Wall	1	294	1,346	609	396	70	490	725	1,014	213	$211	$705	$215	$795	$105	$20	$125
71	N/A	BOYS REST ROOM- ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43	16	16	1,035	33	43	$13	$68	$215	$273	$10	$0	$10
72	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	Ceiling	1	84	1,035	174	87	16	32	1,035	66	87	$26	$137	$363	$480	$20	$0	$20
73	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	Ceiling	1	22	1,035	46	23	10	10	1,035	21	23	$7	$51	$363	$404	$10	$0	$10
74	N/A	CUSTODIAN CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
75	N/A	PIPE CHASE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
76	N/A	CHILD STUDY TEAM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	Wall	1	168	1,346	348	226	70	280	725	580	122	$120	$403	$215	$558	$60	$0	$60
77	N/A	MECH ELEC RM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
78	N/A	BASEMENT HALL BY CAFETERIA	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16			672	2,610	1,754	1,754	16	256	0	668	0	$115	$1,092	$0	$932	$160	$0	$160
79	N/A	BASEMENT HALL BY CAFETERIA	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
80	N/A	BASEMENT CLASSROOM HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	11			462	2,610	1,206	1,206	16	176	0	459	0	$79	$751	$0	$641	$110	$0	$110
81	N/A	BASEMENT CLASSROOM HALL	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
82	N/A	CLASSROOM A1	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,224	771	617	16	192	306	294	154	$77	$819	$363	$1,027	$120	$35	$155
83	N/A	A1 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	$3	$16	$215	$231	$0	$0	$0
84	N/A	CLASSROOM A3	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	$90	$1,411	$363	$1,599	$140	$35	$175

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT.	DATE OF AUDIT:	CUSTOMER	Verona Schools
	38,985	5/6/2013	FACILITY:	FN Brown

SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.172	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
85	N/A	A3 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	$3	$16	$215	$231	$0	$0	$0
86	N/A	CLASSROOM A5	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	$90	$1,411	$363	$1,599	$140	$35	$175
87	N/A	A5 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	$3	$16	$215	$231	$0	$0	$0
88	N/A	CLASSROOM A6	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	$90	$1,411	$363	$1,599	$140	$35	$175
89	N/A	A6 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	$3	$16	$215	$231	$0	$0	$0
90	N/A	CLASSROOM A4	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	$90	$1,411	$363	$1,599	$140	$35	$175
91	N/A	A4 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	$3	$16	$215	$231	$0	$0	$0
92	N/A	CLASSROOM A2	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	14	Ceiling	1	588	1,224	900	720	16	224	306	343	180	$90	$1,411	$363	$1,599	$140	$35	$175
93	N/A	A2 REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2	46	46	252	17	4	$3	$16	$215	$231	$0	$0	$0
94	N/A	STAIRWELL BY LARGE CAFETERIA	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4			168	2,610	438	438	16	64	0	167	0	$29	$273	$0	$233	$40	$0	$40
95	N/A	STAIRWELL BY LARGE CAFETERIA	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	2,610	110	110	70	70	0	183	0	$31	$101	$0	$86	$15	$0	$15
96	N/A	FIRST FLOOR HALL	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	11			462	2,610	1,206	1,206	70	770	0	2,010	0	$345	$1,108	$0	$943	$165	$0	$165
97	N/A	FIRST FLOOR HALL	Exit Sign w/ LED	5			10	8,760	88	88	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
98	N/A	MAIN HALL DISPLAY CASE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
99	N/A	MAIN HALL DISPLAY CASE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
100	N/A	MAIN ENTRANCE CHANDELIER	Incandescent Fixture w/ (1) 60w Incandescent Lamp	2			28	2,610	73	73	46	92	0	240	0	$41	$33	$0	$33	$0	$0	$0
101	N/A	MAIN ENTRANCE CHANDELIER	Compact Fluorescent Antique Chandelier Fixture w/ (2) 13w CFL & Magnetic Ballast	1			30	2,610	78	78	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
102	N/A	ROOM 9 SPEECH	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	Wall	1	84	1,224	129	103	70	140	306	214	26	$41	$202	$215	$386	$30	$0	$30
103	N/A	CLASSROOM 11	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	$148	$1,141	$363	$1,319	$150	$35	$185
104	N/A	CLASSROOM 11	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	Ceiling	0	84	1,224	129	103	70	140	306	214	26	$41	$202	$0	$172	$30	$0	$30
105	N/A	ROOM 10 SGI	2'x2' Troffer w/ (3) FB32T8 3"-U Lamps & (1) Electronic Ballast	9	Wall	1	459	1,346	950	618	37	333	725	689	333	$176	$878	$215	$982	$90	$20	$110
106	N/A	BOYS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	4	Ceiling	1	112	1,035	232	116	30	120	1,035	248	116	$63	$242	$363	$565	$40	$0	$40
107	N/A	CUSTODIAN CLOSET	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
108	N/A	CLASSROOM 13	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$119	$913	$363	$1,121	$120	$35	$155
109	N/A	CLASSROOM 13- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
110	N/A	ART ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$119	$913	$363	$1,121	$120	$35	$155
111	N/A	ART STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
112	N/A	CLASSROOM 15	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$119	$913	$363	$1,121	$120	$35	$155

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT.	DATE OF AUDIT:	CUSTOMER	Verona Schools
	38,985	5/6/2013	FACILITY:	FN Brown

SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.172	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
113	N/A	CLASSROOM 15- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
114	N/A	CLASSROOM 14	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$119	$913	$363	$1,121	$120	$35	$155
115	N/A	CLASSROOM 14- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
116	N/A	CLASSROOM 17	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$119	$913	$363	$1,121	$120	$35	$155
117	N/A	CLASSROOM 17- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
118	N/A	CLASSROOM 16	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$119	$913	$363	$1,121	$120	$35	$155
119	N/A	CLASSROOM 16- STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
120	N/A	GIRLS REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	Ceiling	1	56	1,035	116	58	30	60	1,035	124	58	$31	$121	$363	$464	$20	$0	$20
121	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	Ceiling	0	22	1,035	46	23	10	10	1,035	21	23	$7	$51	$0	$41	$10	$0	$10
122	N/A	AUDITORIUM BALCONY STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
123	N/A	AUDITORIUM BALCONY FAN ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4			168	360	60	60	70	280	0	101	0	$17	$403	$0	$343	$60	$0	$60
124	N/A	AUDIT. BALCONY FAN ROOM ENTRANCE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	360	15	15	70	70	0	25	0	$4	$101	$0	$86	$15	$0	$15
125	N/A	BALCONY SIDE STAIRWELL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
126	N/A	UPPER FLOOR HALLWAY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	10			420	2,610	1,096	1,096	70	700	0	1,827	0	$314	$1,008	$0	$858	$150	$0	$150
127	N/A	UPPER FLOOR HALLWAY	Exit Sign w/ LED	4			8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
128	N/A	EXTERIOR- MAIN ENTRANCE	HID Fixture w/ (1) 100w High Pressure Sodium	1			25	4,745	119	119	105	105	0	498	0	$86	$75	$0	$75	$0	$0	$0
129	N/A	EXTERIOR- RIGHT ENTRANCE	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	1			26	4,745	123	123	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
130	N/A	EXTERIOR- LOWER HALL	Compact Fluorescent Wall Pack Fixture w/ (1) 13w CFL	1			15	4,745	71	71	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
131	N/A	EXTERIOR- LOWER HALL UNDER EAVE	HID Wall Pack Fixture w/ (1) 35w High Pressure Sodium	3			135	4,745	641	641	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
132	N/A	EXTERIOR- CAFÉ/ SIDE/ FRONT	Compact Fluorescent Wall Pack Fixture w/ (1) 13w CFL	9			135	4,745	641	641	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0

LIGHTING RETROFIT SUMMARY FOR:
Forest Avenue
118 Forest Avenue

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS						FINANCIAL					
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS $ FIXT.	ANNUAL SAVINGS $ SENSORS	ANNUAL SAVINGS $ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE $	**FIXTURES** TOTAL (INSTALLED) COST $	**SENSORS** TOTAL (INSTALLED) COST $	**MATERIAL** TOTAL (INSTALLED) COST $	SIMPLE PAYBACK NET OF REBATE (YEARS)
Forest Avenue	**27,750**	**598**	**49,876**	**70,513**	**1.80**	**598**	**38,807**	**37,719**	**1.40**	**11,069**	**32,794**	**7,667**	**$4,973**	**$1,163**	**$6,136**	**10.8**	**$5,455**	**$39,159**	**$11,723**	**$50,882**	**7.4**

11%	**PERCENTAGE OF REBATES IN TOTAL INSTALLED COST**
53%	**PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE**
51%	**EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**
27%	**PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 27,750	DATE OF AUDIT: 5/6/2013	CUSTOMER: Verona Schools FACILITY: Forest Avenue

SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES					
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR
1	2	3	4	5	15	16	17	18	19	20
1	N/A	FACULTY ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	Wall	1	168	1,346	348	226
2	N/A	COPY ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	4	Wall	1	112	1,346	232	151
3	N/A	LIBRARY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	18	Ceiling	2	756	1,224	1,157	925
4	N/A	CLASSROOM 17	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823
5	N/A	CLASSROOM 11	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	18	Ceiling	1	756	1,224	1,157	925
6	N/A	CLASSROOM 16	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823
7	N/A	CLASSROOM 12	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925
8	N/A	CLASSROOM 13	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	Ceiling	1	945	1,224	1,446	1,157
9	N/A	RESOURCE ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	126	1,346	261	170
10	N/A	MENS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	Wall	1	42	1,035	87	43
11	N/A	CLASSROOM 14	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,224	771	617
12	N/A	CLASSROOM 14	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	Ceiling		168	1,224	257	206
13	N/A	CLASSROOM 14	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	Ceiling	0	30	1,224	46	37
14	N/A	FACULTY REST ROOM	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	Wall	1	30	1,035	62	31
15	N/A	CUSTODIAN CLOSET		0			0	360	0	0
16	N/A	BOYS REST ROOM	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	4	Wall	1	100	1,035	207	104
17	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	4	Wall	1	100	1,035	207	104
18	N/A	AUDITORIUM/ GYM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	42	Ceiling	3	1,764	1,482	4,075	2,614
19	N/A	AUDITORIUM/ GYM	Exit Sign w/ LED	3			6	8,760	53	53
20	N/A	STAGE	Incandescent Fixture w/ (1) 150w Incandescent Lamp	124			18,600	360	6,696	6,696
21	N/A	STAGE STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8
22	N/A	STAGE STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15
23	N/A	ART ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	504	1,224	771	617
24	N/A	NURSE'S OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	Wall	1	168	1,346	348	226
25	N/A	NURSE'S OFFICE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall		14	2,070	29	29
26	N/A	NURSE'S STORAGE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1			14	360	5	5
27	N/A	NURSE'S REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	Wall	1	14	108	5	2
28	N/A	MAIN OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	Ceiling	1	168	1,346	348	226
29	N/A	OFFICE STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15

LINE	ENERGY ANALYSIS					
	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.152
1	21	22	23	24	25	26
1	30	180	725	373	122	$75
2	30	120	725	248	81	$50
3	16	288	306	441	231	$102
4	16	256	306	392	206	$91
5	16	288	306	441	231	$102
6	16	256	306	392	206	$91
7	25	300	306	459	231	$105
8	25	375	306	574	289	$131
9	16	48	725	99	91	$29
10	16	16	1,035	33	43	$12
11	16	192	306	294	154	$68
12	70	280	306	428	51	$73
13	90	90	306	138	9	$22
14	90	90	1,035	186	31	$33
15	0	0	0	0	0	$0
16	7	28	1,035	58	104	$24
17	7	28	1,035	58	104	$24
18	16	672	828	1,552	1,461	$457
19	0	0	0	0	0	$0
20	0	0	0	0	0	$0
21	0	0	0	0	0	$0
22	16	16	0	6	0	$1
23	16	192	306	294	154	$68
24	16	64	725	132	122	$39
25	46	46	0	95	0	$14
26	46	46	0	17	0	$3
27	46	46	252	17	4	$3
28	16	64	725	132	122	$39
29	16	16	0	6	0	$1

LINE	COST ANALYSIS			REBATES		
	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
1	27	28	29	53	54	55
1	$363	$215	$517	$60	$0	$60
2	$242	$215	$416	$40	$0	$40
3	$1,814	$727	$2,290	$180	$70	$250
4	$1,612	$363	$1,780	$160	$35	$195
5	$1,814	$363	$1,962	$180	$35	$215
6	$1,612	$363	$1,780	$160	$35	$195
7	$913	$363	$1,121	$120	$35	$155
8	$1,141	$363	$1,319	$150	$35	$185
9	$302	$215	$487	$30	$0	$30
10	$68	$215	$273	$10	$0	$10
11	$1,209	$363	$1,417	$120	$35	$155
12	$403	$0	$343	$60	$0	$60
13	$23	$0	$23	$0	$0	$0
14	$23	$215	$237	$0	$0	$0
15	$0	$0	$0	$0	$0	$0
16	$101	$215	$276	$40	$0	$40
17	$101	$215	$276	$40	$0	$40
18	$4,232	$1,090	$4,797	$420	$105	$525
19	$0	$0	$0	$0	$0	$0
20	$0	$0	$0	$0	$0	$0
21	$0	$0	$0	$0	$0	$0
22	$68	$0	$58	$10	$0	$10
23	$1,209	$363	$1,417	$120	$35	$155
24	$273	$215	$448	$40	$0	$40
25	$16	$0	$16	$0	$0	$0
26	$16	$0	$16	$0	$0	$0
27	$16	$215	$231	$0	$0	$0
28	$273	$363	$596	$40	$0	$40
29	$68	$0	$58	$10	$0	$10

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT. 27,750	DATE OF AUDIT: 5/6/2013	CUSTOMER: Verona Schools FACILITY: Forest Avenue

SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.152	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
30	N/A	PRINCIPAL OFFICE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	Wall	1	84	1,346	174	113	70	140	725	290	61	$53	$202	$215	$386	$30	$0	$30
31	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	8			336	2,610	877	877	16	128	0	334	0	$51	$546	$0	$466	$80	$0	$80
32	N/A	BOILER ROOM	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
33	N/A	ELECTRICAL ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
34	N/A	CUSTODIAN CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
35	N/A	CAFETERIA	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	26	Ceiling	3	1,092	1,482	2,523	1,618	70	1,820	828	4,204	904	$775	$2,620	$1,090	$3,215	$390	$105	$495
36	N/A	KITCHEN	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	2,070	174	174	16	32	0	66	0	$10	$137	$0	$117	$20	$0	$20
37	N/A	KITCHEN STORAGE		0			0	360	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
38	N/A	CLASSROOM 3	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$105	$913	$363	$1,121	$120	$35	$155
39	N/A	COMPUTER LAB	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$105	$913	$363	$1,121	$120	$35	$155
40	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
41	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	126	1,035	261	130	16	48	1,035	99	130	$35	$205	$215	$389	$30	$0	$30
42	N/A	RESOURCE ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	Wall	1	693	1,346	1,435	932	25	275	725	569	502	$162	$837	$215	$921	$110	$20	$130
43	N/A	CUSTODIAN CLOSET	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
44	N/A	BOYS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	126	1,035	261	130	16	48	1,035	99	130	$35	$205	$215	$389	$30	$0	$30
45	N/A	CLASSROOM 23	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	$91	$1,612	$363	$1,780	$160	$35	$195
46	N/A	CLASSROOM 23 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			84	360	30	30	-61	-61	0	-22	0	-$3	$84	$0	$74	$10	$0	$10
47	N/A	CLASSROOM 22	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	$91	$1,612	$363	$1,780	$160	$35	$195
48	N/A	CLASSROOM 22 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
49	N/A	CLASSROOM 24	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	$91	$1,612	$363	$1,780	$160	$35	$195
50	N/A	READING CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2			84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
51	N/A	CLASSROOM 25	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	$91	$1,612	$363	$1,780	$160	$35	$195
52	N/A	CLASSROOM 21	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	$91	$1,612	$363	$1,780	$160	$35	$195
53	N/A	CLASSROOM 21 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
54	N/A	CLASSROOM 20	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	Ceiling	1	672	1,224	1,028	823	16	256	306	392	206	$91	$1,612	$363	$1,780	$160	$35	$195
55	N/A	CLASSROOM 20 STORAGE	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1			23	360	8	8	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
56	N/A	STORAGE ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	360	15	15	70	70	0	25	0	$4	$101	$0	$86	$15	$0	$15
57	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	Wall	1	189	1,035	391	196	25	75	1,035	155	196	$53	$228	$215	$393	$30	$20	$50
58	N/A	SECOND FLOOR HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7			294	2,610	767	767	16	112	0	292	0	$44	$478	$0	$408	$70	$0	$70

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	FACILITY SQ. FT.	DATE OF AUDIT:	CUSTOMER:	Verona Schools
	27,750	5/6/2013	FACILITY:	Forest Avenue

SPACE DESCRIPTION			EXISTING FIXTURES		REPLACEMENT FIXTURES						ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.152	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
59	N/A	SECOND FLOOR HALL	Exit Sign w/ LED	2			4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
60	N/A	STAIRWELL A	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6			252	2,610	658	658	16	96	0	251	0	$38	$410	$0	$350	$60	$0	$60
61	N/A	STAIRWELL A	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
62	N/A	STAIRWELL B	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6			252	2,610	658	658	16	96	0	251	0	$38	$410	$0	$350	$60	$0	$60
63	N/A	STAIRWELL B	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
64	N/A	FIRST FLOOR HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7			294	2,610	767	767	16	112	0	292	0	$44	$478	$0	$408	$70	$0	$70
65	N/A	FIRST FLOOR HALL	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	14			350	2,610	914	914	7	98	0	256	0	$39	$355	$0	$215	$140	$0	$140
66	N/A	FIRST FLOOR HALL	Troffer w/ (4) F17T8 Lamps & (1) 4/17 Elec. NP HE Ballast	2			116	2,610	303	303	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
67	N/A	FIRST FLOOR HALL	2'x4' Troffer w/ (6) FO32T8/32w Lamps & (2) Electronic Ballasts	3			378	2,610	987	987	40	120	0	313	0	$47	$456	$0	$426	$30	$0	$30
68	N/A	FIRST FLOOR HALL	Exit Sign w/ LED	5			10	8,760	88	88	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
69	N/A	MAIN ENTRANCE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1			42	2,610	110	110	70	70	0	183	0	$28	$101	$0	$86	$15	$0	$15
70	N/A	MAIN ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1			42	2,610	110	110	16	16	0	42	0	$6	$68	$0	$58	$10	$0	$10
71	N/A	MAIN ENTRANCE	Exit Sign w/ LED	1			2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
72	N/A	EXTERIOR- MAIN ENTRANCE EAVE	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	1			175	4,745	830	830	120	120	0	569	0	$86	$384	$0	$334	$50	$0	$50
73	N/A	EXTERIOR- FRONT	Incandescent Flood Fixture w/ (1) 100w Halogen Lamp	17			391	4,745	1,855	1,855	77	1,309	0	6,211	0	$942	$387	$0	$387	$0	$0	$0
74	N/A	EXTERIOR- SIDE ENTRANCE WALLPACK	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	1			70	4,745	332	332	50	50	0	237	0	$36	$293	$0	$243	$50	$0	$50
75	N/A	EXTERIOR- SIDE ENTRANCE WALL SCONCE	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	1			70	4,745	332	332	50	50	0	237	0	$36	$293	$0	$243	$50	$0	$50
				598		38	38,807		45,385	37,719		11,069	19,733	25,127	7,667	$4,973	$39,159	$11,723	$45,427	$4,610	$845	$5,455

LIGHTING RETROFIT SUMMARY FOR:
HB Whitehorne Middle School
600 Bloomfield Avenue

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS						FINANCIAL					
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS $ FIXT.	ANNUAL SAVINGS $ SENSORS	ANNUAL SAVINGS $ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE $	**FIXTURES** TOTAL (INSTALLED) COST $	**SENSORS** TOTAL (INSTALLED) COST $	**MATERIAL** TOTAL (INSTALLED) COST $	SIMPLE PAYBACK NET OF REBATE (YEARS)
HB Whitehorne Middle School	**118,224**	**412**	**34,601**	**69,349**	**0.29**	**412**	**22,403**	**39,404**	**0.19**	**12,198**	**29,945**	**6,238**	**$4,620**	**$962**	**$5,582**	**9.9**	**$5,600**	**$37,301**	**$9,430**	**$46,730**	**7.4**

12%	**PERCENTAGE OF REBATES IN TOTAL INSTALLED COST**
57%	**PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE**
13%	**EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**
7%	**PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY: HB Whitehorne Middle School	118,224	5/9/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.154	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	53	54	55
1	N/A	BREAK/ STORAGE ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	10	58	580	1,530	887	59 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	10	42				420	1,530	643	643	16	160	0	245	0	$38	$683	$0	$583	$100	$0	$100
2	N/A	KITCHEN	2'x4' Troffer w/ (4) F40T12/34w Lamps & (2) Energy Efficient Magnetic Ballasts	10	146	1,460	1,530	2,234		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	10	42				420	1,530	643	643	104	1,040	0	1,591	0	$245	$1,008	$0	$1,008	$0	$0	$0
3	N/A	KITCHEN	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	1,530	43	43	30	30	0	46	0	$7	$60	$0	$50	$10	$0	$10
4	N/A	KITCHEN	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
5	N/A	KITCHEN ENTRANCE HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	1,530	129	129	16	32	0	49	0	$8	$137	$0	$117	$20	$0	$20
6	N/A	WASH ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
7	N/A	KITCHEN REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
8	N/A	ELECTRICAL ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
9	N/A	KITHCEN OFFICE	2'x4' Troffer w/ (4) F40T12/34w Lamps & (2) Energy Efficient Magnetic Ballasts	1	146	146	1,530	223		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	1,530	64	64	104	104	0	159	0	$25	$101	$0	$101	$0	$0	$0
10	N/A	ANNEX CAFETERIA	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	39	58	2,262	2,088	4,723	OCC SENSOR	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	39	42				1,638	2,088	3,420	3,420	16	624	0	1,303	0	$201	$2,662	$0	$2,272	$390	$0	$390
11	N/A	ANNEX CAFETERIA	Exit Sign w/ LED	3	2	6	8,760	53		None	3	2				6	8,760	53	53	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
12	N/A	ANNEX CAFETERIA	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,088	121	OCC SENSOR	Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28	0	Ceiling	2	28	2,088	58	58	30	30	0	63	0	$10	$60	$727	$777	$10	$0	$10
13	N/A	WOMENS REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,035	60	OCC SENSOR	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,035	43	43	16	16	0	17	0	$3	$68	$0	$58	$10	$0	$10
14	N/A	WOMENS REST ROOM	2'x4' Troffer w/ (1) FO32T8 Lamp & (1) Electronic Ballast	1	32	32	2,070	66		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Normal-Power High Efficiency Ballast	1	25	1035	Wall	1	25	1,035	52	26	7	7	1,035	14	26	$6	$25	$215	$230	$10	$0	$10
15	N/A	MAIN CAFETERIA	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	36	58	2,088	2,070	4,322		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	36	42	724.5	Ceiling	3	1,512	1,346	3,130	2,034	16	576	725	1,192	1,095	$353	$2,457	$1,090	$3,082	$360	$105	$465
16	N/A	MAIN CAFETERIA	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7	58	406	2,070	840		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	7	42	724.5	Ceiling		294	1,346	609	396	16	112	725	232	213	$69	$478	$0	$408	$70	$0	$70
17	N/A	MAIN CAFETERIA	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
18	N/A	CAFÉ LOBBY	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63				126	2,070	261	261	25	50	0	104	0	$16	$152	$0	$132	$20	$0	$20
19	N/A	MENS REST ROOM	2'x4' Troffer w/ (4) F40T12/34w Lamps & (2) Energy Efficient Magnetic Ballasts	2	146	292	2,070	604		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42	1035	Wall	1	84	1,035	174	87	104	208	1,035	431	87	$80	$202	$215	$416	$0	$0	$0
20	N/A	STORAGE	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
21	N/A	FILE ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
22	N/A	SERVER ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	1,530	343		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42				84	1,530	129	129	70	140	0	214	0	$33	$202	$0	$172	$30	$0	$30
23	N/A	OLD SCHOOL- STORAGE		0	0	0	360	0	LOCKED		0	0	252	Ceiling	1	0	108	0	0	0	0	252	0	0	$0	$0	$363	$363	$0	$0	$0
24	N/A	CUSTODIAN		0	0	0	360	0	LOCKED		0	0	252	Ceiling	1	0	108	0	0	0	0	252	0	0	$0	$0	$363	$363	$0	$0	$0
25	N/A	AIR FILTER STORAGE	4' Wrap Fluorescent w/ (2) F40T12/34w Lamps & (1) Energy Efficient Magnetic Ballast	2	73	146	360	53		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	31	62	0	22	0	$3	$137	$0	$117	$20	$0	$20
26	N/A	TEACHER STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1	112	112	360	40		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	360	15	15	70	70	0	25	0	$4	$101	$0	$86	$15	$0	$15
27	N/A	GRAFITTI STAIRWELL	4' Wrap Fluorescent w/ (2) F40T12/34w Lamps & (1) Energy Efficient Magnetic Ballast	1	73	73	2,070	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,070	87	87	31	31	0	64	0	$10	$68	$0	$58	$10	$0	$10
28	N/A	BOILER ROOM	4' Industrial Hood w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	2,610	1,378		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63				378	2,610	987	987	25	150	0	392	0	$60	$456	$0	$396	$60	$0	$60
29	N/A	HEAT EXCHANGER ROOM	4' Industrial Hood w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	360	63		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63				126	360	45	45	25	50	0	18	0	$3	$152	$0	$132	$20	$0	$20
30	N/A	CUSTODIAN	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
31	N/A	ELECTRICAL ROOM	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
32	N/A	BOILER HALL	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	2,610	454		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42				126	2,610	329	329	16	48	0	125	0	$19	$205	$0	$175	$30	$0	$30
33	N/A	OLD BASEMENT HALL	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548	16	80	0	209	0	$32	$341	$0	$291	$50	$0	$50
34	N/A	OLD BASEMENT HALL	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	88	88	2,610	230		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	1	63				63	2,610	164	164	25	25	0	65	0	$10	$76	$0	$66	$10	$0	$10
35	N/A	OLD BASEMENT HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110	16	16	0	42	0	$6	$68	$0	$58	$10	$0	$10
36	N/A	FACUTLY ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	2,070	360		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42	724.5	Wall	1	126	1,346	261	170	16	48	725	99	91	$29	$205	$215	$389	$30	$0	$30
37	N/A	MECH ROOM HALL	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110	16	16	0	42	0	$6	$68	$0	$58	$10	$0	$10
38	N/A	ELEVATOR MECH RM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
39	N/A	LOBBY	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
40	N/A	LOBBY	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
41	N/A	CUSTODIAN	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
42	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
43	N/A	MUSIC ROOM 107	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	9	58	522	1,530	799		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	9	42	306	Ceiling	3	378	1,224	578	463	16	144	306	220	116	$52	$614	$1,090	$1,509	$90	$105	$195

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools FACILITY: HB Whitehorne Middle School	FACILITY SQ. FT. 118,224	DATE OF AUDIT: 5/9/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES									
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR
44	N/A	MUSIC ROOM 107	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	24	58	1,392	1,530	2,130		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	24	42	306	Ceiling	1	1,008	1,224	1,542	1,234
45	N/A	MUSIC ROOM 107	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	306	Ceiling		84	1,224	129	103
46	N/A	MUSIC ROOM 107	Exit Sign w/ LED	1	2	2	8,760	18		Relamp & Reballast w/ (4) F28T8 Lamps & (1) 4/32 Elec. Low-Power High Efficiency Ballast	1	84	0	Ceiling	1	84	8,760	736	736
47	N/A	STAGE	4' Wrap Fluorescent w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	360	190		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63				378	360	136	136
48	N/A	NURSE OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	5	88	440	2,070	911		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	5	63				315	2,070	652	652
49	N/A	NURSE OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,070	120		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	2,070	58	58
50	N/A	EXAM ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63				126	2,070	261	261
51	N/A	STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	360	63		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63				126	360	45	45
52	N/A	CLASSROOM 108	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	1,530	1,212	41 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	306	Ceiling	1	567	1,224	868	694
53	N/A	CLASSROOM 108	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	2	28	306	Ceiling		56	1,224	86	69
54	N/A	CLASSROOM 109	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	1,530	1,212		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	306	Ceiling	1	567	1,224	868	694
55	N/A	CLASSROOM 109	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	2	28	306	Ceiling		56	1,224	86	69
56	N/A	HALL, CR109 TO MUSIC	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	10	58	580	2,610	1,514	23 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	10	42				420	2,610	1,096	1,096
57	N/A	HALL, CR109 TO MUSIC	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18
58	N/A	HALL, CR109 TO MUSIC	Downlight Fixture w/ (2) 26w CFL & Electronic Ballast	2	54	108	2,610	282		None	2	54				108	2,610	282	282
59	N/A	HALL, CR109 TO MUSIC	Fixture w/ (4) 26w CFL	1	104	104	2,610	271		None	1	104				104	2,610	271	271
60	N/A	CLASSROOM 110	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	1,530	1,212	53 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	306	Ceiling	1	567	1,224	868	694
61	N/A	CLASSROOM 110	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	2	28				56	1,530	86	86
62	N/A	CLASSROOM 111	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	1,530	1,212		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	306	Ceiling	1	567	1,224	868	694
63	N/A	CLASSROOM 111	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	2	28				56	1,530	86	86
64	N/A	FACUTLY REST ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	88	88	360	32		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	1	63	252	Wall	1	63	108	23	7
65	N/A	FACUTLY REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42	252	Wall	1	42	108	15	5
66	N/A	CLASSROOM 112	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	1,530	1,212		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	306	Ceiling	1	567	1,224	868	694
67	N/A	CLASSROOM 112	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	2	28	306	Ceiling		56	1,224	86	69
68	N/A	HALL, CR110 TO CR112	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548
69	N/A	HALL, CR110 TO CR112	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18
70	N/A	CST LOBBY	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	2,070	729	71 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63				252	2,070	522	522
71	N/A	CST CONFERENCE	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	2,070	360		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42	724.5	Ceiling	1	126	1,346	261	170
72	N/A	CST CONFERENCE	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	6	26	156	2,070	323		None	6	26	724.5	Ceiling		156	1,346	323	210
73	N/A	LDTC OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63				126	2,070	261	261
74	N/A	PSYCHOLOGIST	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63				126	2,070	261	261
75	N/A	CLASSROOM 106	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925
76	N/A	CLASSROOM 105	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056	68 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617
77	N/A	HALL, CAFÉ TO CR105	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	22	58	1,276	2,610	3,330		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	22	42				924	2,610	2,412	2,412
78	N/A	HALL, CAFÉ TO CR105	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219
79	N/A	HALL, CAFÉ TO CR105	Exit Sign w/ LED	4	2	8	8,760	70		None	4	2				8	8,760	70	70
80	N/A	ELEVATOR LOWER HALL	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	2,610	454		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42				126	2,610	329	329
81	N/A	CLASSROOM 112 RAMP UP	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7	58	406	2,610	1,060		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	7	42				294	2,610	767	767
82	N/A	CLASSROOM 112 RAMP UP	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	1	26	26	2,610	68		None	1	26				26	2,610	68	68
83	N/A	STAIRWELL TO GYM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	2,610	606		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	2,610	438	438
84	N/A	GYM	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	30	295	8,850	2,610	23,099		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	30	175	522	Ceiling	3	5,250	2,088	13,703	10,962
85	N/A	GYM	Exit Sign w/ LED	4	2	8	8,760	70		None	4	2				8	8,760	70	70
86	N/A	GYM STORAGE	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219

	ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.154	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
44	16	384	306	588	308	$138	$1,638	$363	$1,726	$240	$35	$275
45	16	32	306	49	26	$12	$137	$0	$117	$20	$0	$20
46	-82	-82	0	-718	0	-$111	$84	$363	$437	$10	$0	$10
47	25	150	0	54	0	$8	$456	$0	$396	$60	$0	$60
48	25	125	0	259	0	$40	$380	$0	$330	$50	$0	$50
49	30	30	0	62	0	$10	$60	$0	$50	$10	$0	$10
50	25	50	0	104	0	$16	$152	$0	$132	$20	$0	$20
51	25	50	0	18	0	$3	$152	$0	$132	$20	$0	$20
52	25	225	306	344	174	$80	$684	$363	$923	$90	$35	$125
53	30	60	306	92	17	$17	$121	$0	$101	$20	$0	$20
54	25	225	306	344	174	$80	$684	$363	$923	$90	$35	$125
55	30	60	306	92	17	$17	$121	$0	$101	$20	$0	$20
56	16	160	0	418	0	$64	$683	$0	$583	$100	$0	$100
57	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
58	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
59	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
60	25	225	306	344	174	$80	$684	$363	$923	$90	$35	$125
61	30	60	0	92	0	$14	$121	$0	$101	$20	$0	$20
62	25	225	306	344	174	$80	$684	$363	$923	$90	$35	$125
63	30	60	0	92	0	$14	$121	$0	$101	$20	$0	$20
64	25	25	252	9	16	$4	$76	$215	$281	$10	$0	$10
65	16	16	252	6	11	$3	$68	$215	$273	$10	$0	$10
66	25	225	306	344	174	$80	$684	$363	$923	$90	$35	$125
67	30	60	306	92	17	$17	$121	$0	$101	$20	$0	$20
68	16	80	0	209	0	$32	$341	$0	$291	$50	$0	$50
69	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
70	25	100	0	207	0	$32	$304	$0	$264	$40	$0	$40
71	16	48	725	99	91	$29	$205	$363	$538	$30	$0	$30
72	0	0	725	0	113	$17	$0	$0	$0	$0	$0	$0
73	25	50	0	104	0	$16	$152	$0	$132	$20	$0	$20
74	25	50	0	104	0	$16	$152	$0	$132	$20	$0	$20
75	25	300	306	459	231	$106	$913	$363	$1,121	$120	$35	$155
76	70	840	306	1,285	154	$222	$1,209	$363	$1,357	$180	$35	$215
77	16	352	0	919	0	$142	$1,502	$0	$1,282	$220	$0	$220
78	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
79	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
80	16	48	0	125	0	$19	$205	$0	$175	$30	$0	$30
81	16	112	0	292	0	$45	$478	$0	$408	$70	$0	$70
82	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
83	16	64	0	167	0	$26	$273	$0	$233	$40	$0	$40
84	120	3,600	522	9,396	2,741	$1,872	$11,505	$1,090	$10,990	$1,500	$105	$1,605
85	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
86	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER:	Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY:	HB Whitehorne Middle School	118,224	5/9/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.154	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
87	N/A	GYM OFFICE		0	0	0	2,070	0	LOCKED		0	0				0	2,070	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
88	N/A	GIRLS LOCKER	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	10	32	320	1,530	490		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	10	22				220	1,530	337	337	10	100	0	153	0	$24	$507	$0	$407	$100	$0	$100
89	N/A	GIRLS LOCKER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
90	N/A	GIRLS SHOWER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	1,530	444		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	1,530	321	321	16	80	0	122	0	$19	$341	$0	$291	$50	$0	$50
91	N/A	GIRLS LOCKER REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10
92	N/A	CUSTODIAN	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
93	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
94	N/A	GIRLS COACH OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	1,530	129	129	16	32	0	49	0	$8	$137	$0	$117	$20	$0	$20
95	N/A	COACH REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	2	60	120	360	43		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	2	14				28	360	10	10	46	92	0	33	0	$5	$33	$0	$33	$0	$0	$0
96	N/A	BOYS COACH OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	1,530	129	129	16	32	0	49	0	$8	$137	$0	$117	$20	$0	$20
97	N/A	COACH REST ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	2	60	120	360	43		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	2	14				28	360	10	10	46	92	0	33	0	$5	$33	$0	$33	$0	$0	$0
98	N/A	BOYS LOCKER	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	10	32	320	1,530	490		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	10	22				220	1,530	337	337	10	100	0	153	0	$24	$507	$0	$407	$100	$0	$100
99	N/A	BOYS LOCKER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
100	N/A	BOYS SHOWER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	1,530	444		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	1,530	321	321	16	80	0	122	0	$19	$341	$0	$291	$50	$0	$50
101	N/A	BOYS LOCKER REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10
102	N/A	CUSTODIAN	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1	23	23	360	8		None	1	23				23	360	8	8	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
103	N/A	GYM HALL	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	58	696	2,610	1,817		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	12	42				504	2,610	1,315	1,315	16	192	0	501	0	$77	$819	$0	$699	$120	$0	$120
104	N/A	GYM HALL	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
105	N/A	HALL, CLASSROOM 101	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	17	58	986	2,610	2,573		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	17	42				714	2,610	1,864	1,864	16	272	0	710	0	$110	$1,160	$0	$990	$170	$0	$170
106	N/A	HALL, CLASSROOM 101	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
107	N/A	CLASSROOM 101	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
108	N/A	CLASSROOM 115 MUSIC	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	38	112	4,256	1,530	6,512	85 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	38	42	306	Ceiling	2	1,596	1,224	2,442	1,954	70	2,660	306	4,070	488	$703	$3,829	$727	$3,915	$570	$70	$640
109	N/A	CLASSROOM 115 MUSIC	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28	306	Ceiling		28	1,224	43	34	30	30	306	46	9	$8	$60	$0	$50	$10	$0	$10
110	N/A	CLASSROOM 115 STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	360	84		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	360	60	60	16	64	0	23	0	$4	$273	$0	$233	$40	$0	$40
111	N/A	CLASSROOM 105	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$222	$1,209	$363	$1,357	$180	$35	$215
112	N/A	CLASSROOM 114 SHOP	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	38	112	4,256	1,530	6,512		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	38	42				1,596	1,530	2,442	2,442	70	2,660	0	4,070	0	$628	$3,829	$0	$3,259	$570	$0	$570
113	N/A	COMPUTER ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	360	81		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42				84	360	30	30	70	140	0	50	0	$8	$202	$0	$172	$30	$0	$30
114	N/A	ROBOT ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	360	84		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	360	60	60	16	64	0	23	0	$4	$273	$0	$233	$40	$0	$40
115	N/A	CLASSROOM 103	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	18	112	2,016	1,530	3,084		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	18	42	306	Ceiling	1	756	1,224	1,157	925	70	1,260	306	1,928	231	$333	$1,814	$363	$1,872	$270	$35	$305
116	N/A	CLASSROOM 103 SERVER/ STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	360	81		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42				84	360	30	30	70	140	0	50	0	$8	$202	$0	$172	$30	$0	$30
117	N/A	CLASSROOM 103 REFRIGERATOR	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
118	N/A	CLASSROOM 104	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	18	112	2,016	1,530	3,084		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	18	42	306	Ceiling	1	756	1,224	1,157	925	70	1,260	306	1,928	231	$333	$1,814	$363	$1,872	$270	$35	$305
119	N/A	ROOM 113	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	1,530	355		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42	306	Wall	1	168	1,224	257	206	16	64	306	98	51	$23	$273	$215	$448	$40	$0	$40
120	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,070	720		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42	1035	Ceiling	1	252	1,035	522	261	16	96	1,035	199	261	$71	$410	$363	$678	$60	$35	$95
121	N/A	CUSTODIAN	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
122	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,070	720		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42	1035	Ceiling	1	252	1,035	522	261	16	96	1,035	199	261	$71	$410	$363	$678	$60	$35	$95
123	N/A	STORAGE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
124	N/A	MAIN FLOOR REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,070	120		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28	1035	Ceiling	1	28	1,035	58	29	30	30	1,035	62	29	$14	$60	$363	$414	$10	$0	$10
125	N/A	AUDITORIUM	Incandescent Drum Fixture w/ (2) 60w Incandescent Lamps	5	120	600	1,530	918		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	5	30				150	1,530	230	230	90	450	0	689	0	$106	$114	$0	$114	$0	$0	$0
126	N/A	MAIN OFFICE	2'x4' Troffer w/ (4) F40T12/34w Lamps & (2) Energy Efficient Magnetic Ballasts	7	146	1,022	2,070	2,116	65 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	7	42				294	2,070	609	609	104	728	0	1,507	0	$232	$705	$0	$600	$105	$0	$105
127	N/A	COPY ROOM	2'x4' Troffer w/ (4) F40T12/34w Lamps & (2) Energy Efficient Magnetic Ballasts	2	146	292	2,070	604		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42				84	2,070	174	174	104	208	0	431	0	$66	$202	$0	$172	$30	$0	$30
128	N/A	PRINCIPAL OFFICE	2'x4' Troffer w/ (4) F40T12/34w Lamps & (2) Energy Efficient Magnetic Ballasts	2	146	292	2,070	604		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42	724.5	Wall	1	84	1,346	174	113	104	208	725	431	61	$76	$202	$215	$386	$30	$0	$30
129	N/A	ASISTANT PRINCIPAL LOBBY	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	58	348	2,070	720		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	6	28				168	2,070	348	348	30	180	0	373	0	$57	$363	$0	$303	$60	$0	$60

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER:	Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY:	HB Whitehorne Middle School	118,224	5/9/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.154	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
130	N/A	CONFERENCE ROOM	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	5	26	130	2,070	269		None	5	26	724.5	Wall	1	130	1,346	269	175	0	0	725	0	94	$15	$0	$215	$215	$0	$0	$0
131	N/A	ASISTANT PRINCIPAL OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$30	$152	$215	$347	$20	$0	$20
132	N/A	GUIDACE OFFICE 1	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$30	$152	$215	$347	$20	$0	$20
133	N/A	GUIDACE OFFICE 2	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$30	$152	$215	$347	$20	$0	$20
134	N/A	TIME OUT ROOM	4' Wrap Fluorescent w/ (2) F40T12/34w Lamps & (1) Energy Efficient Magnetic Ballast	2	73	146	1,530	223		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	1,530	129	129	31	62	0	95	0	$15	$137	$0	$117	$20	$0	$20
135	N/A	TIME OUT REST ROOM	2'x2' Troffer w/ (2) F20T12 Lamps & (1) Standard Magnetic Ballast	1	56	56	360	20		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	360	10	10	28	28	0	10	0	$2	$60	$0	$50	$10	$0	$10
136	N/A	CUSTODIAN	2'x2' Troffer w/ (2) F17T8 Lamps & (1) Electronic Ballast	1	34	34	360	12		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	360	10	10	6	6	0	2	0	$0	$60	$0	$50	$10	$0	$10
137	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	2,070	464		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42	1035	Ceiling	1	84	1,035	174	87	70	140	1,035	290	87	$58	$202	$363	$535	$30	$0	$30
138	N/A	CLASSROOM 223	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	14	112	1,568	1,530	2,399	68 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	14	42	306	Ceiling	1	588	1,224	900	720	70	980	306	1,499	180	$259	$1,411	$363	$1,529	$210	$35	$245
139	N/A	CLASSROOM 220	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$222	$1,209	$363	$1,357	$180	$35	$215
140	N/A	STORAGE	2'x2' Troffer w/ (2) F17T8 Lamps & (1) Electronic Ballast	1	34	34	360	12		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	360	10	10	6	6	0	2	0	$0	$60	$0	$50	$10	$0	$10
141	N/A	CLASSROOM 221	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$222	$1,209	$363	$1,357	$180	$35	$215
142	N/A	CLASSROOM 222 SCIENCE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	14	88	1,232	1,530	1,885		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	14	63	306	Ceiling	1	882	1,224	1,349	1,080	25	350	306	536	270	$124	$1,065	$363	$1,253	$140	$35	$175
143	N/A	PREP ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	1,530	269		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63				126	1,530	193	193	25	50	0	77	0	$12	$152	$0	$132	$20	$0	$20
144	N/A	HALL, SECOND FLOOR	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	9	58	522	2,610	1,362		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	9	42				378	2,610	987	987	16	144	0	376	0	$58	$614	$0	$524	$90	$0	$90
145	N/A	HALL, SECOND FLOOR	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
146	N/A	THIRD FLOOR- SMALL OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
147	N/A	CLASSROOM 301	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$222	$1,209	$363	$1,357	$180	$35	$215
148	N/A	AUDITORIUM UPPER BALCONY	Incandescent Drum Fixture w/ (2) 60w Incandescent Lamps	4	120	480	2,610	1,253		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	4	30				120	2,610	313	313	90	360	0	940	0	$145	$91	$0	$91	$0	$0	$0
149	N/A	AUDITORIUM UPPER BALCONY	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
150	N/A	BOOK STORAGE	2'x2' Troffer w/ (2) F17T8 Lamps & (1) Electronic Ballast	1	34	34	360	12		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	360	10	10	6	6	0	2	0	$0	$60	$0	$50	$10	$0	$10
151	N/A	CLASSROOM 302	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	10	112	1,120	1,530	1,714		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	10	42	306	Ceiling	1	420	1,224	643	514	70	700	306	1,071	129	$185	$1,008	$363	$1,186	$150	$35	$185
152	N/A	CLASSROOM 303	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	11	112	1,232	1,530	1,885		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	11	42	306	Ceiling	1	462	1,224	707	565	70	770	306	1,178	141	$204	$1,108	$363	$1,272	$165	$35	$200
153	N/A	CUSTODIAN	2'x2' Troffer w/ (2) F17T8 Lamps & (1) Electronic Ballast	1	34	34	360	12		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	360	10	10	6	6	0	2	0	$0	$60	$0	$50	$10	$0	$10
154	N/A	ELEVATOR LOBBY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
155	N/A	UPPER HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,610	908		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42				252	2,610	658	658	16	96	0	251	0	$39	$410	$0	$350	$60	$0	$60
156	N/A	UPPER HALL	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
157	N/A	SECOND FLOOR- FACULTY ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
158	N/A	FACULTY REST ROOM	2'x2' Troffer w/ (2) F20T12 Lamps & (1) Standard Magnetic Ballast	1	56	56	360	20		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28	252	Wall	1	28	108	10	3	28	28	252	10	7	$3	$60	$215	$265	$10	$0	$10
159	N/A	CUSTODIAN		0	0	0	360	0	NO LIGHTS		0	0				0	360	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
160	N/A	WOMENS RR (NEXT TO LIBRARY)	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall	1	84	1,035	174	87	16	32	1,035	66	87	$24	$137	$215	$331	$20	$0	$20
161	N/A	WOMENS RR (NEXT TO LIBRARY)	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall		84	1,035	174	87	16	32	1,035	66	87	$24	$137	$0	$117	$20	$0	$20
162	N/A	WOMENS RR VESTIBULE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,070	120		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42	1035	Wall	1	42	1,035	87	43	16	16	1,035	33	43	$12	$68	$215	$273	$10	$0	$10
163	N/A	MEDIA CENTER- CUSTODIAN	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
164	N/A	COMPUTER ROOM	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	29	58	1,682	1,530	2,573	92 FC!	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	29	42	306	Ceiling	1	1,218	1,224	1,864	1,491	16	464	306	710	373	$167	$1,979	$363	$2,018	$290	$35	$325
165	N/A	MEDIA CENTER VESTIBULE	2'x2' Troffer w/ (2) F17T8 Lamps & (1) Electronic Ballast	5	34	170	1,530	260		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	5	28	306	Ceiling	1	140	1,224	214	171	6	30	306	46	43	$14	$302	$363	$616	$50	$0	$50
166	N/A	MEDIA CENTER VESTIBULE	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	6	26	156	1,530	239		None	6	26	306	Ceiling	1	156	1,224	239	191	0	0	306	0	48	$7	$0	$363	$363	$0	$0	$0
167	N/A	MEDIA CENTER VESTIBULE	Fixture w/ (4) 26w CFL	1	104	104	1,530	159		None	1	104	306	Ceiling		104	1,224	159	127	0	0	306	0	32	$5	$0	$0	$0	$0	$0	$0
168	N/A	MEDIA CENTER VESTIBULE	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
169	N/A	MEDIA SPECIALIST OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	2,070	729		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63	724.5	Wall	1	252	1,346	522	339	25	100	725	207	183	$60	$304	$215	$459	$40	$20	$60
170	N/A	MEDIA SPECIALIST OFFICE	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	1	26	26	2,070	54		None	1	26	724.5	Wall		26	1,346	54	35	0	0	725	0	19	$3	$0	$0	$0	$0	$0	$0
171	N/A	BOOK STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	360	63		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42				126	360	45	45	16	48	0	17	0	$3	$205	$0	$175	$30	$0	$30
172	N/A	READING AREA	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	2	26	52	1,530	80		None	2	26				52	1,530	80	80	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER:	Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY:	HB Whitehorne Middle School	118,224	5/9/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.154	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
173	N/A	READING AREA	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	1,530	266		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42				126	1,530	193	193	16	48	0	73	0	$11	$205	$0	$175	$30	$0	$30
174	N/A	MEDIA CENTER	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28	306	Ceiling		28	1,224	43	34	30	30	306	46	9	$8	$60	$0	$50	$10	$0	$10
175	N/A	MEDIA CENTER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
176	N/A	MEDIA CENTER		6	0	0	1,530	0	MED SCONCE		6	0				0	1,530	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
177	N/A	MEDIA CENTER		2	0	0	1,530	0	LARGE HANGING		2	0				0	1,530	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
178	N/A	MEDIA CENTER	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	25	58	1,450	1,530	2,219		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	25	42	306	Ceiling	2	1,050	1,224	1,607	1,285	16	400	306	612	321	$144	$1,706	$727	$2,113	$250	$70	$320
179	N/A	CLASSROOM 208 ART	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	8	88	704	1,530	1,077		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	8	63	306	Ceiling	1	504	1,224	771	617	25	200	306	306	154	$71	$608	$363	$857	$80	$35	$115
180	N/A	CLASSROOM 208 ART	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	3	58	174	1,530	266		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	3	28	306	Ceiling	1	84	1,224	129	103	30	90	306	138	26	$25	$181	$363	$515	$30	$0	$30
181	N/A	STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
182	N/A	CLASSROOM 207	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056	65 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$222	$1,209	$363	$1,357	$180	$35	$215
183	N/A	CLASSROOM 206	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570	92 FC!	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
184	N/A	CLASSROOM 209	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	1,530	808		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63	306	Ceiling	1	378	1,224	578	463	25	150	306	230	116	$53	$456	$363	$725	$60	$35	$95
185	N/A	HALL, ELEVATOR TO CR209	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	58	696	2,610	1,817		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	12	42				504	2,610	1,315	1,315	16	192	0	501	0	$77	$819	$0	$699	$120	$0	$120
186	N/A	HALL, ELEVATOR TO CR209	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
187	N/A	CLASSROOM 210	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	1,530	808	37 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63	306	Ceiling	1	378	1,224	578	463	25	150	306	230	116	$53	$456	$363	$725	$60	$35	$95
188	N/A	CLASSROOM 211 SCIENCE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$106	$913	$363	$1,121	$120	$35	$155
189	N/A	PREP ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	360	95		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	360	68	68	25	75	0	27	0	$4	$228	$0	$198	$30	$0	$30
190	N/A	CLASSROOM 212 SCIENCE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$106	$913	$363	$1,121	$120	$35	$155
191	N/A	HALL, CR211 TO DOUBLE DOORS	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	58	696	2,610	1,817	11 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	12	42				504	2,610	1,315	1,315	16	192	0	501	0	$77	$819	$0	$699	$120	$0	$120
192	N/A	HALL, CR211 TO DOUBLE DOORS	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	88	88	2,610	230		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	1	63				63	2,610	164	164	25	25	0	65	0	$10	$76	$0	$66	$10	$0	$10
193	N/A	HALL, CR211 TO DOUBLE DOORS	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	1	112	112	2,610	292		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	1	42				42	2,610	110	110	70	70	0	183	0	$28	$101	$0	$86	$15	$0	$15
194	N/A	HALL, CR211 TO DOUBLE DOORS	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	1	26	26	2,610	68		None	1	26				26	2,610	68	68	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
195	N/A	HALL, CR211 TO DOUBLE DOORS	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
196	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,070	720		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42	1035	Ceiling	1	252	1,035	522	261	16	96	1,035	199	261	$71	$410	$363	$678	$60	$35	$95
197	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	360	84		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	360	60	60	16	64	0	23	0	$4	$273	$0	$233	$40	$0	$40
198	N/A	STORAGE	2'x2' Troffer w/ (2) F17T8 Lamps & (1) Electronic Ballast	1	34	34	360	12		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28				28	360	10	10	6	6	0	2	0	$0	$60	$0	$50	$10	$0	$10
199	N/A	CUSTODIAN	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
200	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,070	720		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42	1035	Ceiling	1	252	1,035	522	261	16	96	1,035	199	261	$71	$410	$363	$678	$60	$35	$95
201	N/A	CLASSROOM 205	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	9	112	1,008	1,530	1,542		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	9	42	306	Ceiling	1	378	1,224	578	463	70	630	306	964	116	$167	$907	$363	$1,100	$135	$35	$170
202	N/A	WOMENS REST ROOM	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	120	120	2,070	248		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	1	30	1035	Wall	1	30	1,035	62	31	90	90	1,035	186	31	$34	$23	$215	$237	$0	$0	$0
203	N/A	MEN REST ROOM	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	120	120	2,070	248		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	1	30	1035	Wall	1	30	1,035	62	31	90	90	1,035	186	31	$34	$23	$215	$237	$0	$0	$0
204	N/A	CLASSROOM 213	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
205	N/A	CLASSROOM 214	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
206	N/A	CLASSROOM 204	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
207	N/A	CLASSROOM 203	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
208	N/A	CLASSROOM 215	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
209	N/A	CLASSROOM 216	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
210	N/A	CLASSROOM 201	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
211	N/A	CLASSROOM 202	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
212	N/A	CLASSROOM 217	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$278	$1,511	$363	$1,615	$225	$35	$260
213	N/A	HALL, CR217	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	17	58	986	2,610	2,573		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	17	42				714	2,610	1,864	1,864	16	272	0	710	0	$110	$1,160	$0	$990	$170	$0	$170
214	N/A	HALL, CR217	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
215	N/A	STAIRWELL, CR217 TOP LANDING	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548	16	80	0	209	0	$32	$341	$0	$291	$50	$0	$50

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY: HB Whitehorne Middle School	118,224	5/9/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES									
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR
216	N/A	STAIRWELL, MEDIA CENTER	4' Strip Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110
217	N/A	STAIRWELL, MEDIA CENTER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18
218	N/A	STAIRWELL, MEDIA CENTER	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	2,610	606		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	2,610	438	438
219	N/A	STAIRWELL, CENTER 1	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7	58	406	2,610	1,060		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	7	42				294	2,610	767	767
220	N/A	STAIRWELL, CENTER 2	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	7	58	406	2,610	1,060		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	7	42				294	2,610	767	767
221	N/A	AUDITORIUM	Incandescent Drum Fixture w/ (2) 60w Incandescent Lamps	5	120	600	1,530	918		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	5	30	306	Ceiling	1	150	1,224	230	184
222	N/A	AUDITORIUM	Exit Sign w/ LED	5	2	10	8,760	88		None	5	2				10	8,760	88	88
223	N/A	AUDITORIUM	5 Watt LED PAR 19 fixture	12	5	60	1,530	92		None	12	5	306	Ceiling	1	60	1,224	92	73
224	N/A	AUDITORIUM	HID Fixture w/ (1) 400w Metal Halide Lamp & Ballast	9	455	4,095	1,530	6,265		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	9	175	306	Ceiling	1	1,575	1,224	2,410	1,928
225	N/A	MAIN LOBBY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	8	112	896	2,610	2,339		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	8	42				336	2,610	877	877
226	N/A	MAIN LOBBY	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35
227	N/A	EXTERIOR, ENTRANCE SCONCE	Incandescent Vanity Fixture w/ (4) 15w Incandescent Lamps	1	60	60	4,745	285	OFF	None	1	60				60	4,745	285	285
228	N/A	EXTERIOR, ENTRANCE CHANDELIER		1	0	0	4,745	0	OFF		1	0				0	4,745	0	0
229	N/A	EXTERIOR, WALL PACK	HID Fixture w/ (1) 150w Metal Halide Lamp & Ballast	15	195	2,925	4,745	13,879		New Fixture w/ (1) 100w Induction Lamp & Induction Ballast Universal Voltage	15	110				1,650	4,745	7,829	7,829
230	N/A	BENCH LIGHTS		2	0	0	4,745	0			2	0				0	4,745	0	0
231	N/A	EXTERIOR, SIDE DOOR WALL PACK	HID Fixture w/ (1) 50w Metal Halide Lamp & Ballast	3	62	186	4,745	883		New Wall Pack Fixture w/ (1) 40w Induction Lamp & Induction Ballast Universal Voltage	3	40				120	4,745	569	569
232	N/A	EXTERIOR, FLOODLIGHTS		2	0	0	4,745	0	H1X50		2	0				0	4,745	0	0
233	N/A	EXTERIOR, REAR EAVE	HID Fixture w/ (1) 50w High Pressure Sodium Lamp & Ballast	2	60	120	4,745	569		New Wall Pack Fixture w/ (2) 18w CF Lamps & Electronic Ballast Photocell	2	40				80	4,745	380	380
234	N/A	EXTERIOR, MEDIA SCONCE	HID Fixture w/ (1) 50w Metal Halide Lamp & Ballast	3	62	186	4,745	883		None	3	62				186	4,745	883	883
				412		34,601		69,349			412				28	22,403		45,642	39,404

LINE	ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.154	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
216	16	16	0	42	0	$6	$68	$0	$58	$10	$0	$10
217	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
218	16	64	0	167	0	$26	$273	$0	$233	$40	$0	$40
219	16	112	0	292	0	$45	$478	$0	$408	$70	$0	$70
220	16	112	0	292	0	$45	$478	$0	$408	$70	$0	$70
221	90	450	306	689	46	$113	$114	$363	$477	$0	$0	$0
222	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
223	0	0	306	0	18	$3	$0	$363	$363	$0	$0	$0
224	280	2,520	306	3,856	482	$669	$3,452	$363	$3,330	$450	$35	$485
225	70	560	0	1,462	0	$225	$806	$0	$686	$120	$0	$120
226	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
227	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
228	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
229	85	1,275	0	6,050	0	$933	$5,655	$0	$4,605	$1,050	$0	$1,050
230	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
231	22	66	0	313	0	$48	$761	$0	$761	$0	$0	$0
232	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
233	20	40	0	190	0	$29	$163	$0	$163	$0	$0	$0
234	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
		12,198	11,201	23,707	6,238	$4,620	$37,301	$9,430	$41,130	$5,005	$595	$5,600

LIGHTING RETROFIT SUMMARY FOR:
Laning Ave
18 Laning Road

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS						FINANCIAL					
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS $ FIXT.	ANNUAL SAVINGS $ SENSORS	ANNUAL SAVINGS $ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE $	**FIXTURES** TOTAL (INSTALLED) COST $	**SENSORS** TOTAL (INSTALLED) COST $	**MATERIAL** TOTAL (INSTALLED) COST $	SIMPLE PAYBACK NET OF REBATE (YEARS)
Laning Ave	**46,477**	**574**	**52,368**	**106,614**	**1.13**	**574**	**28,169**	**48,973**	**0.61**	**24,199**	**57,641**	**9,939**	**$8,705**	**$1,501**	**$10,206**	**19.1**	**$8,105**	**$50,330**	**$17,471**	**$67,801**	**5.8**

12%	**PERCENTAGE OF REBATES IN TOTAL INSTALLED COST**
46%	**PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE**
43%	**EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**
20%	**PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY: Laning Ave	46,477	5/6/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.151	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	53	54	55
1	N/A	MAIN LOBBY	Downlight Fixture w/ (1) one 26W QUAD CFL and High Efficiency Electronic Ballast	11	27	297	2,070	615		None	11	27				297	2,070	615	615	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
2	N/A	MAIN LOBBY	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
3	N/A	MEDIA CENTER	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	9	58	522	2,070	1,081		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	9	28				252	2,070	522	522	30	270	0	559	0	$84	$644	$0	$554	$90	$0	$90
4	N/A	MEDIA CENTER	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	30	88	2,640	2,070	5,465	58 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	30	63	724.5	Ceiling	3	1,890	1,346	3,912	2,543	25	750	725	1,553	1,369	$441	$2,282	$1,090	$2,967	$300	$105	$405
5	N/A	MEDIA CENTER	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
6	N/A	COMPUTER LAB	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	360	380		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	252	Ceiling	1	756	108	272	82	25	300	252	108	191	$45	$913	$363	$1,121	$120	$35	$155
7	N/A	LIBRARIAN OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	3	58	174	1,530	266		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	3	28	306	Wall	1	84	1,224	129	103	30	90	306	138	26	$25	$181	$215	$366	$30	$0	$30
8	N/A	BOOK STORAGE		0	0	0	2,070	0	LOCKED		0	0				0	2,070	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
9	N/A	MULTIPURPOSE ROOM	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	6	295	1,770	360	637		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	6	175	252	Ceiling	3	1,050	108	378	113	120	720	252	259	265	$79	$2,301	$1,090	$2,986	$300	$105	$405
10	N/A	MULTIPURPOSE ROOM	Exit Sign w/ LED	3	2	6	8,760	53		None	3	2				6	8,760	53	53	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
11	N/A	STAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	1,530	129	129	16	32	0	49	0	$7	$137	$0	$117	$20	$0	$20
12	N/A	STAGE	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
13	N/A	GYM	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	12	295	3,540	2,310	8,177		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	12	175	828	Ceiling	3	2,100	1,482	4,851	3,112	120	1,440	828	3,326	1,739	$765	$4,602	$1,090	$4,987	$600	$105	$705
14	N/A	GYM	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
15	N/A	BOYS REST RM NEXT TO GYM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,070	174	174	16	32	0	66	0	$10	$137	$0	$117	$20	$0	$20
16	N/A	BOYS REST RM NEXT TO GYM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	2	32	64	2,070	132		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	2	22				44	2,070	91	91	10	20	0	41	0	$6	$101	$0	$81	$20	$0	$20
17	N/A	CUSTODIAN CLOSET		0	0	0	1,530	0	LOCKED		0	0				0	1,530	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
18	N/A	GIRLS REST RM NEXT TO GYM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	724.5	Ceiling	1	84	1,346	174	113	16	32	725	66	61	$19	$137	$363	$480	$20	$0	$20
19	N/A	GIRLS REST RM NEXT TO GYM	4' Wrap Fluorescent w/ (1) FO32T8 Lamp & (1) Electronic Ballast	2	32	64	2,070	132		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	2	22	724.5	Ceiling	1	44	1,346	91	59	10	20	725	41	32	$11	$101	$363	$445	$20	$0	$20
20	N/A	ATTIC ACROSS FROM 112	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
21	N/A	BOILER ROOM- STAIRWELL	Fixture w/ 23w Screw-In CFL	1	23	23	1,530	35		None	1	23				23	1,530	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
22	N/A	BASEMENT STORAGE	4' Wrap Fluorescent w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	1,530	539		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63				252	1,530	386	386	25	100	0	153	0	$23	$304	$0	$264	$40	$0	$40
23	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (3) FO32T8 Lamps & (1) Electronic Ballast	5	88	440	1,530	673		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	5	63				315	1,530	482	482	25	125	0	191	0	$29	$380	$0	$330	$50	$0	$50
24	N/A	BOILER ROOM	Incandescent Fixture w/ (1) 60w Incandescent Lamp	3	60	180	1,530	275		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	3	14				42	1,530	64	64	46	138	0	211	0	$32	$49	$0	$49	$0	$0	$0
25	N/A	BOILER ROOM	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
26	N/A	BASEMENT EXIT- STAIRWELL	4' Wrap Fluorescent w/ (4) F40T12/34w Lamps & (2) Energy Efficient Magnetic Ballasts	1	146	146	360	53		Relamp & Reballast w/ (4) F28T8 Lamps & (1) 4/32 Elec. Low-Power High Efficiency Ballast	1	84				84	360	30	30	62	62	0	22	0	$3	$84	$0	$74	$10	$0	$10
27	N/A	BASEMENT EXIT- STAIRWELL	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
28	N/A	CLASSROOM 124	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616	73 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925	25	300	306	459	231	$104	$913	$363	$1,121	$120	$35	$155
29	N/A	CLASSROOM 123	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	2,070	1,639		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	724.5	Ceiling	1	567	1,346	1,174	763	25	225	725	466	411	$132	$684	$363	$923	$90	$35	$125
30	N/A	CLASSROOM 114	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	2,610	2,756		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	522	Ceiling	1	756	2,088	1,973	1,579	25	300	522	783	395	$178	$913	$363	$1,121	$120	$35	$155
31	N/A	CLASSROOM 115 ART	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	27	112	3,024	2,610	7,893	89 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	27	42	522	Ceiling	1	1,134	2,088	2,960	2,368	70	1,890	522	4,933	592	$834	$2,720	$363	$2,644	$405	$35	$440
32	N/A	RESOURCE CENTER	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	6	112	672	2,070	1,391		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	6	42	724.5	Ceiling	2	252	1,346	522	339	70	420	725	869	183	$159	$605	$727	$1,171	$90	$70	$160
33	N/A	STORAGE		0	0	0	2,610	0	LOCKED		0	0				0	2,610	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
34	N/A	CLASSROOM 112	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	2,610	3,508		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	522	Ceiling	1	504	2,088	1,315	1,052	70	840	522	2,192	263	$371	$1,209	$363	$1,357	$180	$35	$215
35	N/A	CLASSROOM 111	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$217	$1,209	$363	$1,357	$180	$35	$215
36	N/A	CLASSROOM 110	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$217	$1,209	$363	$1,357	$180	$35	$215
37	N/A	CLASSROOM 109	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$217	$1,209	$363	$1,357	$180	$35	$215
38	N/A	CLASSROOM 108	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$217	$1,209	$363	$1,357	$180	$35	$215
39	N/A	GIRLS REST ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	1,530	343		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42	306	Ceiling	1	84	1,224	129	103	70	140	306	214	26	$36	$202	$363	$535	$30	$0	$30
40	N/A	120 SGI	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	1,530	266		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42	306	Ceiling	1	126	1,224	193	154	16	48	306	73	39	$17	$205	$363	$538	$30	$0	$30
41	N/A	CUSTODIAN CLOSET		0	0	0	360	0	LOCKED		0	0				0	360	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
42	N/A	BOYS REST ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	2,610	585		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42	522	Ceiling	1	84	2,088	219	175	70	140	522	365	44	$62	$202	$363	$535	$30	$0	$30
43	N/A	ROOM ACROSS FROM NURSE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	88	968	2,070	2,004		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	11	63				693	2,070	1,435	1,435	25	275	0	569	0	$86	$837	$0	$727	$110	$0	$110

CUSTOMER:	Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
FACILITY:	Laning Ave	46,477	5/6/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.151	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
44	N/A	MAIN OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	11	58	638	2,610	1,665		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	11	28	522	Ceiling	1	308	2,088	804	643	30	330	522	861	161	$154	$787	$363	$1,005	$110	$35	$145
45	N/A	MAIN OFFICE	Downlight Fixture w/ (1) one 26W QUAD CFL and High Efficiency Electronic Ballast	8	27	216	1,530	330		None	8	27	306	Ceiling		216	1,224	330	264	0	0	306	0	66	$10	$0	$0	$0	$0	$0	$0
46	N/A	PRINCIPAL OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	58	348	1,530	532	56 FC	Relamp & Reballast w/ (4) F28T8 Lamps & (1) 4/32 Elec. Low-Power High Efficiency Ballast	6	84	306	Wall	1	504	1,224	771	617	-26	-156	306	-239	154	-$13	$503	$215	$638	$60	$20	$80
47	N/A	NURSE'S OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	7	58	406	360	146		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	7	28	252	Wall	1	196	108	71	21	30	210	252	76	49	$19	$423	$215	$548	$70	$20	$90
48	N/A	NURSE'S REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	1	28	306	Ceiling	1	28	1,224	43	34	30	30	306	46	9	$8	$60	$363	$414	$10	$0	$10
49	N/A	117 FACULTY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	360	104		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42	252	Wall	1	210	108	76	23	16	80	252	29	53	$12	$341	$215	$486	$50	$20	$70
50	N/A	117 FACULTY	Compact Fluorescent 12"x12" Square Fixture w/ (2) 23w CFL & Electronic Ballast	1	46	46	1,530	70		None	1	46	306	Wall		46	1,224	70	56	0	0	306	0	14	$2	$0	$0	$0	$0	$0	$0
51	N/A	WOMENS RR	Compact Fluorescent 12"x12" Square Fixture w/ (2) 23w CFL & Electronic Ballast	1	46	46	360	17		None	1	46	252	Ceiling	1	46	108	17	5	0	0	252	0	12	$2	$0	$363	$363	$0	$0	$0
52	N/A	MENS RR	Compact Fluorescent 12"x12" Square Fixture w/ (2) 23w CFL & Electronic Ballast	1	46	46	1,530	70		None	1	46	306	Ceiling	1	46	1,224	70	56	0	0	306	0	14	$2	$0	$363	$363	$0	$0	$0
53	N/A	CUSTODIAN OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	306	Ceiling	1	84	1,224	129	103	16	32	306	49	26	$11	$137	$363	$480	$20	$0	$20
54	N/A	CLASSROOM 101	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	8	112	896	1,530	1,371		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	8	42	306	Ceiling	1	336	1,224	514	411	70	560	306	857	103	$145	$806	$363	$1,014	$120	$35	$155
55	N/A	CLASSROOM 102	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	8	112	896	1,530	1,371		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	8	42	306	Ceiling	1	336	1,224	514	411	70	560	306	857	103	$145	$806	$363	$1,014	$120	$35	$155
56	N/A	CLASSROOM 103	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	16	112	1,792	1,530	2,742		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	16	42	306	Ceiling	1	672	1,224	1,028	823	70	1,120	306	1,714	206	$290	$1,612	$363	$1,700	$240	$35	$275
57	N/A	CLASSROOM 105	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	11	112	1,232	360	444		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	11	42	252	Ceiling	1	462	108	166	50	70	770	252	277	116	$59	$1,108	$363	$1,272	$165	$35	$200
58	N/A	CUSTODIAN CLOSET	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10
59	N/A	CLASSROOM 104	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	10	112	1,120	1,530	1,714		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	10	42	306	Ceiling	1	420	1,224	643	514	70	700	306	1,071	129	$181	$1,008	$363	$1,186	$150	$35	$185
60	N/A	CST CONFERENCE ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	5	58	290	360	104		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast	5	28	252	Wall	1	140	108	50	15	30	150	252	54	35	$13	$302	$215	$467	$50	$0	$50
61	N/A	CST OFFICE		0	0	0	360	0	LOCKED		0	0				0	360	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
62	N/A	OT/PT STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	360	63		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42				126	360	45	45	16	48	0	17	0	$3	$205	$0	$175	$30	$0	$30
63	N/A	130 OT/PT CLASSROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	1,530	1,212	39 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63	306	Ceiling	1	567	1,224	868	694	25	225	306	344	174	$78	$684	$363	$923	$90	$35	$125
64	N/A	CLASSROOM 128	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	14	88	1,232	1,530	1,885	54 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	14	63	306	Ceiling	1	882	1,224	1,349	1,080	25	350	306	536	270	$122	$1,065	$363	$1,253	$140	$35	$175
65	N/A	CLASSROOM 128- STORAGE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10
66	N/A	CLASSROOM 128- REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,070	120		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	1	28	724.5	Wall	1	28	1,346	58	38	30	30	725	62	20	$12	$72	$215	$276	$10	$0	$10
67	N/A	CLASSROOM 129	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	88	968	2,070	2,004		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	11	63	724.5	Ceiling	1	693	1,346	1,435	932	25	275	725	569	502	$162	$837	$363	$1,055	$110	$35	$145
68	N/A	CLASSROOM 127	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	88	968	2,070	2,004		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	11	63	724.5	Ceiling	1	693	1,346	1,435	932	25	275	725	569	502	$162	$837	$363	$1,055	$110	$35	$145
69	N/A	CLASSROOM 127- REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,070	120		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	1	28	724.5	Wall	1	28	1,346	58	38	30	30	725	62	20	$12	$72	$215	$276	$10	$0	$10
70	N/A	CLASSROOM 126	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	88	968	2,070	2,004	71 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	11	63	724.5	Ceiling	1	693	1,346	1,435	932	25	275	725	569	502	$162	$837	$363	$1,055	$110	$35	$145
71	N/A	CLASSROOM 126- REST ROOM	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	1	28	522	Wall	1	28	2,088	73	58	30	30	522	78	15	$14	$72	$215	$276	$10	$0	$10
72	N/A	#1 PIP OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	58	348	2,610	908		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	6	28	522	Wall	1	168	2,088	438	351	30	180	522	470	88	$84	$429	$215	$584	$60	$0	$60
73	N/A	#2 OFFICE	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	6	58	348	2,610	908		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	6	28	522	Wall	1	168	2,088	438	351	30	180	522	470	88	$84	$429	$215	$584	$60	$0	$60
74	N/A	KITCHEN	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219	16	32	0	84	0	$13	$137	$0	$117	$20	$0	$20
75	N/A	REST ROOM NEXT TO LIBRARY	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	1	28	522	Wall	1	28	2,088	73	58	30	30	522	78	15	$14	$72	$215	$276	$10	$0	$10
76	N/A	REST ROOM NEXT TO LIBRARY	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	1	28	522	Wall	1	28	2,088	73	58	30	30	522	78	15	$14	$72	$215	$276	$10	$0	$10
77	N/A	HALLWAY NEXT TO LIBRARY	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	3	58	174	2,610	454	30 FC	Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	3	28				84	2,610	219	219	30	90	0	235	0	$35	$215	$0	$185	$30	$0	$30
78	N/A	HALLWAY NEXT TO LIBRARY	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
79	N/A	HALLWAY KITCHEN TO OFFICE #1	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	58	696	2,610	1,817		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	12	42				504	2,610	1,315	1,315	16	192	0	501	0	$76	$819	$0	$699	$120	$0	$120
80	N/A	HALLWAY KITCHEN TO OFFICE #1	Exit Sign w/ LED	7	2	14	8,760	123		None	7	2				14	8,760	123	123	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
81	N/A	HALLWAY KITCHEN TO 101	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	10	112	1,120	2,610	2,923		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	10	42				420	2,610	1,096	1,096	70	700	0	1,827	0	$276	$1,008	$0	$858	$150	$0	$150
82	N/A	HALLWAY KITCHEN TO 101	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
83	N/A	HALLWAY OUTSIDE AUDITORIUM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	6	112	672	2,610	1,754		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	6	42				252	2,610	658	658	70	420	0	1,096	0	$166	$605	$0	$515	$90	$0	$90
84	N/A	HALLWAY NEXT TO MAIN OFFICE	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	18	112	2,016	2,610	5,262		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	18	42				756	2,610	1,973	1,973	70	1,260	0	3,289	0	$497	$1,814	$0	$1,544	$270	$0	$270
85	N/A	HALLWAY NEXT TO MAIN OFFICE	Exit Sign w/ LED	4	2	8	8,760	70		None	4	2				8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
86	N/A	SIDE HALLWAY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	2,610	585		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42				84	2,610	219	219	70	140	0	365	0	$55	$202	$0	$172	$30	$0	$30

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY: Laning Ave	46,477	5/6/2013

SPACE DESCRIPTION			EXISTING FIXTURES						
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES
87	N/A	MAIN HALLWAY	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	27	112	3,024	2,610	7,893	
88	N/A	MAIN HALLWAY	Exit Sign w/ LED	4	2	8	2,610	21	
89	N/A	EXTERIOR- 1/2 ROUND WALL SCONCE	Wall-Mounted Fixture w/ (1) 42W CFL and Electronic Ballast	7	45	315	8,760	2,759	
90	N/A	EXTERIOR- MEDIUM WALLPACK	HID Fixture w/ (1) 250w High Pressure Sodium	6	295	1,770	2,610	4,620	
91	N/A	EXTERIOR- SMALL WALLPACK	HID Fixture w/ (1) 70w High Pressure Sodium Lamp & Ballast	3	92	276	4,745	1,310	
92	N/A	EXTERIOR- MAIN ENTRANCE	Wall-Mounted Fixture w/ (1) 42W CFL and Electronic Ballast	6	45	270	2,610	705	
93	N/A	EXTERIOR- GYM ENTRANCE	Wall-Mounted Fixture w/ (1) 42W CFL and Electronic Ballast	9	45	405	8,760	3,548	
				574		52,368		106,614	

	REPLACEMENT FIXTURES										
LINE	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR
87	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	27	42				1,134	2,610	2,960	2,960
88	None	4	2				8	2,610	21	21
89	None	7	45				315	8,760	2,759	2,759
90	New Fixture w/ (1) 150w Induction Lamp & Induction Ballast Universal Voltage	6	157				942	2,610	2,459	2,459
91	New Wall Pack Fixture w/ (1) 40w Induction Lamp & Induction Ballast Universal Voltage	3	40				120	4,745	569	569
92	None	6	45				270	2,610	705	705
93	None	9	45				405	8,760	3,548	3,548
		574				53	28,169		58,913	48,973

	ENERGY ANALYSIS					
LINE	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.151
87	70	1,890	0	4,933	0	$745
88	0	0	0	0	0	$0
89	0	0	0	0	0	$0
90	138	828	0	2,161	0	$326
91	52	156	0	740	0	$112
92	0	0	0	0	0	$0
93	0	0	0	0	0	$0
		24,199	21,177	47,701	9,939	8,705

	COST ANALYSIS			REBATES		
LINE	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
87	$2,720	$0	$2,315	$405	$0	$405
88	$0	$0	$0	$0	$0	$0
89	$0	$0	$0	$0	$0	$0
90	$2,652	$0	$2,352	$300	$0	$300
91	$761	$0	$761	$0	$0	$0
92	$0	$0	$0	$0	$0	$0
93	$0	$0	$0	$0	$0	$0
	50,330	17,471	59,696	6,925	1,180	8,105

LIGHTING RETROFIT SUMMARY FOR:
Verona High School
151 Fairview Avenue

BUILDING INFORMATION		EXISTING FIXTURES				PROPOSED FIXTURES				SAVINGS						FINANCIAL					
BUILDING	SQ. FT.	PRE TOTAL FIXT. QTY	PRE TOTAL FIXT. WATTS	PRE ANNUAL KWH CONSUMPTION	PRE WATTS / SQ. FT	POST TOTAL FIXT. QTY	POST TOTAL FIXT. WATTS	POST ANNUAL KWH CONSUMPTION	POST WATTS / SQ. FT	WATTS SAVED	ANNUAL KWH SAVED	ANNUAL KWH SAVED WITH SENSORS	ANNUAL SAVINGS $ FIXT.	ANNUAL SAVINGS $ SENSORS	ANNUAL SAVINGS $ TOTAL	CO2 REDUCTION (TONS)	NJ Smart Start REBATE $	**FIXTURES** TOTAL (INSTALLED) COST $	**SENSORS** TOTAL (INSTALLED) COST $	**MATERIAL** TOTAL (INSTALLED) COST $	SIMPLE PAYBACK NET OF REBATE (YEARS)
Verona High School	**120,245**	**1578**	**167,788**	**358,721**	**1.40**	**1,578**	**106,996**	**218,205**	**0.89**	**60,792**	**140,517**	**23,085**	**$23,883**	**$3,924**	**$27,807**	**46.4**	**$20,340**	**$138,772**	**$31,405**	**$170,178**	**5.4**

12%	**PERCENTAGE OF REBATES IN TOTAL INSTALLED COST**
61%	**PERCENTAGE OF CONSUMPTION COMPARE TO EXISTING STATE**
45%	**EXISTING PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**
27%	**PROPOSED PERCENTAGE OF LIGHTING ENERGY CONSUMPTION OF THE WHOLE BUILDING**

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY: Verona High School	120,245	5/7/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.170	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	53	54	55
1	N/A	CLASSROOM 28	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056	72 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
2	N/A	CLASSROOM 30	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
3	N/A	CLASSROOM 32	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
4	N/A	CLASSROOM 31	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
5	N/A	CLASSROOM 34	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
6	N/A	CLASSROOM 33	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
7	N/A	ART ROOM 36	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	25	88	2,200	1,530	3,366	74 FC	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	25	63	306	Ceiling	1	1,575	1,224	2,410	1,928	25	625	306	956	482	$244	$1,901	$363	$1,980	$250	$35	$285
8	N/A	CLASSROOM 35	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
9	N/A	CLASSROOM 37	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
10	N/A	CLASSROOM 39	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056	63 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
11	N/A	COMPUTER CLASS 38	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	21	112	2,352	1,530	3,599		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	21	42	306	Ceiling	1	882	1,224	1,349	1,080	70	1,470	306	2,249	270	$428	$2,116	$363	$2,129	$315	$35	$350
12	N/A	COMPUTER CLASS 38	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	1,530	532		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42	306	Ceiling	1	252	1,224	386	308	16	96	306	147	77	$38	$410	$363	$678	$60	$35	$95
13	N/A	CLASSROOM 40	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	15	112	1,680	1,530	2,570		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	15	42	306	Ceiling	1	630	1,224	964	771	70	1,050	306	1,607	193	$306	$1,511	$363	$1,615	$225	$35	$260
14	N/A	CLASSROOM 45	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
15	N/A	CLASSROOM 47	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	10	112	1,120	1,530	1,714		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	10	42	306	Ceiling	1	420	1,224	643	514	70	700	306	1,071	129	$204	$1,008	$363	$1,186	$150	$35	$185
16	N/A	WOODSHOP 42	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	20	112	2,240	1,530	3,427		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	20	42				840	1,530	1,285	1,285	70	1,400	0	2,142	0	$364	$2,015	$0	$1,715	$300	$0	$300
17	N/A	42 STORAGE/ INSTRUCTOR	2'x4' Troffer w/ (2) F40T12/34w Lamps & (1) Energy Efficient Magnetic Ballast	2	73	146	360	53		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	31	62	0	22	0	$4	$137	$0	$137	$0	$0	$0
18	N/A	CUSTODIAN	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
19	N/A	CLASSROOM 49	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
20	N/A	BOYS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall	1	84	1,035	174	87	16	32	1,035	66	87	$26	$137	$215	$331	$20	$0	$20
21	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
22	N/A	KITCHEN	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	18	112	2,016	1,530	3,084		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	18	42				756	1,530	1,157	1,157	70	1,260	0	1,928	0	$328	$1,814	$0	$1,544	$270	$0	$270
23	N/A	ICE MAKER RM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
24	N/A	KITCHEN REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
25	N/A	KITCHEN REST ROOM	Downlight Fixture w/ (1) 13w CFL screw in	1	15	15	360	5		None	1	15				15	360	5	5	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
26	N/A	KITCHEN STORAGE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22		Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
27	N/A	KITCHEN OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10
28	N/A	SERVING AREA	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42				504	1,530	771	771	70	840	0	1,285	0	$218	$1,209	$0	$1,029	$180	$0	$180
29	N/A	DISHWASHER ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	1,530	129	129	16	32	0	49	0	$8	$137	$0	$117	$20	$0	$20
30	N/A	GIRLS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Ceiling	1	84	1,035	174	87	16	32	1,035	66	87	$26	$137	$363	$480	$20	$0	$20
31	N/A	CLASSROOM 51	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
32	N/A	CAFETERIA	1'x4' Indirect Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	126	58	7,308	2,610	19,074		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	126	42	522	Ceiling	3	5,292	2,088	13,812	11,050	16	2,016	522	5,262	2,762	$1,364	$8,600	$1,090	$8,325	$1,260	$105	$1,365
33	N/A	CAFETERIA	Exit Sign w/ LED	4	2	8	8,760	70		None	4	2				8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
34	N/A	FACULTY CAFETERIA	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	2,070	480		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42	724.5	Ceiling	1	168	1,346	348	226	16	64	725	132	122	$43	$273	$363	$596	$40	$0	$40
35	N/A	CLASSROOM 53	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	20	112	2,240	1,530	3,427		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	20	42	306	Ceiling	1	840	1,224	1,285	1,028	70	1,400	306	2,142	257	$408	$2,015	$363	$2,043	$300	$35	$335
36	N/A	CLASSROOM 53 STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
37	N/A	SCHOOL STORE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10
38	N/A	CAFÉ HALL	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	18	58	1,044	2,610	2,725	24 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	18	42				756	2,610	1,973	1,973	16	288	0	752	0	$128	$1,229	$0	$1,049	$180	$0	$180
39	N/A	CAFÉ HALL	Exit Sign w/ LED	9	2	18	8,760	158		None	9	2				18	8,760	158	158	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
40	N/A	SHORT HALL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	4	58	232	2,610	606		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	4	42				168	2,610	438	438	16	64	0	167	0	$28	$273	$0	$233	$40	$0	$40
41	N/A	SHORT HALL	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
42	N/A	STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548	16	80	0	209	0	$35	$341	$0	$291	$50	$0	$50
43	N/A	CLASSROOM 41	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	7	112	784	1,530	1,200		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	7	42	306	Ceiling	1	294	1,224	450	360	70	490	306	750	90	$143	$705	$363	$929	$105	$35	$140

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER: Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY: Verona High School	120,245	5/7/2013

SPACE DESCRIPTION / EXISTING FIXTURES

LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES
44	N/A	CLASSROOM 43	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	7	112	784	1,530	1,200	
45	N/A	ROOM 17	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	3	112	336	2,610	877	
46	N/A	FACULTY MENS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,070	120	
47	N/A	FACULTY MENS REST ROOM	Incandescent 12"x12" Square Fixture w/ 23w Screw-In CFL	1	23	23	2,070	48	
48	N/A	CUSTODIAN	Downlight Fixture w/ (1) 13w CFL screw in	1	15	15	2,070	31	
49	N/A	FACULTY ROOM	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	360	161	
50	N/A	FACULTY WOMENS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42	
51	N/A	FACULTY WOMENS REST ROOM	Downlight Fixture w/ (1) 13w CFL screw in	2	15	30	360	11	
52	N/A	LIBRARIAN/ SOCIAL WORKER	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	8	112	896	2,070	1,855	
53	N/A	LIBRARY/ MEDIA CENTER	2'x2' Troffer w/ (2) FB40T12/34w 3"-U Lamps & (1) Energy Efficient Magnetic Ballast	14	73	1,022	2,070	2,116	
54	N/A	LIBRARY/ MEDIA CENTER	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	48	112	5,376	2,070	11,128	
55	N/A	LIBRARY/ MEDIA CENTER		5	0	0	2,070	0	
56	N/A	LIBRARY HALL	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	9	58	522	2,610	1,362	
57	N/A	LIBRARY HALL	Exit Sign w/ LED	2	2	4	8,760	35	
58	N/A	OLD SECTION HALL	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,610	908	
59	N/A	OLD SECTION HALL	Exit Sign w/ LED	3	2	6	8,760	53	
60	N/A	FILE STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	2,610	1,169	
61	N/A	COMPUTER CLASS	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	21	112	2,352	1,530	3,599	
62	N/A	COMPUTER CLASS	Exit Sign w/ LED	1	2	2	8,760	18	
63	N/A	CUSTODIAN	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151	
64	N/A	PIPE CHASE	Incandescent Fixture w/ (1) 60w Incandescent Lamp	1	60	60	360	22	
65	N/A	WOMENS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240	
66	N/A	MENS REST ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	2,070	360	
67	N/A	ROOM 29	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	1,530	685	
68	N/A	CLASSROOM 27	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616	56 FC
69	N/A	CLASSROOM 24	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616	
70	N/A	CLASSROOM 24	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	1,530	1,616	71 FC
71	N/A	CLASSROOM 22	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	12	88	1,056	108	114	OCC SENSOR
72	N/A	NEW SECTION HALL	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	2,610	1,378	
73	N/A	NEW SECTION HALL	Exit Sign w/ LED	2	2	4	8,760	35	
74	N/A	NEW SECTION HALL	2'x2' Troffer w/ (2) F17T8 Lamps & (1) Electronic Ballast	6	34	204	2,610	532	
75	N/A	NEW SECTION HALL	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	4	26	104	2,610	271	
76	N/A	NEW SECTION HALL		1	0	0	2,610	0	UNKNOWN
77	N/A	NEW SECTION HALL	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	2,610	454	
78	N/A	CLASSROOM 20	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	20	88	1,760	108	190	OCC SENSOR
79	N/A	FACULTY MENS REST ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	88	88	360	32	OCC SENSOR
80	N/A	FACULTY WOMENS REST ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	1	88	88	360	32	OCC SENSOR
81	N/A	BOARD OFFICE RECEPTION	2'x2' Troffer w/ (2) FB40T12/34w 3"-U Lamps & (1) Energy Efficient Magnetic Ballast	6	73	438	2,070	907	LOCKED
82	N/A	BOARD OFFICE RECEPTION	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	9	88	792	2,070	1,639	LOCKED
83	N/A	BOARD OFFICE RECEPTION	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,070	120	
84	N/A	ATHLETIC DIRECTOR	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	2,070	729	
85	N/A	OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	2,070	1,093	
86	N/A	OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	6	88	528	2,070	1,093	

REPLACEMENT FIXTURES

LINE	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR
44	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	7	42	306	Ceiling	1	294	1,224	450	360
45	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	3	42	522	Wall	1	126	2,088	329	263
46	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,070	87	87
47	None	1	23				23	2,070	48	48
48	None	1	15				15	2,070	31	31
49	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42	252	Wall	1	168	108	60	18
50	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	252	Wall	1	84	108	30	9
51	None	2	15				30	360	11	11
52	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	8	42	724.5	Wall	1	336	1,346	696	452
53	Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	14	28	724.5	Ceiling	1	392	1,346	811	527
54	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	48	42	724.5	Ceiling	1	2,016	1,346	4,173	2,713
55		5	0	724.5	Ceiling	1	0	1,346	0	0
56	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	9	42				378	2,610	987	987
57	None	2	2				4	8,760	35	35
58	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42				252	2,610	658	658
59	None	3	2				6	8,760	53	53
60	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42				168	2,610	438	438
61	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	21	42	306	Ceiling	1	882	1,224	1,349	1,080
62	None	1	2				2	8,760	18	18
63	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110
64	Relamp w/ (1) 14 watt Compact Fluorescent Mini Spring Lamp Screw-In 1 Piece	1	14				14	360	5	5
65	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall	1	84	1,035	174	87
66	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42	1035	Wall	1	126	1,035	261	130
67	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42	306	Wall	1	168	1,224	257	206
68	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925
69	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925
70	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	306	Ceiling	1	756	1,224	1,157	925
71	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	12	63	0	Ceiling	1	756	108	82	82
72	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63				378	2,610	987	987
73	None	2	2				4	8,760	35	35
74	Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	6	28				168	2,610	438	438
75	None	4	26				104	2,610	271	271
76		1	0				0	2,610	0	0
77	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42				126	2,610	329	329
78	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	20	63	0	Ceiling	1	1,260	108	136	136
79	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	1	63	252	Wall	1	63	108	23	7
80	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	1	63	252	Wall	1	63	108	23	7
81	Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	6	28				168	2,070	348	348
82	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	9	63				567	2,070	1,174	1,174
83	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,070	87	87
84	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63	724.5	Wall	1	252	1,346	522	339
85	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63	724.5	Wall	1	378	1,346	782	509
86	Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	6	63	724.5	Wall	1	378	1,346	782	509

ENERGY ANALYSIS / COST ANALYSIS / REBATES

LINE	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.170	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
44	70	490	306	750	90	$143	$705	$363	$929	$105	$35	$140
45	70	210	522	548	66	$104	$302	$215	$472	$45	$0	$45
46	16	16	0	33	0	$6	$68	$0	$58	$10	$0	$10
47	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
48	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
49	70	280	252	101	42	$24	$403	$215	$558	$60	$0	$60
50	16	32	252	12	21	$6	$137	$215	$331	$20	$0	$20
51	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
52	70	560	725	1,159	243	$238	$806	$215	$881	$120	$20	$140
53	45	630	725	1,304	284	$270	$1,001	$363	$1,329	$0	$35	$35
54	70	3,360	725	6,955	1,461	$1,430	$4,836	$363	$4,444	$720	$35	$755
55	0	0	725	0	0	$0	$0	$363	$363	$0	$0	$0
56	16	144	0	376	0	$64	$614	$0	$524	$90	$0	$90
57	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
58	16	96	0	251	0	$43	$410	$0	$350	$60	$0	$60
59	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
60	70	280	0	731	0	$124	$403	$0	$343	$60	$0	$60
61	70	1,470	306	2,249	270	$428	$2,116	$363	$2,129	$315	$35	$350
62	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
63	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
64	46	46	0	17	0	$3	$16	$0	$16	$0	$0	$0
65	16	32	1,035	66	87	$26	$137	$215	$331	$20	$0	$20
66	16	48	1,035	99	130	$39	$205	$215	$389	$30	$0	$30
67	70	280	306	428	51	$82	$403	$215	$558	$60	$0	$60
68	25	300	306	459	231	$117	$913	$363	$1,121	$120	$35	$155
69	25	300	306	459	231	$117	$913	$363	$1,121	$120	$35	$155
70	25	300	306	459	231	$117	$913	$363	$1,121	$120	$35	$155
71	25	300	0	32	0	$6	$913	$363	$1,121	$120	$35	$155
72	25	150	0	392	0	$67	$456	$0	$396	$60	$0	$60
73	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
74	6	36	0	94	0	$16	$429	$0	$369	$60	$0	$60
75	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
76	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
77	16	48	0	125	0	$21	$205	$0	$175	$30	$0	$30
78	25	500	0	54	0	$9	$1,521	$363	$1,649	$200	$35	$235
79	25	25	252	9	16	$4	$76	$215	$281	$10	$0	$10
80	25	25	252	9	16	$4	$76	$215	$281	$10	$0	$10
81	45	270	0	559	0	$95	$429	$0	$429	$0	$0	$0
82	25	225	0	466	0	$79	$684	$0	$594	$90	$0	$90
83	16	16	0	33	0	$6	$68	$0	$58	$10	$0	$10
84	25	100	725	207	183	$66	$304	$215	$459	$40	$20	$60
85	25	150	725	311	274	$99	$456	$215	$591	$60	$20	$80
86	25	150	725	311	274	$99	$456	$215	$591	$60	$20	$80

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER:	Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY:	Verona High School	120,245	5/7/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.170	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
87	N/A	114D PAYROLL	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
88	N/A	114 ACCOUNTS PAYCHECK	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
89	N/A	114G DIRECTOR	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	7	88	616	2,070	1,275		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	7	63	724.5	Wall	1	441	1,346	913	593	25	175	725	362	320	$116	$532	$215	$657	$70	$20	$90
90	N/A	114K CONFERENCE	4' Uplight Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	16	58	928	2,070	1,921		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	16	42	724.5	Wall	1	672	1,346	1,391	904	16	256	725	530	487	$173	$1,092	$215	$1,127	$160	$20	$180
91	N/A	COPY AREA	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	2,070	729		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63	724.5	Wall	1	252	1,346	522	339	25	100	725	207	183	$66	$304	$215	$459	$40	$20	$60
92	N/A	114J BREAK ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
93	N/A	115 SPECIAL SERVICES	2'x2' Troffer w/ (2) FB40T12/34w 3"-U Lamps & (1) Energy Efficient Magnetic Ballast	10	73	730	2,070	1,511		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	10	28	724.5	Wall	1	280	1,346	580	377	45	450	725	932	203	$193	$715	$215	$910	$0	$20	$20
94	N/A	115 SPECIAL SERVICES	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall		126	1,346	261	170	25	50	725	104	91	$33	$152	$0	$132	$20	$0	$20
95	N/A	115F BREAK ROOM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
96	N/A	AASG STORAGE	2'x2' Troffer w/ (2) FB40T12/34w 3"-U Lamps & (1) Energy Efficient Magnetic Ballast	3	73	219	360	79		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	3	28				84	360	30	30	45	135	0	49	0	$8	$215	$0	$215	$0	$0	$0
97	N/A	115D SOCIAL WORKER	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
98	N/A	115C	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
99	N/A	115B	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
100	N/A	OFFICE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	2	88	176	2,070	364		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	2	63	724.5	Wall	1	126	1,346	261	170	25	50	725	104	91	$33	$152	$215	$347	$20	$0	$20
101	N/A	115A CONFERENCE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	4	88	352	2,070	729		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	4	63	724.5	Ceiling	1	252	1,346	522	339	25	100	725	207	183	$66	$304	$363	$593	$40	$35	$75
102	N/A	CLASSROOM 18	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	88	1,320	1,530	2,020		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	15	63	306	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	$147	$1,141	$363	$1,319	$150	$35	$185
103	N/A	CLASSROOM 18 STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	360	95		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	360	68	68	25	75	0	27	0	$5	$228	$0	$198	$30	$0	$30
104	N/A	CLASSROOM 23	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	88	1,320	1,530	2,020		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	15	63	306	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	$147	$1,141	$363	$1,319	$150	$35	$185
105	N/A	CLASSROOM 21	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	88	1,320	1,530	2,020		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	15	63	306	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	$147	$1,141	$363	$1,319	$150	$35	$185
106	N/A	CLASSROOM 21 STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	360	95		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	360	68	68	25	75	0	27	0	$5	$228	$0	$198	$30	$0	$30
107	N/A	CLASSROOM 21 PREP RM	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	360	95		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	360	68	68	25	75	0	27	0	$5	$228	$0	$198	$30	$0	$30
108	N/A	CLASSROOM 16	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	88	1,320	1,530	2,020		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	15	63	306	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	$147	$1,141	$363	$1,319	$150	$35	$185
109	N/A	CLASSROOM 16 STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	360	95		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	360	68	68	25	75	0	27	0	$5	$228	$0	$198	$30	$0	$30
110	N/A	CLASSROOM 19	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	88	1,320	1,530	2,020		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	15	63	306	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	$147	$1,141	$363	$1,319	$150	$35	$185
111	N/A	CLASSROOM 14	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	15	88	1,320	1,530	2,020		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	15	63	306	Ceiling	1	945	1,224	1,446	1,157	25	375	306	574	289	$147	$1,141	$363	$1,319	$150	$35	$185
112	N/A	CLASSROOM 14 STORAGE	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	3	88	264	360	95		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	3	63				189	360	68	68	25	75	0	27	0	$5	$228	$0	$198	$30	$0	$30
113	N/A	SCIENCE HALL	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	88	968	2,610	2,526		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	11	63				693	2,610	1,809	1,809	25	275	0	718	0	$122	$837	$0	$727	$110	$0	$110
114	N/A	SCIENCE HALL	Exit Sign w/ LED	3	2	6	8,760	53		None	3	2				6	8,760	53	53	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
115	N/A	CLASSROOM 12	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
116	N/A	COMPUTER OFFICE	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	2,070	927		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42	724.5	Wall	1	168	1,346	348	226	70	280	725	580	122	$119	$403	$215	$558	$60	$0	$60
117	N/A	OFFICE	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	2,070	927		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42	724.5	Wall	1	168	1,346	348	226	70	280	725	580	122	$119	$403	$215	$558	$60	$0	$60
118	N/A	STUDENT ASSISTANCE	2'x4' Troffer w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	2,070	927		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42	724.5	Wall	1	168	1,346	348	226	70	280	725	580	122	$119	$403	$215	$558	$60	$0	$60
119	N/A	CLASSROOM 10	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	27	58	1,566	1,530	2,396		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	27	42	306	Wall	1	1,134	1,224	1,735	1,388	16	432	306	661	347	$171	$1,843	$215	$1,767	$270	$20	$290
120	N/A	COURTYARD ACCESS HALL	2'x2' Troffer w/ (2) FB40T12/34w 3"-U Lamps & (1) Energy Efficient Magnetic Ballast	3	73	219	2,610	572		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	3	28				84	2,610	219	219	45	135	0	352	0	$60	$215	$0	$215	$0	$0	$0
121	N/A	CLASSROOM 15	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
122	N/A	NURSE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	3	112	336	2,070	696		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	3	42	724.5	Ceiling	1	126	1,346	261	170	70	210	725	435	91	$89	$302	$363	$621	$45	$0	$45
123	N/A	NURSE OFFICE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	2,070	927		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42	724.5	Wall	1	168	1,346	348	226	70	280	725	580	122	$119	$403	$215	$558	$60	$0	$60
124	N/A	NURSE REST ROOM	Downlight Fixture w/ (1) 13w CFL screw in	1	15	15	360	5		None	1	15				15	360	5	5	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
125	N/A	CLASSROOM 13	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	12	112	1,344	1,530	2,056		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	12	42	306	Ceiling	1	504	1,224	771	617	70	840	306	1,285	154	$245	$1,209	$363	$1,357	$180	$35	$215
126	N/A	"WHITE GYM" (AKA OLD GYM)	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	20	295	5,900	2,610	15,399		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	20	175	522	Ceiling	3	3,500	2,088	9,135	7,308	120	2,400	522	6,264	1,827	$1,375	$7,670	$1,090	$7,655	$1,000	$105	$1,105
127	N/A	"WHITE GYM" (AKA OLD GYM)	Exit Sign w/ LED	4	2	8	8,760	70		None	4	2				8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
128	N/A	"MAROON GYM" AKA NEW GYM	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	30	295	8,850	2,610	23,099		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	30	175	522	Ceiling	3	5,250	2,088	13,703	10,962	120	3,600	522	9,396	2,741	$2,063	$11,505	$1,090	$10,990	$1,500	$105	$1,605
129	N/A	"MAROON GYM" AKA NEW GYM	Exit Sign w/ LED	4	2	8	8,760	70		None	4	2				8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER:	Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY:	Verona High School	120,245	5/7/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.170	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
130	N/A	CLASSROOM 55	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	27	112	3,024	1,530	4,627		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	27	42	306	Ceiling	1	1,134	1,224	1,735	1,388	70	1,890	306	2,892	347	$550	$2,720	$363	$2,644	$405	$35	$440
131	N/A	CLASSROOM 55 STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151	9 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
132	N/A	BOILER ROOM ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219	16	32	0	84	0	$14	$137	$0	$117	$20	$0	$20
133	N/A	BOILER OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303	13 FC	Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42				84	2,610	219	219	16	32	0	84	0	$14	$202	$0	$182	$20	$0	$20
134	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548	16	80	0	209	0	$35	$341	$0	$291	$50	$0	$50
135	N/A	BOILER ROOM	4' Wrap Fluorescent w/ (3) FO32T8 Lamps & (1) Electronic Ballast	11	88	968	2,610	2,526		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	11	63				693	2,610	1,809	1,809	25	275	0	718	0	$122	$837	$0	$727	$110	$0	$110
136	N/A	BOILER ROOM	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
137	N/A	OLD GYM OFFICE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	724.5	Wall	1	84	1,346	174	113	16	32	725	66	61	$22	$137	$215	$331	$20	$0	$20
138	N/A	OLD GYM OFFICE REST ROOM	Downlight Fixture w/ (1) 13w CFL screw in	1	15	15	360	5		None	1	15	252	Wall	1	15	108	5	2	0	0	252	0	4	$1	$0	$215	$215	$0	$0	$0
139	N/A	OLD GYM OFFICE REST ROOM	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	120	120	360	43		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	1	30	252	Wall		30	108	11	3	90	90	252	32	8	$7	$23	$0	$23	$0	$0	$0
140	N/A	OLD GYM STORAGE	Incandescent Fixture w/ (2) 60w Incandescent Lamps	1	120	120	360	43		Relamp w/ (2) 15 watt Compact Fluorescent Screw-In	1	30				30	360	11	11	90	90	0	32	0	$6	$23	$0	$23	$0	$0	$0
141	N/A	TEAM ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	58	696	1,530	1,065		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	12	42	306	Ceiling	2	504	1,224	771	617	16	192	306	294	154	$76	$819	$727	$1,356	$120	$70	$190
142	N/A	TEAM ROOM	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
143	N/A	TEAM ROOM SHOWER	4' Wrap Fluorescent w/ (2) F40T12/34w Lamps & (1) Energy Efficient Magnetic Ballast	2	73	146	360	53		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	31	62	0	22	0	$4	$137	$0	$137	$0	$0	$0
144	N/A	TEAM ROOM REST ROOM	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	306	Wall	1	84	1,224	129	103	16	32	306	49	26	$13	$137	$215	$331	$20	$0	$20
145	N/A	HALL BETWEEN GYMS	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,610	908		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42				252	2,610	658	658	16	96	0	251	0	$43	$410	$0	$350	$60	$0	$60
146	N/A	HALL BETWEEN GYMS	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
147	N/A	GIRLS LOCKER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	58	696	2,610	1,817		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	12	42				504	2,610	1,315	1,315	16	192	0	501	0	$85	$819	$0	$699	$120	$0	$120
148	N/A	GIRLS LOCKER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
149	N/A	GIRLS SHOWER	4' Wrap Fluorescent w/ (2) F40T12/34w Lamps & (1) Energy Efficient Magnetic Ballast	2	73	146	360	53		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	31	62	0	22	0	$4	$137	$0	$137	$0	$0	$0
150	N/A	GIRLS LOCKER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	10	58	580	2,070	1,201		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	10	42	724.5	Ceiling		420	1,346	869	565	16	160	725	331	304	$108	$683	$0	$583	$100	$0	$100
151	N/A	GIRLS LOCKER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
152	N/A	GIRLS LOCKER LOBBY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
153	N/A	GIRLS LOCKER LOBBY	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
154	N/A	NEW GYM STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	360	161		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42				168	360	60	60	70	280	0	101	0	$17	$403	$0	$343	$60	$0	$60
155	N/A	ELECTRICAL	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	2	112	224	360	81		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	2	42				84	360	30	30	70	140	0	50	0	$9	$202	$0	$172	$30	$0	$30
156	N/A	TEACHER STORAGE	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	4	112	448	360	161		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	4	42				168	360	60	60	70	280	0	101	0	$17	$403	$0	$343	$60	$0	$60
157	N/A	BOYS LOCKER LOBBY	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	1,530	532		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42				252	1,530	386	386	16	96	0	147	0	$25	$410	$0	$350	$60	$0	$60
158	N/A	BOYS LOCKER LOBBY	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
159	N/A	BOYS LOCKER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	12	58	696	1,530	1,065		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	12	42	306	Ceiling	2	504	1,224	771	617	16	192	306	294	154	$76	$819	$727	$1,356	$120	$70	$190
160	N/A	BOYS LOCKER	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
161	N/A	BOYS LOCKER ENTRANCE	2'x2' Troffer w/ (2) FB40T12/34w 3"-U Lamps & (1) Energy Efficient Magnetic Ballast	1	73	73	1,530	112		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	1	28				28	1,530	43	43	45	45	0	69	0	$12	$72	$0	$72	$0	$0	$0
162	N/A	BOYS LOCKER OFFICE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10
163	N/A	BOYS LOCKER OFFICE REST ROOM	2'x2' Troffer w/ (2) FB40T12/34w 3"-U Lamps & (1) Energy Efficient Magnetic Ballast	1	73	73	1,530	112		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	1	28	306	Wall	1	28	1,224	43	34	45	45	306	69	9	$13	$72	$215	$286	$0	$0	$0
164	N/A	OFFICE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	1,530	177		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	306	Wall	1	84	1,224	129	103	16	32	306	49	26	$13	$137	$215	$331	$20	$0	$20
165	N/A	NEW GYM TEAM ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	27	58	1,566	1,530	2,396		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	27	42	306	Ceiling	2	1,134	1,224	1,735	1,388	16	432	306	661	347	$171	$1,843	$727	$2,229	$270	$70	$340
166	N/A	NEW GYM TEAM ROOM	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
167	N/A	NEW GYM TEAM ROOM SHOWER	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	360	104		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	360	76	76	16	80	0	29	0	$5	$341	$0	$291	$50	$0	$50
168	N/A	ATHLETIC TRAINER OFFICE	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	3	58	174	1,530	266		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	3	42	306	Wall	1	126	1,224	193	154	16	48	306	73	39	$19	$205	$215	$389	$30	$0	$30
169	N/A	GYM/ AUDITORIUM HALL	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	6	58	348	2,610	908		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	6	42				252	2,610	658	658	16	96	0	251	0	$43	$410	$0	$350	$60	$0	$60
170	N/A	GYM/ AUDITORIUM LOBBY	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	5	58	290	2,610	757		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	5	42				210	2,610	548	548	16	80	0	209	0	$35	$341	$0	$291	$50	$0	$50
171	N/A	GYM/ AUDITORIUM LOBBY	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
172	N/A	MUSIC ROOM LOBBY	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	1,530	89		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	1,530	64	64	16	16	0	24	0	$4	$68	$0	$58	$10	$0	$10

Dome-Tech, Inc.

LIGHTING UPGRADE PROJECT LINE x LINE DETAIL	CUSTOMER:	Verona Schools	FACILITY SQ. FT.	DATE OF AUDIT:
	FACILITY:	Verona High School	120,245	5/7/2013

SPACE DESCRIPTION			EXISTING FIXTURES							REPLACEMENT FIXTURES										ENERGY ANALYSIS						COST ANALYSIS			REBATES		
LINE	PRINT NUMBER	SPACE DESCRIPTION	PRE FIXTURE DESCRIPTION	PRE FIXT. QTY	PRE WATTS / FIXT.	PRE TOTAL WATTS / LINE	DEFAULT ANNUAL HOURS 2610	PRE ANNUAL KWH	PRE AVERAGE LIGHT LEVEL FOOT CANDLES	PROPOSED FIXTURE DESCRIPTION	POST FIXT. QTY	POST WATTS / FIXT.	ANNUAL HOURS SAVED	SENSOR TYPE	QTY SENSORS / LINE	POST TOTAL WATTS / LINE	ANNUAL HOURS 2610	POST ANNUAL KWH	POST ANNUAL KWH WITH OCC SENSOR	WATTS SAVED / FIXT.	TOTAL WATTS SAVED / LINE	ANNUAL HOURS SAVED	ANNUAL KWH SAVED FROM FIXT.	ANNUAL KWH SAVED WITH OCC	TOTAL ANNUAL $ SAVINGS / LINE (INCLUDING SENSORS) $0.170	TOTAL FIXTURE COST (MATERIAL PLUS LABOR)	TOTAL SENSOR COST (MATERIAL PLUS LABOR)	TOTAL INSTALLED COST AFTER INCENTIVES	TOTAL FIXTURES REBATE PER LINE	TOTAL SENSORS REBATE PER LINE	TOTAL REBATE / LINE
173	N/A	MUSIC ROOM	4' Wrap Fluorescent w/ (4) FO32T8 Lamps & (2) Electronic Ballasts	28	112	3,136	1,530	4,798		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast 2'x4' Silver Reflector Kit	28	42	306	Ceiling	2	1,176	1,224	1,799	1,439	70	1,960	306	2,999	360	$571	$2,821	$727	$3,058	$420	$70	$490
174	N/A	MUSIC KEYBOARDS	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
175	N/A	MUSIC STORAGE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	360	21		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	360	15	15	16	16	0	6	0	$1	$68	$0	$58	$10	$0	$10
176	N/A	MUSIC LOCKER	2'x4' Troffer w/ (3) FO32T8 Lamps & (1) Electronic Ballast	10	88	880	360	317		Relamp & Reballast w/ (3) F28T8 Lamps & (1) 3/32 Elec. Low-Power High Efficiency Ballast	10	63				630	360	227	227	25	250	0	90	0	$15	$761	$0	$661	$100	$0	$100
177	N/A	MUSIC LOCKER	2'x4' Troffer w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	360	30	30	16	32	0	12	0	$2	$137	$0	$117	$20	$0	$20
178	N/A	WEIGHT ROOM	4' Wrap Fluorescent w/ (2) F40T12/34w Lamps & (1) Energy Efficient Magnetic Ballast	24	73	1,752	1,530	2,681		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	24	42	306	Ceiling	1	1,008	1,224	1,542	1,234	31	744	306	1,138	308	$246	$1,638	$363	$1,966	$0	$35	$35
179	N/A	WEIGHT ROOM	Exit Sign w/ LED	2	2	4	8,760	35		None	2	2				4	8,760	35	35	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
180	N/A	HALL, LOWER LEVEL	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,610	303		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42				84	2,610	219	219	16	32	0	84	0	$14	$137	$0	$117	$20	$0	$20
181	N/A	HALL, LOWER LEVEL	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
182	N/A	LOWER LEVEL MENS ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall	1	84	1,035	174	87	16	32	1,035	66	87	$26	$137	$215	$331	$20	$0	$20
183	N/A	LOWER LEVEL WOMENS ROOM	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	2	58	116	2,070	240		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	2	42	1035	Wall	1	84	1,035	174	87	16	32	1,035	66	87	$26	$137	$215	$331	$20	$0	$20
184	N/A	AUDITORIUM	Downlight Fixture w/ (1) 26w CFL & Electronic Ballast	20	26	520	2,610	1,357		None	20	26	522	Ceiling	3	520	2,088	1,357	1,086	0	0	522	0	271	$46	$0	$1,090	$985	$0	$105	$105
185	N/A	AUDITORIUM	Incandescent Flood Fixture w/ (1) 250w Halogen Lamp	14	250	3,500	2,610	9,135		None	14	250				3,500	2,610	9,135	9,135	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
186	N/A	AUDITORIUM	Incandescent Flood Fixture w/ (1) 500w Halogen Lamp	45	500	22,500	2,610	58,725		None	45	500				22,500	2,610	58,725	58,725	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
187	N/A	AUDITORIUM	Fluorecsent Wall Sconce, 42W and electronic ballast	14	43	602	2,610	1,571		None	14	43				602	2,610	1,571	1,571	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
188	N/A	AUDITORIUM	Exit Sign w/ LED	4	2	8	8,760	70		None	4	2				8	8,760	70	70	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
189	N/A	AUDITORIUM BOOTH	2'x2' Troffer w/ (2) FB32T8 3"-U Lamps & (1) Electronic Ballast	2	58	116	360	42		Relamp & Reballast w/ (2) F17T8 Lamps & (1) 2/17 Elec. Low-Power High Efficiency Ballast 2'x2' Silver Reflector Kit	2	28				56	360	20	20	30	60	0	22	0	$4	$143	$0	$123	$20	$0	$20
190	N/A	STAGE	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	24	58	1,392	2,610	3,633		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	24	42				1,008	2,610	2,631	2,631	16	384	0	1,002	0	$170	$1,638	$0	$1,398	$240	$0	$240
191	N/A	STAGE	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
192	N/A	STAGE	Incandescent Flood Fixture w/ (1) 250w Halogen Lamp	10	250	2,500	360	900		None	10	250				2,500	360	900	900	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
193	N/A	PROP RROM	4' Industrial Hood w/ (2) FO32T8 Lamps & (1) Electronic Ballast	8	58	464	360	167		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	8	42				336	360	121	121	16	128	0	46	0	$8	$546	$0	$466	$80	$0	$80
194	N/A	PROP RROM	Exit Sign w/ LED	1	2	2	8,760	18		None	1	2				2	8,760	18	18	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
195	N/A	STAGE REAR ENTRANCE	4' Wrap Fluorescent w/ (2) FO32T8 Lamps & (1) Electronic Ballast	1	58	58	2,610	151		Relamp & Reballast w/ (2) F28T8 Lamps & (1) 2/32 Elec. Low-Power High Efficiency Ballast	1	42				42	2,610	110	110	16	16	0	42	0	$7	$68	$0	$58	$10	$0	$10
196	N/A	EXTERIOR, MAIN ENTRANCE EAVE	HID Fixture w/ (1) 75w Mercury Vapor Lamp & Ballast	9	93	837	4,745	3,972		None	9	93				837	4,745	3,972	3,972	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
197	N/A	EXTERIOR, COBRA HEAD LOT	HID Fixture w/ (1) 100w High Pressure Sodium	2	130	260	4,745	1,234		None	2	130				260	4,745	1,234	1,234	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
198	N/A	EXTERIOR, BOE ENTRANCE PATH LGT	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	3	120	360	4,745	1,708		None	3	120				360	4,745	1,708	1,708	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
199	N/A	EXTERIOR, BOE ENTRANCE EAVE	HID Fixture w/ (1) 70w Metal Halide Lamp & Ballast	2	95	190	4,745	902		New Wall Pack Fixture w/ (1) 70w Induction Lamp & Induction Ballast Universal Voltage	2	70				140	4,745	664	664	25	50	0	237	0	$40	$585	$0	$585	$0	$0	$0
200	N/A	EXTERIOR, WALL PACK	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	6	120	720	4,745	3,416		New Wall Pack Fixture w/ (1) 70w Induction Lamp & Induction Ballast Universal Voltage	6	70				420	4,745	1,993	1,993	50	300	0	1,424	0	$242	$1,755	$0	$1,755	$0	$0	$0
201	N/A	LOWER FRONT ENTRANCE EAVE	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	1	120	120	4,745	569		New Wall Pack Fixture w/ (1) 70w Induction Lamp & Induction Ballast Universal Voltage	1	70				70	4,745	332	332	50	50	0	237	0	$40	$293	$0	$293	$0	$0	$0
202	N/A	EXTERIOR, AUD. WALL SCONCE		0	0	0	4,745	0			0	0				0	4,745	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
203	N/A	POLE LIGHT	HID Fixture w/ (1) 75w Mercury Vapor Lamp & Ballast	0	93	0	4,745	0		None	0	93				0	4,745	0	0	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
204	N/A	EXTERIOR, GYM WALLPACK	HID Fixture w/ (1) 100w High Pressure Sodium	6	130	780	4,745	3,701		New Wall Pack Fixture w/ (1) 70w Induction Lamp & Induction Ballast Universal Voltage	6	70				420	4,745	1,993	1,993	60	360	0	1,708	0	$290	$1,755	$0	$1,755	$0	$0	$0
205	N/A	EXTERIOR, GYM WALLPACK	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	3	120	360	4,745	1,708		New Wall Pack Fixture w/ (1) 70w Induction Lamp & Induction Ballast Universal Voltage	3	70				210	4,745	996	996	50	150	0	712	0	$121	$878	$0	$878	$0	$0	$0
206	N/A	EXTERIOR, GYM UNDER EAVE	HID Fixture w/ (1) 100w Metal Halide Lamp & Ballast	2	120	240	4,745	1,139		New Wall Pack Fixture w/ (1) 70w Induction Lamp & Induction Ballast Universal Voltage	2	70				140	4,745	664	664	50	100	0	475	0	$81	$585	$0	$585	$0	$0	$0
207	N/A	STREET LAMP	HID Fixture w/ (1) 100w High Pressure Sodium	10	130	1,300	4,745	6,169		None	10	130				1,300	4,745	6,169	6,169	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
208	N/A	"VERONA HIGH SCHOOL" SIGN	4' Uplight Fluorescent w/ (1) F40T12/34w Lamp & (1) Energy Efficient Magnetic Ballasts	3	42	126	4,745	598		Relamp & Reballast w/ (1) F28T8 Lamp & (1) 1/32 Elec. Low-Power High Efficiency Ballast	3	22				66	4,745	313	313	20	60	0	285	0	$48	$152	$0	$152	$0	$0	$0
209	N/A	LOT LIGHTS	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	6	295	1,770	4,745	8,399		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	6	175				1,050	4,745	4,982	4,982	120	720	0	3,416	0	$581	$2,301	$0	$2,001	$300	$0	$300
210	N/A	SIDE LOT GOOSE NECK	HID Fixture w/ (1) 100w High Pressure Sodium	9	130	1,170	4,745	5,552		None	9	130				1,170	4,745	5,552	5,552	0	0	0	0	0	$0	$0	$0	$0	$0	$0	$0
211	N/A	TENNIS COURT	HID Fixture w/ (1) 250w Metal Halide Lamp & Ballast	16	295	4,720	4,745	22,396		New Fixture w/ (1) 165w Induction Lamp & Induction Ballast Universal Voltage	16	175				2,800	4,745	13,286	13,286	120	1,920	0	9,110	0	$1,548	$6,136	$0	$5,336	$800	$0	$800

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ECM Costs & Calculations

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ECM #1:

PC Power Management

Brookdale Elementary School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	12,043
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$1,864
Estimated Implementation Cost ($)	$807
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$807
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

FN Brown School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	16,503
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$2,835
Estimated Implementation Cost ($)	$1,076
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$1,076
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

Forest Elementary School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	17,990
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$2,728
Estimated Implementation Cost ($)	$1,166
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$1,166
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

Laning Avenue School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	17,990
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$2,775
Estimated Implementation Cost ($)	$1,166
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$1,166
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

CALCULATIONS

HB Whitehorne Middle School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	49,659
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$7,500
Estimated Implementation Cost ($)	$3,319
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$3,319
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

Verona High School - Computer Time of Day Optimization

Summary

Electricity Savings (kWh/yr)	69,285
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$11,776
Estimated Implementation Cost ($)	$4,664
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$4,664
Simple Payback (Years)	0.4

1. Assuming computers are completely powered down during summer vacation.
2. Computer and monitor power consumption values based on 2009 ASHRAE Fundamentals, Section 18.12, Table 8.
3. Savings assumes all computers go into standby/sleep mode during unoccupied building hours.

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ECM #2:

INSULATE PIPING

CALCULATIONS

Verona High School - HHW Pipe Insulation

N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	2" Pipe Insu	LF	75	5	375	5	341	716
2			1		-		-	-
3			1		-		-	-
4			1		-		-	-
5			1		-		-	-
6			1		-		-	-
	Other Estimated Implementation Costs							150
	TOTAL							**$ 866**
	SUB-TOTAL							716
	O&P						10%	72
	ASBESTOS ABATEMENT							-
	DIRECT COST							787
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							787
	CONTINGENCY						10%	79
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							866
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							866
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 866**

FN Brown Elementary School - HHW Pipe Insulation

N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	2" Pipe Insu	LF	20	5	100	5	91	191
2			1		-		-	-
3			1		-		-	-
4			1		-		-	-
5			1		-		-	-
6			1		-		-	-
	Other Estimated Implementation Costs							40
	TOTAL							**$ 231**
	SUB-TOTAL							191
	O&P						10%	19
	ASBESTOS ABATEMENT							-
	DIRECT COST							210
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							210
	CONTINGENCY						10%	21
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							231
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							231
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 231**

CALCULATIONS

Verona Highschool - Insulate HHW Piping

1. Price of #2 Fuel Oil, $/gal	x
2. Price of City Water, $/1000 gallons	x
3. Price of Electricity, $/kWh (blended rate)	$0.170
4. Price of the Demand of Electricity, $/kW/month	$0.000
5. Price of Natural Gas, $/therm	$0.950

Total Savings			
	Existing Condition	**Proposed System**	**Savings**
Number of Ft of underinsulated pipe	**75**	75	
Inches of insulation	**0**	**1.0**	
Annual Btu losses	50,159,983	7,760,539	**42,399,444**
Annual Therms lost	502	78	**424**
Annual Cost and Savings, $	$ 477	$ 74	**$ 403**

1. Assumes HHW reset betweern 150 and 180degF
2. Assumes 75 feet of 2.00 inch pipe.

CALCULATIONS

F.N. Brown - Insulate LPC Piping

1. Price of #2 Fuel Oil, $/gal	x
2. Price of City Water, $/1000 gallons	x
3. Price of Electricity, $/kWh (blended rate)	$0.172
4. Price of the Demand of Electricity, $/kW/month	$0.000
5. Price of Natural Gas, $/therm	$1.032

Total Savings			
	Existing Condition	**Proposed System**	**Savings**
Number of Ft of underinsulated pipe	**20**	20	
Inches of insulation	**0**	**1.0**	
Annual Btu losses	20,068,364	3,030,067	**17,038,297**
Annual Therms lost	201	30	**170**
Annual Cost and Savings, $	$ 207	$ 31	**$ 176**

1. Assumes 20 feet of 2.00 inch pipe.

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ECM #3:

VENDING MACHINE CONTROLS

CALCULATIONS

Verona HS - Vending Meiser

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL PER UNIT	MATERIAL TOTAL	LABOR PER UNIT	LABOR TOTAL	TOTAL
1	Soda Machine		5	179	895	500	2,500	3,395
2	Snack Machine		-	179	-	500	-	-
	Other Estimated Implementation Costs							-
	TOTAL							**$ 3,395**
	SUB-TOTAL							3,395
	O&P						0%	-
	ASBESTOS ABATEMENT							-
	DIRECT COST							3,395
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							3,395
	CONTINGENCY						0%	-
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							3,395
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							3,395
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 3,395**

HB Whitehorne Middle School - Vending Miser

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL PER UNIT	MATERIAL TOTAL	LABOR PER UNIT	LABOR TOTAL	TOTAL
1	Soda Machine		1	179	179	500	500	679
2	Snack Machine		-	179	-	500	-	-
	Other Estimated Implementation Costs							-
	TOTAL							**$ 679**
	SUB-TOTAL							679
	O&P						0%	-
	ASBESTOS ABATEMENT							-
	DIRECT COST							679
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							679
	CONTINGENCY						0%	-
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							679
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							679
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 679**

FN Brown - Vending Miser

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL PER UNIT	MATERIAL TOTAL	LABOR PER UNIT	LABOR TOTAL	TOTAL
1	Soda Machine		2	179	358	500	1,000	1,358
2	Snack Machine		-	179	-	500	-	-
	Other Estimated Implementation Costs							-
	TOTAL							**$ 1,358**
	SUB-TOTAL							1,358
	O&P						0%	-
	ASBESTOS ABATEMENT							-
	DIRECT COST							1,358
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							1,358
	CONTINGENCY						0%	-
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							1,358
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							1,358
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 1,358**

CALCULATIONS

Verona High School - Vending Machine Power Management System

Price of #2 Fuel Oil, $/gal	
Price of City Water, $/1000 gallons	
Price of Electricity, $/kWh (blended rate)	$0.170
Price of the Demand of Electricity, $/kW/month	
Price of Natural Gas, $/therm	

	Existing Condition	Proposed System	Savings
Soda Machine Power Consumption	100%	44%	56%
Soda Machine Annual Op Cost	$ 2,978	$ 1,310	1,668
Run Hours	8,760	8,760	
Soda Annual Energy Consumption (kWh)	17,520	7,709	9,811
Snack Machine Power Consumption	100%	44%	56%
Annual Op Cost	$ -	$ -	0
Run Hours	8,760	8,760	
Annual Energy Consumption (kWh)	-	-	**-**
Total Annual Energy Consumption (kWh)	17,520	7,709	**9,811**
Annual Cost and Savings, $	$ 2,978	$ 1,310	**$ 1,668**

1. Run hours based on fan motors being run 8760 hrs

CALCULATIONS

HB Whitehorne Middle School- Vending Machine Power Management System

Price of #2 Fuel Oil, $/gal	
Price of City Water, $/1000 gallons	
Price of Electricity, $/kWh (blended rate)	$0.154
Price of the Demand of Electricity, $/kW/month	
Price of Natural Gas, $/therm	

	Existing Condition	Proposed System	Savings
Soda Machine Power Consumption	100%	44%	56%
Soda Machine Annual Op Cost	$ 541	$ 238	303
Run Hours	8,760	8,760	
Soda Annual Energy Consumption (kWh)	3,504	1,542	1,962
Snack Machine Power Consumption	100%	44%	56%
Annual Op Cost	$ -	$ -	0
Run Hours	8,760	8,760	
Annual Energy Consumption (kWh)	-	-	**-**
Total Annual Energy Consumption (kWh)	3,504	1,542	**1,962**
Annual Cost and Savings, $	$ 541	$ 238	**$ 303**

1. Run hours based on fan motors being run 8760 hrs

CALCULATIONS

FN Brown Elementary - Vending Machine Power Management System

Price of #2 Fuel Oil, $/gal	
Price of City Water, $/1000 gallons	
Price of Electricity, $/kWh (blended rate)	$0.172
Price of the Demand of Electricity, $/kW/month	
Price of Natural Gas, $/therm	

	Existing Condition	Proposed System	Savings
Soda Machine Power Consumption	100%	44%	56%
Soda Machine Annual Op Cost	$ 1,204	$ 530	674
Run Hours	8,760	8,760	
Soda Annual Energy Consumption (kWh)	7,008	3,084	3,924
Snack Machine Power Consumption	100%	44%	56%
Annual Op Cost	$ -	$ -	0
Run Hours	8,760	8,760	
Annual Energy Consumption (kWh)	-	-	**-**
Total Annual Energy Consumption (kWh)	7,008	3,084	**3,924**
Annual Cost and Savings, $	$ 1,204	$ 530	**$ 674**

1. Run hours based on fan motors being run 8760 hrs

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ECM #4:

STEAM TRAP REPAIR PROGRAM

COST ESTIMATE

F.N.Brown - Steam Trap Survey

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Steam Trap Survey	ea	30	0	-	55	1,650	1,650
2	Replace Failed Traps	ea	3	82	246	40	120	366
	Other Estimated Implementation Costs							998
	TOTAL							**$ 3,014**
	SUB-TOTAL							2,016
	O&P						15%	302
	ASBESTOS ABATEMENT							-
	DIRECT COST							2,318
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							2,318
	CONTINGENCY						30%	696
	ASBESTOS CONTINGENCY						10%	-
	SUB-TOTAL							3,014
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							3,014
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 3,014**
	New Jersey Smart Start Rebate							**$ -**

Middle School - Steam Trap Survey

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Steam Trap Survey	ea	65	0	-	55	3,575	3,575
2	Replace Failed Traps	ea	7	82	574	40	280	854
	Other Estimated Implementation Costs							2,192
	TOTAL							**$ 6,621**
	SUB-TOTAL							4,429
	O&P						15%	664
	ASBESTOS ABATEMENT							-
	DIRECT COST							5,093
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							5,093
	CONTINGENCY						30%	1,528
	ASBESTOS CONTINGENCY						10%	-
	SUB-TOTAL							6,621
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							6,621
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 6,621**
	New Jersey Smart Start Rebate							**$ -**

Savings from Steam Trap Maintenance Program - F.N. Brown

Price of Natural Gas, $/therm	$1.03

Estimated Number of Steam Traps[1]	30
Estimated Failure Rate[2]	10%
Reduction in Number of Leaking Traps	3
Avg. Size of Orifice (inches diameter)[3]	0.12
Average Steam Pressure (psig)	7
Steam Loss Through Trap(s) (lbs/hr)[4]	7.6
Annual Steam Plant Operating Hours	4,320
Heating Plant Efficiency	80%
Annual Steam Loss (lbs)	98,166
Latent Heat of Steam at Avg Pressure (Btu/lbm)	960
Annual Fuel Savings (therms)	1,178
Annual Fuel Savings	$1,215

1.Steam trap quantity estimated based on building blueprints and equipment.

2. Per Hart F.L. and Jaber D., *Best Practices in Steam System Management. Steam Digest.* US *DoE: "In steam systems that have not been maintained for 3 to 5 years, from 15 to 30 percent of traps may have failed, and regularly-scheduled maintenance should reduce this to under 5 percent of traps."*

3. Based on Spirax Sarco 1/2" thermostatic trap

4. Based on modified Napier equation. Steam flow (lb/hr) = 24.24 x P_a x D^2

Where P_a is absolute pressure, psia, and D is Orifice diamter in inches

CALCULATIONS

Savings from Steam Trap Maintenance Program -
HB Whitehorne Middle School

Price of Natural Gas, $/therm	$1.04

Estimated Number of Steam Traps[1]	65
Estimated Failure Rate[2]	10%
Reduction in Number of Leaking Traps	7
Avg. Size of Orifice (inches diameter)[3]	0.12
Average Steam Pressure (psig)	5
Steam Loss Through Trap(s) (lbs/hr)[4]	6.9
Annual Steam Plant Operating Hours	4,320
Heating Plant Efficiency	80%
Annual Steam Loss (lbs)	207,942
Latent Heat of Steam at Avg Pressure (Btu/lbm)	960
Annual Fuel Savings (therms)	2,495
Annual Fuel Savings	$2,607

1.Steam trap quantity estimated based on building blueprints and equipment.

2. Per Hart F.L. and Jaber D., *Best Practices in Steam System Management. Steam Digest.* US DoE:

"In steam systems that have not been maintained for 3 to 5 years, from 15 to 30 percent of traps may have failed, and regularly-scheduled maintenance should reduce this to under 5 percent of traps."

3. Based on Spirax Sarco 1/2" thermostatic trap

4. Based on modified Napier equation. Steam flow (lb/hr) = 24.24 x P_a x D^2

Where P_a is absolute pressure, psia, and D is Orifice diamter in inches

CALCULATIONS

School	$ / kWh	$ / Therms
Laning Avenue Elementary School	$ 0.15	$ 1.02
Brookdale Avenue Elementary School	$ 0.15	$ 1.17
F.N. Brown Elementary School	**$ 0.17**	**$ 1.03**
Forest Avenue Elementary School	$ 0.15	$ 1.13
H.B. Whitehorne Middle School	**$ 0.15**	**$ 1.04**
Verona High School	$ 0.17	$ 0.95
Averaged Costs	$ 0.16	$ 1.06

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ECM #5:

REPLACE ELECTRIC DHW WITH NATURAL GAS

COST ESTIMATES

Brookdale Elementary School - Replace Electric Resistance Water Heaters With natural gas units

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL PER UNIT	MATERIAL TOTAL	LABOR PER UNIT	LABOR TOTAL	TOTAL
1	Install new 60 gal, 65 MBH nat gas Water Heater	each	1	1215.00	1,215	328.00	328	1,543
2	Install new 75 gal, 75 MBH nat gas Water Heater	each	-	1520.00	-	492.00	-	-
3	Install new 100 gal, 75 MBH nat gas Water Heater	each	-	1870.00	-	656.00	-	-
4	Demo For Large Heaters	each	-		-	230.00	-	-
5	Install Nat Gas Piping	ft per heater	25	6.25	156	5.80	145	301
6	Install Flue	ft per heater	50	9.00	450	1.45	73	523
	Other Estimated Implementation Costs							369

TOTAL		**$ 369**
SUB-TOTAL		1,844
O&P	20%	369
ASBESTOS ABATEMENT		-
DIRECT COST		2,213
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		2,213
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	0%	-
SUB-TOTAL		2,213
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	0.0%	-
SUB-TOTAL		2,213
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		**$ 2,213**
NJ SmartStart Rebate		**$ 130**

Laning Avenue Elementary - Replace Electric Resistance Water Heaters With natural gas units

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL PER UNIT	MATERIAL TOTAL	LABOR PER UNIT	LABOR TOTAL	TOTAL
1	Install new 60 gal, 65 MBH nat gas Water Heater	each	1	1215.00	1,215	328.00	328	1,543
2	Install new 75 gal, 75 MBH nat gas Water Heater	each	-	1520.00	-	492.00	-	-
3	Install new 100 gal, 75 MBH nat gas Water Heater	each	-	1870.00	-	656.00	-	-
4	Demo For Large Heaters	each	-		-	230.00	-	-
5	Install Nat Gas Piping	ft per heater	20	6.25	125	5.80	116	241
6	Install Flue	ft per heater	50	9.00	450	1.45	73	523
	Other Estimated Implementation Costs							357

TOTAL		**$ 357**
SUB-TOTAL		1,784
O&P	20%	357
ASBESTOS ABATEMENT		-
DIRECT COST		2,141
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		2,141
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	0%	-
SUB-TOTAL		2,141
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	0.0%	-
SUB-TOTAL		2,141
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		**$ 2,141**
NJ SmartStart Rebate		**$ 130**

CALCULATIONS

Brookdale Elementary School - Replace Electric Resistance Water Heaters With natural gas units

Price of natural gas ($/therm)	$1.17
Price of Electricity, $/kWh (blended rate)	$0.15

	Existing Condition	Proposed System	Savings
Annual domestic water heating energy input, kWh	4,787	0	4,787
Annual domestic water heating energy input, therms	0	263	-263
Annual Cost and Savings, $	$ 741	$ 308	$ 433

Existing water heater energy factor	0.88
Proposed water heater energy factor	0.544

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ECM #6:

CHANGE CRT'S TO FLATSCREENS

CALCULATIONS

Laning Avenue Elementary - Replace Electric Resistance Water Heaters With natural gas units

Price of natural gas ($/therm)	$1.02
Price of Electricity, $/kWh (blended rate)	$0.15

	Existing Condition	Proposed System	Savings
Annual domestic water heating energy input, kWh	10,620	0	10,620
Annual domestic water heating energy input, therms	0	609	-609
Annual Cost and Savings, $	$ 1,604	$ 624	$ 980

Existing water heater energy factor	0.85
Proposed water heater energy factor	0.506

CALCULATIONS

FN Brown - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	401
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$69
Estimated Implementation Cost ($)	$300
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$300
Simple Payback (Years)	4.3

CALCULATIONS

Forest Elem - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	301
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$46
Estimated Implementation Cost ($)	$225
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$225
Simple Payback (Years)	4.9

CALCULATIONS

Middle School - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	201
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$31
Estimated Implementation Cost ($)	$150
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$150
Simple Payback (Years)	4.8

CALCULATIONS

Brookdale - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	401
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$62
Estimated Implementation Cost ($)	$300
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$300
Simple Payback (Years)	4.8

CALCULATIONS

Brookdale - CRT to FlatScreen Computer

Summary

Electricity Savings (kWh/yr)	100
Natural Gas Savings (therms/yr)	0
Estimated Cost Savings ($/yr)	$15
Estimated Implementation Cost ($)	$75
Estimated Rebate ($)	$0
Estimated Implementation Cost after Rebate ($)	$75
Simple Payback (Years)	4.9

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ECM #8:

DOOR WEATHERIZATION

COST ESTIMATES

Laning Avenue School - Door Weatherization								
N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Door Wea	Ea	3	$ 22	$ 65	$ 57	$ 171	$ 235
	Other Estimated Implementation Costs							-
	TOTAL							**$ 235**
	SUB-TOTAL							**235**
	O&P						0%	-
	ASBESTOS ABATEMENT					SF		-
	DIRECT COST							235
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							235
	CONTINGENCY						0%	-
	Engineering Fees						0%	-
	Architectural fees for Renovation						0%	-
	ASBESTOS CONTINGENCY						15%	-
	SUB-TOTAL							235
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							235
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 235**

Verona High School - Door Weatherization								
N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Door Wea	Ea	1	$ 22	$ 22	$ 57	$ 57	$ 78
	Other Estimated Implementation Costs							-
	TOTAL							**$ 78**
	SUB-TOTAL							**78**
	O&P						0%	-
	ASBESTOS ABATEMENT					SF		-
	DIRECT COST							78
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							78
	CONTINGENCY						0%	-
	Engineering Fees						0%	-
	Architectural fees for Renovation						0%	-
	ASBESTOS CONTINGENCY						15%	-
	SUB-TOTAL							78
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							78
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 78**

COST ESTIMATES

Middle School - Door Weatherization								
N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Door Wea	Ea	6	$ 22	$ 130	$ 57	$ 341	$ 471
	Other Estimated Implementation Costs							-
	TOTAL							**$ 471**
	SUB-TOTAL							**471**
	O&P						0%	-
	ASBESTOS ABATEMENT					SF		-
	DIRECT COST							471
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							471
	CONTINGENCY						0%	-
	Engineering Fees						0%	-
	Architectural fees for Renovation						0%	-
	ASBESTOS CONTINGENCY						15%	-
	SUB-TOTAL							471
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							471
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 471**

FN Brown - Door Weatherization								
N/N	SCRIPTION WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Door Wea	Ea	6	$ 22	$ 130	$ 57	$ 341	$ 471
	Other Estimated Implementation Costs							-
	TOTAL							**$ 471**
	SUB-TOTAL							**471**
	O&P						0%	-
	ASBESTOS ABATEMENT					SF		-
	DIRECT COST							471
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							471
	CONTINGENCY						0%	-
	Engineering Fees						0%	-
	Architectural fees for Renovation						0%	-
	ASBESTOS CONTINGENCY						15%	-
	SUB-TOTAL							471
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	IC FEE						0.0%	-
	SUB-TOTAL							471
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 471**

COST ESTIMATES

Laning Avenue Elementary School - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.151
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	Proposed System	Savings
Number of Doors	3	3	
Estimated Infiltration Rate per Door, CFM	11	2	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	1,913	486	
Annual Heating Consumption, Therms	23	5.93	17
Annual Cost and Savings, $	$ 24	$ 6	**$ 18**

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12
2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.
3. It is assumed that each door has a leakage area of 2 square inches (3 linear feet by 0.05 in). Vestibule doors are not included. There is/are 3 door(s).
4. A 60% load factor was used when calculating the existing leakage rate.
5. Assume no cooling
6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.
7. New weatherstripping is assumed to reduce inflitration by 80%.

COST ESTIMATES

Verona High School - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.170
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$0.950

	Existing Condition	Proposed System	Savings
Number of Doors	1	1	
Estimated Infiltration Rate per Door, CFM	8	2	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	496	126	
Annual Heating Consumption, Therms	6	1.54	5
Annual Cost and Savings, $	$ 6	$ 1	**$ 4**

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12
2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.
3. It is assumed that each door has a leakage area of 4 square inches (7 linear feet by 0.05 in). Vestibule doors are not included. There is/are 1 door(s).
4. A 60% load factor was used when calculating the existing leakage rate.
5. Assume no cooling
6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.
7. New weatherstripping is assumed to reduce inflitration by 80%.

COST ESTIMATES

Middle School Savings - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.154
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$1.045

	Existing Condition	Proposed System	Savings
Number of Doors	6	6	
Estimated Infiltration Rate per Door, CFM	21	4	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	7,652	1,945	
Annual Heating Consumption, Therms	93	23.72	70
Annual Cost and Savings, $	$ 97	$ 25	**$ 73**

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12

2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.

3. It is assumed that each door has a leakage area of 2 square inches (3 linear feet by 0.05 in). Vestibule doors are not included. There is/are 6 door(s).

4. A 60% load factor was used when calculating the existing leakage rate.

5. Assume no cooling

6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.

7. New weatherstripping is assumed to reduce inflitration by 80%.

COST ESTIMATES

FN Brown - Savings From Weatherstripping Doors

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.172
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$1.032

	Existing Condition	Proposed System	Savings
Number of Doors	6	6	
Estimated Infiltration Rate per Door, CFM	21	4	
Annual Cooling Infiltration Total Hours, OAT > 80F	814	814	
Annual Heating Infiltration Total Hours, OAT < 65F	1,729	1,729	
Annual Cooling Load, kBTU	-	-	
Annual Cooling Electrical Consumption, kWh	-	-	0
Annual Heating Load, kBTU	7,652	1,945	
Annual Heating Consumption, Therms	93	23.72	70
Annual Cost and Savings, $	$ 96	$ 24	**$ 72**

1. Infiltration rate was calculated according to ASHRAE Fundamentals 2005 Door Leakage Rate Equation F27.12

2. Estimated hours of infiltration was based on all hours below 65F and above 80F for the region.

3. It is assumed that each door has a leakage area of 2 square inches (3 linear feet by 0.05 in). Vestibule doors are not included. There is/are 6 door(s).

4. A 60% load factor was used when calculating the existing leakage rate.

5. Assume no cooling

6. The average outside air temperature above 80F during the year is 81F. The average outside air temperature below 65F is 42F.

7. New weatherstripping is assumed to reduce inflitration by 80%.

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ECM #9:

DEMAND CONTROL VENTILATION

COST ESTIMATE

Laning Avenue - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000
2	RA / OA Modulating Damper Actuators	EA (avg)	3	600	1,800	100	300	2,100
3	Commissioning	hrs	4		0	150.0	600	600
4	Modulating exhaust dampers 26"x26" with actuator	EA	3	895	2,685	125.0	375	3,060
5	Ductwork demolition	lbs	194		0	0.75	146	146
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061
	Other Estimated Implementation Costs							4,241
	TOTAL							**$ 13,208**
	SUB-TOTAL							8,967
	O&P						30%	2,690
	ASBESTOS ABATEMENT							-
	DIRECT COST							11,657
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							11,657
	CONTINGENCY						10%	1,166
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							12,823
	DISPOSAL							-
	MATERIAL HANDLING FEE						0.0%	-
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	SUB-TOTAL							12,823
	IC FEE						3.0%	385
	SUB-TOTAL							13,208
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 13,208**

COST ESTIMATE

Brookdale Elementary - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000
2	RA / OA Modulating Damper Actuators	EA (avg)	3	600	1,800	100	300	2,100
3	Commissioning	hrs	4		0	150.0	600	600
4	Modulating exhaust dampers 26" x26" with actuator	EA	2	895	1,790	125.0	250	2,040
5	Ductwork demolition	lbs	97		0	0.75	73	73
6	Ductwork modifications	lbs	97	0.69	67	4.77	464	531
	Other Estimated Implementation Costs							3,473
	TOTAL							**$ 10,816**
	SUB-TOTAL							7,344
	O&P						30%	2,203
	ASBESTOS ABATEMENT							-
	DIRECT COST							9,547
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							9,547
	CONTINGENCY						10%	955
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							10,501
	DISPOSAL							-
	MATERIAL HANDLING FEE						0.0%	-
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	SUB-TOTAL							10,501
	IC FEE						3.0%	315
	SUB-TOTAL							10,816
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 10,816**

COST ESTIMATE

FN Brown - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000
2	RA / OA Modulating Damper Actuators	EA (avg)	3	600	1,800	100	300	2,100
3	Commissioning	hrs	4		0	150.0	600	600
4	Modulating exhaust dampers 48" x48" with actuator	EA	3	895	2,685	125.0	375	3,060
5	Ductwork demolition	lbs	194		0	0.75	146	146
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061
	Other Estimated Implementation Costs							4,241
	TOTAL							**$ 13,208**
	SUB-TOTAL							8,967
	O&P						30%	2,690
	ASBESTOS ABATEMENT							-
	DIRECT COST							11,657
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							11,657
	CONTINGENCY						10%	1,166
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							12,823
	DISPOSAL							-
	MATERIAL HANDLING FEE						0.0%	-
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	SUB-TOTAL							12,823
	IC FEE						3.0%	385
	SUB-TOTAL							13,208
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 13,208**

COST ESTIMATE

Forest Avenue - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	CO2 Sensors & Control Wiring	EA	1	375	375	625	625	1,000
2	RA / OA Modulating Damper Actuators	EA (avg)	2	600	1,200	100	200	1,400
3	Commissioning	hrs	2		0	150.0	300	300
4	Modulating exhaust dampers 48" x48" with actuator	EA	2	895	1,790	125.0	250	2,040
5	Ductwork demolition	lbs	97		0	0.75	73	73
6	Ductwork modifications	lbs	97	0.69	67	4.77	464	531
	Other Estimated Implementation Costs							2,527
	TOTAL							**$ 7,871**
	SUB-TOTAL							5,344
	O&P						30%	1,603
	ASBESTOS ABATEMENT							-
	DIRECT COST							6,947
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							6,947
	CONTINGENCY						10%	695
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							7,641
	DISPOSAL							-
	MATERIAL HANDLING FEE						0.0%	-
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	SUB-TOTAL							7,641
	IC FEE						3.0%	229
	SUB-TOTAL							7,871
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 7,871**

COST ESTIMATE

HB Whitehorne Middle School - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	CO2 Sensors & Control Wiring	EA	2	375	750	625	1,250	2,000
2	RA / OA Modulating Damper Actuators	EA (avg)	6	600	3,600	100	600	4,200
3	Commissioning	hrs	4		0	150.0	600	600
4	Modulating exhaust dampers 48" x48" with actuator	EA	3	895	2,685	125.0	375	3,060
5	Ductwork demolition	lbs	194		0	0.75	146	146
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061
	Other Estimated Implementation Costs							3,980
	TOTAL							**$ 15,047**
	SUB-TOTAL							11,067
	O&P						20%	2,213
	ASBESTOS ABATEMENT							-
	DIRECT COST							13,281
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							13,281
	CONTINGENCY						10%	1,328
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							14,609
	DISPOSAL							-
	MATERIAL HANDLING FEE						0.0%	-
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	SUB-TOTAL							14,609
	IC FEE						3.0%	438
	SUB-TOTAL							15,047
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 15,047**

COST ESTIMATE

Verona High School - Demand Control Ventilation

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	CO2 Sensors & Control Wiring	EA	4	375	1,500	625	2,500	4,000
2	RA / OA Modulating Damper Actuators	EA (avg)	4	600	2,400	100	400	2,800
3	Commissioning	hrs	8		0	150.0	1,200	1,200
4	Modulating exhaust dampers 48" x48" with actuator	EA	3	895	2,685	125.0	375	3,060
5	Ductwork demolition	lbs	194		0	0.75	146	146
6	Ductwork modifications	lbs	194	0.69	134	4.77	927	1,061
	Other Estimated Implementation Costs							5,801
	TOTAL							**$ 18,068**
	SUB-TOTAL							12,267
	O&P						30%	3,680
	ASBESTOS ABATEMENT							-
	DIRECT COST							15,947
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							15,947
	CONTINGENCY						10%	1,595
	ASBESTOS CONTINGENCY						0%	-
	SUB-TOTAL							17,542
	DISPOSAL							-
	MATERIAL HANDLING FEE						0.0%	-
	ASBESTOS DESIGN & AIR MONITORING, TESTING							-
	SUB-TOTAL							17,542
	IC FEE						3.0%	526
	SUB-TOTAL							18,068
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 18,068**

CALCULATIONS

Laning Avenue - Demand Control Ventilation

3. Price of Electricity, $/kWh (blended rate)	$0.151
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	12,800	12,800	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	2,907	2,107	800
Annual Electric Cost	$ -	$ -	$ -
Annual Natural Gas Cost	$ 2,978	$ 2,159	$ 819
Annual Cost and Savings, $	$ 2,978	$ 2,159	**$ 819**

CALCULATIONS

Brookdale Elementary - Demand Control Ventilation

3. Price of Electricity, $/kWh (blended rate)	$0.151
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	4,000	4,000	
Heating and Cooling Units Airflow, CFM	5,000	5,000	
Estimated Cooling Electric Use, kWh	24,253	23,936	317
Estimated Heating Natural Gas Use, therms	1,612	1,309	303
Annual Electric Cost	$ 3,663	$ 3,615	$ 48
Annual Natural Gas Cost	$ 1,652	$ 1,341	$ 310
Annual Cost and Savings, $	$ 5,314	$ 4,956	**$ 358**

CALCULATIONS

FN Brown - Demand Control Ventilation

3. Price of Electricity, $/kWh (blended rate)	$0.151
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	9,000	9,000	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	2,044	1,377	667
Annual Electric Cost	$ -	$ -	$ -
Annual Natural Gas Cost	$ 2,094	$ 1,410	$ 683
Annual Cost and Savings, $	$ 2,094	$ 1,410	**$ 683**

CALCULATIONS

Forest Avenue - Demand Control Ventilation

3. Price of Electricity, $/kWh (blended rate)	$0.151
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	**Proposed System**	**Savings**
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	5,000	5,000	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	1,135	859	277
Annual Electric Cost	$ -	$ -	$ -
Annual Natural Gas Cost	$ 1,163	$ 880	$ 283
Annual Cost and Savings, $	$ 1,163	$ 880	**$ 283**

CALCULATIONS

HB Whitehorne Middle School - Demand Control Ventilation

3. Price of Electricity, $/kWh (blended rate)	$0.151
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	15,000	15,000	
Heating and Cooling Units Airflow, CFM	0	0	
Estimated Cooling Electric Use, kWh	0	0	-
Estimated Heating Natural Gas Use, therms	3,406	2,878	528
Annual Electric Cost	$ -	$ -	$ -
Annual Natural Gas Cost	$ 3,490	$ 2,948	$ 541
Annual Cost and Savings, $	$ 3,490	$ 2,948	**$ 541**

CALCULATIONS

Verona High School - Demand Control Ventilation

3. Price of Electricity, $/kWh (blended rate)	$0.151
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	Proposed System	Savings
Run Hours	2,592	2,592	
Heating-Only Units Airflow, CFM	18,800	18,800	
Heating and Cooling Units Airflow, CFM	12,200	12,200	
Estimated Cooling Electric Use, kWh	59,178	58,486	692
Estimated Heating Natural Gas Use, therms	6,097	4,662	1,435
Annual Electric Cost	$ 8,938	$ 8,833	$ 104
Annual Natural Gas Cost	$ 6,246	$ 4,776	$ 1,470
Annual Cost and Savings, $	$ 15,184	$ 13,609	**$ 1,574**

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ECM #10:

REPLACE WINDOW AC'S WITH SPLITS

COST ESTIMATES

FN Brown Elementary School - Replace Window A/C & Spot Cooler Unit with Split Units

N/N	DESCRIPTION OF	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Remove Window AC	each	2		-	130.00	260	260
2	Install Insulated	sq ft	3.8	15.00	2		-	2
3	Caulk new panels	l.f	16.0	0.09	1	0.87	14	15
4	Compressors, 1/2 ton	each	2.0	1500.00	3,000	1200.00	2,400	5,400
5	Evaporators, 1/2 ton	each	2.0	1000.00	2,000	225.00	450	2,450
6	Evaporators, 1 1/2	each	0.0	1700.00	-	225.00	-	-
7	Refrigerant Piping, Evap Liquid, 1/4"	l.f	60	2.80	168	3.67	220	388
8	Refrigerant Piping, Evap Gas, 1/2"	l.f	60	3.35	201	3.95	237	438
12	Electric Wiring, Cond, 14 AWG in conduit	l.f	150.0	2.81	421	4.91	737	1,157
	Other Estimated Implementation Costs							2,386
	Cost Adjustmen to Match Revised Cost Estimate							
	TOTAL							**$ 14,883**

SUB-TOTAL		**$ 10,111**
O&P	20%	2,022
ASBESTOS ABATEMENT		-
DIRECT COST		12,133
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		12,133
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	10%	-
SUB-TOTAL		12,133
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	3.0%	364
SUB-TOTAL		12,497
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		**$ 12,497**
NJ Smart Start Rebate		**$ 123**

COST ESTIMATES

Laning Elementary School - Replace Window A/C Unit with Split Unit

N/N	DESCRIPTION OF	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Remove Window AC	each	1		-	130.00	130	130
2	Install Insulated	sq ft	1.9	15.00	1		-	1
3	Caulk new panels	l.f	8.0	0.09	1	0.87	7	8
4	Compressors, 1 ton	each	1.0	2000.00	2,000	1200.00	1,200	3,200
5	Evaporators, 1 ton	each	1.0	1000.00	1,000	225.00	225	1,225
6	Evaporators, 1 1/2	each	0.0	1700.00	-	225.00	-	-
7	Refrigerant Piping, Evap Liquid, 1/4"	l.f	30	2.80	84	3.67	110	194
8	Refrigerant Piping, Evap Gas, 1/2"	l.f	30	3.35	101	3.95	119	219
9	Electric Wiring, Cond, 14 AWG in conduit	l.f	75.0	2.81	210	4.91	368	579
	Other Estimated Implementation Costs							1,311
	Cost Adjustmen to Match Revised Cost Estimate							
	TOTAL							**$ 8,178**

SUB-TOTAL		**$ 5,555**
O&P	20%	1,111
ASBESTOS ABATEMENT		-
DIRECT COST		6,666
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		6,666
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	10%	-
SUB-TOTAL		6,666
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	3.0%	200
SUB-TOTAL		6,866
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		**$ 6,866**
NJ Smart Start Rebate		**$ 77**

COST ESTIMATES

Forest Elementary School - Replace Window A/C Unit with Split Unit

N/N	DESCRIPTION OF	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	Remove Window AC	each	1		-	130.00	130	130
2	Install Insulated	sq ft	1.9	15.00	1		-	1
3	Caulk new panels	l.f	8.0	0.09	1	0.87	7	8
4	Compressors, 3 ton	each	1.0	5000.00	5,000	1200.00	1,200	6,200
5	Evaporators, 3 ton	each	1.0	1500.00	1,500	225.00	225	1,725
6	Evaporators, 1 1/2	each	0.0	1700.00	-	225.00	-	-
7	Refrigerant Piping, Evap Liquid, 1/4"	l.f	30	2.80	84	3.67	110	194
8	Refrigerant Piping, Evap Gas, 1/2"	l.f	30	3.35	101	3.95	119	219
9	Electric Wiring, Cond, 14 AWG in conduit	l.f	75	2.81	210	4.91	368	579
	Other Estimated Implementation Costs							2,137
	Cost Adjustmen to Match Revised Cost Estimate							
	TOTAL							**$ 13,330**

SUB-TOTAL		**$ 9,055**
O&P	20%	1,811
ASBESTOS ABATEMENT		-
DIRECT COST		10,866
PAYMENT & PERFORMANCE BOND	0%	-
SUB-TOTAL		10,866
CONTINGENCY	0%	-
ASBESTOS CONTINGENCY	10%	-
SUB-TOTAL		10,866
ASBESTOS DESIGN & AIR MONITORING, TESTING		-
IC FEE	3.0%	326
SUB-TOTAL		11,192
INTEREST DURING CONSTRUCTION	0%	-
TOTAL		**$ 11,192**
NJ Smart Start Rebate		**$ 276**

CALCULATIONS

FN Brown Elementary School - Replace Window A/C & Spot Cooler Unit with Split Units

1. Price of #2 Fuel Oil, $/gal	$0.000
2. Price of City Water, $/1000 gallons	N/A
3. Price of Electricity, $/kWh (blended rate)	$0.155
4. Price of the Demand of Electricity, $/kW/month	N/A
5. Price of Natural Gas, $/therm	$1.170

Energy Savings Due to Efficiency Improvement

	Existing Condition	Proposed System	Savings
Annual Cooling Energy, kWh	940	470	470
Annual Electric and Savings, $	$ 146	$ 73	$ 73
Total Annual Cost and Savings, $	$ 146	$ 73	$ 73

CALCULATIONS

Laning Elementary School - Replace Window A/C Unit with Split Unit

1. Price of #2 Fuel Oil, $/gal	$0.000
2. Price of City Water, $/1000 gallons	N/A
3. Price of Electricity, $/kWh (blended rate)	$0.151
4. Price of the Demand of Electricity, $/kW/month	N/A
5. Price of Natural Gas, $/therm	$1.024

Energy Savings Due to Efficiency Improvement

	Existing Condition	Proposed System	Savings
Annual Cooling Energy, kWh	522	294	229
Annual Electric and Savings, $	$ 79	$ 44	$ 35
Total Annual Cost and Savings, $	$ 79	$ 44	$ 35

CALCULATIONS

Forest Elementary School - Replace Window A/C Unit with Split Unit

1. Price of #2 Fuel Oil, $/gal	$0.000
2. Price of City Water, $/1000 gallons	N/A
3. Price of Electricity, $/kWh (blended rate)	$0.172
4. Price of the Demand of Electricity, $/kW/month	N/A
5. Price of Natural Gas, $/therm	$1.032

Energy Savings Due to Efficiency Improvement

	Existing Condition	Proposed System	Savings
Annual Cooling Energy, kWh	8,027	4,264	3,763
Annual Electric and Savings, $	$ 1,379	$ 733	$ 646
Total Annual Cost and Savings, $	$ 1,379	$ 733	$ 646

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ECM #11:

CHANGE TO MODULAR CONDENSING BOILERS

COST ESTIMATES

Brookdale Elementary School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL PER UNIT	MATERIAL TOTAL	LABOR PER UNIT	LABOR TOTAL	TOTAL
1	1,500 MBH Nat Gas Condensing Boiler	ea	4	37,000	148,000	10,000	40,000	188,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							130,853
	TOTAL							**$ 344,450**
	SUB-TOTAL							213,602
	O&P						20%	42,720.40
	ASBESTOS ABATEMENT						0%	-
	DIRECT COST							256,322
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							256,322
	CONTINGENCY						10%	25,632
	ASBESTOS CONTINGENCY						10%	21,360.20
	SUB-TOTAL							303,315
	ASBESTOS DESIGN & AIR MONITORING, TESTING						15%	32,040.30
	IC FEE						3.0%	9,099
	SUB-TOTAL							344,455
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 344,455**
	Total SmartStart Rebate							**$ 10,500**
							Total	**$ 333,955**

Brookdale Elementary School - Like in Kind Boiler Replacement

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N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL PER UNIT	MATERIAL TOTAL	LABOR PER UNIT	LABOR TOTAL	TOTAL
1	2511 MBH Nat Gas Fire Tube Boiler	ea	2	**49,201**	98,402	5,024	10,048	108,450
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							82,120
	TOTAL							**$ 216,170**
	SUB-TOTAL							134,052
	O&P						20%	26,810.39
	ASBESTOS ABATEMENT						0%	-
	DIRECT COST							160,862
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							160,862
	CONTINGENCY						10%	16,086
	ASBESTOS CONTINGENCY						10%	13,405.20
	SUB-TOTAL							190,354
	ASBESTOS DESIGN & AIR MONITORING, TESTING						15%	20,107.79
	IC FEE						3.0%	5,711
	SUB-TOTAL							216,172
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 216,172**
	Total SmartStart Rebate							
							Total	**$ 216,172**

COST ESTIMATES

Laning Avenue School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	1,500 MBH Nat Gas Condensing Boiler	ea	4	37,000	148,000	10,000	40,000	188,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							130,853
	TOTAL							**$ 344,450**
	SUB-TOTAL							213,602
	O&P						20%	42,720.40
	ASBESTOS ABATEMENT						0%	-
	DIRECT COST							256,322
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							256,322
	CONTINGENCY						10%	25,632
	ASBESTOS CONTINGENCY						10%	21,360.20
	SUB-TOTAL							303,315
	ASBESTOS DESIGN & AIR MONITORING, TESTING						15%	32,040.30
	IC FEE						3.0%	9,099
	SUB-TOTAL							344,455
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 344,455**
	Total SmartStart Rebate							**$ 10,500**
							Total	**$ 333,955**

Laning Avenue School - Like in Kind Boiler Replacement

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N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	3000 MBH Nat Gas Fire Tube Boiler	ea	2	**58,654**	117,309	5,024	10,048	127,357
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							93,702
	TOTAL							**$ 246,660**
	SUB-TOTAL							152,959
	O&P						20%	30,591.71
	ASBESTOS ABATEMENT						0%	-
	DIRECT COST							183,550
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							183,550
	CONTINGENCY						10%	18,355
	ASBESTOS CONTINGENCY						10%	15,295.86
	SUB-TOTAL							217,201
	ASBESTOS DESIGN & AIR MONITORING, TESTING						15%	22,943.79
	IC FEE						3.0%	6,516
	SUB-TOTAL							246,661
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 246,661**
	Total SmartStart Rebate							
							Total	**$ 246,661**

COST ESTIMATES

Forest Elementary School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	1,500 MBH Nat Gas Condensing Boiler	ea	4	37,000	148,000	10,000	40,000	188,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							130,853

TOTAL		**$**	**344,450**
SUB-TOTAL			213,602
O&P	20%		42,720.40
ASBESTOS ABATEMENT	0%		-
DIRECT COST			256,322
PAYMENT & PERFORMANCE BOND	0%		-
SUB-TOTAL			256,322
CONTINGENCY	10%		25,632
ASBESTOS CONTINGENCY	10%		21,360.20
SUB-TOTAL			303,315
ASBESTOS DESIGN & AIR MONITORING, TESTING	15%		32,040.30
IC FEE	3.0%		9,099
SUB-TOTAL			344,455
INTEREST DURING CONSTRUCTION	0%		-
TOTAL		**$**	**344,455**
Total SmartStart Rebate		**$**	**10,500**
	Total	**$**	**333,955**

Forest Elementary School - Like in Kind Boiler Replacement

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N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	2511 MBH Nat Gas Fire Tube Boiler	ea	2	**49,201**	98,402	5,024	10,048	108,450
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							82,120

TOTAL		**$**	**216,170**
SUB-TOTAL			134,052
O&P	20%		26,810.39
ASBESTOS ABATEMENT	0%		-
DIRECT COST			160,862
PAYMENT & PERFORMANCE BOND	0%		-
SUB-TOTAL			160,862
CONTINGENCY	10%		16,086
ASBESTOS CONTINGENCY	10%		13,405.20
SUB-TOTAL			190,354
ASBESTOS DESIGN & AIR MONITORING, TESTING	15%		20,107.79
IC FEE	3.0%		5,711
SUB-TOTAL			216,172
INTEREST DURING CONSTRUCTION	0%		-
TOTAL		**$**	**216,172**
Total SmartStart Rebate			
	Total	**$**	**216,172**

COST ESTIMATES

Verona High School - Boiler Conversion to High Efficiency Condensing Boilers

N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	1,500 MBH Nat Gas Condensing Boiler	ea	7	37,000	259,000	10,000	70,000	329,000
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							217,229
	TOTAL							**$ 571,830**
	SUB-TOTAL							354,602
	O&P						20%	70,920.40
	ASBESTOS ABATEMENT						0%	-
	DIRECT COST							425,522
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							425,522
	CONTINGENCY						10%	42,552
	ASBESTOS CONTINGENCY						10%	35,460.20
	SUB-TOTAL							503,535
	ASBESTOS DESIGN & AIR MONITORING, TESTING						15%	53,190.30
	IC FEE						3.0%	15,106
	SUB-TOTAL							571,831
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 571,831**
	Total SmartStart Rebate							**$ 18,375**
							Total	**$ 553,456**

Verona High School - Like in Kind Boiler Replacement

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N/N	DESCRIPTION OF WORK	UNIT	QTY	MATERIAL		LABOR		TOTAL
				PER UNIT	TOTAL	PER UNIT	TOTAL	
1	5200 MBH Nat Gas Fire Tube Boiler	ea	2	**74,860**	149,720	5,024	10,048	159,768
2	Demo Existing Boilers	ls	2		-	2,776	5,552	5,552
3	Piping Modifications	ls	1	4,000	4,000	6,000	6,000	10,000
4	HHW piping	LF	300	13	3,825.00	21	6,225	10,050
5	radiator	ea	-	2,933	0	2,840	-	-
	Other Estimated Implementation Costs							113,558
	TOTAL							**$ 298,930**
	SUB-TOTAL							185,370
	O&P						20%	37,073.98
	ASBESTOS ABATEMENT						0%	-
	DIRECT COST							222,444
	PAYMENT & PERFORMANCE BOND						0%	-
	SUB-TOTAL							222,444
	CONTINGENCY						10%	22,244
	ASBESTOS CONTINGENCY						10%	18,536.99
	SUB-TOTAL							263,225
	ASBESTOS DESIGN & AIR MONITORING, TESTING						15%	27,805.48
	IC FEE						3.0%	7,897
	SUB-TOTAL							298,927
	INTEREST DURING CONSTRUCTION						0%	-
	TOTAL							**$ 298,927**
	Total SmartStart Rebate							
							Total	**$ 298,927**

CALCULATIONS

Brookdale Elementary School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.155
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$1.170

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	10,106	9,320	786
Heating Boiler Fuel Cost	$ 11,822	$ 10,902	**$ 919**

CALCULATIONS

Laning Avenue School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.151
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$1.024

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	23,476	21,650	1,826
Heating Boiler Fuel Cost	$ 24,050	$ 22,179	**$ 1,871**

CALCULATIONS

Forest Elementary School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.152
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$1.131

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	12,487	11,516	971
Heating Boiler Fuel Cost	$ 14,121	$ 13,023	**$ 1,098**

CALCULATIONS

Verona High School- Replace Boilers with Higher Efficiency Boilers

1. Price of #2 Fuel Oil, $/gal	
2. Price of City Water, $/1000 gallons	
3. Price of Electricity, $/kWh (blended rate)	$0.170
4. Price of the Demand of Electricity, $/kW/month	
5. Price of Natural Gas, $/therm	$0.950

	Existing Condition	Proposed System	Savings
Heating Boiler Fuel Consumption, therms	49,583	45,726	3,856
Heating Boiler Fuel Cost	$ 47,123	$ 43,458	**$ 3,665**

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RENEWABLES CALCULATIONS

VERONA SCHOOL DISTRICT
(ALL SCHOOLS)
PV SYSTEM SIZING

Building	BROOKDALE AVENUE ELEMENTARY SCHOOL	LANING AVENUE ELEMENTARY SCHOOL	F.N. BROWN ELEMENTARY SCHOOL	FOREST AVENUE ELEMENTARY SCHOOL	H.B. WHITEHORNE MIDDLE SCHOOL	VERONA HIGH SCHOOL	TOTALS
Site Energy Use (kWh):	329,200	329,200	329,200	329,200	329,200	329,200	1,975,200 kw dc
Location to Install Panels:	roof	roof	roof	roof	roof	roof	roof
Assumptions							
System Capacity, kw-dc (maximum utilization of roof space)	40 kw dc	127 kw dc	39 kw dc	61 kw dc	104 kw dc	309 kw dc	681 kw dc
Annual Electric Generation, kwhrs of AC electricity produced	42,666 kwh	134,058 kwh	41,454 kwh	63,999 kwh	109,695 kwh	325,449 kwh	717,321 kw dc
Total Annual Facility Electric Use, kwhrs	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	329,200 kwh	1,975,200 kw dc
% of Total Annual Usage	13%	41%	13%	19%	33%	99%	36%
All-In Cost of Electric Year 1	$0.155 / kwh	$0.151 / kwh	$0.172 / kwh	$0.152 / kwh	$0.154 / kwh	$0.170 / kwh	$0.159 / kwh
Annual Electric Cost Savings	$6,605	$20,247	$7,122	$9,705	$16,923	$55,316	115,917 kw dc
Estimated SREC Value (Year 1):	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC	$100 / SREC
Estimated Year 1 SREC Revenue:	$4,247	$13,343	$4,126	$6,370	$10,918	$32,392	71,395 kw dc
Environmental Impact							
Equivalent Annual CO2 Emission Reduction (tons per year)[1]	14 tons/yr	44 tons/yr	14 tons/yr	21 tons/yr	36 tons/yr	107 tons/yr	237 tons/yr
Equivalent Cars Removed From Road Annually[2]	2	8	2	4	6	19	7
Equivalent Acres of Trees Planted Annually[3]	4	12	4	6	10	29	65
Financial Results							
System Installed Cost	$222,640	$699,545	$216,315	$333,960	$572,413	$1,698,263	$3,743,135
Simple Payback	20.0	20.4	18.2	20.3	20.0	18.3	19.5
IRR (25 Years)	1.7%	1.5%	2.4%	1.5%	1.7%	2.4%	1.9%
Net Present Value (25 yrs, 4% discount rate)	($47,364)	($158,731)	($32,275)	($75,003)	($122,938)	($265,040)	($701,350)

1. Estimated CO2 Emissions Rate: 0.66 lbs/kWh
2. EPA Estimate: 11,560 lbs CO2 per car
3. EPA Estimate: 7,333 lbs CO2 per acre of trees planted

Wind Turbine Economics

	Building Integrated	Ground Mount 5 kW	Ground Mount 50 kW
Gross Installation Cost Estimate	$325,000	$312,000	$250,000
Number of Units	50	10	1
Net Installation Cost Estimate	$325,000	$312,000	$250,000
Annual Energy Savings	$6,308	$9,956	$18,780
Simple Payback	51.5 yrs.	31.3 yrs.	13.3 yrs.
System Capacity	50 kW	52 kW	50 kW
Annual Avoided Energy Use	37,108 kWh	58,567 kWh	110,472 kWh
Annual CO2 Emisions, tons	13	20	39
% of Annual Electric Use*	4.6%	7.3%	13.8%

Verona High School: 798,601 kWh / year annual consumption

APPENDIX 2 ECM CALCULATIONS

Category		Energy Savings	Operational Savings	Reason for Savings
			Operational Savings have been detailed and agreed to with the School District -	**Back Up Data is available through the Business Administrator.**
Eletrical and Thermal Savings		$194,169		ECM's detailed within / Energy Calculation Details Follow
LED Lighting			$28,519	Based on Bulb Life of 100000 hours, bulb replacement on an annual basis will be almost non existant. No ballast is required for LED and therefore non will need to be replaced. Back Up Data is available through the Business Administrator.
Controls /Building Management System Replacment			$5,000	The school district handle the majorit of repairs iwith in-house personel. Costs for materials associted with these repairs are significant. Back Up Data is available through the Business Administrator.
Mechanical			$5,000	The school district handle the majority of repairs with in-house personel. Costs for materials associted with these repairs are significant. Back Up Data is available through the Business Administrator.
Total		**$194,169**	**$38,519**	**$232,688**

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Verona Public Schools
Exhibit D
ECM 1A - Lighting Upgrades (Includes Drop Down Ceiling Installation at the HS)
Lighting Upgrade and Heating Penalty

ECM DESCRIPTION

Retrofit existing lighting fixtures with new energy efficient lighting fixtures, install motion sensors and implement daylight harvesting in selected areas

DATA / ASSUMPTIONS

* Heating Season	20	Weeks
** Fraction of heat to be made-up	40.0%	
Heating Hours (Weather Data)	3,863	Hours

** Fraction of the Year Representing the Cooling Season Liberal estimate of the heating season, as there are times during the year when the building is neither heated nor cooled.
*** Fraction of the Lighting Reduction that Has to Be Made Up by Heating a portion of the lighting heat is released at night plus interior zones will have limited heating loads

MEASUREMENT AND VERIFICATION

Option
A - The
Enginee

COMMISSIONING

Confirm lighting operation and occupancy sensors functions

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Relatively high safety factor is used for this ECM because of direct measurements are proven over the time and savings are stipulated

CALCULATIONS

Detailed energy savings calculations are in the line-by-line calculation sheet

*Inputs are blue

Building	Lighting Savings (kWh)	Lighting Savings (kW)	Hours
Laning Avenue Elementary School	58,167	29.44	1,975.78
Brookdale Avenue Elementary School	41,252	21.68	1,902.77
F.N. Brown Elementary School	46,923	24.62	1,905.89
Forest Avenue Elementary School	33,182	16.21	2,047.01
H.B. Whitehorne Middle School	166,648	68.21	2,443.16
Verona High School	192,961	81.20	2,376.37
Totals	539,133	241	2,234

CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Lighting Derate	0%	0%	0%	0%	0%	0%
Lighting Savings	58,167	41,252	46,923	33,182	166,648	192,961
kW Savings	29	22	25	16	68	81
Heating Season	20	20	20	20	20	20
** % of Heating Season	38%	38%	38%	38%	38%	38%
***Fraction of Heat to be Made-up	40%	40%	40%	40%	40%	40%
****Annual Equivalent of Lighting kWh Saved in Therms	1,985	1,408	1,601	1,132	5,686	6,584
Current Boiler Efficiency	76.0%	76.0%	73.6%	76.0%	73.6%	76.0%
Heating Penalty (Therms)	(402)	(285)	(335)	(229)	(1,188)	(1,333)

Verona Public Schools
Exhibit D
ECM 1B - Lighting Controls and Daylight Harvesting
Lighting Controls and Heating Penalty

ECM DESCRIPTION

Retrofit existing lighting fixtures with new energy efficient lighting fixtures, install motion sensors and implement daylight harvesting in selected areas

DATA / ASSUMPTIONS

* Heating Season	20	Weeks
** Fraction of heat to be made-up	40.0%	
Heating Hours (Weather Data)	3,863	Hours

** Fraction of the Year Representing the Cooling Season Liberal estimate of the heating season, as there are times during the year when the building is neither heated nor cooled.
*** Fraction of the Lighting Reduction that Has to Be Made Up by Heating a portion of the lighting heat is released at night plus interior zones will have limited heating loads

MEASUREMENT AND VERIFICATION

Option
A - The
Engine

COMMISSIONING

Confirm lighting operation and occupancy sensors functions

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Relatively high safety factor is used for this ECM because of direct measurements are proven over the time and savings are stipulated

Verona Public Schools
Exhibit D
ECM 1B - Lighting Controls and Daylight Harvesting
Lighting Controls and Heating Penalty
CALCULATIONS

Detailed energy savings calculations are in the line-by-line calculation sheet

*Inputs are blue

Building	Lighting Controls Savings (kWh)
Brookdale Avenue Elementary School	4,157
F.N. Brown Elementary School	7,671
Forest Avenue Elementary School	5,681
Laning Avenue Elementary School	6,783
Verona High School	40,409
H.B. Whitehorne Middle School	14,024
Totals	78,725

CALCULATIONS

	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	Laning Avenue Elementary School	Verona High School	H.B. Whitehorne Middle School
Lighting Safety Factor	0%	0%	0%	0%	0%	0%
Lighting Savings	4,157	7,671	5,681	6,783	40,409	14,024
Heating Season	20	20	20	20	20	20
** % of Heating Season	38%	38%	38%	38%	38%	38%
***Fraction of Heat to be Made-up	40%	40%	40%	40%	40%	40%
****Annual Equivalent of Lighting kWh Saved in Therms	142	262	194	231	1,379	478
Current Boiler Efficiency	76.0%	73.6%	76.0%	76.0%	76.0%	73.6%
Heating Penalty	(29)	(55)	(39)	(47)	(279)	(100)

Verona Public Schools
Lighting Line By Line

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Brookdale Elementary	1	2	Office S G I - 2	2444T8DS	LT44-15W	2	2	0.1160	0.0600	2x4, 4-Lamp T8 4', DS	(4) LED Lamp, 15w, 4'	70	120	TRUE	3	2,600	0.22	0.11	0.11	573	296	277
Verona Public Schools NJ	Brookdale Elementary	2	2	Storage S G I	2434T8	NR	1	1	0.0850	0.0850	2x4, 3-Lamp, T8	will Not be Retrofit	55	120	FALSE	7	520	0.08	0.08	-	42	42	-
Verona Public Schools NJ	Brookdale Elementary	3	2	CLASSROOM, S G I - 3	2434T8DS	LT34-15W	6	6	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	70	120	TRUE	25	1,520	0.51	0.26	0.26	780	390	390
Verona Public Schools NJ	Brookdale Elementary	4	2	Corridor S G I	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Brookdale Elementary	5	2	Corridor S G I	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Brookdale Elementary	6	2	Corridor S G I	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Brookdale Elementary	7	2	Classroom 9	2434T8DS	LT34-15W	11	11	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	70	120	TRUE	25	1,520	0.94	0.47	0.47	1,430	715	715
Verona Public Schools NJ	Brookdale Elementary	8	2	Classroom 8	2434T8DS	LT34-15W	10	10	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	70	120	TRUE	25	1,520	0.86	0.43	0.43	1,300	650	650
Verona Public Schools NJ	Brookdale Elementary	9	2	Bathroom, Boys	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	10	2	Bathroom, Boys	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	11	2	Bathroom, Boys	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	29	120	TRUE	15	2,280	0.03	0.01	0.02	69	32	37
Verona Public Schools NJ	Brookdale Elementary	12	2	Closet, Janitor	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	40	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Brookdale Elementary	13	2	Corridor By Elevator	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	Brookdale Elementary	14	2	Corridor By Elevator	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	15	2	Corridor By Elevator	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	16	2	Corridor By Elevator	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Brookdale Elementary	17	2	Classroom 7	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	77	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Brookdale Elementary	18	2	Closet, 7	1444T8	NR	1	1	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit	50	120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	Brookdale Elementary	19	2	Classroom 6	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	77	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Brookdale Elementary	20	2	Closet, 6	1444T8	NR	1	1	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit	50	120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	Brookdale Elementary	21	2	Storage	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Brookdale Elementary	22	2	Classroom 5	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	77	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Brookdale Elementary	23	2	Closet, 5	1444T8	NR	1	1	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit	50	120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	Brookdale Elementary	24	2	Classroom 5	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	77	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Brookdale Elementary	25	2	Closet, 4	1444T8	NR	1	1	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit	50	120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	Brookdale Elementary	26	2	Bathroom, Girls	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	27	2	Bathroom, Girls	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	28	2	Copy Room	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	60	120	TRUE	12	2,640	0.11	0.06	0.05	281	150	130
Verona Public Schools NJ	Brookdale Elementary	29	2	Hallway, Cr 7 To 4	2424T8	LT24-15W	5	5	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.28	0.14	0.13	727	376	351
Verona Public Schools NJ	Brookdale Elementary	30	2	Hallway, Cr 7 To 4	2424T8BB	LT24-15W-BB	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281
Verona Public Schools NJ	Brookdale Elementary	31	2	Hallway, Cr 7 To 4	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	32	SW	Stairs, Cr 8 To Café	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Brookdale Elementary	33	SW	Stairs, Cr 8 To Café	1424T8BB	LT24-15W-BB	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281
Verona Public Schools NJ	Brookdale Elementary	34	SW	Stairs, Cr 8 To Café	1424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	35	SW	Stairs, Cr 7 To Boiler	1424T8	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	27	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281
Verona Public Schools NJ	Brookdale Elementary	36	SW	Stairs, Cr 7 To Boiler	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	27	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	37	SW	Stairs, Cr 4 To Art Room	1424T8	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	27	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Brookdale Elementary	38	SW	Stairs, Cr 4 To Art Room	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	27	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	39	1	Media Center, Entry	222UT8BB	LT22K22-BB-PB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	37	120	TRUE	25	1,520	0.06	0.02	0.04	84	23	61
Verona Public Schools NJ	Brookdale Elementary	40	1	Media Center, Desk	222UT8	LT22K22-8W-PB	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	37	120	TRUE	25	1,520	0.11	0.03	0.08	168	46	121
Verona Public Schools NJ	Brookdale Elementary	41	1	Media Center, Desk	PL26	NR	2	2	0.0280	0.0280	CF PL 26w	will Not be Retrofit	27	120	FALSE	25	1,520	0.05	0.05	-	81	81	-
Verona Public Schools NJ	Brookdale Elementary	42	1	Media Center	1864T8	LT44K18-15W	5	5	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	90	120	TRUE	25	1,520	0.81	0.29	0.52	1,227	433	794
Verona Public Schools NJ	Brookdale Elementary	43	1	Media Center	11294T8	LT94-15W	2	2	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	90	120	TRUE	25	1,520	0.48	0.26	0.23	736	390	347
Verona Public Schools NJ	Brookdale Elementary	44	1	Media Center	PL26	NR	5	5	0.0280	0.0280	CF PL 26w	will Not be Retrofit	26	120	FALSE	25	1,520	0.13	0.13	-	202	202	-
Verona Public Schools NJ	Brookdale Elementary	45	1	Media Center	PL42	NR	1	1	0.0420	0.0420	CF PL 42w	will Not be Retrofit	45	120	FALSE	25	1,520	0.04	0.04	-	61	61	-
Verona Public Schools NJ	Brookdale Elementary	46	1	Closet, M D F	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Brookdale Elementary	47	1	Computer Lab	1864T8	LT44K18-15W	2	2	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	90	120	TRUE	25	1,520	0.32	0.11	0.21	491	173	318
Verona Public Schools NJ	Brookdale Elementary	48	1	Computer Lab	11294T8	LT94-15W	2	2	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	90	120	TRUE	25	1,520	0.48	0.26	0.23	736	390	347
Verona Public Schools NJ	Brookdale Elementary	49	1	Media Center	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Brookdale Elementary	50	1	Office, Media Center	2434T8	LT34-15W	2	2	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	60	120	TRUE	3	2,600	0.16	0.09	0.08	420	222	198
Verona Public Schools NJ	Brookdale Elementary	51	1	Bathroom, Girls	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	52	1	Bathroom, Girls	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	53	1	Bathroom, Girls	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	29	120	TRUE	15	2,280	0.03	0.01	0.02	69	32	37
Verona Public Schools NJ	Brookdale Elementary	54	1	Corridor By Elevator	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	Brookdale Elementary	55	1	Corridor By Elevator	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	56	1	Corridor By Elevator	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	57	1	Corridor By Elevator	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	58	1	Bathroom, Boys	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	59	1	Bathroom, Boys	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	60	1	Bathroom, Boys	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	29	120	TRUE	15	2,280	0.03	0.01	0.02	69	32	37
Verona Public Schools NJ	Brookdale Elementary	61	1	Closet, Janitor	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	40	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Brookdale Elementary	62	1	Classroom 3	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	95	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Brookdale Elementary	63	1	Closet, 3	1444T8	NR	1	1	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit	50	120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	Brookdale Elementary	64	1	Office, Nurse	222UT8	LT22K22-8W-PB	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	54	120	TRUE	3	2,600	0.33	0.09	0.24	860	237	622
Verona Public Schools NJ	Brookdale Elementary	65	1	Office, Nurse	222UT8BB	LT22K22-BB-PB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	54	120	TRUE	3	2,600	0.06	0.02	0.04	143	40	104
Verona Public Schools NJ	Brookdale Elementary	66	1	Bathroom, Nurse	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	67	1	Main Office	222UT8	LT22K22-8W-PB	5	5	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	54	120	TRUE	3	2,600	0.28	0.08	0.20	716	198	519
Verona Public Schools NJ	Brookdale Elementary	68	1	Main Office	222UT8BB	LT22K22-BB-PB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	54	120	TRUE	3	2,600	0.06	0.02	0.04	143	40	104
Verona Public Schools NJ	Brookdale Elementary	69	1	Office, Principal	222UT8	LT22K22-8W-PB	4	4	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	54	120	TRUE	3	2,600	0.22	0.06	0.16	573	158	415
Verona Public Schools NJ	Brookdale Elementary	70	1	Main Entry	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	71	1	Classroom 2	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	95	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Brookdale Elementary	72	1	Classroom 1	1884T8	LT44K18-15W	7	7	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	95	120	TRUE	25	1,520	1.49	0.40	1.09	2,264	606	1,658
Verona Public Schools NJ	Brookdale Elementary	73	1	Closet, 1	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	39	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Brookdale Elementary	74	1	Bathroom, 1	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	75	1	Workroom, Teacher	2434T8DS	LT34-15W	3	3	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'		120	TRUE	12	2,640	0.26	0.13	0.13	677	339	339
Verona Public Schools NJ	Brookdale Elementary	76	1	Bathroom, Faculty	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Brookdale Elementary	77	1	Faculty Lounge	2424T8	LT24-15W	6	6	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	40	120	TRUE	12	2,640	0.33	0.17	0.16	873	451	421
Verona Public Schools NJ	Brookdale Elementary	78	1	Hallway, Cr 3 To 1	2424T8	LT24-15W	5	5	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	31	120	TRUE	12	2,640	0.28	0.14	0.13	727	376	351
Verona Public Schools NJ	Brookdale Elementary	79	1	Hallway, Cr 3 To 1	2424T8BB	LT24-15W-BB	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	31	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281
Verona Public Schools NJ	Brookdale Elementary	80	1	Hallway, Cr 3 To 1	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	81	1	Hallway, Cr 3 To 1	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Brookdale Elementary	82	B	Storage, Basement	2424T8	NR	3	3	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	43	120	FALSE	7	520	0.17	0.17	-	86	86	-
Verona Public Schools NJ	Brookdale Elementary	83	B	Classroom Kinderg.	1884T8	LT44K18-15W	8	8	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	90	120	TRUE	25	1,520	1.70	0.46	1.25	2,588	693	1,895
Verona Public Schools NJ	Brookdale Elementary	84	B	Classroom Kinderg.	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.11	0.06	0.05	162	87	75
Verona Public Schools NJ	Brookdale Elementary	85	B	Bathroom, Kinderg.	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	86	B	Storage, Kinderg.	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	43	120	TRUE	13	2,200	0.17	0.09	0.08	364	188	176
Verona Public Schools NJ	Brookdale Elementary	87	B	Hallway By Kinderg.	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	40	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	Brookdale Elementary	88	B	Hallway By Kinderg.	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	89	B	Stage	1434T8	LT34-15W	7	7	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	28	120	TRUE	28	1,520	0.57	0.30	0.27	859	455	404
Verona Public Schools NJ	Brookdale Elementary	90	B	Stage	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	28	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	Brookdale Elementary	91	B	Gymnasium	M250	LEDHB100-IBL	21	21	0.2950	0.1000	MH 250w	LED 100w High Bay with Bi-level Sensor	25	120	TRUE	27	1,900	5.89	2.00	3.89	11,182	3,791	7,391
Verona Public Schools NJ	Brookdale Elementary	92	B	Gymnasium	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	Brookdale Elementary	93	B	Bathroom, Boys	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	94	B	Bathroom, Boys	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	29	120	TRUE	15	2,280	0.03	0.01	0.02	69	32	37
Verona Public Schools NJ	Brookdale Elementary	95	B	Bathroom, Boys	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	96	B	Closet, Bathroom	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	40	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Brookdale Elementary	97	B	Cafeteria	222UT8	LT22K22-8W	16	16	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	48	120	TRUE	26	1,520	0.88	0.24	0.64	1,340	370	970
Verona Public Schools NJ	Brookdale Elementary	98	B	Cafeteria	222UT8BB	LT22K22-BB	4	4	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	48	120	TRUE	26	1,520	0.22	0.06	0.16	335	92	243
Verona Public Schools NJ	Brookdale Elementary	99	B	Cafeteria	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	100	B	Kitchen	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	26	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	Brookdale Elementary	101	B	Bathroom, Girls	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	102	B	Bathroom, Girls	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	103	B	Bathroom, Girls	1824T8	LT24-15W	1	1	0.0580	0.0300	1x8, 2-Lamp T8 4'	LED Lamp, (2) 15w	29	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Brookdale Elementary	104	B	Closet, Janitor	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Brookdale Elementary	105	B	Lobby To Outside	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	43	120	TRUE	12	2,640	0.06	0.02	0.04	145	40	105
Verona Public Schools NJ	Brookdale Elementary	106	B	Lobby To Outside	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	48	120	TRUE	12	2,640	0.06	0.02	0.04	145	40	105
Verona Public Schools NJ	Brookdale Elementary	107	B	Lobby To Outside	222UT8	LT22K22-8W	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	48	120	TRUE	12	2,640	0.11	0.03	0.08	291	80	211
Verona Public Schools NJ	Brookdale Elementary	108	B	Lobby To Outside	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	48	120	TRUE	12	2,640	0.06	0.02	0.04	145	40	105
Verona Public Schools NJ	Brookdale Elementary	109	B	Lobby To Outside	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Brookdale Elementary	110	B	Lobby To Outside	1313	LT13-13W	2	2	0.0410	0.0130	1x3, 1-Lamp	(1) 3' LED Lamps		120	TRUE	12	2,640	0.08	0.02	0.05	206	65	140
Verona Public Schools NJ	Brookdale Elementary	111	B	Closet, Elevator 102	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	45	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Brookdale Elementary	112	B	Corridor Ramp	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	113	B	Corridor Ramp	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	114	B	Corridor Ramp	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Brookdale Elementary	115	B	Boiler Room	1434T8	LT34-15W	3	3	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	13	120	TRUE	3	2,600	0.24	0.13	0.11	630	333	296

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Brookdale Elementary	116	B	Ramp	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	27	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Brookdale Elementary	117	B	Office, Custodian	1434T8	LT34-15W	3	3	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	31	120	TRUE	3	2,600	0.24	0.13	0.11	630	333	296
Verona Public Schools NJ	Brookdale Elementary	118	B	Closet, Electrical	1434T8	LT34-15W	1	1	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	31	120	TRUE	13	2,200	0.08	0.04	0.04	178	94	84
Verona Public Schools NJ	Brookdale Elementary	119	B	Classroom, Music	2434T8DS	LT34-15W	9	9	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	60	120	TRUE	25	1,520	0.77	0.38	0.38	1,170	585	585
Verona Public Schools NJ	Brookdale Elementary	120	B	Storage, Music	1424T8	NR	3	3	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	28	120	FALSE	7	520	0.17	0.17	-	86	86	-
Verona Public Schools NJ	Brookdale Elementary	121	B	Storage, Pine Oil	2424T8	NR	2	2	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	39	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Brookdale Elementary	122	B	Classroom, S G I - 1	2434T8DS	LT34-15W	3	3	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.26	0.13	0.13	390	195	195
Verona Public Schools NJ	Brookdale Elementary	123	B	Storage, Art	2434T8DS	NR	4	4	0.0900	0.0900	2x4, 3-Lamp T8, DS	will Not be Retrofit	43	120	FALSE	7	520	0.34	0.34	-	178	178	-
Verona Public Schools NJ	Brookdale Elementary	124	B	Classroom, Art	2434T8DS	LT34-15W	12	12	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	60	120	TRUE	25	1,520	1.03	0.51	0.51	1,560	780	780
Verona Public Schools NJ	Brookdale Elementary	125	B	Closet, Art	2424T8	NR	2	2	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Brookdale Elementary	126	B	Hallway, Boiler To Art	2424T8	LT24-15W	7	7	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.39	0.20	0.19	1,018	527	492
Verona Public Schools NJ	Brookdale Elementary	127	B	Hallway, Boiler To Art	2424T8BB	LT24-15W-BB	5	5	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	12	2,640	0.28	0.14	0.13	727	376	351
Verona Public Schools NJ	Brookdale Elementary	128	B	Hallway, Boiler To Art	K-LED	NR	5	5	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	166	166	-
Verona Public Schools NJ	Brookdale Elementary	129	Ext	Main Entry	CFL32	L19A	1	1	0.0320	0.0190	CFL 32w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.03	0.02	0.01	133	79	54
Verona Public Schools NJ	Brookdale Elementary	130	Ext	Side Door	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Brookdale Elementary	131	Ext	Lobby Door	PL26	NR	1	1	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	10	4,380	0.03	0.03	-	117	117	-
Verona Public Schools NJ	Brookdale Elementary	132	Ext	High On Walls	M100	LED46MWPFCO-DECO-HI	6	6	0.1300	0.0460	MH 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.74	0.26	0.48	3,246	1,148	2,097
Verona Public Schools NJ	Brookdale Elementary	133	Ext	Low On Walls	M100	LED46MWPFCO-DECO	1	1	0.1300	0.0460	MH 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.12	0.04	0.08	541	191	350
Verona Public Schools NJ	Brookdale Elementary	134	Ext	Playground Side Wall 7'	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Brookdale Elementary	135	Ext	Playground Side Wall 10'	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	FN Brown Elementary	1	2	Bathroom, Girls	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	FN Brown Elementary	2	2	Bathroom, Girls	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	FN Brown Elementary	3	2	Bathroom, Girls	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	30	120	TRUE	15	2,280	0.03	0.01	0.02	69	32	37
Verona Public Schools NJ	FN Brown Elementary	4	2	Stair Landing Fl 2	2444T8	LT24K24-15W	2	2	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	60	120	TRUE	12	2,640	0.21	0.06	0.16	562	150	411
Verona Public Schools NJ	FN Brown Elementary	5	2	Stair Landing Fl 2	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	6	2	Classroom 17	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	67	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	FN Brown Elementary	7	2	Closet, 17	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	8	2	Classroom 15	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	67	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	FN Brown Elementary	9	2	Closet, 15	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	10	2	Classroom 13	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	67	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	FN Brown Elementary	11	2	Closet, 13	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	12	2	Office, Speech	2444T8	LT44-15W	2	2	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	65	120	TRUE	3	2,600	0.21	0.11	0.10	553	296	257
Verona Public Schools NJ	FN Brown Elementary	13	2	Classroom 11	2434T8	LT34-15W	15	15	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	67	120	TRUE	25	1,520	1.21	0.64	0.57	1,841	975	866
Verona Public Schools NJ	FN Brown Elementary	14	2	Closet, 11	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	FN Brown Elementary	15	2	Classroom 10, S G I	223UDS	LT32K22-8W	9	9	0.1156	0.0240	2x2, 3-Lamp U	(3) 2' LED Lamps, Bracket Kit	83	120	TRUE	25	1,520	0.99	0.21	0.78	1,502	312	1,190
Verona Public Schools NJ	FN Brown Elementary	16	2	Bathroom, Boys	222UT8	LT22K22-8W	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.11	0.03	0.08	251	69	182
Verona Public Schools NJ	FN Brown Elementary	17	2	Bathroom, Boys	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	FN Brown Elementary	18	2	Closet, Mop	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line	9	120	TRUE	13	2,200	0.01	0.01	0.00	27	17	10
Verona Public Schools NJ	FN Brown Elementary	19	A	Attic	I60	L08A	5	5	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	7	520	0.29	0.04	0.25	148	20	128

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	FN Brown Elementary	20	2	Classroom Art	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	67	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	FN Brown Elementary	21	2	Closet, Art	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	22	2	Classroom 14	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	67	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	FN Brown Elementary	23	2	Closet, 14	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	24	2	Classroom 16	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	67	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	FN Brown Elementary	25	2	Classroom 16	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	25	1,520	0.06	0.03	0.03	84	43	40
Verona Public Schools NJ	FN Brown Elementary	26	2	Hallway, Floor 2	2444T8	LT24K24-15W	8	8	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit		120	TRUE	12	2,640	0.85	0.23	0.62	2,247	602	1,645
Verona Public Schools NJ	FN Brown Elementary	27	2	Hallway, Floor 2	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit	31	120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	FN Brown Elementary	28	2	Hallway, Floor 2	I60	L08A	1	1	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	12	2,640	0.06	0.01	0.05	150	20	130
Verona Public Schools NJ	FN Brown Elementary	29	SW	Stairs, Rm 10 To Boiler	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	20	120	TRUE	12	2,640	0.11	0.06	0.05	281	150	130
Verona Public Schools NJ	FN Brown Elementary	30	SW	Stairs, Rm 10 To Boiler	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	20	120	TRUE	12	2,640	0.11	0.06	0.05	281	150	130
Verona Public Schools NJ	FN Brown Elementary	31	SW	Stairs, Rm 10 To Boiler	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	FN Brown Elementary	32	SW	Stairs, Rm 10 To Boiler	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	33	SW	Stairs, Gym To Cr 17	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	FN Brown Elementary	34	SW	Stairs, Gym To Cr 17	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	35	SW	Stairs, Gym To Cr 17	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	20	120	TRUE	12	2,640	0.11	0.06	0.05	281	150	130
Verona Public Schools NJ	FN Brown Elementary	36	SW	Stairs, Gym To Cr 17	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	FN Brown Elementary	37	SW	Stairs, Gym To Cr 17	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	38	1	Classroom 7	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	FN Brown Elementary	39	1	Closet, 7	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	40	1	Corridor, Faculty Room	222UT8	LT22K22-8W	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	44	120	TRUE	12	2,640	0.11	0.03	0.08	291	80	211
Verona Public Schools NJ	FN Brown Elementary	41	1	Bathroom, Faculty	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	42	1	Faculty Lounge	2424T8	LT24-15W	5	5	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	12	2,640	0.28	0.14	0.13	727	376	351
Verona Public Schools NJ	FN Brown Elementary	43	1	Faculty Lounge	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	44	1	Faculty Lounge	VEND-CD	NR	1	1	0.3390	0.3390	Cold Drink Machine	will Not be Retrofit		120	FALSE	1	8,760	0.32	0.32	-	2,821	2,821	-
Verona Public Schools NJ	FN Brown Elementary	45	1	Computer Lab, 3	2434T8DS	LT34-15W-PB	11	11	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.94	0.47	0.47	1,430	715	715
Verona Public Schools NJ	FN Brown Elementary	46	1	Computer Lab, 3	2434T8DSBB	LT34-BB-PB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.09	0.04	0.04	130	65	65
Verona Public Schools NJ	FN Brown Elementary	47	1	Closet, 3	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	FN Brown Elementary	48	1	Library, Main Floor	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	44	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	FN Brown Elementary	49	1	Library, Main Floor	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	50	1	Library, Book Stacks	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	33	120	TRUE	25	1,520	0.11	0.06	0.05	162	87	75
Verona Public Schools NJ	FN Brown Elementary	51	1	Library, Bathroom	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	52	1	Library, Storage	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	FN Brown Elementary	53	1	Library, Office	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	33	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	FN Brown Elementary	54	1	Library, Stairs	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	55	1	Office, Copy 1 A	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	33	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	FN Brown Elementary	56	1	Bathroom, Boys	222UT8	LT22K22-8W	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.11	0.03	0.08	251	69	182
Verona Public Schools NJ	FN Brown Elementary	57	1	Bathroom, Boys	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	FN Brown Elementary	58	1	Closet, Mop	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line	9	120	TRUE	13	2,200	0.01	0.01	0.00	27	17	10

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	FN Brown Elementary	59	1	Office, Nurse	223U	LT32K22-8W-PB	4	4	0.1156	0.0240	2x2, 3-Lamp U	(3) 2' LED Lamps, Bracket Kit	57	120	TRUE	3	2,600	0.44	0.09	0.35	1,142	237	905
Verona Public Schools NJ	FN Brown Elementary	60	1	Office, Nurse	223UBB	LT32K22-BB-PB	1	1	0.1156	0.0240	2x2, 3-Lamp U	(3) 2' LED Lamps, Bracket Kit	57	120	TRUE	3	2,600	0.11	0.02	0.09	286	59	226
Verona Public Schools NJ	FN Brown Elementary	61	1	Office, Nurse	222UT8	LT22K22-8W	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	67	120	TRUE	3	2,600	0.33	0.09	0.24	860	237	622
Verona Public Schools NJ	FN Brown Elementary	62	1	Bathroom, Nurse	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	37	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	63	1	Main Office	2434T8DS	LT34-15W-PB	3	3	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	48	120	TRUE	3	2,600	0.26	0.13	0.13	667	333	333
Verona Public Schools NJ	FN Brown Elementary	64	1	Main Office	2434T8DSBB	LT34-BB-PB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	48	120	TRUE	3	2,600	0.09	0.04	0.04	222	111	111
Verona Public Schools NJ	FN Brown Elementary	65	1	Main Office	223U	LT32K22-8W-PB	2	2	0.1156	0.0240	2x2, 3-Lamp U	(3) 2' LED Lamps, Bracket Kit	57	120	TRUE	3	2,600	0.22	0.05	0.17	571	119	453
Verona Public Schools NJ	FN Brown Elementary	66	1	Main Office	PL26	NR	3	3	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	13	2,200	0.08	0.08	-	176	176	-
Verona Public Schools NJ	FN Brown Elementary	67	1	Conference Room	2434T8DS	LT34-15W-PB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	48	120	TRUE	25	1,520	0.09	0.04	0.04	130	65	65
Verona Public Schools NJ	FN Brown Elementary	68	1	Conference Room	2434T8DSBB	LT34-BB-PB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	48	120	TRUE	25	1,520	0.09	0.04	0.04	130	65	65
Verona Public Schools NJ	FN Brown Elementary	69	1	Office, Principal	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	48	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	FN Brown Elementary	70	1	Foyer, Main Entry	I4X15	L4X8A	1	1	0.0600	0.0320	Inc (4) 15w	(4) LED Lamp, 8w A-Line		120	TRUE	12	2,640	0.06	0.03	0.03	150	80	70
Verona Public Schools NJ	FN Brown Elementary	71	1	Office, Psych	223UDS	LT32K22-8W	4	4	0.1156	0.0240	2x2, 3-Lamp U	(3) 2' LED Lamps, Bracket Kit	64	120	TRUE	3	2,600	0.44	0.09	0.35	1,142	237	905
Verona Public Schools NJ	FN Brown Elementary	72	1	Office, Psych	223UDSBB	LT32K22-BB	1	1	0.1156	0.0240	2x2, 3-Lamp U	(3) 2' LED Lamps, Bracket Kit	64	120	TRUE	3	2,600	0.11	0.02	0.09	286	59	226
Verona Public Schools NJ	FN Brown Elementary	73	1	Classroom 6	1844T8	LT44-15W	6	6	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	25	1,520	0.64	0.34	0.30	970	520	451
Verona Public Schools NJ	FN Brown Elementary	74	1	Closet, 6	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	75	1	Bathroom, Girls	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	FN Brown Elementary	76	1	Bathroom, Girls	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	FN Brown Elementary	77	1	Bathroom, Girls	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	30	120	TRUE	15	2,280	0.03	0.01	0.02	69	32	37
Verona Public Schools NJ	FN Brown Elementary	78	1	Hallway, Floor 1	2444T8	LT24K24-15W	8	8	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit		120	TRUE	12	2,640	0.85	0.23	0.62	2,247	602	1,645
Verona Public Schools NJ	FN Brown Elementary	79	1	Hallway, Floor 1	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit	31	120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	FN Brown Elementary	80	1	Hallway, Floor 1	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit	31	120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	81	1	Hallway, Floor 1	I60	L08A	3	3	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	12	2,640	0.17	0.02	0.15	451	60	391
Verona Public Schools NJ	FN Brown Elementary	82	1	Stair Landing Fl 1	2444T8	LT24K24-15W	3	3	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	60	120	TRUE	12	2,640	0.32	0.09	0.23	843	226	617
Verona Public Schools NJ	FN Brown Elementary	83	1	Stair Landing Fl 1	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	84	1	Lobby, Auditorium	I4X15	L4X8A	3	3	0.0600	0.0320	Inc (4) 15w	(4) LED Lamp, 8w A-Line		120	TRUE	25	1,520	0.17	0.09	0.08	260	139	121
Verona Public Schools NJ	FN Brown Elementary	85	1	Lobby, Auditorium	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	FN Brown Elementary	86	1	Work Room;	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	23	120	TRUE	12	2,640	0.03	0.01	0.02	80	38	43
Verona Public Schools NJ	FN Brown Elementary	87	1	Auditorium	CFL8X32	L8X8A	6	6	0.2560	0.0640	(8) CFL 32w	(8) LED Lamp, 8w A-Line	7	120	TRUE	28	1,520	1.46	0.36	1.09	2,218	554	1,663
Verona Public Schools NJ	FN Brown Elementary	88	1	Auditorium	CFL4X32	L4X8A	2	2	0.1280	0.0320	(4) CFL 32w	(4) LED Lamp, 8w A-Line	7	120	TRUE	28	1,520	0.24	0.06	0.18	370	92	277
Verona Public Schools NJ	FN Brown Elementary	89	1	Auditorium	K-LED	NR	5	5	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	166	166	-
Verona Public Schools NJ	FN Brown Elementary	90	SW	Stairs, Aud To Gym Left	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	18	120	TRUE	1	8,760	0.17	0.09	0.08	1,448	749	699
Verona Public Schools NJ	FN Brown Elementary	91	SW	Stairs, Aud To Gym Left	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	92	SW	Storage, Teacher Stair Left	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	93	1	Corridor, Music Ofc	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	FN Brown Elementary	94	1	Corridor, Music Ofc	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	FN Brown Elementary	95	1	Mechanical Room 1	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	96	1	Mechanical Room 2	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	97	1	Office, Music	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	3	2,600	0.06	0.03	0.03	143	74	69

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	FN Brown Elementary	98	SW	Stairs, Aud To Gym Right	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	18	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	FN Brown Elementary	99	SW	Stairs, Aud To Gym Right	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	100	SW	Storage, Teacher Stair Right	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	101	SW	Storage, Teacher Stair Right	1844T8	NR	1	1	0.1120	0.1120	1x8, 4-Lamp T8 4'	will Not be Retrofit	18	120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	FN Brown Elementary	102	1	Stage	CFL18	L08A	9	9	0.0180	0.0080	CFL 18w	LED Lamp, 8w A-Line		120	TRUE	28	1,520	0.15	0.07	0.09	234	104	130
Verona Public Schools NJ	FN Brown Elementary	103	SW	Stairs To Balcony	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	104	1	Mechanical Rooms, Balcony	1444T8	NR	1	1	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	FN Brown Elementary	105	1	Mechanical Rooms, Balcony	1444T8	NR	2	2	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	FN Brown Elementary	106	1	Mechanical Rooms, Balcony	1884T8	NR	1	1	0.2240	0.2240	1x8, 8-Lamp T8 4'	will Not be Retrofit		120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	FN Brown Elementary	107	1	Storage, Balcony	1414T8	NR	1	1	0.0320	0.0320	1x4, 1-Lamp T8	will Not be Retrofit	25	120	FALSE	7	520	0.03	0.03	-	16	16	-
Verona Public Schools NJ	FN Brown Elementary	108	G	Stair Landing By B-9	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	FN Brown Elementary	109	G	Stair Landing By B-9	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	110	G	Gymnasium	1444T5	NR	12	12	0.1200	0.1200	1x4, 4-Lamp T5	will Not be Retrofit		120	FALSE	27	1,900	1.37	1.37	-	2,599	2,599	-
Verona Public Schools NJ	FN Brown Elementary	111	G	Gymnasium	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	FN Brown Elementary	112	G	Gymnasium	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	27	1,900	0.11	0.06	0.05	209	108	101
Verona Public Schools NJ	FN Brown Elementary	113	G	Office, Gym	2444T8	LT44-15W	2	2	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	38	120	TRUE	3	2,600	0.21	0.11	0.10	553	296	257
Verona Public Schools NJ	FN Brown Elementary	114	G	Cafeteria 1	1864T8	LT44K18-15W	5	5	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	83	120	TRUE	26	1,520	0.81	0.29	0.52	1,227	433	794
Verona Public Schools NJ	FN Brown Elementary	115	G	Cafeteria 1	222UT8	LT22K22-8W	3	3	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	42	120	TRUE	26	1,520	0.17	0.05	0.12	251	69	182
Verona Public Schools NJ	FN Brown Elementary	116	G	Cafeteria 1	PL26	NR	6	6	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	26	1,520	0.16	0.16	-	243	243	-
Verona Public Schools NJ	FN Brown Elementary	117	G	Cafeteria 1	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	118	G	Kitchen	2434T8	LT24K24-15W	3	3	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	83	120	TRUE	26	1,520	0.24	0.09	0.16	368	130	238
Verona Public Schools NJ	FN Brown Elementary	119	G	Cafeteria 2	1864T8	LT44K18-15W	9	9	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	83	120	TRUE	26	1,520	1.45	0.51	0.94	2,209	780	1,430
Verona Public Schools NJ	FN Brown Elementary	120	G	Cafeteria 2	222UT8	LT22K22-8W	4	4	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	42	120	TRUE	26	1,520	0.22	0.06	0.16	335	92	243
Verona Public Schools NJ	FN Brown Elementary	121	G	Cafeteria 2	PL26	NR	6	6	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	26	1,520	0.16	0.16	-	243	243	-
Verona Public Schools NJ	FN Brown Elementary	122	G	Cafeteria 2	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	123	G	Corridor Stair By Boiler	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	124	G	Corridor Stair By Boiler	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	125	G	Corridor Stair By Boiler	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	FN Brown Elementary	126	G	Corridor Stair By Boiler	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	127	G	Classroom A-2	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	33	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	FN Brown Elementary	128	G	Classroom A-2	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	25	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	FN Brown Elementary	129	G	Bathroom, A-2	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	15	2,280	0.01	0.01	0.00	28	17	11
Verona Public Schools NJ	FN Brown Elementary	130	G	Classroom A-4	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	33	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	FN Brown Elementary	131	G	Classroom A-4	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	25	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	FN Brown Elementary	132	G	Bathroom, A-4	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	15	2,280	0.01	0.01	0.00	28	17	11
Verona Public Schools NJ	FN Brown Elementary	133	G	Classroom A-6	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	33	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	FN Brown Elementary	134	G	Classroom A-6	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	25	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	FN Brown Elementary	135	G	Bathroom, A-6	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	15	2,280	0.01	0.01	0.00	28	17	11
Verona Public Schools NJ	FN Brown Elementary	136	G	Classroom A-5	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	33	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	FN Brown Elementary	137	G	Classroom A-5	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	25	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	FN Brown Elementary	138	G	Bathroom, A-5	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	15	2,280	0.01	0.01	0.00	28	17	11
Verona Public Schools NJ	FN Brown Elementary	139	G	Classroom A-3	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	33	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	FN Brown Elementary	140	G	Classroom A-3	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	25	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	FN Brown Elementary	141	G	Bathroom, A-3	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	15	2,280	0.01	0.01	0.00	28	17	11
Verona Public Schools NJ	FN Brown Elementary	142	G	Classroom A-1	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	33	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	FN Brown Elementary	143	G	Classroom A-1	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	25	1,520	0.11	0.06	0.05	168	87	81
Verona Public Schools NJ	FN Brown Elementary	144	G	Bathroom, A-1	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	15	2,280	0.01	0.01	0.00	28	17	11
Verona Public Schools NJ	FN Brown Elementary	145	G	Hallway, A-1 To A-6	1424T8	LT24-15W	8	8	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	18	120	TRUE	12	2,640	0.44	0.23	0.21	1,164	602	562
Verona Public Schools NJ	FN Brown Elementary	146	G	Hallway, A-1 To A-6	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	FN Brown Elementary	147	G	Hallway, A-1 To A-6	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	FN Brown Elementary	148	G	Boiler Room	1884T8	LT44K18-15W	3	3	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	30	120	TRUE	13	2,200	0.64	0.17	0.47	1,404	376	1,028
Verona Public Schools NJ	FN Brown Elementary	149	G	Boiler Room	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	19	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	FN Brown Elementary	150	G	Storage, Boiler	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	FN Brown Elementary	151	G	Bathroom, Vestibule	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	152	G	Bathroom, Unisex	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	153	G	Bathroom, Women	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.11	0.06	0.05	251	130	121
Verona Public Schools NJ	FN Brown Elementary	154	G	Bathroom, Women	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	155	G	Storage Room, Art	1864T8	NR	4	4	0.1700	0.1700	1x8, 6-Lamp T8	will Not be Retrofit	65	120	FALSE	7	520	0.65	0.65	-	336	336	-
Verona Public Schools NJ	FN Brown Elementary	156	G	Workroom, Teachers	2444T8	LT44-15W	8	8	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	115	120	TRUE	12	2,640	0.85	0.46	0.40	2,247	1,204	1,043
Verona Public Schools NJ	FN Brown Elementary	157	G	Classroom B-7 Music	2444T8	LT44-15W	12	12	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	115	120	TRUE	25	1,520	1.28	0.68	0.59	1,941	1,040	901
Verona Public Schools NJ	FN Brown Elementary	158	G	Classroom B-7 Music	222UT8	LT32K22-8W	2	2	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	115	120	TRUE	25	1,520	0.11	0.05	0.06	168	69	98
Verona Public Schools NJ	FN Brown Elementary	159	G	Classroom B-8	2444T8	LT44-15W	3	3	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	84	120	TRUE	25	1,520	0.32	0.17	0.15	485	260	225
Verona Public Schools NJ	FN Brown Elementary	160	G	Closet, Mech - B-8	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	19	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	161	G	Classroom B-9	2444T8	LT44-15W	6	6	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	115	120	TRUE	25	1,520	0.64	0.34	0.30	970	520	451
Verona Public Schools NJ	FN Brown Elementary	162	G	Bathroom, Vestibule	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	163	G	Closet, Custodial	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	FN Brown Elementary	164	G	Storage, Custodial	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	45	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	FN Brown Elementary	165	G	Bathroom, Men	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.11	0.06	0.05	251	130	121
Verona Public Schools NJ	FN Brown Elementary	166	G	Bathroom, Men	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	FN Brown Elementary	167	G	Classroom Child Study	2444T8	LT44-15W	6	6	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	115	120	TRUE	25	1,520	0.64	0.34	0.30	970	520	451
Verona Public Schools NJ	FN Brown Elementary	168	G	Mech/ Elec Room	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	15	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	FN Brown Elementary	169	G	Hallway Ground Floor	2424T8	LT24-15W	16	16	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	12	2,640	0.88	0.46	0.43	2,327	1,204	1,124
Verona Public Schools NJ	FN Brown Elementary	170	G	Hallway Ground Floor	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	FN Brown Elementary	171	Ext	Side Entry Ground Level	CFL32	LED13SWP	1	1	0.0320	0.0130	CFL 32w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.03	0.01	0.02	133	54	79
Verona Public Schools NJ	FN Brown Elementary	172	Ext	Side Entry Ground Level	I75	L19A	2	2	0.0750	0.0190	Inc 75w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.14	0.04	0.11	624	158	466
Verona Public Schools NJ	FN Brown Elementary	173	Ext	Exterior Vend Dasani	VEND-CD	NR	1	1	0.3390	0.3390	Cold Drink Machine	will Not be Retrofit		120	FALSE	1	8,760	0.32	0.32	-	2,821	2,821	-
Verona Public Schools NJ	FN Brown Elementary	174	Ext	Playground Wall	I2X75	L2X18PAR38	1	1	0.1500	0.0360	Inc (2) 75w	(2) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.14	0.03	0.11	624	150	474
Verona Public Schools NJ	FN Brown Elementary	175	Ext	Entry	I75	L19A	3	3	0.0750	0.0190	Inc 75w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.21	0.05	0.16	936	237	699

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	FN Brown Elementary	176	Ext	Entry	PL2X13BB	NR	1	1	0.0260	0.0260	CF (2) PL 13w	will Not be Retrofit		120	FALSE	10	4,380	0.02	0.02	-	108	108	-
Verona Public Schools NJ	FN Brown Elementary	177	Ext	Café / Kitchen Wall	PL2X13BB	NR	4	4	0.0260	0.0260	CF (2) PL 13w	will Not be Retrofit		120	FALSE	10	4,380	0.10	0.10	-	433	433	-
Verona Public Schools NJ	FN Brown Elementary	178	Ext	Side Wall Auditorium	PL2X13BB	NR	2	2	0.0260	0.0260	CF (2) PL 13w	will Not be Retrofit		120	FALSE	10	4,380	0.05	0.05	-	216	216	-
Verona Public Schools NJ	FN Brown Elementary	179	Ext	Auditorium Entry Door	M70	LED13SWP	2	2	0.0950	0.0130	MH 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.18	0.02	0.16	791	108	682
Verona Public Schools NJ	FN Brown Elementary	180	Ext	Main Entry	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	FN Brown Elementary	181	Ext	Entry Media Center	CFL26	LED13SWP	1	1	0.0260	0.0130	CFL 26w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.02	0.01	0.01	108	54	54
Verona Public Schools NJ	Forest Avenue Elementary	1	2	Classroom 20	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	2	2	Closet, 20	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line	4	120	TRUE	7	520	0.02	0.01	0.01	11	4	7
Verona Public Schools NJ	Forest Avenue Elementary	3	2	Classroom 21	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	4	2	Closet, 21	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line	4	120	TRUE	7	520	0.02	0.01	0.01	11	4	7
Verona Public Schools NJ	Forest Avenue Elementary	5	2	Closet, Books	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	16	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Forest Avenue Elementary	6	2	Classroom 22	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	7	2	Closet, 22	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line	4	120	TRUE	7	520	0.02	0.01	0.01	11	4	7
Verona Public Schools NJ	Forest Avenue Elementary	8	2	Classroom 23	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	55	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	9	2	Closet, 23	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line	4	120	TRUE	7	520	0.02	0.01	0.01	11	4	7
Verona Public Schools NJ	Forest Avenue Elementary	10	2	Bathroom, Boys Floor 2	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	22	120	TRUE	15	2,280	0.17	0.09	0.08	377	195	182
Verona Public Schools NJ	Forest Avenue Elementary	11	2	Closet, Janitor	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Forest Avenue Elementary	12	2	Classroom 24	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	13	2	Classroom 25	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	14	2	Closet, Storage	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Forest Avenue Elementary	15	2	Bathroom, Girls Floor 2	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	22	120	TRUE	15	2,280	0.17	0.09	0.08	377	195	182
Verona Public Schools NJ	Forest Avenue Elementary	16	2	Hallway Floor 2	1424T8	LT24-15W	7	7	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	12	120	TRUE	12	2,640	0.39	0.20	0.19	1,018	527	492
Verona Public Schools NJ	Forest Avenue Elementary	17	2	Hallway Floor 2	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Forest Avenue Elementary	18	SW	Stairwell B	1424T8	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281
Verona Public Schools NJ	Forest Avenue Elementary	19	SW	Stairwell B	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Forest Avenue Elementary	20	SW	Stairwell B	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Forest Avenue Elementary	21	SW	Stairwell A	1424T8	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281
Verona Public Schools NJ	Forest Avenue Elementary	22	SW	Stairwell A	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Forest Avenue Elementary	23	SW	Stairwell A	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Forest Avenue Elementary	24	1	Library	1844T8	LT44-15W	9	9	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	39	120	TRUE	25	1,520	0.96	0.51	0.44	1,456	780	676
Verona Public Schools NJ	Forest Avenue Elementary	25	1	Classroom 11	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	50	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	26	1	Main Entry Steps	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	50	120	TRUE	12	2,640	0.11	0.06	0.05	281	150	130
Verona Public Schools NJ	Forest Avenue Elementary	27	1	Main Entry Steps	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Forest Avenue Elementary	28	1	Main Entry Steps	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Forest Avenue Elementary	29	1	Classroom 12	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	65	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	Forest Avenue Elementary	30	1	Classroom 12	222UT8	LT32K22-8W	1	1	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	38	120	TRUE	25	1,520	0.06	0.02	0.03	84	35	49
Verona Public Schools NJ	Forest Avenue Elementary	31	1	Vestibule, Rooms 13/12	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	12	2,640	0.06	0.02	0.04	145	40	105
Verona Public Schools NJ	Forest Avenue Elementary	32	1	Bathroom, Rooms 13/12	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	38	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Forest Avenue Elementary	33	1	Classroom 13	2434T8	LT34-15W	15	15	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	70	120	TRUE	25	1,520	1.21	0.64	0.57	1,841	975	866

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Forest Avenue Elementary	34	1	Resource Room	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	25	1,520	0.06	0.03	0.03	84	43	40
Verona Public Schools NJ	Forest Avenue Elementary	35	1	Resource Room	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	31	120	TRUE	25	1,520	0.11	0.06	0.05	162	87	75
Verona Public Schools NJ	Forest Avenue Elementary	36	1	Bathroom, Faculty	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Forest Avenue Elementary	37	1	Classroom 14	1844T8	LT44-15W	6	6	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	25	1,520	0.64	0.34	0.30	970	520	451
Verona Public Schools NJ	Forest Avenue Elementary	38	1	Story Area, 14	2444T8	LT44-15W	2	2	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	68	120	TRUE	25	1,520	0.21	0.11	0.10	323	173	150
Verona Public Schools NJ	Forest Avenue Elementary	39	1	Locker Nook, 14	2444T8	LT44-15W	2	2	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	60	120	TRUE	25	1,520	0.21	0.11	0.10	323	173	150
Verona Public Schools NJ	Forest Avenue Elementary	40	1	Exit Vestibule, 14	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	8	120	TRUE	12	2,640	0.07	0.01	0.06	188	28	161
Verona Public Schools NJ	Forest Avenue Elementary	41	1	Bath Girls, 14	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	8	120	TRUE	15	2,280	0.07	0.01	0.06	162	24	139
Verona Public Schools NJ	Forest Avenue Elementary	42	1	Bath Boys, 14	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	8	120	TRUE	15	2,280	0.07	0.01	0.06	162	24	139
Verona Public Schools NJ	Forest Avenue Elementary	43	1	Closet, 14	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Forest Avenue Elementary	44	1	Bathroom, Faculty	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line		120	TRUE	15	2,280	0.07	0.01	0.06	162	24	139
Verona Public Schools NJ	Forest Avenue Elementary	45	1	Bathroom, Girls	1414T8	LT14-15W	3	3	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	18	120	TRUE	15	2,280	0.09	0.04	0.05	208	97	110
Verona Public Schools NJ	Forest Avenue Elementary	46	1	Closet, Janitor	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	16	120	TRUE	13	2,200	0.03	0.01	0.02	67	31	36
Verona Public Schools NJ	Forest Avenue Elementary	47	1	Bathroom, Boys	1414T8	LT14-15W	3	3	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	18	120	TRUE	15	2,280	0.09	0.04	0.05	208	97	110
Verona Public Schools NJ	Forest Avenue Elementary	48	1	Gymnasium	1844T8	DIS-HI	21	21	0.1120	-	1x8, 4-Lamp T8 4'	Disconnect and Remove	22	120	TRUE	27	1,900	2.23	-	2.23	4,245	-	4,245
Verona Public Schools NJ	Forest Avenue Elementary	49	1	Gymnasium	NL	LEDHB148-IBL	13	13	-	0.1480	New Layout	LED 148w High Bay with Bi-level Sensor		120	TRUE	27	1,900	-	1.83	(1.83)	-	3,473	(3,473)
Verona Public Schools NJ	Forest Avenue Elementary	50	1	Gymnasium	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	Forest Avenue Elementary	51	1	Office, Gym	I200	LED24DRM	2	2	0.2000	0.0240	Inc 200w	LED 24w DRUM	11	120	TRUE	3	2,600	0.38	0.05	0.33	988	119	869
Verona Public Schools NJ	Forest Avenue Elementary	52	1	Stage	1884T8	LT44K18-15W	4	4	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit		120	TRUE	28	1,520	0.85	0.23	0.62	1,294	347	947
Verona Public Schools NJ	Forest Avenue Elementary	53	1	Stage	I150	L18PAR38	8	8	0.1500	0.0180	Inc 150w	LED Lamp, 18w PAR 38		120	TRUE	28	1,520	1.14	0.14	1.00	1,733	208	1,525
Verona Public Schools NJ	Forest Avenue Elementary	54	1	Storage, Stage	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Forest Avenue Elementary	55	1	Storage, Stage	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line		120	TRUE	7	520	0.02	0.01	0.01	11	4	7
Verona Public Schools NJ	Forest Avenue Elementary	56	1	Stage Exit Door	I100	L18PAR38	1	1	0.1000	0.0180	Inc 100w	LED Lamp, 18w PAR 38		120	TRUE	12	2,640	0.10	0.02	0.08	251	45	206
Verona Public Schools NJ	Forest Avenue Elementary	57	1	Stage Exit Door	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Forest Avenue Elementary	58	1	Classroom Art	1844T8	LT44-15W	6	6	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	45	120	TRUE	25	1,520	0.64	0.34	0.30	970	520	451
Verona Public Schools NJ	Forest Avenue Elementary	59	1	Office Nurse Entry	LED-A10	NR	1	1	0.0100	0.0100	LED 10w Fixture	will Not be Retrofit	15	120	FALSE	3	2,600	0.01	0.01	-	25	25	-
Verona Public Schools NJ	Forest Avenue Elementary	60	1	Bathroom, Nurse	LED-A10	NR	1	1	0.0100	0.0100	LED 10w Fixture	will Not be Retrofit	15	120	FALSE	15	2,280	0.01	0.01	-	22	22	-
Verona Public Schools NJ	Forest Avenue Elementary	61	1	Office Nurse	1844T8	LT44-15W	2	2	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	44	120	TRUE	3	2,600	0.21	0.11	0.10	553	296	257
Verona Public Schools NJ	Forest Avenue Elementary	62	1	Closet, Nurse	LED-A10	NR	1	1	0.0100	0.0100	LED 10w Fixture	will Not be Retrofit	15	120	FALSE	13	2,200	0.01	0.01	-	21	21	-
Verona Public Schools NJ	Forest Avenue Elementary	63	1	Main Office	1844T8	LT44-15W	2	2	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	50	120	TRUE	3	2,600	0.21	0.11	0.10	553	296	257
Verona Public Schools NJ	Forest Avenue Elementary	64	1	Break Room Main Ofc	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	15	120	TRUE	12	2,640	0.03	0.01	0.02	80	38	43
Verona Public Schools NJ	Forest Avenue Elementary	65	1	Office Principal	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	65	120	TRUE	3	2,600	0.21	0.06	0.16	553	148	405
Verona Public Schools NJ	Forest Avenue Elementary	66	1	Classroom 16	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	38	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	67	1	Classroom 17	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	38	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Forest Avenue Elementary	68	1	Copy Room	222UT8	LT22K22-8W	4	4	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	50	120	TRUE	12	2,640	0.22	0.06	0.16	582	161	421
Verona Public Schools NJ	Forest Avenue Elementary	69	1	Faculty Lounge	222UT8	LT22K22-8W	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	45	120	TRUE	12	2,640	0.33	0.09	0.24	873	241	632
Verona Public Schools NJ	Forest Avenue Elementary	70	1	Hallway, Floor 1	1424T8	LT24-15W	7	7	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	18	120	TRUE	12	2,640	0.39	0.20	0.19	1,018	527	492
Verona Public Schools NJ	Forest Avenue Elementary	71	1	Hallway, Floor 1	1414T8	LT14-15W	14	14	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	16	120	TRUE	12	2,640	0.43	0.20	0.23	1,124	527	597
Verona Public Schools NJ	Forest Avenue Elementary	72	1	Hallway, Floor 1	K-LED	NR	5	5	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	166	166	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Forest Avenue Elementary	73	1	Hallway, Floor 1	222UT8	LT22K22-8W	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit		120	TRUE	12	2,640	0.11	0.03	0.08	291	80	211
Verona Public Schools NJ	Forest Avenue Elementary	74	1	Hallway, Floor 1	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Forest Avenue Elementary	75	1	Hallway, Floor 1	2444T8	LT24K24-15W	3	3	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	60	120	TRUE	12	2,640	0.32	0.09	0.23	843	226	617
Verona Public Schools NJ	Forest Avenue Elementary	76	B	Classroom, Computer	2434T8	LT34-15W	11	11	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	80	120	TRUE	25	1,520	0.89	0.47	0.42	1,350	715	635
Verona Public Schools NJ	Forest Avenue Elementary	77	B	Classroom, Computer	2434T8BB	LT34-BB	1	1	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	80	120	TRUE	25	1,520	0.08	0.04	0.04	123	65	58
Verona Public Schools NJ	Forest Avenue Elementary	78	B	Classroom 2	2434T8	LT34-15W	10	10	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	80	120	TRUE	25	1,520	0.81	0.43	0.38	1,227	650	578
Verona Public Schools NJ	Forest Avenue Elementary	79	B	Classroom 2	2434T8BB	LT34-BB	1	1	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	80	120	TRUE	25	1,520	0.08	0.04	0.04	123	65	58
Verona Public Schools NJ	Forest Avenue Elementary	80	B	Classroom 3	2434T8	LT34-15W	10	10	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	80	120	TRUE	25	1,520	0.81	0.43	0.38	1,227	650	578
Verona Public Schools NJ	Forest Avenue Elementary	81	B	Classroom 3	2434T8BB	LT34-BB	1	1	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	80	120	TRUE	25	1,520	0.08	0.04	0.04	123	65	58
Verona Public Schools NJ	Forest Avenue Elementary	82	B	Storage, Basement	2424T8	NR	3	3	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.17	0.17	-	86	86	-
Verona Public Schools NJ	Forest Avenue Elementary	83	B	Kitchen	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	26	1,520	0.06	0.03	0.03	84	43	40
Verona Public Schools NJ	Forest Avenue Elementary	84	B	Kitchen	2434T8BB	LT34-BB	1	1	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	80	120	TRUE	26	1,520	0.08	0.04	0.04	123	65	58
Verona Public Schools NJ	Forest Avenue Elementary	85	B	Storage Books	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Forest Avenue Elementary	86	B	Boiler Room	1424T8	NR	8	8	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	15	120	FALSE	7	520	0.44	0.44	-	229	229	-
Verona Public Schools NJ	Forest Avenue Elementary	87	B	Boiler Room	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Forest Avenue Elementary	88	B	Bathroom, Boys Basement	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	22	120	TRUE	15	2,280	0.17	0.09	0.08	377	195	182
Verona Public Schools NJ	Forest Avenue Elementary	89	B	Closet Janitor	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Forest Avenue Elementary	90	B	Cafeteria	2444T8	LT44-15W	26	26	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	110	120	TRUE	26	1,520	2.77	1.48	1.28	4,205	2,253	1,952
Verona Public Schools NJ	Forest Avenue Elementary	91	B	Office Child Study	2434T8	LT34-15W	11	11	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	95	120	TRUE	3	2,600	0.89	0.47	0.42	2,309	1,223	1,087
Verona Public Schools NJ	Forest Avenue Elementary	92	B	School Storage	1424T8	LT24-15W	1	1	0.0580	0.0580	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	FALSE	13	2,200	0.06	0.06	-	121	121	-
Verona Public Schools NJ	Forest Avenue Elementary	93	B	Bathroom, Girls Basement	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	22	120	TRUE	15	2,280	0.17	0.09	0.08	377	195	182
Verona Public Schools NJ	Forest Avenue Elementary	94	B	Hallway, Basement	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	48	120	TRUE	12	2,640	0.11	0.06	0.05	281	150	130
Verona Public Schools NJ	Forest Avenue Elementary	95	B	Hallway, Basement	1844T8	LT44-15W	6	6	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	35	120	TRUE	12	2,640	0.64	0.34	0.30	1,685	903	782
Verona Public Schools NJ	Forest Avenue Elementary	96	B	Hallway, Basement	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Forest Avenue Elementary	97	Ext	By Gym Doors	I2X75	L2X18PAR38	1	1	0.1500	0.0360	Inc (2) 75w	(2) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.14	0.03	0.11	624	150	474
Verona Public Schools NJ	Forest Avenue Elementary	98	Ext	By Gym Steps	I2X75	L2X18PAR38	2	2	0.1500	0.0360	Inc (2) 75w	(2) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.29	0.07	0.22	1,248	300	949
Verona Public Schools NJ	Forest Avenue Elementary	99	Ext	Gym Rear Wall	I2X75	L2X18PAR38	2	2	0.1500	0.0360	Inc (2) 75w	(2) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.29	0.07	0.22	1,248	300	949
Verona Public Schools NJ	Forest Avenue Elementary	100	Ext	Front Wall Corner	I2X75	L2X18PAR38	1	1	0.1500	0.0360	Inc (2) 75w	(2) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.14	0.03	0.11	624	150	474
Verona Public Schools NJ	Forest Avenue Elementary	101	Ext	Front Corner, 30'	I3X75	LED3X18PAR38-HI	1	1	0.2250	0.0540	Inc (3) 75w	(3) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.21	0.05	0.16	936	225	712
Verona Public Schools NJ	Forest Avenue Elementary	102	Ext	Door At Stairwell	I75	L18PAR38	1	1	0.0750	0.0180	Inc 75w	LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.07	0.02	0.05	312	75	237
Verona Public Schools NJ	Forest Avenue Elementary	103	Ext	Main Entry	M250	LED84MWPFCO	1	1	0.2950	0.0840	MH 250w	LED 84w Wall Pack Full Cut Off,		120	TRUE	10	4,380	0.28	0.08	0.20	1,227	350	878
Verona Public Schools NJ	Forest Avenue Elementary	104	Ext	Front Corner, 30'	I3X75	LED3X18PAR38-HI	1	1	0.2250	0.0540	Inc (3) 75w	(3) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.21	0.05	0.16	936	225	712
Verona Public Schools NJ	Forest Avenue Elementary	105	Ext	Side Wall	PL42	NR	1	1	0.0420	0.0420	CF PL 42w	will Not be Retrofit		120	FALSE	10	4,380	0.04	0.04	-	175	175	-
Verona Public Schools NJ	Forest Avenue Elementary	106	Ext	Side Door	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Forest Avenue Elementary	107	Ext	Rear Corner, 30'	I3X75	LED3X18PAR38-HI	1	1	0.2250	0.0540	Inc (3) 75w	(3) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.21	0.05	0.16	936	225	712
Verona Public Schools NJ	HBW Middle School	1	2	Classroom 217	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	2	2	Classroom 217	1444T8	DIS	3	3	0.1120	-	1x4, 4-Lamp T8	Disconnect and Remove	100	120	TRUE	30	2,200	0.32	-	0.32	702	-	702
Verona Public Schools NJ	HBW Middle School	3	2	Classroom 216	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	4	2	Classroom 216	1444T8	DIS	3	3	0.1120	-	1x4, 4-Lamp T8	Disconnect and Remove	100	120	TRUE	30	2,200	0.32	-	0.32	702	-	702

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	5	2	Classroom 215	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	6	2	Classroom 215	1444T8	DIS	3	3	0.1120	-	1x4, 4-Lamp T8	Disconnect and Remove	100	120	TRUE	30	2,200	0.32	-	0.32	702	-	702
Verona Public Schools NJ	HBW Middle School	7	2	Classroom 214	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	8	2	Classroom 214	1444T8	DIS	3	3	0.1120	-	1x4, 4-Lamp T8	Disconnect and Remove	100	120	TRUE	30	2,200	0.32	-	0.32	702	-	702
Verona Public Schools NJ	HBW Middle School	9	2	Bathroom, Girls By 214	1844T8	LT44-15W	3	3	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	14	2,850	0.32	0.17	0.15	910	487	422
Verona Public Schools NJ	HBW Middle School	10	2	Closet, Mop	CFL26	L08A	1	1	0.0260	0.0080	CFL 26w	LED Lamp, 8w A-Line		120	TRUE	13	2,200	0.02	0.01	0.02	54	17	38
Verona Public Schools NJ	HBW Middle School	11	2	Bathroom, Boys By 214	1844T8	LT44-15W	3	3	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	14	2,850	0.32	0.17	0.15	910	487	422
Verona Public Schools NJ	HBW Middle School	12	2	Storeroom Books Fl 2	1424T8	NR	4	4	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	16	120	FALSE	7	520	0.22	0.22	-	115	115	-
Verona Public Schools NJ	HBW Middle School	13	2	Bathroom, Women's	I60	L08A	1	1	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line	4	120	TRUE	14	2,850	0.06	0.01	0.05	162	22	141
Verona Public Schools NJ	HBW Middle School	14	2	Bathroom, Men's	I60	L08A	1	1	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line	4	120	TRUE	14	2,850	0.06	0.01	0.05	162	22	141
Verona Public Schools NJ	HBW Middle School	15	2	Classroom 205	1884T8	LT44K18-15W	3	3	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	0.64	0.17	0.47	1,404	376	1,028
Verona Public Schools NJ	HBW Middle School	16	2	Classroom 205	1444T8	LT44-15W	3	3	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	100	120	TRUE	30	2,200	0.32	0.17	0.15	702	376	326
Verona Public Schools NJ	HBW Middle School	17	2	Classroom 204	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	18	2	Classroom 204	1444T8	DIS	3	3	0.1120	-	1x4, 4-Lamp T8	Disconnect and Remove	100	120	TRUE	30	2,200	0.32	-	0.32	702	-	702
Verona Public Schools NJ	HBW Middle School	19	2	Classroom 203	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	20	2	Classroom 203	1444T8	DIS	3	3	0.1120	-	1x4, 4-Lamp T8	Disconnect and Remove	100	120	TRUE	30	2,200	0.32	-	0.32	702	-	702
Verona Public Schools NJ	HBW Middle School	21	2	Hallway 201-205	2424T8	LT24-15W	17	17	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	11	3,300	0.94	0.48	0.45	3,091	1,599	1,492
Verona Public Schools NJ	HBW Middle School	22	2	Hallway 201-205	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	23	2	Hallway 201-205	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	24	SW	Stairwell 217-101	1424T8	LT24-15W	5	5	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	12	120	TRUE	11	3,300	0.28	0.14	0.13	909	470	439
Verona Public Schools NJ	HBW Middle School	25	SW	Stairwell 205-113	1424T8	LT24-15W	5	5	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	12	120	TRUE	11	3,300	0.28	0.14	0.13	909	470	439
Verona Public Schools NJ	HBW Middle School	26	2	Breezeway	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	100	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	HBW Middle School	27	2	Breezeway	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	100	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	28	2	Breezeway	PL4X32	NR	1	1	0.1280	0.1280	(4) CF PL 32w	will Not be Retrofit		120	FALSE	11	3,300	0.12	0.12	-	401	401	-
Verona Public Schools NJ	HBW Middle School	29	2	Classroom 212	2434T8DS	LT34-15W	11	11	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.94	0.47	0.47	1,655	828	828
Verona Public Schools NJ	HBW Middle School	30	2	Classroom 212	2434T8DSBB	LT34-BB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.09	0.04	0.04	150	75	75
Verona Public Schools NJ	HBW Middle School	31	2	Prep Room	2434T8DS	LT24K24-15W	3	3	0.0900	0.0300	2x4, 3-Lamp T8, DS	(2) LED Lamp, 15w, 4', Bracket Kit	43	120	TRUE	103	2,080	0.26	0.09	0.17	534	178	356
Verona Public Schools NJ	HBW Middle School	32	2	Classroom 211	2434T8DS	LT34-15W	11	11	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.94	0.47	0.47	1,655	828	828
Verona Public Schools NJ	HBW Middle School	33	2	Classroom 211	2434T8DSBB	LT34-BB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.09	0.04	0.04	150	75	75
Verona Public Schools NJ	HBW Middle School	34	2	Media Center Corridor	222UT8	LT22K22-8W	12	12	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit		120	TRUE	11	3,300	0.66	0.18	0.48	2,182	602	1,580
Verona Public Schools NJ	HBW Middle School	35	2	Media Center Corridor	222UT8BB	LT22K22-BB	7	7	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit		120	TRUE	11	3,300	0.39	0.11	0.28	1,273	351	922
Verona Public Schools NJ	HBW Middle School	36	2	Media Center Corridor	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	HBW Middle School	37	2	Computer Room	11294T8	LT94-15W	9	9	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	110	120	TRUE	130	1,760	2.18	1.15	1.03	3,837	2,031	1,806
Verona Public Schools NJ	HBW Middle School	38	2	Computer Room	1864T8	LT44K18-15W	1	1	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	110	120	TRUE	130	1,760	0.16	0.06	0.10	284	100	184
Verona Public Schools NJ	HBW Middle School	39	2	Office Media Specialist	2434T8DS	LT34-15W	4	4	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'		120	TRUE	103	2,080	0.34	0.17	0.17	711	356	356
Verona Public Schools NJ	HBW Middle School	40	2	Office Media Specialist Media	PL32	NR	2	2	0.0320	0.0320	CF PL 32w	will Not be Retrofit		120	FALSE	103	2,080	0.06	0.06	-	126	126	-
Verona Public Schools NJ	HBW Middle School	41	2	Storage Room Media	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	103	2,080	0.17	0.09	0.08	344	178	166
Verona Public Schools NJ	HBW Middle School	42	2	Closet, Data	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	HBW Middle School	43	2	Circulation	PL32H-8-W-DW-DEC	NR	6	6	0.0320	0.0320	CF PL 32w	will Not be Retrofit		120	FALSE	30	2,200	0.18	0.18	-	401	401	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	44	2	Circulation	PL4X32	NR	1	1	0.1280	0.1280	(4) CF PL 32w	will Not be Retrofit		120	FALSE	30	2,200	0.12	0.12	-	268	268	-
Verona Public Schools NJ	HBW Middle School	45	2	Reading By Window	1424T8	LT24-15W	6	6	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	30	2,200	0.33	0.17	0.16	727	376	351
Verona Public Schools NJ	HBW Middle School	46	2	Reading By Window	PL32H-8-W-DW-DEC	NR	2	2	0.0320	0.0320	CF PL 32w	will Not be Retrofit		120	FALSE	30	2,200	0.06	0.06	-	134	134	-
Verona Public Schools NJ	HBW Middle School	47	2	Media Center Seating	PL2X42	NR	6	6	0.0420	0.0420	(2) CF PL 42w	will Not be Retrofit		120	FALSE	30	2,200	0.24	0.24	-	527	527	-
Verona Public Schools NJ	HBW Middle School	48	2	Media Center Seating	PL3X42	NR	3	3	0.1260	0.1260	(3) CF PL 42w	will Not be Retrofit		120	FALSE	30	2,200	0.36	0.36	-	790	790	-
Verona Public Schools NJ	HBW Middle School	49	2	Media Center Seating	I250DIM	NR	12	12	0.2500	0.2500	Inc 250w	will Not be Retrofit		120	FALSE	98	500	2.85	2.85	-	1,425	1,425	-
Verona Public Schools NJ	HBW Middle School	50	2	Media Center Stacks	11294T8	LT94-15W	5	5	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	80	120	TRUE	130	1,760	1.21	0.64	0.57	2,132	1,129	1,003
Verona Public Schools NJ	HBW Middle School	51	2	Media Center Stacks	1864T8	LT44K18-15W	5	5	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	110	120	TRUE	130	1,760	0.81	0.29	0.52	1,421	502	920
Verona Public Schools NJ	HBW Middle School	52	2	Classroom 209/210	2434T8DS	LT34-15W	10	10	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	60	120	TRUE	130	1,760	0.86	0.43	0.43	1,505	752	752
Verona Public Schools NJ	HBW Middle School	53	2	Classroom 209/210	2434T8DSBB	LT34-BB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	60	120	TRUE	130	1,760	0.17	0.09	0.09	301	150	150
Verona Public Schools NJ	HBW Middle School	54	2	Hallway 210- Media Ctr	2434T8	LT24K24-15W	4	4	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit		120	TRUE	11	3,300	0.32	0.11	0.21	1,066	376	690
Verona Public Schools NJ	HBW Middle School	55	2	Hallway 210- Media Ctr	2434T8BB	LT34-BB	3	3	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'		120	TRUE	11	3,300	0.24	0.13	0.11	799	423	376
Verona Public Schools NJ	HBW Middle School	56	2	Hallway 210- Media Ctr	PL26	NR	2	2	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	11	3,300	0.05	0.05	-	176	176	-
Verona Public Schools NJ	HBW Middle School	57	2	Hallway 210- Media Ctr	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	58	2	Display Cases	1414	LT14-15W	2	2	0.0420	0.0150	1x4, 1-Lamp	LED Lamp, (1) 15w		120	TRUE	1	8,760	0.08	0.03	0.05	699	250	449
Verona Public Schools NJ	HBW Middle School	59	SW	Stairs Media Ctr To Exterior	1424T8EM	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88
Verona Public Schools NJ	HBW Middle School	60	SW	Stairs Media Ctr To Exterior	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	61	SW	Stairs Media Ctr To Exterior	2424T8EM	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88
Verona Public Schools NJ	HBW Middle School	62	SW	Stairs Media Ctr To Exterior	2424T8	LT24-15W-HI	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88
Verona Public Schools NJ	HBW Middle School	63	SW	Stairs Media Ctr To Exterior	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	11	3,300	0.01	0.01	-	25	25	-
Verona Public Schools NJ	HBW Middle School	64	2	Classroom 208	2434T8DS	LT34-15W	8	8	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	57	120	TRUE	30	2,200	0.68	0.34	0.34	1,505	752	752
Verona Public Schools NJ	HBW Middle School	65	2	Classroom 208	222UT8	LT32K22-8W	3	3	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	35	120	TRUE	30	2,200	0.17	0.07	0.10	364	150	213
Verona Public Schools NJ	HBW Middle School	66	2	Storage C R 208	222UT8	NR	2	2	0.0580	0.0580	2x2, 2-Lamp U T8	will Not be Retrofit	35	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	HBW Middle School	67	2	Bathroom, Women's	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	14	2,850	0.11	0.06	0.05	314	162	152
Verona Public Schools NJ	HBW Middle School	68	2	Bathroom, Women's	1424T8	LT24-15W-PB	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	14	2,850	0.22	0.11	0.11	628	325	303
Verona Public Schools NJ	HBW Middle School	69	2	Teachers Lounge	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	3-	120	TRUE	11	3,300	0.11	0.06	0.05	351	188	163
Verona Public Schools NJ	HBW Middle School	70	2	Bathroom, Tch Lge	1222	LT22-8W	1	1	0.0500	0.0160	1x2, 2-Lamp	(2) 2' LED Lamps	13	120	TRUE	14	2,850	0.05	0.02	0.03	135	43	92
Verona Public Schools NJ	HBW Middle School	71	2	Closet, Mop	I60	L08A	1	1	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	13	2,200	0.06	0.01	0.05	125	17	109
Verona Public Schools NJ	HBW Middle School	72	2	Hallway 209- Faculty	2424T8	LT24-15W	8	8	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.44	0.23	0.21	1,455	752	702
Verona Public Schools NJ	HBW Middle School	73	2	Hallway 209- Faculty	2424T8BB	LT24-15W-BB	5	5	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.28	0.14	0.13	909	470	439
Verona Public Schools NJ	HBW Middle School	74	2	Hallway 209- Faculty	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	75	2	Hallway 209- Faculty	1414	LT14-15W	1	1	0.0420	0.0150	1x4, 1-Lamp	LED Lamp, (1) 15w		120	TRUE	11	3,300	0.04	0.01	0.03	132	47	85
Verona Public Schools NJ	HBW Middle School	76	2	Classroom 207	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	77	2	Classroom 207	1444T8	LT44-15W	3	3	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	100	120	TRUE	30	2,200	0.32	0.17	0.15	702	376	326
Verona Public Schools NJ	HBW Middle School	78	2	Classroom 206	2444T8	LT44-15W	15	15	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	115	120	TRUE	30	2,200	1.60	0.86	0.74	3,511	1,881	1,630
Verona Public Schools NJ	HBW Middle School	79	1	Classroom 115	2434T8	LT34-15W	38	38	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	100	120	TRUE	30	2,200	3.07	1.62	1.44	6,751	3,574	3,177
Verona Public Schools NJ	HBW Middle School	80	1	Classroom 115	222UT8	LT32K22-8W	1	1	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit		120	TRUE	30	2,200	0.06	0.02	0.03	121	50	71
Verona Public Schools NJ	HBW Middle School	81	1	Storage A In 115	1844T8	NR	2	2	0.1120	0.1120	1x8, 4-Lamp T8 4'	will Not be Retrofit		120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	HBW Middle School	82	1	Storage C In 115	2444T8	NR	2	2	0.1120	0.1120	2x4, 4-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.21	0.21	-	111	111	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	83	1	Storage B In 115	1844T8	NR	2	2	0.1120	0.1120	1x8, 4-Lamp T8 4'	will Not be Retrofit		120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	HBW Middle School	84	1	Classroom 114	1884T8	LT44K18-15W	19	19	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	4.04	1.08	2.96	8,895	2,383	6,512
Verona Public Schools NJ	HBW Middle School	85	1	Classroom 114	1444T8	LT44-15W	2	2	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	100	120	TRUE	30	2,200	0.21	0.11	0.10	468	251	217
Verona Public Schools NJ	HBW Middle School	86	1	Storage Wood 114	1884T8	NR	1	1	0.2240	0.2240	1x8, 8-Lamp T8 4'	will Not be Retrofit		120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	HBW Middle School	87	1	Classroom 113	1844T8	LT44-15W	2	2	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'		120	TRUE	30	2,200	0.21	0.11	0.10	468	251	217
Verona Public Schools NJ	HBW Middle School	88	1	Bathroom, Girls By 113	1844T8	LT44-15W	3	3	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	14	2,850	0.32	0.17	0.15	910	487	422
Verona Public Schools NJ	HBW Middle School	89	1	Closet, Mop	CFL26	L08A	1	1	0.0260	0.0080	CFL 26w	LED Lamp, 8w A-Line		120	TRUE	13	2,200	0.02	0.01	0.02	54	17	38
Verona Public Schools NJ	HBW Middle School	90	1	Bathroom, Boys By 113	1844T8	LT44-15W	3	3	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	40	120	TRUE	14	2,850	0.32	0.17	0.15	910	487	422
Verona Public Schools NJ	HBW Middle School	91	1	Storeroom Books Fl 1	1424T8	NR	4	4	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	16	120	FALSE	7	520	0.22	0.22	-	115	115	-
Verona Public Schools NJ	HBW Middle School	92	1	Classroom 104	1884T8	LT44K18-15W	9	9	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.92	0.51	1.40	4,213	1,129	3,085
Verona Public Schools NJ	HBW Middle School	93	1	Classroom 104	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit		120	TRUE	30	2,200	0.21	0.06	0.16	468	125	343
Verona Public Schools NJ	HBW Middle School	94	1	Break Nook 104	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88
Verona Public Schools NJ	HBW Middle School	95	1	Classroom 103	1884T8	LT44K18-15W	9	9	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.92	0.51	1.40	4,213	1,129	3,085
Verona Public Schools NJ	HBW Middle School	96	1	Classroom 102	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	95	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	97	1	Classroom 101	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	98	1	Classroom 101	1444T8	LT44-15W	3	3	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	100	120	TRUE	30	2,200	0.32	0.17	0.15	702	376	326
Verona Public Schools NJ	HBW Middle School	99	1	Hallway 101-104	2424T8	LT24-15W	18	18	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	11	3,300	0.99	0.51	0.48	3,273	1,693	1,580
Verona Public Schools NJ	HBW Middle School	100	1	Hallway 101-104	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	101	1	Hallway 101-104	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	102	1	Hallway 101-104	1414	LT14-15W	1	1	0.0420	0.0150	1x4, 1-Lamp	LED Lamp, (1) 15w		120	TRUE	11	3,300	0.04	0.01	0.03	132	47	85
Verona Public Schools NJ	HBW Middle School	103	1	Hallway Steps To Gym	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	HBW Middle School	104	1	Hallway Gym	2424T8	LT24-15W	12	12	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	11	3,300	0.66	0.34	0.32	2,182	1,129	1,053
Verona Public Schools NJ	HBW Middle School	105	1	Locker Room Boys	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	13	120	TRUE	22	2,850	0.06	0.03	0.03	157	81	76
Verona Public Schools NJ	HBW Middle School	106	1	Locker Room Boys	1414T8	LT14-15W	10	10	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	10	120	TRUE	22	2,850	0.30	0.14	0.16	866	406	460
Verona Public Schools NJ	HBW Middle School	107	1	Locker Room Boys	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	108	1	Office Boys Lockers	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	31	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	HBW Middle School	109	1	Bathroom, Coach	I60	L08A	2	2	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line	4	120	TRUE	14	2,850	0.11	0.02	0.10	325	43	282
Verona Public Schools NJ	HBW Middle School	110	1	Showers, Boys Lockers	1424T8	LT24-15W	5	5	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	22	2,850	0.28	0.14	0.13	785	406	379
Verona Public Schools NJ	HBW Middle School	111	1	Closet, Boys Lockers	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	15	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	HBW Middle School	112	1	Vestibule, Boys Lockers	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	113	1	Vestibule, Boys Lockers	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88
Verona Public Schools NJ	HBW Middle School	114	1	Gymnasium	M400	LEDHB177-IBL	30	30	0.4580	0.1770	MH 400w	LED 177w High Bay with Bi-level Sensor		120	TRUE	22	2,850	13.05	5.04	8.01	37,201	14,377	22,824
Verona Public Schools NJ	HBW Middle School	115	1	Gymnasium	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	HBW Middle School	116	1	Storage, Gym North	1844T8	NR	3	3	0.1120	0.1120	1x8, 4-Lamp T8 4'	will Not be Retrofit		120	FALSE	7	520	0.32	0.32	-	166	166	-
Verona Public Schools NJ	HBW Middle School	117	1	Storage, Gym South	1844T8	NR	3	3	0.1120	0.1120	1x8, 4-Lamp T8 4'	will Not be Retrofit		120	FALSE	7	520	0.32	0.32	-	166	166	-
Verona Public Schools NJ	HBW Middle School	118	1	Vestibule, Girls Lockers	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88
Verona Public Schools NJ	HBW Middle School	119	1	Locker Room Girls	1414T8	LT14-15W	11	11	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	10	120	TRUE	22	2,850	0.33	0.16	0.18	953	447	506
Verona Public Schools NJ	HBW Middle School	120	1	Showers, Girls Lockers	1424T8	LT24-15W	5	5	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	22	2,850	0.28	0.14	0.13	785	406	379
Verona Public Schools NJ	HBW Middle School	121	1	Toilets, Girls Lockers	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	22	2,850	0.06	0.03	0.03	157	81	76

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	122	1	Closet, Girls Lockers	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	15	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	HBW Middle School	123	1	Hall / Ramp T0 112	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	100	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	HBW Middle School	124	1	Hall / Ramp T0 112	2424T8BB	LT24-15W-BB	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	100	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	125	1	Hall / Ramp T0 112	PL4X32	NR	1	1	0.1280	0.1280	(4) CF PL 32w	will Not be Retrofit		120	FALSE	11	3,300	0.12	0.12	-	401	401	-
Verona Public Schools NJ	HBW Middle School	126	1	Classroom 112	2434T8DS	LT34-15W	8	8	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.68	0.34	0.34	1,204	602	602
Verona Public Schools NJ	HBW Middle School	127	1	Classroom 112	222UT8	LT32K22-8W	2	2	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	54	120	TRUE	130	1,760	0.11	0.05	0.06	194	80	114
Verona Public Schools NJ	HBW Middle School	128	1	Classroom 112	2434T8DSBB	LT34-BB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.09	0.04	0.04	150	75	75
Verona Public Schools NJ	HBW Middle School	129	1	Classroom 111	2434T8DS	LT34-15W	8	8	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.68	0.34	0.34	1,204	602	602
Verona Public Schools NJ	HBW Middle School	130	1	Classroom 111	222UT8	LT32K22-8W	2	2	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	54	120	TRUE	130	1,760	0.11	0.05	0.06	194	80	114
Verona Public Schools NJ	HBW Middle School	131	1	Classroom 111	2434T8DSBB	LT34-BB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.09	0.04	0.04	150	75	75
Verona Public Schools NJ	HBW Middle School	132	1	Classroom 110	2434T8DS	LT34-15W	8	8	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.68	0.34	0.34	1,204	602	602
Verona Public Schools NJ	HBW Middle School	133	1	Classroom 110	222UT8	LT32K22-8W	2	2	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	54	120	TRUE	130	1,760	0.11	0.05	0.06	194	80	114
Verona Public Schools NJ	HBW Middle School	134	1	Classroom 110	2434T8DSBB	LT34-BB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.09	0.04	0.04	150	75	75
Verona Public Schools NJ	HBW Middle School	135	1	Classroom 109	2434T8DS	LT34-15W	8	8	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.68	0.34	0.34	1,204	602	602
Verona Public Schools NJ	HBW Middle School	136	1	Classroom 109	222UT8	LT32K22-8W	2	2	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	54	120	TRUE	130	1,760	0.11	0.05	0.06	194	80	114
Verona Public Schools NJ	HBW Middle School	137	1	Classroom 109	2434T8DSBB	LT34-BB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.09	0.04	0.04	150	75	75
Verona Public Schools NJ	HBW Middle School	138	1	Classroom 108	2434T8DS	LT34-15W	8	8	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.68	0.34	0.34	1,204	602	602
Verona Public Schools NJ	HBW Middle School	139	1	Classroom 108	222UT8	LT32K22-8W	2	2	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	54	120	TRUE	130	1,760	0.11	0.05	0.06	194	80	114
Verona Public Schools NJ	HBW Middle School	140	1	Classroom 108	2434T8DSBB	LT34-BB	1	1	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	54	120	TRUE	130	1,760	0.09	0.04	0.04	150	75	75
Verona Public Schools NJ	HBW Middle School	141	1	Classroom 107	1424T8	LT24-15W	9	9	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	30	2,200	0.50	0.26	0.24	1,091	564	527
Verona Public Schools NJ	HBW Middle School	142	1	Classroom 107	11294T8	LT94-15W	5	5	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	50	120	TRUE	130	1,760	1.21	0.64	0.57	2,132	1,129	1,003
Verona Public Schools NJ	HBW Middle School	143	1	Classroom 107	2434T8	LT34-15W	2	2	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	50	120	TRUE	30	2,200	0.16	0.09	0.08	355	188	167
Verona Public Schools NJ	HBW Middle School	144	1	Classroom 107	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	145	1	Office Nurse Open	2434T8DS	LT34-15W	5	5	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	103	2,080	0.43	0.21	0.21	889	445	445
Verona Public Schools NJ	HBW Middle School	146	1	Office Nurse Open	222UT8	LT22K22-8W	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	55	120	TRUE	103	2,080	0.11	0.03	0.08	229	63	166
Verona Public Schools NJ	HBW Middle School	147	1	Office Nurse Exam	2434T8DS	LT34-15W	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	103	2,080	0.17	0.09	0.09	356	178	178
Verona Public Schools NJ	HBW Middle School	148	1	Storage Nurse	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	107	416	0.11	0.06	0.05	46	24	22
Verona Public Schools NJ	HBW Middle School	149	1	Bathroom, Nurse	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	28	120	TRUE	114	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	HBW Middle School	150	1	Office Nurse Open	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	151	1	Bathroom, Faculty M	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	114	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	HBW Middle School	152	1	Bathroom, Faculty W	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	114	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	HBW Middle School	153	1	Office C S T	2434T8	LT34-15W	4	4	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	52	120	TRUE	103	2,080	0.32	0.17	0.15	672	356	316
Verona Public Schools NJ	HBW Middle School	154	1	Office C S T	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	155	1	Conference Room C S T	11264T8	LT64-15W	1	1	0.1700	0.0900	1x12, 6-Lamp T8	(6) LED Lamp, 15w, 4'	25	120	TRUE	16	1,140	0.16	0.09	0.08	184	97	87
Verona Public Schools NJ	HBW Middle School	156	1	Conference Room C S T	PL26	NR	6	6	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	16	1,140	0.16	0.16	-	182	182	-
Verona Public Schools NJ	HBW Middle School	157	1	Office L D T C	2434T8DS	LT34-15W	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	63	120	TRUE	103	2,080	0.17	0.09	0.09	356	178	178
Verona Public Schools NJ	HBW Middle School	158	1	Office Psychologist	2434T8DS	LT34-15W	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	63	120	TRUE	103	2,080	0.17	0.09	0.09	356	178	178
Verona Public Schools NJ	HBW Middle School	159	1	Classroom 106	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	57	120	TRUE	30	2,200	0.97	0.51	0.46	2,132	1,129	1,003
Verona Public Schools NJ	HBW Middle School	160	1	Classroom 105	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	57	120	TRUE	30	2,200	0.97	0.51	0.46	2,132	1,129	1,003

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	161	1	Hallway By Elec Panel L P 2	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	72	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	162	1	Hallway ramp To Room 107	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	HBW Middle School	163	1	Hallway 107-109	2424T8	LT24-15W	5	5	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	11	3,300	0.28	0.14	0.13	909	470	439
Verona Public Schools NJ	HBW Middle School	164	1	Hallway 107-109	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	30	120	TRUE	11	3,300	0.06	0.02	0.04	182	50	132
Verona Public Schools NJ	HBW Middle School	165	1	Hallway 107-109	2434T8	LT24K24-15W	1	1	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	62	120	TRUE	11	3,300	0.08	0.03	0.05	266	94	172
Verona Public Schools NJ	HBW Middle School	166	1	Hallway 107-109	PL26	NR	2	2	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	11	3,300	0.05	0.05	-	176	176	-
Verona Public Schools NJ	HBW Middle School	167	1	Hallway 110-112	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	168	1	Hallway 110-112	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	169	1	Hallway 110-112	PL26	NR	2	2	0.0280	0.0280	CF PL 26w	will Not be Retrofit		120	FALSE	11	3,300	0.05	0.05	-	176	176	-
Verona Public Schools NJ	HBW Middle School	170	1	Hallway 110-112	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	171	1	Hallway 105-106	2424T8	LT24-15W	6	6	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	26	120	TRUE	11	3,300	0.33	0.17	0.16	1,091	564	527
Verona Public Schools NJ	HBW Middle School	172	1	Hallway 105-106	2424T8BB	LT24-15W-BB	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	26	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	173	1	Hallway 105-106	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	174	1	Hallway 105-106	1313	LT13-13W	2	2	0.0410	0.0130	1x3, 1-Lamp	(1) 3' LED Lamps		120	TRUE	11	3,300	0.08	0.02	0.05	257	82	176
Verona Public Schools NJ	HBW Middle School	175	1	Vestibule Crossover	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	26	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	176	1	Vestibule Crossover	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	26	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	177	1	Vestibule Crossover	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	178	1	Closet Custodial	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	HBW Middle School	179	1	Closet Storage	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	HBW Middle School	180	SW	Stairwell East X-over East	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	181	SW	Stairwell East X-over East	2424T8BB	LT24-15W-BB	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	182	SW	Stairwell East X-over East	2424T8	LT24-15W-HI	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	183	3	Office By Balcony	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	30	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	HBW Middle School	184	3	Classroom 301	2444T8	LT44-15W	12	12	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	95	120	TRUE	130	1,760	1.28	0.68	0.59	2,247	1,204	1,043
Verona Public Schools NJ	HBW Middle School	185	3	Classroom 302	1884T8	LT44K18-15W	4	4	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	30	2,200	0.85	0.23	0.62	1,873	502	1,371
Verona Public Schools NJ	HBW Middle School	186	3	Classroom 302	1444T8	LT44-15W	2	2	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	100	120	TRUE	30	2,200	0.21	0.11	0.10	468	251	217
Verona Public Schools NJ	HBW Middle School	187	3	Classroom 303	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	85	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	188	3	Elevator Landing	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	43	120	TRUE	11	3,300	0.11	0.06	0.05	351	188	163
Verona Public Schools NJ	HBW Middle School	189	3	Hallway Floor 3	1424T8	LT24-15W	6	6	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	22	120	TRUE	11	3,300	0.33	0.17	0.16	1,091	564	527
Verona Public Schools NJ	HBW Middle School	190	3	Control Booth	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	HBW Middle School	191	3	Hallway Floor 3	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	192	SW	Stairwell East X-over West	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	193	SW	Stairwell East X-over West	2424T8BB	LT24-15W-BB	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	HBW Middle School	194	SW	Stairwell East X-over West	2424T8	LT24-15W-HI	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	195	SW	Stairwell East X-over West	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	196	2	Bathroom, Boys By 223	2444	LT24K24-15W	2	2	0.1440	0.0300	2x4, 4-Lamp	(2) LED Lamp, 15w, 4', Bracket Kit	43	120	TRUE	14	2,850	0.27	0.06	0.22	780	162	617
Verona Public Schools NJ	HBW Middle School	197	2	Classroom 223	1884T8	LT44K18-15W	8	8	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	85	120	TRUE	30	2,200	1.70	0.46	1.25	3,745	1,003	2,742
Verona Public Schools NJ	HBW Middle School	198	2	Classroom 222	2434T8	LT34-15W	14	14	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	56	120	TRUE	30	2,200	1.13	0.60	0.53	2,487	1,317	1,170
Verona Public Schools NJ	HBW Middle School	199	2	Prep Room 222	2434T8	LT24K24-15W	2	2	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	56	120	TRUE	30	2,200	0.16	0.06	0.10	355	125	230

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	200	2	Classroom 221	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	85	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	201	2	Classroom 220	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	85	120	TRUE	30	2,200	1.28	0.34	0.93	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	202	2	Closet, Mop By Time Out	1222	LT22-8W	1	1	0.0500	0.0160	1x2, 2-Lamp	(2) 2' LED Lamps	18	120	TRUE	13	2,200	0.05	0.02	0.03	105	33	71
Verona Public Schools NJ	HBW Middle School	203	2	Time Out Room	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	204	2	Bathroom, Time Out	1222	LT22-8W	1	1	0.0500	0.0160	1x2, 2-Lamp	(2) 2' LED Lamps	18	120	TRUE	14	2,850	0.05	0.02	0.03	135	43	92
Verona Public Schools NJ	HBW Middle School	205	2	Hallway Time Out- 222	1424T8	LT24-15W	9	9	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	22	120	TRUE	11	3,300	0.50	0.26	0.24	1,636	846	790
Verona Public Schools NJ	HBW Middle School	206	2	Hallway Time Out- 222	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	207	2	Hallway Time Out- 222	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	208	SW	Stairs 222- Caféteria	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	209	SW	Stairs 222- Caféteria	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	24	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	210	SW	Stairs 222- Caféteria	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	24	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	211	1	Caféteria	1884T8	LT44K18-15W	18	18	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	87	120	TRUE	21	1,440	3.83	1.03	2.80	5,516	1,477	4,038
Verona Public Schools NJ	HBW Middle School	212	1	Caféteria	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	21	1,440	0.22	0.11	0.11	317	164	153
Verona Public Schools NJ	HBW Middle School	213	1	Caféteria	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	21	1,440	0.17	0.09	0.08	238	123	115
Verona Public Schools NJ	HBW Middle School	214	1	Caféteria	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	215	1	Café Private Dining	1884T8	LT44K18-15W	4	4	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	30	120	TRUE	11	3,300	0.85	0.23	0.62	2,809	752	2,057
Verona Public Schools NJ	HBW Middle School	216	1	Café Private Dining	1444	LT44-15W	2	2	0.1440	0.0600	1x4, 4-Lamp	(4) LED Lamp, 15w, 4'	65	120	TRUE	11	3,300	0.27	0.11	0.16	903	376	527
Verona Public Schools NJ	HBW Middle School	217	1	Kitchen	2444T8	LT44-15W	10	10	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	30	120	TRUE	21	1,440	1.06	0.57	0.49	1,532	821	711
Verona Public Schools NJ	HBW Middle School	218	1	Kitchen	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	30	120	TRUE	21	1,440	0.06	0.02	0.04	79	22	57
Verona Public Schools NJ	HBW Middle School	219	1	Kitchen Range Hood	I75	L11A	4	4	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line		120	TRUE	21	1,440	0.29	0.04	0.24	410	60	350
Verona Public Schools NJ	HBW Middle School	220	1	Office Kitchen	222U	LT22K22-8W	1	1	0.0720	0.0160	2x2, 2-Lamp U	(2) 2' LED Lamps, Bracket Kit		120	TRUE	21	1,440	0.07	0.02	0.05	98	22	77
Verona Public Schools NJ	HBW Middle School	221	1	Kitchen	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	222	1	Corridor Kitchen	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	223	1	Walk In Cooler	I60	L08A	2	2	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	21	1,440	0.11	0.02	0.10	164	22	142
Verona Public Schools NJ	HBW Middle School	224	1	Electrical Room	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	HBW Middle School	225	1	Locker Room	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	21	1,440	0.11	0.06	0.05	159	82	77
Verona Public Schools NJ	HBW Middle School	226	1	Laundry Kitchen	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	43	120	TRUE	21	1,440	0.06	0.03	0.03	79	41	38
Verona Public Schools NJ	HBW Middle School	227	1	Cafeteria	VEND-CD	NR	1	1	0.3390	0.3390	Cold Drink Machine	will Not be Retrofit		120	FALSE	1	8,760	0.32	0.32	-	2,821	2,821	-
Verona Public Schools NJ	HBW Middle School	228	1	Caféteria Annex	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	121	1,152	0.11	0.06	0.05	127	66	61
Verona Public Schools NJ	HBW Middle School	229	1	Caféteria Annex	11294T8	LT94-15W	7	7	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	65	120	TRUE	121	1,152	1.70	0.90	0.80	1,954	1,034	919
Verona Public Schools NJ	HBW Middle School	230	1	Caféteria Annex	1864T8	LT44K18-15W	3	3	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	65	120	TRUE	121	1,152	0.48	0.17	0.31	558	197	361
Verona Public Schools NJ	HBW Middle School	231	1	Caféteria Annex	11294T8	LT94-15W	2	2	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	65	120	TRUE	121	1,152	0.48	0.26	0.23	558	295	263
Verona Public Schools NJ	HBW Middle School	232	1	Caféteria Annex	1864T8	LT44K18-15W	2	2	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	76	120	TRUE	121	1,152	0.32	0.11	0.21	372	131	241
Verona Public Schools NJ	HBW Middle School	233	1	Caféteria Annex	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	43	120	TRUE	121	1,152	0.06	0.02	0.04	63	18	46
Verona Public Schools NJ	HBW Middle School	234	1	Bathroom, Girls	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	114	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	HBW Middle School	235	1	Caféteria Annex	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	HBW Middle School	236	1	Bathroom, Men's	2444T8	LT24K24-15W	2	2	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit		120	TRUE	14	2,850	0.21	0.06	0.16	606	162	444
Verona Public Schools NJ	HBW Middle School	237	1	Storage	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	25	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	HBW Middle School	238	1	Corridor Bath To Café	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	239	1	Corridor Bath To Café	2434T8EM	LT24K24-15W	1	1	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	58	120	TRUE	1	8,760	0.08	0.03	0.05	707	250	458
Verona Public Schools NJ	HBW Middle School	240	1	Bathroom, Faculty - Main Lobby	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	36	120	TRUE	14	2,850	0.06	0.02	0.04	157	43	114
Verona Public Schools NJ	HBW Middle School	241	1	Office Asst Principal Open	222UT8	LT22K22-8W-PB	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	48	120	TRUE	3	2,600	0.33	0.09	0.24	860	237	622
Verona Public Schools NJ	HBW Middle School	242	1	Conference Room Guidance	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	25	120	TRUE	16	1,140	0.11	0.06	0.05	121	65	56
Verona Public Schools NJ	HBW Middle School	243	1	Conference Room Guidance	PL42	NR	6	6	0.0420	0.0420	CF PL 42w	will Not be Retrofit	51	120	FALSE	16	1,140	0.24	0.24	-	273	273	-
Verona Public Schools NJ	HBW Middle School	244	1	Office A P	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	65	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	HBW Middle School	245	1	Office Guidance 1	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	65	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	HBW Middle School	246	1	Office Guidance 2	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	65	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	HBW Middle School	247	1	Main Office	2444	LT44-15W	7	7	0.1440	0.0600	2x4, 4-Lamp	(4) LED Lamp, 15w, 4'	80	120	TRUE	3	2,600	0.96	0.40	0.56	2,490	1,037	1,452
Verona Public Schools NJ	HBW Middle School	248	1	Copy Room	2444	LT44-15W	2	2	0.1440	0.0600	2x4, 4-Lamp	(4) LED Lamp, 15w, 4'	46	120	TRUE	11	3,300	0.27	0.11	0.16	903	376	527
Verona Public Schools NJ	HBW Middle School	249	1	Office Principal	2444	LT44-15W	6	6	0.1440	0.0600	2x4, 4-Lamp	(4) LED Lamp, 15w, 4'	65	120	TRUE	3	2,600	0.82	0.34	0.48	2,134	889	1,245
Verona Public Schools NJ	HBW Middle School	250	1	Storage Main Hall	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	25	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	HBW Middle School	251	1	Elevator Landing	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	HBW Middle School	252	1	Chairlift Landing	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	111	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	HBW Middle School	253	1	Hallway Main Lobby	2424T8	22LED32TG-TILE	7	7	0.0580	0.0320	2x4, 2-Lamp T8	LED 32w 2x2 Troffer Panel	33	120	TRUE	11	3,300	0.39	0.21	0.17	1,273	702	571
Verona Public Schools NJ	HBW Middle School	254	1	Hallway Main Lobby	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	255	1	Main Lobby	2444T8	22LED32TG-TILE	8	8	0.1120	0.0320	2x4, 4-Lamp T8	LED 32w 2x2 Troffer Panel	65	120	TRUE	11	3,300	0.85	0.24	0.61	2,809	803	2,006
Verona Public Schools NJ	HBW Middle School	256	1	Main Lobby	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	257	1	Auditorium Rear	I3X75	L3X11A	5	5	0.2250	0.0330	Inc (3) 75w	(3) LED Lamp, 11w A-Line		120	TRUE	23	1,520	1.07	0.16	0.91	1,625	238	1,386
Verona Public Schools NJ	HBW Middle School	258	1	Auditorium Rear	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	HBW Middle School	259	1	Auditorium Main	LEDCAN	NR	12	12	0.0190	0.0190	LED 19w Fixture	will Not be Retrofit	26	120	FALSE	23	1,520	0.22	0.22	-	329	329	-
Verona Public Schools NJ	HBW Middle School	260	1	Auditorium Main	M250	2444SBT5-HI	9	9	0.2950	0.2350	MH 250w	New 2x4 w/ Elect. NPPS Bal. & (4) 4' T5's, Refl	22	120	TRUE	23	1,520	2.52	2.01	0.51	3,834	3,054	780
Verona Public Schools NJ	HBW Middle School	261	1	Auditorium Rear	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	262	1	Auditorium Balcony	I3X75	L3X11A	4	4	0.2250	0.0330	Inc (3) 75w	(3) LED Lamp, 11w A-Line		120	TRUE	23	1,520	0.86	0.13	0.73	1,300	191	1,109
Verona Public Schools NJ	HBW Middle School	263	1	Auditorium Balcony	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	HBW Middle School	264	1	Stage	1434T8	LT34-15W-HI	6	6	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	13	120	TRUE	23	1,520	0.48	0.26	0.23	736	390	347
Verona Public Schools NJ	HBW Middle School	265	1	Closet Auditorium	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	30	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	HBW Middle School	266	1	Stage Stairs Down	1414T8	LT14-15W	1	1	0.0320	0.0150	1x4, 1-Lamp T8	LED Lamp, (1) 15w	23	120	TRUE	23	1,520	0.03	0.01	0.02	46	22	25
Verona Public Schools NJ	HBW Middle School	267	B	Boiler Room	1424T8	LT24-15W	6	6	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	12	120	TRUE	13	2,200	0.33	0.17	0.16	727	376	351
Verona Public Schools NJ	HBW Middle School	268	B	Boiler Room	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	12	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	HBW Middle School	269	B	Boiler Room	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	HBW Middle School	270	B	Pump Room	1434T8	LT34-15W	2	2	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	22	120	TRUE	1	8,760	0.16	0.09	0.08	1,415	749	666
Verona Public Schools NJ	HBW Middle School	271	B	Corridors Basement	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	272	B	Corridors Basement	1424T8	LT24-15W	7	7	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.39	0.20	0.19	1,273	658	614
Verona Public Schools NJ	HBW Middle School	273	B	Corridors Basement	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.06	0.03	0.03	182	94	88
Verona Public Schools NJ	HBW Middle School	274	B	Storage Rooms (4)	1424T8	NR	12	12	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.66	0.66	-	344	344	-
Verona Public Schools NJ	HBW Middle School	275	B	Office Custodian	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	276	B	Electrical Room	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	HBW Middle School	277	B	Storage Teachers	1424T8	NR	3	3	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.17	0.17	-	86	86	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	HBW Middle School	278	B	Teachers Lounge	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	279	B	Vestibule To Mechanical Room	2434T8	LT24K24-15W	1	1	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	75	120	TRUE	11	3,300	0.08	0.03	0.05	266	94	172
Verona Public Schools NJ	HBW Middle School	280	B	Corridor To Mechanical Room	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	281	B	Mech / Elevator Room	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	23	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	HBW Middle School	282	B	Hallway Basement	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	38	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	HBW Middle School	283	B	Hallway Basement	2424T8BB	LT24-15W-BB	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	38	120	TRUE	11	3,300	0.17	0.09	0.08	545	282	263
Verona Public Schools NJ	HBW Middle School	284	B	Hallway Basement	1444T8	LT44-15W	3	3	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	95	120	TRUE	11	3,300	0.32	0.17	0.15	1,053	564	489
Verona Public Schools NJ	HBW Middle School	285	B	Hallway Basement	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	HBW Middle School	286	Ext	Walls 1967 Wing	H100	LED46MWPFCO-DECO-HI	1	1	0.1250	0.0460	MV 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.12	0.04	0.08	520	191	329
Verona Public Schools NJ	HBW Middle School	287	Ext	Walls 1967 Wing	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	HBW Middle School	288	Ext	Main Bldg East Side	H100	LED46MWPFCO-DECO-HI	2	2	0.1250	0.0460	MV 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.24	0.09	0.15	1,040	383	657
Verona Public Schools NJ	HBW Middle School	289	Ext	Main Bldg East Side	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	HBW Middle School	290	Ext	Main Bldg Front East Wall	H100	LED46MWPFCO-DECO-HI	2	2	0.1250	0.0460	MV 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.24	0.09	0.15	1,040	383	657
Verona Public Schools NJ	HBW Middle School	291	Ext	Front Walk Main Building East	M70	NR	2	2	0.0950	0.0950	MH 70w	will Not be Retrofit		120	FALSE	10	4,380	0.18	0.18	-	791	791	-
Verona Public Schools NJ	HBW Middle School	292	Ext	Door	I60	L08A	1	1	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	10	4,380	0.06	0.01	0.05	250	33	216
Verona Public Schools NJ	HBW Middle School	293	Ext	Main Entry	I3X60	L3X8A	2	2	0.1800	0.0240	Inc (3) 60w	(3) LED Lamp, 8w A-Line		120	TRUE	10	4,380	0.34	0.05	0.30	1,498	200	1,298
Verona Public Schools NJ	HBW Middle School	294	Ext	Main Entry	M100	NR	1	1	0.1300	0.1300	MH 100w	will Not be Retrofit		120	FALSE	10	4,380	0.12	0.12	-	541	541	-
Verona Public Schools NJ	HBW Middle School	295	Ext	West Wall Facing South	H100	LED46MWPFCO-DECO-HI	3	3	0.1250	0.0460	MV 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.36	0.13	0.23	1,560	574	986
Verona Public Schools NJ	HBW Middle School	296	Ext	West Wall Facing South	I60	L08A	1	1	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	10	4,380	0.06	0.01	0.05	250	33	216
Verona Public Schools NJ	HBW Middle School	297	Ext	West Wall Facing South	M70	NR	2	2	0.0950	0.0950	MH 70w	will Not be Retrofit		120	FALSE	10	4,380	0.18	0.18	-	791	791	-
Verona Public Schools NJ	HBW Middle School	298	Ext	West Wall Facing West	H100	LED46MWPFCO-DECO-HI	1	1	0.1250	0.0460	MV 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.12	0.04	0.08	520	191	329
Verona Public Schools NJ	HBW Middle School	299	Ext	West Wall Facing West	I60	L08A	1	1	0.0600	0.0080	Inc 60w	LED Lamp, 8w A-Line		120	TRUE	10	4,380	0.06	0.01	0.05	250	33	216
Verona Public Schools NJ	HBW Middle School	300	Ext	North Wall By Teachers Lot	M150	LED41MWP-HI	2	2	0.1800	0.0410	MH 150w	LED 41w Wall Pack		120	TRUE	10	4,380	0.34	0.08	0.26	1,498	341	1,157
Verona Public Schools NJ	HBW Middle School	301	Ext	North Wall By Teachers Lot	H100	LED46MWPFCO-DECO	1	1	0.1250	0.0460	MV 100w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.12	0.04	0.08	520	191	329
Verona Public Schools NJ	HBW Middle School	302	Ext	North Wall By Teachers Lot To Gym	M400	LED158FL	6	6	0.4580	0.1580	MH 400w	LED 158w Flood		120	TRUE	10	4,380	2.61	0.90	1.71	11,434	3,945	7,490
Verona Public Schools NJ	HBW Middle School	303	Ext	North Wall By Teachers Lot	PL13	NR	1	1	0.0130	0.0130	CF PL 13w	will Not be Retrofit		120	FALSE	10	4,380	0.01	0.01	-	54	54	-
Verona Public Schools NJ	HBW Middle School	304	Ext	Door To Gym	M70	LED13SWP	1	1	0.0950	0.0130	MH 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	395	54	341
Verona Public Schools NJ	HBW Middle School	305	Ext	Wall Gym	M175	LED41MWP	1	1	0.2100	0.0410	MH 175w	LED 41w Wall Pack		120	TRUE	10	4,380	0.20	0.04	0.16	874	171	703
Verona Public Schools NJ	HBW Middle School	306	Ext	Wall Gym	S100	LED46C	2	2	0.1300	0.0460	HPS 100w	LED 46w Canopy		120	TRUE	10	4,380	0.25	0.09	0.16	1,082	383	699
Verona Public Schools NJ	HBW Middle School	307	Ext	Corner Wall By Gym	I90	L18PAR38-HI	1	1	0.0900	0.0180	Inc 90w	LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.09	0.02	0.07	374	75	300
Verona Public Schools NJ	HBW Middle School	308	Ext	School Wall	I90	L18PAR38-HI	1	1	0.0900	0.0180	Inc 90w	LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.09	0.02	0.07	374	75	300
Verona Public Schools NJ	HBW Middle School	309	Ext	Gym Wall Pointing At Lot	I90	L18PAR38	2	2	0.0900	0.0180	Inc 90w	LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.17	0.03	0.14	749	150	599
Verona Public Schools NJ	Laning Elementary	1	1	Gymnasium	M400	LEDHB232-IBL	12	12	0.4580	0.2320	MH 400w	LED 232w High Bay with Bi-level Sensor	16	120	TRUE	27	1,900	5.22	2.64	2.58	9,920	5,025	4,895
Verona Public Schools NJ	Laning Elementary	2	1	Gymnasium	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Laning Elementary	3	1	Office, Storage -gym	1424T8	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	40	120	TRUE	3	2,600	0.22	0.11	0.11	573	296	277
Verona Public Schools NJ	Laning Elementary	4	1	Closet, Elec - Gym	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	32	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Laning Elementary	5	1	Bathroom, Boys	1824T8	LT24-15W	1	1	0.0580	0.0300	1x8, 2-Lamp T8 4'	LED Lamp, (2) 15w	33	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Laning Elementary	6	1	Bathroom, Boys	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Laning Elementary	7	1	Bathroom, Boys	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Laning Elementary	8	1	Bathroom, Girls	1824T8	LT24-15W	1	1	0.0580	0.0300	1x8, 2-Lamp T8 4'	LED Lamp, (2) 15w	33	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Laning Elementary	9	1	Bathroom, Girls	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Laning Elementary	10	1	Bathroom, Girls	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	15	2,280	0.06	0.03	0.03	126	65	61
Verona Public Schools NJ	Laning Elementary	11	1	Classroom 114	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	56	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	Laning Elementary	12	1	Classroom 124	2434T8DS	LT34-15W	12	12	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	65	120	TRUE	25	1,520	1.03	0.51	0.51	1,560	780	780
Verona Public Schools NJ	Laning Elementary	13	1	Classroom 123	2434T8DS	LT34-15W	9	9	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	56	120	TRUE	25	1,520	0.77	0.38	0.38	1,170	585	585
Verona Public Schools NJ	Laning Elementary	14	1	Classroom 115 Art	1884T8	LT44K18-15W	12	12	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	125	120	TRUE	25	1,520	2.55	0.68	1.87	3,881	1,040	2,842
Verona Public Schools NJ	Laning Elementary	15	1	Classroom 115 Art	1444T8	LT44-15W	3	3	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	125	120	TRUE	25	1,520	0.32	0.17	0.15	485	260	225
Verona Public Schools NJ	Laning Elementary	16	1	Resource Room	1884T8	LT44K18-15W	3	3	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	75	120	TRUE	25	1,520	0.64	0.17	0.47	970	260	710
Verona Public Schools NJ	Laning Elementary	17	1	Closet Storage	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line	8	120	TRUE	7	520	0.02	0.01	0.01	11	4	7
Verona Public Schools NJ	Laning Elementary	18	1	Storage Loft	I150	L18PAR38	1	1	0.1500	0.0180	Inc 150w	LED Lamp, 18w PAR 38	5	120	TRUE	7	520	0.14	0.02	0.13	74	9	65
Verona Public Schools NJ	Laning Elementary	19	1	Classroom 110	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	125	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Laning Elementary	20	1	Bathroom, Girls By 110	2444T8	LT24K24-15W	2	2	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	41	120	TRUE	15	2,280	0.21	0.06	0.16	485	130	355
Verona Public Schools NJ	Laning Elementary	21	1	Boiler Room Stairs	CFL18	L08A	1	1	0.0180	0.0080	CFL 18w	LED Lamp, 8w A-Line	5	120	TRUE	13	2,200	0.02	0.01	0.01	38	17	21
Verona Public Schools NJ	Laning Elementary	22	B	Storage, Basement	1434T8	NR	4	4	0.0850	0.0850	1x4, 3-Lamp T8	will Not be Retrofit	18	120	FALSE	7	520	0.32	0.32	-	168	168	-
Verona Public Schools NJ	Laning Elementary	23	B	Pump Room	I90	L18PAR38	1	1	0.0900	0.0180	Inc 90w	LED Lamp, 18w PAR 38	10	120	TRUE	7	520	0.09	0.02	0.07	44	9	36
Verona Public Schools NJ	Laning Elementary	24	B	Boiler Room	1434T8	LT34-15W	5	5	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	18	120	TRUE	13	2,200	0.40	0.21	0.19	888	470	418
Verona Public Schools NJ	Laning Elementary	25	1	Office 120 S G I	2444T8	LT44-15W	3	3	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	45	120	TRUE	3	2,600	0.32	0.17	0.15	830	445	385
Verona Public Schools NJ	Laning Elementary	26	1	Closet, Custodial	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line	7	120	TRUE	13	2,200	0.02	0.01	0.01	48	17	31
Verona Public Schools NJ	Laning Elementary	27	1	Bathroom, Boys By 119	2444T8	LT24K24-15W	2	2	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	41	120	TRUE	15	2,280	0.21	0.06	0.16	485	130	355
Verona Public Schools NJ	Laning Elementary	28	1	Classroom 119	2434T8DS	LT34-15W	11	11	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	72	120	TRUE	25	1,520	0.94	0.47	0.47	1,430	715	715
Verona Public Schools NJ	Laning Elementary	29	1	Bathroom, 119	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	30	1	Faculty Room 117	1844T8	LT44-15W	2	2	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	45	120	TRUE	12	2,640	0.21	0.11	0.10	562	301	261
Verona Public Schools NJ	Laning Elementary	31	1	Faculty Room 117	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	45	120	TRUE	12	2,640	0.11	0.06	0.05	281	150	130
Verona Public Schools NJ	Laning Elementary	32	1	Faculty Room 117	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line	20	120	TRUE	12	2,640	0.10	0.02	0.08	251	48	203
Verona Public Schools NJ	Laning Elementary	33	1	Bathroom, Faculty W	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	5	120	TRUE	15	2,280	0.07	0.01	0.06	162	24	139
Verona Public Schools NJ	Laning Elementary	34	1	Bathroom, Faculty M	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	5	120	TRUE	15	2,280	0.07	0.01	0.06	162	24	139
Verona Public Schools NJ	Laning Elementary	35	1	Office, Custodian	2444T8	LT44-15W	1	1	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	40	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	Laning Elementary	36	1	Classroom 101	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	35	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Laning Elementary	37	1	Bathroom, 101	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	5	120	TRUE	15	2,280	0.07	0.01	0.06	162	24	139
Verona Public Schools NJ	Laning Elementary	38	1	Classroom 102	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	35	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Laning Elementary	39	1	Bathroom, 102	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	5	120	TRUE	15	2,280	0.07	0.01	0.06	162	24	139
Verona Public Schools NJ	Laning Elementary	40	1	Classroom 103	1884T8	LT44K18-15W	8	8	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	95	120	TRUE	25	1,520	1.70	0.46	1.25	2,588	693	1,895
Verona Public Schools NJ	Laning Elementary	41	1	Bathroom, 103	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line		120	TRUE	15	2,280	0.02	0.01	0.01	50	17	32
Verona Public Schools NJ	Laning Elementary	42	1	Conference Rm - C S T	222UT8	LT22K22-8W-PB	5	5	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	57	120	TRUE	16	1,140	0.28	0.08	0.20	314	87	227
Verona Public Schools NJ	Laning Elementary	43	1	Office- C S T	222UT8	LT22K22-8W-PB	5	5	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	57	120	TRUE	3	2,600	0.28	0.08	0.20	716	198	519
Verona Public Schools NJ	Laning Elementary	44	1	Storage O T/ P T	2424T8	NR	3	3	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	21	120	FALSE	7	520	0.17	0.17	-	86	86	-
Verona Public Schools NJ	Laning Elementary	45	1	Classroom 128	2434T8DS	LT34-15W	14	14	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	83	120	TRUE	25	1,520	1.20	0.60	0.60	1,819	910	910
Verona Public Schools NJ	Laning Elementary	46	1	Storage 128	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	30	120	FALSE	7	520	0.06	0.06	-	29	29	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Laning Elementary	47	1	Bathroom, 128	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	48	1	Classroom 126	2434T8DS	LT34-15W	11	11	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	73	120	TRUE	25	1,520	0.94	0.47	0.47	1,430	715	715
Verona Public Schools NJ	Laning Elementary	49	1	Storage 126	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	30	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Laning Elementary	50	1	Bathroom, 126	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	51	1	Office, 2	222UT8	LT22K22-8W-PB	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	57	120	TRUE	3	2,600	0.33	0.09	0.24	860	237	622
Verona Public Schools NJ	Laning Elementary	52	1	Vestibule; Exit Door	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Laning Elementary	53	1	Office, 1	222UT8	LT22K22-8W-PB	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	57	120	TRUE	3	2,600	0.33	0.09	0.24	860	237	622
Verona Public Schools NJ	Laning Elementary	54	1	Classroom 127	2434T8DS	LT34-15W	11	11	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	73	120	TRUE	25	1,520	0.94	0.47	0.47	1,430	715	715
Verona Public Schools NJ	Laning Elementary	55	1	Storage 127	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	30	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Laning Elementary	56	1	Bathroom, 127	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	57	1	Classroom 129	2434T8DS	LT34-15W	14	14	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	83	120	TRUE	25	1,520	1.20	0.60	0.60	1,819	910	910
Verona Public Schools NJ	Laning Elementary	58	1	Storage 129	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	30	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Laning Elementary	59	1	Bathroom, 129	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	60	1	Classroom 130	2434T8DS	LT34-15W	9	9	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	58	120	TRUE	25	1,520	0.77	0.38	0.38	1,170	585	585
Verona Public Schools NJ	Laning Elementary	61	1	Storage 130	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	35	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Laning Elementary	62	1	Classroom 104	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	35	120	TRUE	25	1,520	0.85	0.46	0.40	1,294	693	601
Verona Public Schools NJ	Laning Elementary	63	1	Classroom 104	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	90	120	TRUE	25	1,520	0.21	0.06	0.16	323	87	237
Verona Public Schools NJ	Laning Elementary	64	1	Classroom 104	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	25	1,520	0.01	0.01	0.00	19	12	7
Verona Public Schools NJ	Laning Elementary	65	1	Classroom 104	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line		120	TRUE	25	1,520	0.02	0.01	0.01	33	12	22
Verona Public Schools NJ	Laning Elementary	66	1	Classroom 104	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Laning Elementary	67	1	Closet, Custodial	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Laning Elementary	68	1	Classroom 105	1444T8	LT44-15W	11	11	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	52	120	TRUE	25	1,520	1.17	0.63	0.54	1,779	953	826
Verona Public Schools NJ	Laning Elementary	69	1	Closet, 105	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	36	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Laning Elementary	70	1	Classroom 105	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	25	1,520	0.01	0.01	0.00	19	12	7
Verona Public Schools NJ	Laning Elementary	71	1	Bathroom, 105	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	73	120	TRUE	15	2,280	0.11	0.06	0.05	251	130	121
Verona Public Schools NJ	Laning Elementary	72	1	Corridor To Courtyard	222UT8	LT22K22-8W-PB	3	3	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	42	120	TRUE	12	2,640	0.17	0.05	0.12	436	120	316
Verona Public Schools NJ	Laning Elementary	73	1	Corridor To Courtyard	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Laning Elementary	74	Ext	Courtyard Garden	CFL26BB	NR	2	2	0.0260	0.0260	CFL 26w	will Not be Retrofit		120	FALSE	12	2,640	0.05	0.05	-	130	130	-
Verona Public Schools NJ	Laning Elementary	75	Ext	Courtyard Garden	M70	LED46MWPFCO-DECO	1	1	0.0950	0.0460	MH 70w	LED 46w Medium Wall Pack, Full Cut Off		120	TRUE	10	4,380	0.09	0.04	0.05	395	191	204
Verona Public Schools NJ	Laning Elementary	76	1	Media Center	1864T8	LT44K18-15W	4	4	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	75	120	TRUE	25	1,520	0.65	0.23	0.42	982	347	635
Verona Public Schools NJ	Laning Elementary	77	1	Media Center	11294T8	LT94-15W	5	5	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	75	120	TRUE	25	1,520	1.21	0.64	0.57	1,841	975	866
Verona Public Schools NJ	Laning Elementary	78	1	Media Center	11294T8	LT94-15W	3	3	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	75	120	TRUE	25	1,520	0.73	0.38	0.34	1,105	585	520
Verona Public Schools NJ	Laning Elementary	79	1	Media Center	1864T8	LT44K18-15W	3	3	0.1700	0.0600	1x8, 6-Lamp T8	(4) LED Lamp, 15w, 4' and Bracket Kit	75	120	TRUE	25	1,520	0.48	0.17	0.31	736	260	477
Verona Public Schools NJ	Laning Elementary	80	1	Media Center	222UT8	LT32K22-8W-PB	4	4	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	38	120	TRUE	25	1,520	0.22	0.09	0.13	335	139	196
Verona Public Schools NJ	Laning Elementary	81	1	Media Center	222UT8BB	LT22K22-BB-PB	4	4	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	25	1,520	0.22	0.06	0.16	335	92	243
Verona Public Schools NJ	Laning Elementary	82	1	Media Center, Computer Lab	11294T8	LT94-15W	4	4	0.2550	0.1350	1x12, 9-Lamp T8	(9) LED Lamp, 15w, 4'	54	120	TRUE	25	1,520	0.97	0.51	0.46	1,473	780	693
Verona Public Schools NJ	Laning Elementary	83	1	Media Center	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Laning Elementary	84	1	Media Center	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Laning Elementary	85	1	Book Storage, Media	2424T8	NR	3	3	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	52	120	FALSE	7	520	0.17	0.17	-	86	86	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Laning Elementary	86	1	Office- Librarian	222UT8	LT22K22-8W-PB	3	3	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	57	120	TRUE	3	2,600	0.17	0.05	0.12	430	119	311
Verona Public Schools NJ	Laning Elementary	87	1	Bathroom 1, Unisex	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	88	1	Bathroom 2, Unisex	222UT8BB	LT22K22-BB	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	89	1	Kitchen	1444T8	LT44-15W	2	2	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	31	120	TRUE	26	1,520	0.21	0.11	0.10	323	173	150
Verona Public Schools NJ	Laning Elementary	90	1	Multi-purpose Room	M250	LEDHB177-IBL-MM	6	6	0.2950	0.1770	MH 250w	LED 177w High Bay with Bi-level Sensor	6	120	TRUE	28	1,520	1.68	1.01	0.67	2,556	1,534	1,022
Verona Public Schools NJ	Laning Elementary	91	1	Multi-purpose Room	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	Laning Elementary	92	1	Storage Multi Purp	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	15	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Laning Elementary	93	1	Mechanical Loft	1434T8	NR	3	3	0.0850	0.0850	1x4, 3-Lamp T8	will Not be Retrofit	18	120	FALSE	7	520	0.24	0.24	-	126	126	-
Verona Public Schools NJ	Laning Elementary	94	1	Mechanical Loft	CFL23	L08A	1	1	0.0230	0.0080	CFL 23w	LED Lamp, 8w A-Line		120	TRUE	7	520	0.02	0.01	0.01	11	4	7
Verona Public Schools NJ	Laning Elementary	95	1	Entry Stage Left	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Laning Elementary	96	1	Entry Stage Right	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	15	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Laning Elementary	97	1	Stage	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Laning Elementary	98	1	Main Lobby	PL26	NR	9	9	0.0280	0.0280	CF PL 26w	will Not be Retrofit	13	120	FALSE	12	2,640	0.24	0.24	-	632	632	-
Verona Public Schools NJ	Laning Elementary	99	1	Main Lobby	PL26	NR	2	2	0.0280	0.0280	CF PL 26w	will Not be Retrofit	17	120	FALSE	12	2,640	0.05	0.05	-	140	140	-
Verona Public Schools NJ	Laning Elementary	100	1	Main Lobby	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Laning Elementary	101	1	Main Office	222UT8	LT22K22-8W-PB	9	9	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	40	120	TRUE	3	2,600	0.50	0.14	0.36	1,289	356	934
Verona Public Schools NJ	Laning Elementary	102	1	Main Office	222UT8BB	LT22K22-BB-PB	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit		120	TRUE	3	2,600	0.11	0.03	0.08	287	79	207
Verona Public Schools NJ	Laning Elementary	103	1	Main Lobby	PL26	NR	2	2	0.0280	0.0280	CF PL 26w	will Not be Retrofit	17	120	FALSE	12	2,640	0.05	0.05	-	140	140	-
Verona Public Schools NJ	Laning Elementary	104	1	Main Lobby	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Laning Elementary	105	1	Closet; Data Main Ofc	1222T8	NR	1	1	0.0340	0.0340	1x2, 2-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.03	0.03	-	17	17	-
Verona Public Schools NJ	Laning Elementary	106	1	Office, Principal	222UT8	LT22K22-8W-PB	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	47	120	TRUE	3	2,600	0.33	0.09	0.24	860	237	622
Verona Public Schools NJ	Laning Elementary	107	1	Office, Nurse	222UT8	LT22K22-8W-PB	5	5	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	40	120	TRUE	3	2,600	0.28	0.08	0.20	716	198	519
Verona Public Schools NJ	Laning Elementary	108	1	Office, Nurse	222UT8BB	LT22K22-BB-PB	2	2	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	40	120	TRUE	3	2,600	0.11	0.03	0.08	287	79	207
Verona Public Schools NJ	Laning Elementary	109	1	Bathroom Nurse	222UT8	LT22K22-8W	1	1	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	38	120	TRUE	15	2,280	0.06	0.02	0.04	126	35	91
Verona Public Schools NJ	Laning Elementary	110	1	Classroom 108	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	90	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Laning Elementary	111	1	Classroom 109	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	90	120	TRUE	25	1,520	1.28	0.34	0.93	1,941	520	1,421
Verona Public Schools NJ	Laning Elementary	112	1	Classroom 111	2444T8	LT44-15W	12	12	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	60	120	TRUE	25	1,520	1.28	0.68	0.59	1,941	1,040	901
Verona Public Schools NJ	Laning Elementary	113	1	Classroom 112	2444T8	LT44-15W	12	12	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	60	120	TRUE	25	1,520	1.28	0.68	0.59	1,941	1,040	901
Verona Public Schools NJ	Laning Elementary	114	1	Hallway To Gym	2434T8	LT24K24-15W	3	3	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	50	120	TRUE	12	2,640	0.24	0.09	0.16	640	226	414
Verona Public Schools NJ	Laning Elementary	115	1	Hallway To Gym	2434T8BB	LT34-BB	1	1	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	50	120	TRUE	12	2,640	0.08	0.04	0.04	213	113	100
Verona Public Schools NJ	Laning Elementary	116	1	Hallway 116 To 124	2434T8	LT24K24-15W	3	3	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	50	120	TRUE	12	2,640	0.24	0.09	0.16	640	226	414
Verona Public Schools NJ	Laning Elementary	117	1	Hallway 116 To 124	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Laning Elementary	118	1	Hallway 124 To Exit	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Laning Elementary	119	1	Hallway 124 To Exit	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Laning Elementary	120	1	Hallway 112 To Main	2444T8	LT24K24-15W	5	5	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	55	120	TRUE	12	2,640	0.53	0.14	0.39	1,404	376	1,028
Verona Public Schools NJ	Laning Elementary	121	1	Vestibule By 109	2444T8	LT24K24-15W	1	1	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	55	120	TRUE	12	2,640	0.11	0.03	0.08	281	75	206
Verona Public Schools NJ	Laning Elementary	122	1	Hallway 109 To Main Office	2444T8	LT24K24-15W	14	14	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	55	120	TRUE	12	2,640	1.49	0.40	1.09	3,933	1,053	2,879
Verona Public Schools NJ	Laning Elementary	123	1	Hallway 109 To Main Lobby	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Laning Elementary	124	1	Hallway 109 To Main Lobby	K-LED	NR	6	6	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	200	200	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Laning Elementary	125	1	Hallway Aud To Lobby	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	Laning Elementary	126	1	Hallway Aud To Lobby	2424T8BB	LT24-15W-BB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	50	120	TRUE	12	2,640	0.11	0.06	0.05	291	150	140
Verona Public Schools NJ	Laning Elementary	127	1	Hallway Aud To 101	2444T8	LT24K24-15W	6	6	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	55	120	TRUE	12	2,640	0.64	0.17	0.47	1,685	451	1,234
Verona Public Schools NJ	Laning Elementary	128	1	Hallway 101 To104	2444T8	LT24K24-15W	9	9	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	55	120	TRUE	12	2,640	0.96	0.26	0.70	2,528	677	1,851
Verona Public Schools NJ	Laning Elementary	129	1	Hallway 105 / 121	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Laning Elementary	130	1	Hallway 105 / 121	2424T8BB	LT24-15W-BB	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	12	2,640	0.06	0.03	0.03	145	75	70
Verona Public Schools NJ	Laning Elementary	131	1	Hallway 101 To104	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	Laning Elementary	132	1	Hallway 101 To104	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Laning Elementary	133	1	Hallway 104	2444T8	LT24K24-15W	3	3	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	55	120	TRUE	12	2,640	0.32	0.09	0.23	843	226	617
Verona Public Schools NJ	Laning Elementary	134	1	Hallway 104	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Laning Elementary	135	1	Hallway Cst - 126	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	12	2,640	0.22	0.11	0.11	582	301	281
Verona Public Schools NJ	Laning Elementary	136	1	Hallway Cst - 126	2424T8BB	LT24-15W-BB	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	12	2,640	0.17	0.09	0.08	436	226	211
Verona Public Schools NJ	Laning Elementary	137	1	Hallway Cst - 126	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Laning Elementary	138	Ext	Main Entry	PL32	NR	6	6	0.0320	0.0320	CF PL 32w	will Not be Retrofit		120	FALSE	10	4,380	0.18	0.18	-	799	799	-
Verona Public Schools NJ	Laning Elementary	139	Ext	Front Wall Left Door	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Laning Elementary	140	Ext	West Wall Side Door	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Laning Elementary	141	Ext	Patio To Gym Entry	PL32	NR	6	6	0.0320	0.0320	CF PL 32w	will Not be Retrofit		120	FALSE	10	4,380	0.18	0.18	-	799	799	-
Verona Public Schools NJ	Laning Elementary	142	Ext	Patio To Gym Entry	PL32BB	NR	3	3	0.0320	0.0320	CF PL 32w	will Not be Retrofit		120	FALSE	10	4,380	0.09	0.09	-	399	399	-
Verona Public Schools NJ	Laning Elementary	143	Ext	Walls, Gym	M250	LED79MWP	2	2	0.2950	0.0790	MH 250w	LED 79w Wall Pack		120	TRUE	10	4,380	0.56	0.15	0.41	2,455	657	1,798
Verona Public Schools NJ	Laning Elementary	144	Ext	Doors Steps, Gym	PL2X26BB	NR	1	1	0.0520	0.0520	CF (2) PL 26w	will Not be Retrofit		120	FALSE	10	4,380	0.05	0.05	-	216	216	-
Verona Public Schools NJ	Laning Elementary	145	Ext	Door To Hallway	PL26BB	NR	2	2	0.0260	0.0260	CF PL 26w	will Not be Retrofit		120	FALSE	10	4,380	0.05	0.05	-	216	216	-
Verona Public Schools NJ	Laning Elementary	146	Ext	Walls Rear	M250	LED79MWP	3	3	0.2950	0.0790	MH 250w	LED 79w Wall Pack		120	TRUE	10	4,380	0.84	0.23	0.62	3,682	986	2,696
Verona Public Schools NJ	Laning Elementary	147	Ext	Door To Hallway	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Laning Elementary	148	Ext	Walls 125,126	M250	LED79MWP	1	1	0.2950	0.0790	MH 250w	LED 79w Wall Pack		120	TRUE	10	4,380	0.28	0.08	0.21	1,227	329	899
Verona Public Schools NJ	Laning Elementary	149	Ext	Doors To 128	PL2X26BB	NR	1	1	0.0520	0.0520	CF (2) PL 26w	will Not be Retrofit		120	FALSE	10	4,380	0.05	0.05	-	216	216	-
Verona Public Schools NJ	Laning Elementary	150	Ext	East Wall	M70	LED13SWP	2	2	0.0950	0.0130	MH 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.18	0.02	0.16	791	108	682
Verona Public Schools NJ	Laning Elementary	151	Ext	East Wall	PL2X26BB	NR	1	1	0.0520	0.0520	CF (2) PL 26w	will Not be Retrofit		120	FALSE	10	4,380	0.05	0.05	-	216	216	-
Verona Public Schools NJ	Verona High School	1	1	Gymnasium, New	M400	LEDHB232-IBL	30	30	0.4580	0.2320	MH 400w	LED 232w High Bay with Bi-level Sensor	13	120	TRUE	22	2,850	13.05	6.61	6.44	37,201	18,844	18,357
Verona Public Schools NJ	Verona High School	2	1	Gymnasium, New	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	Verona High School	3	1	Gymnasium, New	222U	LT32K22-8W	2	2	0.0720	0.0240	2x2, 2-Lamp U	(3) 2' LED Lamps, Bracket Kit	20	120	TRUE	22	2,850	0.14	0.05	0.09	390	130	260
Verona Public Schools NJ	Verona High School	4	1	Corridor, Gym	2424T8	LT24-15W	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	Verona High School	5	1	Corridor, Gym	2444T8	LT44-15W	2	2	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	60	120	TRUE	1	8,760	0.21	0.11	0.10	1,864	999	865
Verona Public Schools NJ	Verona High School	6	1	Corridor, Gym	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Verona High School	7	1	Corridor, Gym	VEND-CD	NR	1	1	0.3390	0.3390	Cold Drink Machine	will Not be Retrofit		120	FALSE	1	8,760	0.32	0.32	-	2,821	2,821	-
Verona Public Schools NJ	Verona High School	8	1	Boys Team Room	2444T8	LT44-15W	16	16	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	96	120	TRUE	122	2,280	1.70	0.91	0.79	3,881	2,079	1,802
Verona Public Schools NJ	Verona High School	9	1	Boys Team Room	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Verona High School	10	1	Boys Team Toilets	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	50	120	TRUE	22	2,850	0.11	0.06	0.05	303	162	141
Verona Public Schools NJ	Verona High School	11	1	Boys Team Sink	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	22	2,850	0.06	0.03	0.03	157	81	76
Verona Public Schools NJ	Verona High School	12	1	Boys Team Showers	1424T8	LT24-15W	5	5	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	22	2,850	0.28	0.14	0.13	785	406	379

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	13	1	Office A Coach	2424T8	LT24-15W	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	39	120	TRUE	3	2,600	0.11	0.06	0.05	287	148	138
Verona Public Schools NJ	Verona High School	14	1	Office Corridor	222U	LT22K22-8W	1	1	0.0720	0.0160	2x2, 2-Lamp U	(2) 2' LED Lamps, Bracket Kit		120	TRUE	3	2,600	0.07	0.02	0.05	178	40	138
Verona Public Schools NJ	Verona High School	15	1	Office B Coach	2424T8	LT24-15W	1	1	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	32	120	TRUE	3	2,600	0.06	0.03	0.03	143	74	69
Verona Public Schools NJ	Verona High School	16	1	Trainer	2424T8	LT24-15W	3	3	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	42	120	TRUE	22	2,850	0.17	0.09	0.08	471	244	227
Verona Public Schools NJ	Verona High School	17	1	Trainer	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	45	120	TRUE	22	2,850	0.06	0.03	0.03	157	81	76
Verona Public Schools NJ	Verona High School	18	1	Boys Lockers	1844T8	LT44-15W	7	7	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	18	120	TRUE	22	2,850	0.74	0.40	0.35	2,123	1,137	986
Verona Public Schools NJ	Verona High School	19	1	Boys Lockers	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	18	120	TRUE	22	2,850	0.17	0.09	0.08	471	244	227
Verona Public Schools NJ	Verona High School	20	1	Boys Lockers	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	21	1	Boys Lockers	222U	LT22K22-8W	1	1	0.0720	0.0160	2x2, 2-Lamp U	(2) 2' LED Lamps, Bracket Kit	23	120	TRUE	22	2,850	0.07	0.02	0.05	195	43	152
Verona Public Schools NJ	Verona High School	22	SW	Stairs Down	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	Verona High School	23	SW	Stairs Down	1844T8	LT44-15W	2	2	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	51	120	TRUE	11	3,300	0.21	0.11	0.10	702	376	326
Verona Public Schools NJ	Verona High School	24	SW	Stairs Down	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	36	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	Verona High School	25	B	Weight Room	1844T8	LT44-15W	8	8	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	19	120	TRUE	11	3,300	0.85	0.46	0.40	2,809	1,505	1,304
Verona Public Schools NJ	Verona High School	26	B	Weight Room	1424T8	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	19	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	Verona High School	27	B	Weight Room	1424T8EM	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	19	120	TRUE	1	8,760	0.22	0.11	0.11	1,931	999	932
Verona Public Schools NJ	Verona High School	28	B	Weight Room	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Verona High School	29	B	Corridor	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	35	120	TRUE	11	3,300	0.21	0.06	0.16	702	188	514
Verona Public Schools NJ	Verona High School	30	B	Bathroom, Women's	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	35	120	TRUE	14	2,850	0.21	0.06	0.16	606	162	444
Verona Public Schools NJ	Verona High School	31	B	Bathroom, Men's	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	35	120	TRUE	14	2,850	0.11	0.06	0.05	303	162	141
Verona Public Schools NJ	Verona High School	32	1	Storage, Gym	1884T8	NR	2	2	0.2240	0.2240	1x8, 8-Lamp T8 4'	will Not be Retrofit	35	120	FALSE	7	520	0.43	0.43	-	221	221	-
Verona Public Schools NJ	Verona High School	33	1	Storage A, Gym	1884T8	NR	1	1	0.2240	0.2240	1x8, 8-Lamp T8 4'	will Not be Retrofit	40	120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	Verona High School	34	1	Storage B, Gym	1884T8	NR	2	2	0.2240	0.2240	1x8, 8-Lamp T8 4'	will Not be Retrofit	40	120	FALSE	7	520	0.43	0.43	-	221	221	-
Verona Public Schools NJ	Verona High School	35	1	Girls Team Room	222U	LT22K22-8W	1	1	0.0720	0.0160	2x2, 2-Lamp U	(2) 2' LED Lamps, Bracket Kit	19	120	TRUE	22	2,850	0.07	0.02	0.05	195	43	152
Verona Public Schools NJ	Verona High School	36	1	Girls Team Room	1424T8	LT24-15W	9	9	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	22	2,850	0.50	0.26	0.24	1,413	731	682
Verona Public Schools NJ	Verona High School	37	1	Storage	2424T8	NR	1	1	0.0580	0.0580	2x4, 2-Lamp T8	will Not be Retrofit	25	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Verona High School	38	1	Girls Team Toilets	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	22	2,850	0.11	0.06	0.05	314	162	152
Verona Public Schools NJ	Verona High School	39	1	Girls Team Mop Sink	I75	L15A	1	1	0.0750	0.0150	Inc 75w	LED Lamp, 15w A-Line	8	120	TRUE	22	2,850	0.07	0.01	0.06	203	41	162
Verona Public Schools NJ	Verona High School	40	1	Girls Team Showers	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	22	2,850	0.11	0.06	0.05	314	162	152
Verona Public Schools NJ	Verona High School	41	1	Girls Locker Room	1424T8	LT24-15W	10	10	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	22	2,850	0.55	0.29	0.27	1,570	812	758
Verona Public Schools NJ	Verona High School	42	1	Girls Locker Room	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Verona High School	43	1	Girls Locker Vestibule	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	22	2,850	0.06	0.03	0.03	157	81	76
Verona Public Schools NJ	Verona High School	44	1	Girls Locker Vestibule	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	45	1	Office Girls Locker	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	3	2,600	0.11	0.06	0.05	287	148	138
Verona Public Schools NJ	Verona High School	46	1	Bathroom, Office	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	14	2,850	0.06	0.03	0.03	157	81	76
Verona Public Schools NJ	Verona High School	47	1	Storage Old Gym	1424T8	LT24-15W	20	20	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	20	120	TRUE	13	2,200	1.10	0.57	0.53	2,424	1,254	1,170
Verona Public Schools NJ	Verona High School	48	1	Gymnasium, Old	M400	LEDHB232-IBL	19	19	0.4580	0.2320	MH 400w	LED 232w High Bay with Bi-level Sensor	13	120	TRUE	22	2,850	8.27	4.19	4.08	23,561	11,935	11,626
Verona Public Schools NJ	Verona High School	49	1	Gymnasium, Old	IND200	LEDHB232-IBL	1	1	0.2050	0.2320	Induction 200w Fixture	LED 232w High Bay with Bi-level Sensor	27	120	TRUE	22	2,850	0.19	0.22	(0.03)	555	628	(73)
Verona Public Schools NJ	Verona High School	50	1	Gymnasium, Old	I150	L19A-HI	8	8	0.1500	0.0190	Inc 150w	LED Lamp, 19w A-Line		120	TRUE	22	2,850	1.14	0.14	1.00	3,249	412	2,837
Verona Public Schools NJ	Verona High School	51	1	Gymnasium, Old	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	52	1	Storage Old Gym	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	13	2,200	0.11	0.06	0.05	242	125	117
Verona Public Schools NJ	Verona High School	53	1	Office, Old Gym	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	3	2,600	0.11	0.06	0.05	287	148	138
Verona Public Schools NJ	Verona High School	54	1	Bathroom In Gym Office	CFL2X13	L2X8A	1	1	0.0260	0.0160	CFL (2) 13w	(2) LED Lamp, 8w A-Line	11	120	TRUE	14	2,850	0.02	0.02	0.01	70	43	27
Verona Public Schools NJ	Verona High School	55	1	Bathroom In Gym Office	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line	6	120	TRUE	14	2,850	0.01	0.01	0.00	35	22	14
Verona Public Schools NJ	Verona High School	56	1	Storage Gym Office	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	3	2,600	0.06	0.03	0.03	143	74	69
Verona Public Schools NJ	Verona High School	57	1	Storage Gym Office	CFL3X13	L3X8A	1	1	0.0390	0.0240	CFL (3) 13w	(3) LED Lamp, 8w A-Line		120	TRUE	3	2,600	0.04	0.02	0.01	96	59	37
Verona Public Schools NJ	Verona High School	58	1	Team Room Old Gym	1424T8	LT24-15W	10	10	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	22	2,850	0.55	0.29	0.27	1,570	812	758
Verona Public Schools NJ	Verona High School	59	1	Team Room Old Gym	CFL3X13	L3X8A	1	1	0.0390	0.0240	CFL (3) 13w	(3) LED Lamp, 8w A-Line		120	TRUE	22	2,850	0.04	0.02	0.01	106	65	41
Verona Public Schools NJ	Verona High School	60	1	Team Room Old Gym	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	61	1	Team Showers Old Gym	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	22	2,850	0.11	0.06	0.05	314	162	152
Verona Public Schools NJ	Verona High School	62	1	Team Toilets Old Gym	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	22	2,850	0.11	0.06	0.05	314	162	152
Verona Public Schools NJ	Verona High School	63	1	Mop Sink Old gym	I75	L15A	1	1	0.0750	0.0150	Inc 75w	LED Lamp, 15w A-Line	8	120	TRUE	13	2,200	0.07	0.01	0.06	157	31	125
Verona Public Schools NJ	Verona High School	64	1	Vestibule, Boiler	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	Verona High School	65	1	Office, Maintenance	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	30	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	Verona High School	66	1	Bath in Maint Ofc	CFL3X13	L3X8A	1	1	0.0390	0.0240	CFL (3) 13w	(3) LED Lamp, 8w A-Line		120	TRUE	14	2,850	0.04	0.02	0.01	106	65	41
Verona Public Schools NJ	Verona High School	67	1	Boiler Room	1434T8	LT34-15W	10	10	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	22	120	TRUE	13	2,200	0.81	0.43	0.38	1,777	941	836
Verona Public Schools NJ	Verona High School	68	1	Boiler Room	1434T8EM	LT34-15W	1	1	0.0850	0.0450	1x4, 3-Lamp T8	(3) LED Lamp, 15w, 4'	22	120	TRUE	1	8,760	0.08	0.04	0.04	707	374	333
Verona Public Schools NJ	Verona High School	69	1	Boiler Room	1424T8	LT24-15W	5	5	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	16	120	TRUE	13	2,200	0.28	0.14	0.13	606	314	293
Verona Public Schools NJ	Verona High School	70	1	Boiler Room	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	71	1	Auditorium	PL32	NR	21	21	0.0320	0.0320	CF PL 32w	will Not be Retrofit		120	FALSE	23	1,520	0.64	0.64	-	970	970	-
Verona Public Schools NJ	Verona High School	72	1	Auditorium	PL36SCONCE	NR	12	12	0.0360	0.0360	CF PL 36w	will Not be Retrofit		120	FALSE	23	1,520	0.41	0.41	-	624	624	-
Verona Public Schools NJ	Verona High School	73	1	Auditorium	I65	L18PAR38-HI	44	44	0.0650	0.0180	Inc 65w	LED Lamp, 18w PAR 38		120	TRUE	23	1,520	2.72	0.75	1.96	4,130	1,144	2,986
Verona Public Schools NJ	Verona High School	74	1	Auditorium	I10X150ACCENT	NR	1	1	1.5000	1.5000	Inc (150) 10w	will Not be Retrofit		120	FALSE	23	1,520	1.43	1.43	-	2,166	2,166	-
Verona Public Schools NJ	Verona High School	75	1	Auditorium	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	Verona High School	76	1	Control Booth	222UT8	NR	2	2	0.0580	0.0580	2x2, 2-Lamp U T8	will Not be Retrofit	55	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Verona High School	77	1	Front Vestibules	CFL13	NR	2	2	0.0130	0.0130	CFL 13w	will Not be Retrofit	7	120	FALSE	11	3,300	0.02	0.02	-	82	82	-
Verona Public Schools NJ	Verona High School	78	1	Office Principal	1884T8	LT44K18-15W	3	3	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	71	120	TRUE	3	2,600	0.64	0.17	0.47	1,660	445	1,215
Verona Public Schools NJ	Verona High School	79	1	Main Office	1884T8	LT44K18-15W	5	5	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	71	120	TRUE	3	2,600	1.06	0.29	0.78	2,766	741	2,025
Verona Public Schools NJ	Verona High School	80	1	Main Office	1444T8	LT44-15W	4	4	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	71	120	TRUE	3	2,600	0.43	0.23	0.20	1,107	593	514
Verona Public Schools NJ	Verona High School	81	1	Main Office	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	71	120	TRUE	3	2,600	0.21	0.06	0.16	553	148	405
Verona Public Schools NJ	Verona High School	82	1	Office Student Assistance	1444T8	LT44-15W	2	2	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	71	120	TRUE	3	2,600	0.21	0.11	0.10	553	296	257
Verona Public Schools NJ	Verona High School	83	1	Vault	1444T8	NR	2	2	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit	71	120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	Verona High School	84	1	Office Psychologist	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	71	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	Verona High School	85	1	Bathroom, Main Office	1222	LT22-8W	1	1	0.0500	0.0160	1x2, 2-Lamp	(2) 2' LED Lamps	13	120	TRUE	14	2,850	0.05	0.02	0.03	135	43	92
Verona Public Schools NJ	Verona High School	86	1	Bathroom, Main Office	1212	LT12-8W	1	1	0.0280	0.0080	1x2, 1-Lamp	(1) 2' LED Lamps	12	120	TRUE	14	2,850	0.03	0.01	0.02	76	22	54
Verona Public Schools NJ	Verona High School	87	1	Office Grant	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	71	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	Verona High School	88	1	Office Guidance	1884T8	LT44K18-15W	2	2	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	71	120	TRUE	3	2,600	0.43	0.11	0.31	1,107	296	810
Verona Public Schools NJ	Verona High School	89	1	Office Guidance	1444T8	LT44-15W	4	4	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	71	120	TRUE	3	2,600	0.43	0.23	0.20	1,107	593	514
Verona Public Schools NJ	Verona High School	90	1	Office Student Activity	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	71	120	TRUE	3	2,600	0.21	0.06	0.16	553	148	405

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	91	1	Office Student Activity	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	71	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	Verona High School	92	1	Office Nurse	1444T8	LT44-15W	3	3	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	71	120	TRUE	3	2,600	0.32	0.17	0.15	830	445	385
Verona Public Schools NJ	Verona High School	93	1	Bathroom In Nurse Office	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line	6	120	TRUE	14	2,850	0.01	0.01	0.00	35	22	14
Verona Public Schools NJ	Verona High School	94	1	Private Office Nurse	1884T8	LT44K18-15W	2	2	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	71	120	TRUE	3	2,600	0.43	0.11	0.31	1,107	296	810
Verona Public Schools NJ	Verona High School	95	1	Classroom 10	1844T8	LT44-15W-PB	12	12	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	50	120	TRUE	20	1,900	1.28	0.68	0.59	2,426	1,300	1,126
Verona Public Schools NJ	Verona High School	96	1	Classroom 10	1424T8	LT24-15W-PB	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w		120	TRUE	20	1,900	0.17	0.09	0.08	314	162	152
Verona Public Schools NJ	Verona High School	97	1	Classroom 12	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit		120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	98	1	Classroom 12	1884T8	LT44K18-15W	2	2	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	85	120	TRUE	20	1,900	0.43	0.11	0.31	809	217	592
Verona Public Schools NJ	Verona High School	99	1	Classroom 14	2434T8	LT34-15W	15	15	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	68	120	TRUE	20	1,900	1.21	0.64	0.57	2,301	1,218	1,083
Verona Public Schools NJ	Verona High School	100	1	Storage Bio	1424T8	NR	2	2	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	18	120	FALSE	7	520	0.11	0.11	-	57	57	-
Verona Public Schools NJ	Verona High School	101	1	Classroom 16	2434T8	LT34-15W	12	12	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	68	120	TRUE	20	1,900	0.97	0.51	0.46	1,841	975	866
Verona Public Schools NJ	Verona High School	102	1	Storage ChemISTRY	2434T8	NR	3	3	0.0850	0.0850	2x4, 3-Lamp, T8	will Not be Retrofit	68	120	FALSE	7	520	0.24	0.24	-	126	126	-
Verona Public Schools NJ	Verona High School	103	1	Classroom 18	2434T8	LT34-15W	15	15	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	68	120	TRUE	20	1,900	1.21	0.64	0.57	2,301	1,218	1,083
Verona Public Schools NJ	Verona High School	104	1	Classroom 23	2434T8	LT34-15W	15	15	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	68	120	TRUE	20	1,900	1.21	0.64	0.57	2,301	1,218	1,083
Verona Public Schools NJ	Verona High School	105	1	Prep Room	2434T8	LT24K24-15W	3	3	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	68	120	TRUE	3	2,600	0.24	0.09	0.16	630	222	408
Verona Public Schools NJ	Verona High School	106	1	Classroom 21	2434T8	LT34-15W	15	15	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	68	120	TRUE	20	1,900	1.21	0.64	0.57	2,301	1,218	1,083
Verona Public Schools NJ	Verona High School	107	1	Classroom 19	2434T8	LT34-15W	15	15	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	68	120	TRUE	20	1,900	1.21	0.64	0.57	2,301	1,218	1,083
Verona Public Schools NJ	Verona High School	108	1	Prep Room	2434T8	LT24K24-15W	3	3	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	68	120	TRUE	3	2,600	0.24	0.09	0.16	630	222	408
Verona Public Schools NJ	Verona High School	109	1	Classroom 17	2434T8	LT34-15W	3	3	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	50	120	TRUE	20	1,900	0.24	0.13	0.11	460	244	217
Verona Public Schools NJ	Verona High School	110	1	Bathroom, Men's Faculty	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	28	120	TRUE	14	2,850	0.06	0.03	0.03	157	81	76
Verona Public Schools NJ	Verona High School	111	1	Bathroom, Men's Faculty	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line	6	120	TRUE	14	2,850	0.01	0.01	0.00	35	22	14
Verona Public Schools NJ	Verona High School	112	1	Classroom 43	2444T8	LT44-15W	7	7	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	51	120	TRUE	20	1,900	0.74	0.40	0.35	1,415	758	657
Verona Public Schools NJ	Verona High School	113	1	Classroom 41	2444T8	LT44-15W	7	7	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	51	120	TRUE	20	1,900	0.74	0.40	0.35	1,415	758	657
Verona Public Schools NJ	Verona High School	114	1	Media Center	2444T8	LT44-15W	48	48	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	85	120	TRUE	20	1,900	5.11	2.74	2.37	9,704	5,198	4,505
Verona Public Schools NJ	Verona High School	115	1	Media Center	222UT8	LT32K22-8W	19	19	0.0580	0.0240	2x2, 2-Lamp U T8	(3) 2' LED Lamps, Bracket Kit	27	120	TRUE	20	1,900	1.05	0.43	0.61	1,989	823	1,166
Verona Public Schools NJ	Verona High School	116	1	Media Center	M175	1424SWPS	2	2	0.2100	0.0460	MH 175w	New 1x4 w/ Elect. NPPS Bal. & (2) 4' T8's	25	120	TRUE	20	1,900	0.40	0.09	0.31	758	166	592
Verona Public Schools NJ	Verona High School	117	1	Media Center	M175	1424SWPS	3	3	0.2100	0.0460	MH 175w	New 1x4 w/ Elect. NPPS Bal. & (2) 4' T8's	25	120	TRUE	20	1,900	0.60	0.13	0.47	1,137	249	888
Verona Public Schools NJ	Verona High School	118	1	Media Center	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	119	1	Server Room	2444T8	LT44-15W	4	4	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	90	120	TRUE	1	8,760	0.43	0.23	0.20	3,728	1,997	1,731
Verona Public Schools NJ	Verona High School	120	1	Office Tech	2444T8	LT44-15W	4	4	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	55	120	TRUE	3	2,600	0.43	0.23	0.20	1,107	593	514
Verona Public Schools NJ	Verona High School	121	1	Office Librarian	2444T8	LT44-15W	4	4	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	90	120	TRUE	3	2,600	0.43	0.23	0.20	1,107	593	514
Verona Public Schools NJ	Verona High School	122	1	Faculty Lounge	2444T8	LT44-15W	4	4	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	55	120	TRUE	11	3,300	0.43	0.23	0.20	1,404	752	652
Verona Public Schools NJ	Verona High School	123	1	Faculty Lounge	VEND-CD	NR	1	1	0.3390	0.3390	Cold Drink Machine	will Not be Retrofit		120	FALSE	1	8,760	0.32	0.32	-	2,821	2,821	-
Verona Public Schools NJ	Verona High School	124	1	Bathroom, Women's Faculty	1844T8	LT44-15W	1	1	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	30	120	TRUE	14	2,850	0.11	0.06	0.05	303	162	141
Verona Public Schools NJ	Verona High School	125	1	Bathroom, Women's Faculty	CFL13	L08A	2	2	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line	6	120	TRUE	14	2,850	0.02	0.02	0.01	70	43	27
Verona Public Schools NJ	Verona High School	126	1	Mop Closet	I75	L15A	1	1	0.0750	0.0150	Inc 75w	LED Lamp, 15w A-Line		120	TRUE	13	2,200	0.07	0.01	0.06	157	31	125
Verona Public Schools NJ	Verona High School	127	1	Office Social Worker	2444T8	LT44-15W	4	4	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	65	120	TRUE	3	2,600	0.43	0.23	0.20	1,107	593	514
Verona Public Schools NJ	Verona High School	128	1	Corridor To Courtyard	222U	LT22K22-8W	3	3	0.0720	0.0160	2x2, 2-Lamp U	(2) 2' LED Lamps, Bracket Kit	33	120	TRUE	1	8,760	0.21	0.05	0.16	1,798	399	1,398
Verona Public Schools NJ	Verona High School	129	1	Classroom 15	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	66	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	130	1	Classroom 13	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	66	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	131	1	Classroom 11	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	66	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	132	1	Office Vice Principal	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	56	120	TRUE	3	2,600	0.21	0.06	0.16	553	148	405
Verona Public Schools NJ	Verona High School	133	1	Office Vice Principal	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	56	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	Verona High School	134	1	Office Vice Principal	1884T8	LT44K18-15W	1	1	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	56	120	TRUE	3	2,600	0.21	0.06	0.16	553	148	405
Verona Public Schools NJ	Verona High School	135	1	Office Vice Principal	1444T8	LT44-15W	1	1	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	56	120	TRUE	3	2,600	0.11	0.06	0.05	277	148	128
Verona Public Schools NJ	Verona High School	136	1	Bathroom, Girls	2444T8	LT24K24-15W	6	6	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	65	120	TRUE	14	2,850	0.64	0.17	0.47	1,819	487	1,332
Verona Public Schools NJ	Verona High School	137	1	Teachers Workroom	2444T8	LT44-15W	6	6	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	50	120	TRUE	11	3,300	0.64	0.34	0.30	2,107	1,129	978
Verona Public Schools NJ	Verona High School	138	1	Mop Closet	I75	L15A	1	1	0.0750	0.0150	Inc 75w	LED Lamp, 15w A-Line		120	TRUE	13	2,200	0.07	0.01	0.06	157	31	125
Verona Public Schools NJ	Verona High School	139	1	Bathroom, Boys	2444T8	LT24K24-15W	6	6	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	65	120	TRUE	14	2,850	0.64	0.17	0.47	1,819	487	1,332
Verona Public Schools NJ	Verona High School	140	1	Classroom 55	2444T8	LT44-15W	15	15	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	118	120	TRUE	20	1,900	1.60	0.86	0.74	3,032	1,625	1,408
Verona Public Schools NJ	Verona High School	141	1	Storage 55	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Verona High School	142	1	School Store	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	2	120	TRUE	3	2,600	0.06	0.03	0.03	143	74	69
Verona Public Schools NJ	Verona High School	143	1	Classroom 53	1884T8	LT44K18-15W	10	10	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	95	120	TRUE	20	1,900	2.13	0.57	1.56	4,043	1,083	2,960
Verona Public Schools NJ	Verona High School	144	1	Storage 53	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	20	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Verona High School	145	1	Classroom 51	2444T8	LT44-15W	9	9	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	66	120	TRUE	20	1,900	0.96	0.51	0.44	1,819	975	845
Verona Public Schools NJ	Verona High School	146	1	Bathroom, Girls	2444T8	LT24K24-15W	3	3	0.1120	0.0300	2x4, 4-Lamp T8	(2) LED Lamp, 15w, 4', Bracket Kit	53	120	TRUE	14	2,850	0.32	0.09	0.23	910	244	666
Verona Public Schools NJ	Verona High School	147	1	Bathroom, Boys	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	17	120	TRUE	14	2,850	0.11	0.06	0.05	314	162	152
Verona Public Schools NJ	Verona High School	148	1	Classroom 49	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	149	1	Classroom 47	2444T8	LT44-15W	10	10	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	66	120	TRUE	20	1,900	1.06	0.57	0.49	2,022	1,083	939
Verona Public Schools NJ	Verona High School	150	1	Classroom 45	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	151	1	Classroom 39	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	152	1	Classroom 37	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	153	1	Classroom 35	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	154	1	Classroom 33	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	155	1	Classroom 31	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	156	1	Classroom 28	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	157	1	Classroom 30	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	158	1	Classroom 32	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	159	1	Classroom 34	1884T8	LT44K18-15W	6	6	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	60	120	TRUE	20	1,900	1.28	0.34	0.93	2,426	650	1,776
Verona Public Schools NJ	Verona High School	160	1	Classroom 36	2434T8	LT34-15W	25	25	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	75	120	TRUE	20	1,900	2.02	1.07	0.95	3,836	2,031	1,805
Verona Public Schools NJ	Verona High School	161	1	Storage 36	1844T8	NR	2	2	0.1120	0.1120	1x8, 4-Lamp T8 4'	will Not be Retrofit	23	120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	Verona High School	162	1	Classroom 38	2444T8	LT44-15W	15	15	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	78	120	TRUE	20	1,900	1.60	0.86	0.74	3,032	1,625	1,408
Verona Public Schools NJ	Verona High School	163	1	Classroom 38	2444T8	DIS	6	6	0.1120	-	2x4, 4-Lamp T8	Disconnect and Remove		120	TRUE	20	1,900	0.64	-	0.64	1,213	-	1,213
Verona Public Schools NJ	Verona High School	164	1	Classroom 38	1424T8	LT24-15W	6	6	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	58	120	TRUE	20	1,900	0.33	0.17	0.16	628	325	303
Verona Public Schools NJ	Verona High School	165	1	Classroom 40	2444T8	LT44-15W	15	15	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	80	120	TRUE	20	1,900	1.60	0.86	0.74	3,032	1,625	1,408
Verona Public Schools NJ	Verona High School	166	1	Storage 40	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line		120	TRUE	7	520	0.07	0.01	0.06	37	5	32
Verona Public Schools NJ	Verona High School	167	1	Classroom 42 (shop)	2444T8	LT44-15W	20	20	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	80	120	TRUE	20	1,900	2.13	1.14	0.99	4,043	2,166	1,877
Verona Public Schools NJ	Verona High School	168	1	Office 42	1424	LT24-15W	2	2	0.0720	0.0300	1x4, 2-Lamp	LED Lamp, (2) 15w	19	120	TRUE	3	2,600	0.14	0.06	0.08	356	148	207

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	169	1	Storage 42	1424	LT24-15W	1	1	0.0720	0.0300	1x4, 2-Lamp	LED Lamp, (2) 15w	16	120	TRUE	7	520	0.07	0.03	0.04	36	15	21
Verona Public Schools NJ	Verona High School	170	1	Mop Closet	I75	L15A	1	1	0.0750	0.0150	Inc 75w	LED Lamp, 15w A-Line		120	TRUE	13	2,200	0.07	0.01	0.06	157	31	125
Verona Public Schools NJ	Verona High School	171	1	Corridor Receiving	1424T8	LT24-15W	4	4	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	34	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	Verona High School	172	1	Corridor Receiving	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	173	1	Storage In Rec'g Corridor	1844T8	LT44-15W	2	2	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	25	120	TRUE	1	8,760	0.21	0.11	0.10	1,864	999	865
Verona Public Schools NJ	Verona High School	174	1	Storage In Rec'g Corridor	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	1	8,760	0.06	0.03	0.03	483	250	233
Verona Public Schools NJ	Verona High School	175	1	File Storage	1884T8	NR	1	1	0.2240	0.2240	1x8, 8-Lamp T8 4'	will Not be Retrofit	47	120	FALSE	7	520	0.21	0.21	-	111	111	-
Verona Public Schools NJ	Verona High School	176	1	File Storage	1444T8	NR	1	1	0.1120	0.1120	1x4, 4-Lamp T8	will Not be Retrofit		120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	Verona High School	177	1	Stage B O E 26	2444T8	LT44-15W	5	5	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	65	120	TRUE	20	1,900	0.53	0.29	0.25	1,011	542	469
Verona Public Schools NJ	Verona High School	178	1	Storage On Stage	2444T8	NR	1	1	0.1120	0.1120	2x4, 4-Lamp T8	will Not be Retrofit	65	120	FALSE	7	520	0.11	0.11	-	55	55	-
Verona Public Schools NJ	Verona High School	179	1	Classroom 26	2444T8	LT44-15W	16	16	0.1120	0.0600	2x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	60	120	TRUE	20	1,900	1.70	0.91	0.79	3,235	1,733	1,502
Verona Public Schools NJ	Verona High School	180	1	Classroom 26	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	Verona High School	181	1	Classroom 24	2434T8DS	LT34-15W	12	12	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	85	120	TRUE	120	1,520	1.03	0.51	0.51	1,560	780	780
Verona Public Schools NJ	Verona High School	182	1	Classroom 22	2434T8DS	LT34-15W	12	12	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	85	120	TRUE	20	1,900	1.03	0.51	0.51	1,949	975	975
Verona Public Schools NJ	Verona High School	183	1	Classroom 20	2434T8DS	LT34-15W	12	12	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	85	120	TRUE	120	1,520	1.03	0.51	0.51	1,560	780	780
Verona Public Schools NJ	Verona High School	184	1	Classroom 25	2434T8DS	LT34-15W	12	12	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	85	120	TRUE	120	1,520	1.03	0.51	0.51	1,560	780	780
Verona Public Schools NJ	Verona High School	185	1	Classroom 27	2434T8DS	LT34-15W	12	12	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	85	120	TRUE	120	1,520	1.03	0.51	0.51	1,560	780	780
Verona Public Schools NJ	Verona High School	186	1	Storage 29	2444T8	NR	4	4	0.1120	0.1120	2x4, 4-Lamp T8	will Not be Retrofit	70	120	FALSE	7	520	0.43	0.43	-	221	221	-
Verona Public Schools NJ	Verona High School	187	1	Bathroom, Men's	1424T8	LT24-15W	3	3	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	14	2,850	0.17	0.09	0.08	471	244	227
Verona Public Schools NJ	Verona High School	188	1	Mop Closet	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	13	2,200	0.06	0.03	0.03	121	63	59
Verona Public Schools NJ	Verona High School	189	1	Bathroom, Women's	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	25	120	TRUE	14	2,850	0.11	0.06	0.05	314	162	152
Verona Public Schools NJ	Verona High School	190	1	Stage	1844T8	LT44-15W-HI	12	12	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'	19	120	TRUE	23	1,520	1.28	0.68	0.59	1,941	1,040	901
Verona Public Schools NJ	Verona High School	191	1	Stage	I65	L18PAR38-HI	11	11	0.0650	0.0180	Inc 65w	LED Lamp, 18w PAR 38		120	TRUE	23	1,520	0.68	0.19	0.49	1,032	286	747
Verona Public Schools NJ	Verona High School	192	1	Stage	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	23	1,520	0.01	0.01	-	12	12	-
Verona Public Schools NJ	Verona High School	193	1	Stage Vestibule Music	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	33	120	TRUE	10	4,380	0.06	0.03	0.03	241	125	117
Verona Public Schools NJ	Verona High School	194	1	Storage Stage	1844T8	NR	4	4	0.1120	0.1120	1x8, 4-Lamp T8 4'	will Not be Retrofit	43	120	FALSE	7	520	0.43	0.43	-	221	221	-
Verona Public Schools NJ	Verona High School	195	1	Storage Stage	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	7	520	0.00	0.00	-	2	2	-
Verona Public Schools NJ	Verona High School	196	1	Platform Stage	I2X100	NR	1	1	0.2000	0.2000	Inc (2) 100w	will Not be Retrofit		120	FALSE	7	520	0.19	0.19	-	99	99	-
Verona Public Schools NJ	Verona High School	197	1	Catwalk	I75	L11A	25	25	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line		120	TRUE	7	520	1.78	0.26	1.52	926	136	790
Verona Public Schools NJ	Verona High School	198	1	Closet Music Room	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	35	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Verona High School	199	1	Vestibule Music	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	35	120	TRUE	20	1,900	0.06	0.03	0.03	105	54	51
Verona Public Schools NJ	Verona High School	200	1	Classroom Music	1884T8	LT44K18-15W	12	12	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	105	120	TRUE	20	1,900	2.55	0.68	1.87	4,852	1,300	3,552
Verona Public Schools NJ	Verona High School	201	1	Classroom Music	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	20	1,900	0.00	0.00	-	7	7	-
Verona Public Schools NJ	Verona High School	202	1	Storage Music Room	2434T8	LT24K24-15W	12	12	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	67	120	TRUE	13	2,200	0.97	0.34	0.63	2,132	752	1,379
Verona Public Schools NJ	Verona High School	203	1	Office Music Room	2434T8	LT34-15W	2	2	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	65	120	TRUE	3	2,600	0.16	0.09	0.08	420	222	198
Verona Public Schools NJ	Verona High School	204	1	Closet A Music Room	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	35	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Verona High School	205	1	Closet B Music Room	1424T8	NR	1	1	0.0580	0.0580	1x4, 2-Lamp T8	will Not be Retrofit	35	120	FALSE	7	520	0.06	0.06	-	29	29	-
Verona Public Schools NJ	Verona High School	206	1	Entry Vestibule	LED14A	NR	1	1	0.0140	0.0140	LED 14w Fixture	will Not be Retrofit		120	FALSE	11	3,300	0.01	0.01	-	44	44	-
Verona Public Schools NJ	Verona High School	207	1	Entry Vestibule	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	208	1	Lobby	PL32BB	NR	4	4	0.0320	0.0320	CF PL 32w	will Not be Retrofit	25	120	FALSE	11	3,300	0.12	0.12	-	401	401	-
Verona Public Schools NJ	Verona High School	209	1	Lobby	1414T8	NR	3	3	0.0320	0.0320	1x4, 1-Lamp T8	will Not be Retrofit	25	120	FALSE	11	3,300	0.09	0.09	-	301	301	-
Verona Public Schools NJ	Verona High School	210	1	Lobby	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Verona High School	211	1	Reception	222UT8	LT22K22-8W-PB	6	6	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	65	120	TRUE	11	3,300	0.33	0.09	0.24	1,091	301	790
Verona Public Schools NJ	Verona High School	212	1	Reception	PL32	NR	5	5	0.0320	0.0320	CF PL 32w	will Not be Retrofit	20	120	FALSE	11	3,300	0.15	0.15	-	502	502	-
Verona Public Schools NJ	Verona High School	213	1	Reception	1414T8	NR	1	1	0.0320	0.0320	1x4, 1-Lamp T8	will Not be Retrofit		120	FALSE	11	3,300	0.03	0.03	-	100	100	-
Verona Public Schools NJ	Verona High School	214	1	Office Corridor	2434T8	LT34-15W-PB	5	5	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	50	120	TRUE	3	2,600	0.40	0.21	0.19	1,050	556	494
Verona Public Schools NJ	Verona High School	215	1	Office Corridor	2434T8BB	LT34-BB-PB	4	4	0.0850	0.0450	2x4, 3-Lamp, T8	(3) LED Lamp, 15w, 4'	50	120	TRUE	3	2,600	0.32	0.17	0.15	840	445	395
Verona Public Schools NJ	Verona High School	216	1	Copy Area	2424T8	LT24-15W-PB	4	4	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	38	120	TRUE	11	3,300	0.22	0.11	0.11	727	376	351
Verona Public Schools NJ	Verona High School	217	1	File Room 114 H	2424T8	LT24-15W-PB	2	2	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	38	120	TRUE	3	2,600	0.11	0.06	0.05	287	148	138
Verona Public Schools NJ	Verona High School	218	1	Break Room 114 J	2434T8	LT24K24-15W	2	2	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	85	120	TRUE	11	3,300	0.16	0.06	0.10	533	188	345
Verona Public Schools NJ	Verona High School	219	1	Closet Electrical 114 N	2434T8	NR	1	1	0.0850	0.0850	2x4, 3-Lamp, T8	will Not be Retrofit	85	120	FALSE	7	520	0.08	0.08	-	42	42	-
Verona Public Schools NJ	Verona High School	220	1	Conference Room	1844T8DS	LT44-15W	8	8	0.1160	0.0600	1x4, 4-Lamp T8 4', DS	(4) LED Lamp, 15w, 4'	70	120	TRUE	16	1,140	0.88	0.46	0.43	1,005	520	485
Verona Public Schools NJ	Verona High School	221	1	Conference Room	1424T8DS	LT24-15W	3	3	0.0640	0.0300	1x4, 2-Lamp T8, DS	LED Lamp, (2) 15w	70	120	TRUE	16	1,140	0.18	0.09	0.10	208	97	110
Verona Public Schools NJ	Verona High School	222	1	Office 114 G	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	223	1	Office 114	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	224	1	Office 114 D	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	225	1	Office 114 C	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	226	1	Office 114 B	2434T8DS	LT34-15W-PB	6	6	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.51	0.26	0.26	1,334	667	667
Verona Public Schools NJ	Verona High School	227	1	Office 114 A	2434T8DS	LT34-15W-PB	6	6	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.51	0.26	0.26	1,334	667	667
Verona Public Schools NJ	Verona High School	228	1	Office No Windows	2434T8DS	LT34-15W	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	229	1	Bathroom, Women's	2434T8	LT24K24-15W	1	1	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	60	120	TRUE	114	2,280	0.08	0.03	0.05	184	65	119
Verona Public Schools NJ	Verona High School	230	1	Bathroom, Men's	2434T8	LT24K24-15W	1	1	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	60	120	TRUE	114	2,280	0.08	0.03	0.05	184	65	119
Verona Public Schools NJ	Verona High School	231	1	Special Services	222UT8	LT22K22-8W-PB	7	7	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	65	120	TRUE	3	2,600	0.39	0.11	0.28	1,003	277	726
Verona Public Schools NJ	Verona High School	232	1	Special Services	222UT8BB	LT22K22-BB-PB	3	3	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	46	120	TRUE	3	2,600	0.17	0.05	0.12	430	119	311
Verona Public Schools NJ	Verona High School	233	1	Conference Room 115 A	2434T8DS	LT34-15W	4	4	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	45	120	TRUE	16	1,140	0.34	0.17	0.17	390	195	195
Verona Public Schools NJ	Verona High School	234	1	Office Pvt 115	2434T8DS	LT34-15W	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	235	1	Office Pvt 115 C	2434T8DS	LT34-15W	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	55	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	236	1	Break Room 115 F	2434T8DS	LT24K24-15W	2	2	0.0900	0.0300	2x4, 3-Lamp T8, DS	(2) LED Lamp, 15w, 4', Bracket Kit	55	120	TRUE	11	3,300	0.17	0.06	0.11	564	188	376
Verona Public Schools NJ	Verona High School	237	1	File Room 115 G	222UT8	LT22K22-8W-PB	3	3	0.0580	0.0160	2x2, 2-Lamp U T8	(2) 2' LED Lamps, Bracket Kit	50	120	TRUE	3	2,600	0.17	0.05	0.12	430	119	311
Verona Public Schools NJ	Verona High School	238	1	Office 115 D	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	239	1	Office 115 B	2434T8DS	LT34-15W-PB	2	2	0.0900	0.0450	2x4, 3-Lamp T8, DS	(3) LED Lamp, 15w, 4'	145	120	TRUE	3	2,600	0.17	0.09	0.09	445	222	222
Verona Public Schools NJ	Verona High School	240	1	Hallway	2434T8	LT24K24-15W	2	2	0.0850	0.0300	2x4, 3-Lamp, T8	(2) LED Lamp, 15w, 4', Bracket Kit	40	120	TRUE	11	3,300	0.16	0.06	0.10	533	188	345
Verona Public Schools NJ	Verona High School	241	1	Hallway	2222BIAXBB	22LED32TG-BB	6	6	0.1060	0.0320	2x2,2-Lamp Biax 50w	LED 32w 2x2 Troffer Panel	49	120	TRUE	11	3,300	0.60	0.18	0.42	1,994	602	1,392
Verona Public Schools NJ	Verona High School	242	1	Pantry, Kitchen	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	24	120	TRUE	21	1,440	0.11	0.06	0.05	159	82	77
Verona Public Schools NJ	Verona High School	243	1	Walk In Cooler	CFL13	L08A	2	2	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	21	1,440	0.02	0.02	0.01	36	22	14
Verona Public Schools NJ	Verona High School	244	1	Storage, Kitchen	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	24	120	TRUE	21	1,440	0.11	0.06	0.05	159	82	77
Verona Public Schools NJ	Verona High School	245	1	Mop Closet	I75	L11A	1	1	0.0750	0.0110	Inc 75w	LED Lamp, 11w A-Line	8	120	TRUE	13	2,200	0.07	0.01	0.06	157	23	134
Verona Public Schools NJ	Verona High School	246	1	Wet Room	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	19	120	TRUE	21	1,440	0.06	0.03	0.03	79	41	38

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	247	1	Bathroom, Kitchen	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	24	120	TRUE	14	2,850	0.06	0.03	0.03	157	81	76
Verona Public Schools NJ	Verona High School	248	1	Bathroom, Kitchen	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line	6	120	TRUE	14	2,850	0.01	0.01	0.00	35	22	14
Verona Public Schools NJ	Verona High School	249	1	Office, Kitchen	1424T8	LT24-15W	1	1	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	24	120	TRUE	21	1,440	0.06	0.03	0.03	79	41	38
Verona Public Schools NJ	Verona High School	250	1	Corridor, Kitchen	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	24	120	TRUE	11	3,300	0.11	0.06	0.05	364	188	176
Verona Public Schools NJ	Verona High School	251	1	Kitchen	1444T8	LT44-15W	8	8	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	100	120	TRUE	21	1,440	0.85	0.46	0.40	1,226	657	569
Verona Public Schools NJ	Verona High School	252	1	Kitchen	1884T8	LT44K18-15W	4	4	0.2240	0.0600	1x8, 8-Lamp T8 4'	(4) LED Lamp, 15w, 4' and Bracket Kit	100	120	TRUE	21	1,440	0.85	0.23	0.62	1,226	328	897
Verona Public Schools NJ	Verona High School	253	1	Range Hood	CFL13	L08A	7	7	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	21	1,440	0.09	0.05	0.03	124	77	48
Verona Public Schools NJ	Verona High School	254	1	Kitchen	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	255	1	Serving Line	1444T8	LT44-15W	12	12	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	75	120	TRUE	1	8,760	1.28	0.68	0.59	11,185	5,992	5,193
Verona Public Schools NJ	Verona High School	256	1	Dishwashing	1424T8	LT24-15W	2	2	0.0580	0.0300	1x4, 2-Lamp T8	LED Lamp, (2) 15w	16	120	TRUE	21	1,440	0.11	0.06	0.05	159	82	77
Verona Public Schools NJ	Verona High School	257	1	Dish Hood	CFL13	L08A	2	2	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	21	1,440	0.02	0.02	0.01	36	22	14
Verona Public Schools NJ	Verona High School	258	1	Faculty Dining Room	1444T8	LT44-15W	4	4	0.1120	0.0600	1x4, 4-Lamp T8	(4) LED Lamp, 15w, 4'	40	120	TRUE	11	3,300	0.43	0.23	0.20	1,404	752	652
Verona Public Schools NJ	Verona High School	259	1	Cafeteria (windows)	11264T8	LT64-15W	6	6	0.1700	0.0900	1x12, 6-Lamp T8	(6) LED Lamp, 15w, 4'		120	TRUE	21	1,440	0.97	0.51	0.46	1,395	739	657
Verona Public Schools NJ	Verona High School	260	1	Cafeteria (windows)	1844T8	LT44-15W	6	6	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'		120	TRUE	21	1,440	0.64	0.34	0.30	919	492	427
Verona Public Schools NJ	Verona High School	261	1	Cafeteria	11264T8	LT64-15W	20	20	0.1700	0.0900	1x12, 6-Lamp T8	(6) LED Lamp, 15w, 4'		120	TRUE	21	1,440	3.23	1.71	1.52	4,651	2,462	2,189
Verona Public Schools NJ	Verona High School	262	1	Cafeteria	1844T8	LT44-15W	12	12	0.1120	0.0600	1x8, 4-Lamp T8 4'	(4) LED Lamp, 15w, 4'		120	TRUE	21	1,440	1.28	0.68	0.59	1,839	985	854
Verona Public Schools NJ	Verona High School	263	1	Cafeteria	K-LED	NR	4	4	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	133	133	-
Verona Public Schools NJ	Verona High School	264	1	Cafeteria	VEND-CD	NR	1	1	0.3390	0.3390	Cold Drink Machine	will Not be Retrofit		120	FALSE	1	8,760	0.32	0.32	-	2,821	2,821	-
Verona Public Schools NJ	Verona High School	265	1	Hallway, Boiler To Lobby	2424T8	LT24-15W	11	11	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.61	0.31	0.29	2,000	1,035	966
Verona Public Schools NJ	Verona High School	266	1	Hallway, Boiler To Lobby	1424	LT24-15W	1	1	0.0720	0.0300	1x4, 2-Lamp	LED Lamp, (2) 15w		120	TRUE	7	520	0.07	0.03	0.04	36	15	21
Verona Public Schools NJ	Verona High School	267	1	Hallway, Boiler To Lobby	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	268	1	Hallway, Boiler To Lobby	VEND-CD	NR	1	1	0.3390	0.3390	Cold Drink Machine	will Not be Retrofit		120	FALSE	1	8,760	0.32	0.32	-	2,821	2,821	-
Verona Public Schools NJ	Verona High School	269	1	Hallway, Lobby To Music	2424T8	LT24-15W	11	11	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.61	0.31	0.29	2,000	1,035	966
Verona Public Schools NJ	Verona High School	270	1	Hallway, Lobby To Music	I75	L13PAR30	4	4	0.0750	0.0130	Inc 75w	LED Lamp, 13w PAR 30		120	TRUE	11	3,300	0.29	0.05	0.24	941	163	777
Verona Public Schools NJ	Verona High School	271	1	Main Lobby	2424T8	22LED32TG-TILE	17	17	0.0580	0.0320	2x4, 2-Lamp T8	LED 32w 2x2 Troffer Panel	23	120	TRUE	11	3,300	0.94	0.52	0.42	3,091	1,705	1,386
Verona Public Schools NJ	Verona High School	272	1	Hallway, Lobby To Music	I75	L13PAR30	3	3	0.0750	0.0130	Inc 75w	LED Lamp, 13w PAR 30		120	TRUE	11	3,300	0.21	0.04	0.18	705	122	583
Verona Public Schools NJ	Verona High School	273	1	Hallway, Lobby To Music	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	274	1	Hallway, Lobby To Music	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	275	1	Main Entry Vestibule	2262T8	LT32K22-8W	2	2	0.1020	0.0240	2x2, 6-Lamp T8	(3) 2' LED Lamps, Bracket Kit	35	120	TRUE	11	3,300	0.19	0.05	0.15	640	150	489
Verona Public Schools NJ	Verona High School	276	1	Main Entry Vestibule	CFL13	L08A	1	1	0.0130	0.0080	CFL 13w	LED Lamp, 8w A-Line		120	TRUE	11	3,300	0.01	0.01	0.00	41	25	16
Verona Public Schools NJ	Verona High School	277	1	Hallway, Lobby To B O E	2424T8	LT24-15W	21	21	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	1.16	0.60	0.56	3,818	1,975	1,843
Verona Public Schools NJ	Verona High School	278	1	Hallway, Lobby To B O E	1424	LT24-15W	4	4	0.0720	0.0300	1x4, 2-Lamp	LED Lamp, (2) 15w		120	TRUE	11	3,300	0.27	0.11	0.16	903	376	527
Verona Public Schools NJ	Verona High School	279	1	Hallway, Lobby To B O E	1212	LT12-8W	3	3	0.0280	0.0080	1x2, 1-Lamp	(1) 2' LED Lamps		120	TRUE	11	3,300	0.08	0.02	0.06	263	75	188
Verona Public Schools NJ	Verona High School	280	1	Hallway, Lobby To B O E	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Verona High School	281	1	Hallway, Lobby To B O E	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	282	1	Hallway, Class 26 To Class 22	2424T8	LT24-15W	6	6	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.33	0.17	0.16	1,091	564	527
Verona Public Schools NJ	Verona High School	283	1	Hallway, Class 26 To Class 22	K-LED	NR	2	2	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	67	67	-
Verona Public Schools NJ	Verona High School	284	1	Hallway, Class 26 To Class 22	K-LED	NR	1	1	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.00	0.00	-	33	33	-
Verona Public Schools NJ	Verona High School	285	1	Courtyard 2	I2X75	L2X18PAR38	1	1	0.1500	0.0360	Inc (2) 75w	(2) LED Lamp, 18w PAR 38		120	TRUE	10	4,380	0.14	0.03	0.11	624	150	474

Site Name	Building Name	Index	Floor	Location	Existing Code	Proposed Code	Existing Qty	Proposed Qty	Existing kW	Proposed kW	Existing Description	Proposed Description	Existing Foot Candles	Volts	Included in Project	Hour Code	Total Hours	Total Pre kW	Total Post kW	Total Saved kW	Total kWh Existing	Total kWh Proposed	Total kWh Saved
Verona Public Schools NJ	Verona High School	286	1	Hallway, By Library	2424T8	LT24-15W	12	12	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	0.66	0.34	0.32	2,182	1,129	1,053
Verona Public Schools NJ	Verona High School	287	1	Hallway, By Library	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	Verona High School	288	1	Hallway, Café To Class 28	2424T8	LT24-15W	29	29	0.0580	0.0300	2x4, 2-Lamp T8	LED Lamp, (2) 15w	23	120	TRUE	11	3,300	1.60	0.83	0.77	5,273	2,727	2,546
Verona Public Schools NJ	Verona High School	289	1	Hallway, Café To Class 28	K-LED	NR	3	3	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.01	0.01	-	100	100	-
Verona Public Schools NJ	Verona High School	290	1	Hallway, Café To Class 28	K-LED	NR	6	6	0.0040	0.0040	Exit Sign - LED	will Not be Retrofit		120	FALSE	1	8,760	0.02	0.02	-	200	200	-
Verona Public Schools NJ	Verona High School	291	1	Main Entry Canopy	PL2X13	LED12CAN	9	9	0.0260	0.0120	CF (2) PL 13w	LED 12w Canopy		120	TRUE	10	4,380	0.22	0.10	0.12	974	449	524
Verona Public Schools NJ	Verona High School	292	1	Secondary Entry Canopy	PL2X13	LED12CAN	1	1	0.0260	0.0120	CF (2) PL 13w	LED 12w Canopy		120	TRUE	10	4,380	0.02	0.01	0.01	108	50	58
Verona Public Schools NJ	Verona High School	293	1	Board Of Ed Entry	M70	NR	3	3	0.0950	0.0950	MH 70w	will Not be Retrofit		120	FALSE	10	4,380	0.27	0.27	-	1,186	1,186	-
Verona Public Schools NJ	Verona High School	294	1	Board Of Ed Entry	M70	NR	2	2	0.0950	0.0950	MH 70w	will Not be Retrofit		120	FALSE	10	4,380	0.18	0.18	-	791	791	-
Verona Public Schools NJ	Verona High School	295	1	Walls South & B O E	M70	LED13SWP	6	6	0.0950	0.0130	MH 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.54	0.07	0.47	2,372	325	2,047
Verona Public Schools NJ	Verona High School	296	1	Entry Door South	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	Verona High School	297	1	Walls South & B O E	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Verona High School	298	1	Entry Door East	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	Verona High School	299	1	Entry Door East	PL2X13	LED12CAN	9	9	0.0260	0.0120	CF (2) PL 13w	LED 12w Canopy		120	TRUE	10	4,380	0.22	0.10	0.12	974	449	524
Verona Public Schools NJ	Verona High School	300	1	Walls Kitchen	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Verona High School	301	1	Walls Kitchen	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	Verona High School	302	1	Door To Cafeteria	M70	NR	1	1	0.0950	0.0950	MH 70w	will Not be Retrofit		120	FALSE	10	4,380	0.09	0.09	-	395	395	-
Verona Public Schools NJ	Verona High School	303	1	Walls Boiler Room	S70	LED13SWP	2	2	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.18	0.02	0.15	782	108	674
Verona Public Schools NJ	Verona High School	304	1	Door Boiler Room Area	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	Verona High School	305	1	Gyn Door Rear	S70	LED13SWP	1	1	0.0940	0.0130	HPS 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	391	54	337
Verona Public Schools NJ	Verona High School	306	1	Gyn Door Rear	I100	L19A	1	1	0.1000	0.0190	Inc 100w	LED Lamp, 19w A-Line		120	TRUE	10	4,380	0.10	0.02	0.08	416	79	337
Verona Public Schools NJ	Verona High School	307	1	School Sign Light	1818	NR	3	3	0.0742	0.0742	1x8, 1-Lamp	will Not be Retrofit		120	FALSE	10	4,380	0.21	0.21	-	926	926	-
Verona Public Schools NJ	Verona High School	308	1	Entry Door To Music	M70	LED13SWP	1	1	0.0950	0.0130	MH 70w	LED 13w Small Wall Pack		120	TRUE	10	4,380	0.09	0.01	0.08	395	54	341
Verona Public Schools NJ	Verona High School	309	1	Entry Door To Music	H100	LED19K	2	2	0.1250	0.0120	MV 100w	LED Lamp, 12w A-Line		120	TRUE	10	4,380	0.24	0.02	0.21	1,040	100	940
Verona Public Schools NJ	Verona High School	310	1	Gymnasium Walls 20'	H175	LED41MWP-HI	3	3	0.2050	0.0410	MV 175w	LED 41w Wall Pack		120	TRUE	10	4,380	0.58	0.12	0.47	2,559	512	2,047
Verona Public Schools NJ	Verona High School	311	1	Gymnasium Walls 12'	H175	LED41MWP	2	2	0.2050	0.0410	MV 175w	LED 41w Wall Pack		120	TRUE	10	4,380	0.39	0.08	0.31	1,706	341	1,365
Verona Public Schools NJ	Verona High School	312	1	Stage Door Entry	PL2X13	NR	2	2	0.0260	0.0260	CF (2) PL 13w	will Not be Retrofit		120	FALSE	10	4,380	0.05	0.05	-	216	216	-
Verona Public Schools NJ	Verona High School	313	1	Auditorium Door	PL13	NR	1	1	0.0130	0.0130	CF PL 13w	will Not be Retrofit		120	FALSE	10	4,380	0.01	0.01	-	54	54	-
						Fixtures Included for Upgraded	**3,836**	**3,836**									**2,979**	**445**	**203**	**241**	**983,269**	**444,136**	**539,133**
						Total Fixtures Identified	**4,475**	**4,475**															

Verona Public Schools
Exhibit D
ECM 1C - Vending Misers
Vending Mizers

ECM DESCRIPTION

Install vending machines with vending misers, mounted on the respective vending machine.

DATA / ASSUMPTIONS

Cold Drink Run Hour Reduction	34%	
Snack Machine Run Hour Reduction	40%	
Typical Cold Drink Wattage	0.339	Watts
Typical Snack Machine Wattage	0.041	Watts

MEASUREMENT AND VERIFICATION

Option A - The Engineering Calculations are based on 5% of the retrofitted lighting fixtures direct kW measurements and operating hours. The kW Measurements are taken for existing lighting fixtures before removal and for new installed lighting fixtures. Lighting operating hours are agreed by client basis from the audit, logging data, and operating personal input. The occupancy sensors savings are calculated as % of operating hours basebd on logging data and historical statistical data.

COMMISSIONING

Confirm vending miser operation

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 10%

Relatively high safety factor is used for this ECM because of direct measurements are proven over the time and savings are stipulated

CALCULATIONS

Detailed energy savings calculations are in the line-by-line calculation sheet

*Inputs are blue

Building	Label	Type	Qty	Location
Verona High School	-	Cold Beverage	1	Faculty Rm
Verona High School	-	Cold Beverage	1	Hallway B/n Gyms
Verona High School	-	Cold Beverage	1	Hallway outside cafeteria
Verona High School	-	Cold Beverage	2	Cafeteria
H.B. Whitehorne Middle School	-	Cold Beverage	1	Cafeteria
F.N. Brown Elementary School	-	Cold Beverage	1	Faculty Rm
-	-	-	-	-
-	-	-	-	-
Totals	**-**	**-**	**7**	**-**

CALCULATION

	Verona High School	Verona High School	Verona High School	Verona High School	Whitehorne Middle Scl	. Brown Elementary Sch
Label	-	-	-	-	-	-
Type	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage	Cold Beverage
Location	Faculty Rm	Hallway B/n Gyms	Hallway outside cafeteria	Cafeteria	Cafeteria	Faculty Rm
Quantity	1	1	1	2	1	1
Run Hours	**8,760**	**8,760**	**8,760**	**8,760**	**8,760**	**8,760**
Existing kWh Consumption	2,970	2,970	2,970	5,939	2,970	2,970
Proposed kWh Consumption	1,960	1,960	1,960	3,920	1,960	1,960
Safety Factor	0%	0%	0%	0%	0%	0%
kWh Savings	1,010	1,010	1,010	2,019	1,010	1,010

Verona Public Schools
Exhibit D
ECM 1D - Plug Load Management
Plug Load Management

ECM DESCRIPTION

Install BERT plug load management plug on the various plug loads throughout the district. Integrate equipment onto a central wifi network to schedule these pieces of equipment

DATA / ASSUMPTIONS

Electrical draw for Cold Beverage Machine when off	**418**	W
Electrical draw for Snack Machine when off	**60**	W
Electrical draw for Large Copier when off	**80**	W
Electrical draw for Small Printer / Copier when off	**27**	W
Electrical draw for Monitor Combo (Printer) when off	**9**	W
Electrical draw for Labtop Charging Cart when off	**35**	W
Electrical draw for Projectors when off	**5**	W
Electrical draw for Water Fountains when off	**8**	W
Electrical draw for LCD when off	**29**	W
Electrical draw for AC Unit (120v) when off	**40**	W

Annual Savings for smart strips and smart board projectors are based on logging results for the various pieces of equipment

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements over a defined time period of the existing plug load and post BERT device. A population will be measured before the switch to the BERT devices to determine a baseline usage during a defined time period.

COMMISSIONING

Review installation and network integration with the IT department

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = **0%**

The safety factor for this ECM is taken at 0 due to conserative run hours based on data logging results.

FORMULAE

$$W_{TOTAL} = (W_{STRIPS} \cdot Strips_{\#}) + (W_{PROJECTORS} \cdot Projectors_{\#})$$

Verona Public Schools
Exhibit D
ECM 1D - Plug Load Management
Plug Load Management

Variable	Units	Description
W_{TOTAL}	kWh	Total Electrical Savings associated with this measure
W_{STRIPS}	kWh	Electrical Savings associated with smart strips
$W_{PROJECTORS}$	kWh	Electrical Savings associated with smart boards projectors
$Strips_{\#}$	-	Numbers of Electrical Strips
$Projectors_{\#}$	-	Numbers of Projectors

* Inputs are in blue

Building	Cold Beverage Machine	Snack Machine	Large Copier	Small Printer \ Copier	Monitor Combo (Printer)	Laptop Charging Carts	Projectors	Water Fountains	LCD	AC unit (120v)
Laning Avenue Elementary School			**3**		**8**		**11**			**3**
Brookdale Avenue Elementary School			**2**	**2**	**1**		**7**	**8**		
F.N. Brown Elementary School	**1**		**3**	**1**	**10**		**16**	**9**		
Forest Avenue Elementary School	**1**			**1**	**2**		**6**			**1**
H.B. Whitehorne Middle School	**1**		**4**	**1**	**20**	**1**	**6**	**13**	**2**	
Verona High School	**2**		**7**	**5**	**20**		**32**	**3**	**2**	**1**
	5	**-**	**19**	**10**	**61**	**1**	**78**	**33**	**4**	**5**

CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Cold Beverage Machine	-	-	1	1	1	2
Snack Machine	-	-	-	-	-	-
Large Copier	3	2	3	-	4	7
Small Printer \ Copier	-	2	1	1	1	5
Monitor Combo (Printer)	8	1	10	2	20	20
Laptop Charging Carts	-	-	-	-	1	-
Projectors	11	7	16	6	6	32
Water Fountains	-	8	9	-	13	3
LCD	-	-	-	-	2	2
AC unit (120v)	3	-	-	1	-	1
Total Devices	25	20	40	11	48	72
kW Electrical Draw	0.487	0.322	0.927	0.533	1.172	1.993
Operational Hours per Week Pre-Bert	168.0	168.0	168.0	168.0	168.0	168.0
Off Time Hours per Week	113	113	113	113	108	98
New Operational Hours	55	55	55	55	60	70
kWh Savings	2,862	1,892	5,447	3,132	6,582	10,156
Safety Factor	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**

Verona Public Schools
Exhibit D
ECM 1D - Plug Load Management
Plug Load Management

kWh Savings	2,862	1,892	5,447	3,132	6,582	10,156

Verona Public Schools
Exhibit D
ECM 1E - Install De-stratification Fans
De-stratifcation fans

ECM DESCRIPTION

Install de-stratification fans in large open ares. Fans will push and hold hot air down to reduce heating losses through the roof and upper section of the outside walls due to reducing the indoor temperature in these sections above the fan.

DATA / ASSUMPTIONS

Heating Hours 3,863 Hours

*Heating efficiency of de-stratification fans assumed at 60%

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify that the installed fans operate. Install clock meter on fans to verify that fans are running 24/7 during heating season

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Fuel savings recovery factor is conservatively set for 0 for the ECM due to the uncertainity in consistency of temperature difference between room and upper level temperatures, electric penalties recovery factor is at 0.

FORMULA

$W_{TOTAL} = W_{FAN} \cdot q \cdot t_{FAN}$

$Q_{SAVINGS} = Q_{TOTAL} \cdot \mu$

$Q_{TOTAL} = Q_{WALL} + Q_{ROOF} + Q_{WIN}$

$Q_{WALL} = \sum^{60}_{-5} ((T_{OCC} - T_{BIN}) \cdot A_{WALL} \cdot U_{WALL} \cdot t_{OCC)} + ((T_{UNOCC} - T_{BIN}) \cdot A_{WALL} \cdot U_{WALL} \cdot t_{UNOCC})$
$Q_{WIN} = \sum^{60}_{-5} ((T_{OCC} - T_{BIN}) \cdot A_{WIN} \cdot U_{WIN} \cdot t_{OCC)} + ((T_{UNOCC} - T_{BIN}) \cdot A_{WIN} \cdot U_{WIN} \cdot t_{UNOCC})$
$Q_{ROOF} = \sum^{60}_{-5} ((T_{OCC} - T_{BIN}) \cdot A_{ROOF} \cdot U_{ROOF} \cdot t_{OCC)} + ((T_{UNOCC} - T_{BIN}) \cdot A_{ROOF} \cdot U_{ROOF} \cdot t_{UNOCC})$

Variable	Units	Description
$Q_{SAVINGS}$	Therms	Annual thermal savings
$\sum^{60}_{-5}$	-	Summation of all bins from -5°F to 60°F
μ	%	Diversity factor of de-stratification fans (25% - 50%)
Q_{TOTAL}	btu	Total heat loss
Q_{WALL}	btu	Heat loss through wall (above de-stratification fan)
Q_{ROOF}	btu	Heat loss through roof
Q_{WIN}	btu	Heat loss through windows (above de-stratification fan)
T_{BIN}	°F	Temperature of respective bin
T_{OCC}	°F	Existing temperature of space during occupied hours
T_{UNOCC}	°F	Existing temperature of space during unoccupied hours
t_{OCC}	Hrs	Occupied Bin Hours in respective temperature bin
t_{UNOCC}	Hrs	Unoccupied Bin Hours in respective temperature bin
A_{WALL}	ft^2	Exposed wall area adove de-stratification fan
A_{ROOF}	ft^2	Exposed roof area adove de-stratification fan
A_{WINDOW}	ft^2	Exposed window area adove de-stratification fan
U_{WALL}	btu / ft^2 / °F	U-factor of wall
U_{ROOF}	btu / ft^2 / °F	U-factor of roof
U_{WIN}	btu / ft^2 / °F	U-factor of windows
W_{TOTAL}	kWh	Annual electrical consumption of fans
q	-	Quantity of fans
W_{FAN}	kW	Input kW of fan
t_{FAN}	Hrs	Annual run time of de-stratification fan (annual heating hours)

Verona Public Schools
Exhibit D
ECM 1E - Install De-stratification Fans
De-stratifcation fans

ASSUMPTIONS / DATA

* Inputs are in blue

Building	Location	Wall Length Perimeter (ft)	Wall Width Perimeter (ft)	Exposed Wall Height above Fan (ft)	Roof Area (ft^2)	Window Area (ft^2 - above Fan)	Roof U-Factor	Window U-Factor	Wall U-Factor
Laning Avenue Elementary School	New Gym	160	108	8.0	4,320	0	0.15	0.90	0.21
Brookdale Avenue Elementary School	Gym	140	90	8.0	3,150	0	0.15	0.90	0.21
F.N. Brown Elementary School	Gym	130	90	8.0	-	96	0.15	0.90	0.21
Forest Avenue Elementary School	Audit - Gym	128	104	8.0	3,328	0	0.15	0.90	0.21
H.B. Whitehorne Middle School	Gym	180	140	8.0	6,300	0	0.15	0.90	0.21
Verona High School	White Gym	192	140	8.0	6,720	189	0.15	0.90	0.21
Verona High School	Maroon Gym	200	160	8.0	8,000	0	0.15	0.90	0.21
Totals									

CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School	Verona High School
Location #1	New Gym	Gym	Gym	Audit - Gym	Gym	White Gym	Maroon Gym
Wall Length	160	140	130	128	180	192	200
Wall Width	108	90	90	104	140	140	160
Wall Height Above Fan	8.0	8.0	8.0	8.0	8.0	8.0	8.0
Roof Area	4,320	3,150	-	3,328	6,300	6,720	8,000
Window Area	-	-	96	-	-	189	-
Wall Exposed Area	2,144	1,840	1,664	1,856	2,560	2,467	2,880
Roof U-Factor	0.15	0.15	0.15	0.15	0.15	0.15	0.15
Window U-Factor	0.90	0.90	0.90	0.90	0.90	0.90	0.90
Wall U-Factor	0.21	0.21	0.21	0.21	0.21	0.21	0.21
Fan Model	Air Pear 45	Air Pear 25	Air Pear 15	Air Pear 25	Air Pear 25	Air Pear 45	Air Pear 45
Total run hours	3,863	3,863	3,863	3,863	3,863	3,863	3,863
Fan Input watts	45	35	17	35	35	45	45
kwh consumed by fan	174	135	66	135	135	174	174
SF per Fan	1,500	1,200	800	1,200	1,200	1,500	1,500
Total Fans	4	4	4	4	6	6	8
Total Kwh Consumed	695	541	263	541	811	1,043	1,391
Existing Occupied Heating Setpoint	72.0	72.0	72.0	72	72	72	72
Existing Unoccup. Heating Setpoint	65.0	65.0	65.0	65	65	65	65
Diversity Factor	70%	70%	70%	70%	70%	70%	70%
Boiler Efficiency	76.0%	76.0%	73.6%	76.0%	73.6%	76.0%	76.0%
Additional Electric Usage	(695)	(541)	(263)	(541)	(811)	(1,043)	(1,391)
Calculated Fuel Savings Therms	1,061	846	435	912	1,515	1,917	2,040
Safety Factor Electric	0%	0%	0%	0%	0%	0%	0%
Safety Factor Thermal	0%	0%	0%	0%	0%	0%	0%
Additional Electric usage	(695)	(541)	(263)	(541)	(811)	(1,043)	(1,391)
Calculated Fuel Savings	1,061	846	435	912	1,515	1,917	2,040

Verona Public Schools
Exhibit D
ECM 1E - Install De-stratification Fans
De-stratifcation fans

LANING AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	btu/ft^2/°F	btu/ft^2/°F	btu/ft^2/°F	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	113	129	118	360	133	227	2,144	4,320	0	0.21	0.15	0.90	1,635,863	2,354,386	-	3,990,249
50 to 55	52.5	131	253	181	565	253	312	2,144	4,320	0	0.21	0.15	0.90	3,978,461	5,725,930	-	9,704,392
45 to 50	47.5	117	180	134	431	182	249	2,144	4,320	0	0.21	0.15	0.90	3,970,835	5,714,955	-	9,685,790
40 to 45	42.5	169	194	221	584	200	384	2,144	4,320	0	0.21	0.15	0.90	6,547,840	9,423,864	-	15,971,704
35 to 40	37.5	215	186	247	648	197	451	2,144	4,320	0	0.21	0.15	0.90	8,643,820	12,440,466	-	21,084,286
30 to 35	32.5	260	111	196	567	129	438	2,144	4,320	0	0.21	0.15	0.90	8,704,180	12,527,338	-	21,231,519
25 to 30	27.5	144	59	119	322	69	253	2,144	4,320	0	0.21	0.15	0.90	5,654,817	8,138,596	-	13,793,414
20 to 25	22.5	140	20	69	229	32	197	2,144	4,320	0	0.21	0.15	0.90	4,481,576	6,450,030	-	10,931,606
15 to 20	17.5	66	21	16	103	26	77	2,144	4,320	0	0.21	0.15	0.90	2,284,602	3,288,073	-	5,572,676
10 to 15	12.5	26	3	19	48	5	43	2,144	4,320	0	0.21	0.15	0.90	1,150,954	1,656,490	-	2,807,445
5 to 10	7.5	3	-	1	4	0	4	2,144	4,320	0	0.21	0.15	0.90	104,399	150,255	-	254,654
0 to 5	2.5	2	-	-	2	0	2	2,144	4,320	0	0.21	0.15	0.90	56,843	81,810	-	138,653
-5 to 0	-2.5	-	-	-	-	-	-	2,144	4,320	0	0.21	0.15	0.90	-	-	-	-
-10 to -5	-7.5	-	-	-	-	-	-	2,144	4,320	0	0.21	0.15	0.90	-	-	-	-
-15 to -10	-12.5	-	-	-	-	-	-	2,144	4,320	0	0.21	0.15	0.90	-	-	-	-
Total		1,386	1,156	1,321	3,863	1,228	2,635							47,214,192	67,952,196	-	115,166,388

BROOKDALE AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	btu/ft^2/°F	btu/ft^2/°F	btu/ft^2/°F	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	113	129	118	360	159	201	1,840	3,150	0	0.21	0.15	0.90	1,474,068	1,802,528	-	3,276,596
50 to 55	52.5	131	253	181	565	288	277	1,840	3,150	0	0.21	0.15	0.90	3,508,174	4,289,887	-	7,798,060
45 to 50	47.5	117	180	134	431	211	220	1,840	3,150	0	0.21	0.15	0.90	3,486,053	4,262,836	-	7,748,888
40 to 45	42.5	169	194	221	584	239	345	1,840	3,150	0	0.21	0.15	0.90	5,724,468	7,000,028	-	12,724,496
35 to 40	37.5	215	186	247	648	244	404	1,840	3,150	0	0.21	0.15	0.90	7,544,508	9,225,622	-	16,770,130
30 to 35	32.5	260	111	196	567	181	386	1,840	3,150	0	0.21	0.15	0.90	7,608,989	9,304,470	-	16,913,459
25 to 30	27.5	144	59	119	322	98	224	1,840	3,150	0	0.21	0.15	0.90	4,929,691	6,028,155	-	10,957,846
20 to 25	22.5	140	20	69	229	57	172	1,840	3,150	0	0.21	0.15	0.90	3,916,164	4,788,787	-	8,704,951
15 to 20	17.5	66	21	16	103	39	64	1,840	3,150	0	0.21	0.15	0.90	1,995,080	2,439,636	-	4,434,715
10 to 15	12.5	26	3	19	48	10	38	1,840	3,150	0	0.21	0.15	0.90	1,000,679	1,223,657	-	2,224,336
5 to 10	7.5	3	-	1	4	1	3	1,840	3,150	0	0.21	0.15	0.90	91,045	111,333	-	202,378
0 to 5	2.5	2	-	-	2	1	1	1,840	3,150	0	0.21	0.15	0.90	49,749	60,834	-	110,583
-5 to 0	-2.5	-	-	-	-	-	-	1,840	3,150	0	0.21	0.15	0.90	-	-	-	-
-10 to -5	-7.5	-	-	-	-	-	-	1,840	3,150	0	0.21	0.15	0.90	-	-	-	-
-15 to -10	-12.5	-	-	-	-	-	-	1,840	3,150	0	0.21	0.15	0.90	-	-	-	-
Total		1,386	1,156	1,321	3,863	1,527	2,336							41,328,668	50,537,773	-	91,866,441

F.N. BROWN ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	btu/ft^2/°F	btu/ft^2/°F	btu/ft^2/°F	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	113	129	118	360	133	227	1,664	-	96	0.21	0.15	0.90	1,269,625	-	313,918	1,583,543
50 to 55	52.5	131	253	181	565	253	312	1,664	-	96	0.21	0.15	0.90	3,087,761	-	763,457	3,851,218
45 to 50	47.5	117	180	134	431	182	249	1,664	-	96	0.21	0.15	0.90	3,081,842	-	761,994	3,843,836
40 to 45	42.5	169	194	221	584	200	384	1,664	-	96	0.21	0.15	0.90	5,081,906	-	1,256,515	6,338,421
35 to 40	37.5	215	186	247	648	197	451	1,664	-	96	0.21	0.15	0.90	6,708,636	-	1,658,729	8,367,365
30 to 35	32.5	260	111	196	567	129	438	1,664	-	96	0.21	0.15	0.90	6,755,483	-	1,670,312	8,425,795
25 to 30	27.5	144	59	119	322	69	253	1,664	-	96	0.21	0.15	0.90	4,388,814	-	1,085,146	5,473,960
20 to 25	22.5	140	20	69	229	32	197	1,664	-	96	0.21	0.15	0.90	3,478,238	-	860,004	4,338,242
15 to 20	17.5	66	21	16	103	26	77	1,664	-	96	0.21	0.15	0.90	1,773,124	-	438,410	2,211,534
10 to 15	12.5	26	3	19	48	5	43	1,664	-	96	0.21	0.15	0.90	893,278	-	220,865	1,114,143
5 to 10	7.5	3	-	1	4	0	4	1,664	-	96	0.21	0.15	0.90	81,026	-	20,034	101,060
0 to 5	2.5	2	-	-	2	0	2	1,664	-	96	0.21	0.15	0.90	44,117	-	10,908	55,025
-5 to 0	-2.5	-	-	-	-	-	-	1,664	-	96	0.21	0.15	0.90	-	-	-	-
-10 to -5	-7.5	-	-	-	-	-	-	1,664	-	96	0.21	0.15	0.90	-	-	-	-
-15 to -10	-12.5	-	-	-	-	-	-	1,664	-	96	0.21	0.15	0.90	-	-	-	-
Total		1,386	1,156	1,321	3,863	1,228	2,635							36,643,851	-	9,060,293	45,704,144

Verona Public Schools
Exhibit D
ECM 1E - Install De-stratification Fans
De-stratifcation fans

FOREST AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	btu/ft^2/°F	btu/ft^2/°F	btu/ft^2/°F	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	113	129	118	360	213	147	1,856	3,328	0	0.21	0.15	0.90	1,633,435	2,092,085	-	3,725,520
50 to 55	52.5	131	253	181	565	361	204	1,856	3,328	0	0.21	0.15	0.90	3,738,724	4,788,514	-	8,527,238
45 to 50	47.5	117	180	134	431	270	161	1,856	3,328	0	0.21	0.15	0.90	3,676,168	4,708,392	-	8,384,560
40 to 45	42.5	169	194	221	584	331	253	1,856	3,328	0	0.21	0.15	0.90	6,023,790	7,715,198	-	13,738,988
35 to 40	37.5	215	186	247	648	351	297	1,856	3,328	0	0.21	0.15	0.90	7,904,284	10,123,714	-	18,027,998
30 to 35	32.5	260	111	196	567	285	282	1,856	3,328	0	0.21	0.15	0.90	7,960,848	10,196,160	-	18,157,008
25 to 30	27.5	144	59	119	322	158	164	1,856	3,328	0	0.21	0.15	0.90	5,137,914	6,580,579	-	11,718,493
20 to 25	22.5	140	20	69	229	105	124	1,856	3,328	0	0.21	0.15	0.90	4,079,131	5,224,502	-	9,303,633
15 to 20	17.5	66	21	16	103	57	46	1,856	3,328	0	0.21	0.15	0.90	2,061,928	2,640,893	-	4,702,821
10 to 15	12.5	26	3	19	48	20	28	1,856	3,328	0	0.21	0.15	0.90	1,037,541	1,328,870	-	2,366,412
5 to 10	7.5	3	-	1	4	2	2	1,856	3,328	0	0.21	0.15	0.90	94,273	120,744	-	215,017
0 to 5	2.5	2	-	-	2	1	1	1,856	3,328	0	0.21	0.15	0.90	51,351	65,770	-	117,120
-5 to 0	-2.5	-	-	-	-	-	-	1,856	3,328	0	0.21	0.15	0.90	-	-	-	-
-10 to -5	-7.5	-	-	-	-	-	-	1,856	3,328	0	0.21	0.15	0.90	-	-	-	-
-15 to -10	-12.5	-	-	-	-	-	-	1,856	3,328	0	0.21	0.15	0.90	-	-	-	-
Total		1,386	1,156	1,321	3,863	2,154	1,709							43,399,386	55,585,421	-	98,984,807

H.B. WHITEHORNE MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	btu/ft^2/°F	btu/ft^2/°F	btu/ft^2/°F	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	113	129	118	360	164	196	2,560	6,300	0	0.21	0.15	0.90	2,067,173	3,633,702	-	5,700,875
50 to 55	52.5	131	253	181	565	288	277	2,560	6,300	0	0.21	0.15	0.90	4,882,450	8,582,431	-	13,464,881
45 to 50	47.5	117	180	134	431	214	217	2,560	6,300	0	0.21	0.15	0.90	4,859,232	8,541,619	-	13,400,851
40 to 45	42.5	169	194	221	584	246	338	2,560	6,300	0	0.21	0.15	0.90	7,988,669	14,042,582	-	22,031,251
35 to 40	37.5	215	186	247	648	254	394	2,560	6,300	0	0.21	0.15	0.90	10,537,699	18,523,299	-	29,060,999
30 to 35	32.5	260	111	196	567	199	368	2,560	6,300	0	0.21	0.15	0.90	10,655,131	18,729,723	-	29,384,854
25 to 30	27.5	144	59	119	322	108	214	2,560	6,300	0	0.21	0.15	0.90	6,897,173	12,123,937	-	19,021,109
20 to 25	22.5	140	20	69	229	69	160	2,560	6,300	0	0.21	0.15	0.90	5,492,256	9,654,356	-	15,146,612
15 to 20	17.5	66	21	16	103	44	59	2,560	6,300	0	0.21	0.15	0.90	2,794,411	4,912,051	-	7,706,462
10 to 15	12.5	26	3	19	48	12	36	2,560	6,300	0	0.21	0.15	0.90	1,400,482	2,461,784	-	3,862,266
5 to 10	7.5	3	-	1	4	1	3	2,560	6,300	0	0.21	0.15	0.90	127,680	224,437	-	352,117
0 to 5	2.5	2	-	-	2	1	1	2,560	6,300	0	0.21	0.15	0.90	69,888	122,850	-	192,738
-5 to 0	-2.5	-	-	-	-	-	-	2,560	6,300	0	0.21	0.15	0.90	-	-	-	-
-10 to -5	-7.5	-	-	-	-	-	-	2,560	6,300	0	0.21	0.15	0.90	-	-	-	-
-15 to -10	-12.5	-	-	-	-	-	-	2,560	6,300	0	0.21	0.15	0.90	-	-	-	-
Total		1,386	1,156	1,321	3,863	1,599	2,264							57,772,243	101,552,771	-	159,325,014

VERONA HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	btu/ft^2/°F	btu/ft^2/°F	btu/ft^2/°F	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	113	129	118	360	353	7	2,467	6,720	189	0.21	0.15	0.90	2,677,566	5,209,694	879,136	8,766,396
50 to 55	52.5	131	253	181	565	554	11	2,467	6,720	189	0.21	0.15	0.90	5,666,795	11,025,787	1,860,602	18,553,184
45 to 50	47.5	117	180	134	431	423	8	2,467	6,720	189	0.21	0.15	0.90	5,440,174	10,584,853	1,786,194	17,811,221
40 to 45	42.5	169	194	221	584	570	14	2,467	6,720	189	0.21	0.15	0.90	8,875,198	17,268,322	2,914,029	29,057,549
35 to 40	37.5	215	186	247	648	633	15	2,467	6,720	189	0.21	0.15	0.90	11,525,962	22,425,868	3,784,365	37,736,196
30 to 35	32.5	260	111	196	567	555	12	2,467	6,720	189	0.21	0.15	0.90	11,558,498	22,489,172	3,795,048	37,842,718
25 to 30	27.5	144	59	119	322	315	7	2,467	6,720	189	0.21	0.15	0.90	7,396,435	14,391,118	2,428,501	24,216,054
20 to 25	22.5	140	20	69	229	225	4	2,467	6,720	189	0.21	0.15	0.90	5,856,926	11,395,721	1,923,028	19,175,674
15 to 20	17.5	66	21	16	103	102	1	2,467	6,720	189	0.21	0.15	0.90	2,904,551	5,651,336	953,663	9,509,550
10 to 15	12.5	26	3	19	48	47	1	2,467	6,720	189	0.21	0.15	0.90	1,475,298	2,870,463	484,391	4,830,151
5 to 10	7.5	3	-	1	4	4	0	2,467	6,720	189	0.21	0.15	0.90	133,435	259,622	43,811	436,869
0 to 5	2.5	2	-	-	2	2	0	2,467	6,720	189	0.21	0.15	0.90	72,011	140,112	23,644	235,767
-5 to 0	-2.5	-	-	-	-	-	-	2,467	6,720	189	0.21	0.15	0.90	-	-	-	-
-10 to -5	-7.5	-	-	-	-	-	-	2,467	6,720	189	0.21	0.15	0.90	-	-	-	-
-15 to -10	-12.5	-	-	-	-	-	-	2,467	6,720	189	0.21	0.15	0.90	-	-	-	-
Total		1,386	1,156	1,321	3,863	3,780	83							63,582,848	123,712,067	20,876,411	208,171,327

Verona Public Schools
Exhibit D
ECM 1E - Install De-stratification Fans
De-stratifcation fans

VERONA HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Exposed Wall area	Exposed Roof area	Window area	Wall U factor	Roof U factor	Window U factor	Wall Heat loss	Roof Heat Loss	Windows Heat Loss	Total Heat loss
HEATING								ft^2	ft^2	ft^2	btu/ft^2/°F	btu/ft^2/°F	btu/ft^2/°F	btu/Yr	btu/Yr	btu/Yr	btu/Yr
55 to 60	57.5	113	129	118	360	353	7	2,880	8,000	0	0.21	0.15	0.90	3,125,817	6,202,017	-	9,327,834
50 to 55	52.5	131	253	181	565	554	11	2,880	8,000	0	0.21	0.15	0.90	6,615,472	13,125,937	-	19,741,409
45 to 50	47.5	117	180	134	431	423	8	2,880	8,000	0	0.21	0.15	0.90	6,350,912	12,601,016	-	18,951,928
40 to 45	42.5	169	194	221	584	570	14	2,880	8,000	0	0.21	0.15	0.90	10,360,993	20,557,526	-	30,918,519
35 to 40	37.5	215	186	247	648	633	15	2,880	8,000	0	0.21	0.15	0.90	13,455,521	26,697,462	-	40,152,983
30 to 35	32.5	260	111	196	567	555	12	2,880	8,000	0	0.21	0.15	0.90	13,493,503	26,772,824	-	40,266,328
25 to 30	27.5	144	59	119	322	315	7	2,880	8,000	0	0.21	0.15	0.90	8,634,671	17,132,283	-	25,766,954
20 to 25	22.5	140	20	69	229	225	4	2,880	8,000	0	0.21	0.15	0.90	6,837,432	13,566,334	-	20,403,767
15 to 20	17.5	66	21	16	103	102	1	2,880	8,000	0	0.21	0.15	0.90	3,390,801	6,727,781	-	10,118,582
10 to 15	12.5	26	3	19	48	47	1	2,880	8,000	0	0.21	0.15	0.90	1,722,278	3,417,217	-	5,139,495
5 to 10	7.5	3	-	1	4	4	0	2,880	8,000	0	0.21	0.15	0.90	155,773	309,074	-	464,847
0 to 5	2.5	2	-	-	2	2	0	2,880	8,000	0	0.21	0.15	0.90	84,067	166,799	-	250,866
-5 to 0	-2.5	-	-	-	-	-	-	2,880	8,000	0	0.21	0.15	0.90	-	-	-	-
-10 to -5	-7.5	-	-	-	-	-	-	2,880	8,000	0	0.21	0.15	0.90	-	-	-	-
-15 to -10	-12.5	-	-	-	-	-	-	2,880	8,000	0	0.21	0.15	0.90	-	-	-	-
Total		1,386	1,156	1,321	3,863	3,780	83							74,227,240	147,276,271	-	221,503,511

Verona Public Schools
Exhibit D
ECM 2A - Boiler Replacement
Boiler Replacement Calculation

ECM DESCRIPTION

Replace boilers in respective buildings with new high efficiency condensing boilers

DATA / ASSUMPTIONS

Typical Condensing Boiler Seasonal Efficiency =	91.5%	
Heating Hours	3,863	Hours

* Utility baseline reduced by 10.5% to account for domestic hot water, science labs, and kitchen usage
* An adjusted baseline is used for the boiler baseline usage as to not double-dip on savings

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify all functions of the boiler control system, safety and operation. Verify air/fuel ratio is consistent through firing range. Provide training of the boiler operators

RECOVERY/SAFETY FACTOR

Safety Factor (Thermal) =	0%

A safety factor of 0 is used due to minimal variables and the proven results of this measure

FORMULAE

$$Q_{savings} = ((\eta_{NEW} - \eta_{OLD}) / \eta_{NEW}) \cdot Fuel_{ADJ}$$

Variable	Units	Description
$Q_{savings}$	Therms	Thermal Savings
η_{NEW}	%	Efficiency of New Boiler
η_{OLD}	%	Efficiency of Old Boiler
$Fuel_{ADJ}$	Therms	Adjusted Boiler Fuel Usage

*Inputs are blue

Building	Label	Boilers to be Replaced
Laning Avenue Elementary School	B4-1	1
Laning Avenue Elementary School	B4-2	1
-	-	-
Totals		**2**

Laning Avenue Elementary Sch	ning Avenue Elementary Sch	-	-
B4-1	B4-2	-	-
1	1	-	-
Natural Gas	Natural Gas	-	-
Natural Gas	Natural Gas	-	-

CALCULATIONS

	Laning Avenue Elementary School	Laning Avenue Elementary School
Label	B4-1	B4-2
No. of Units to be Replaced	1	1
Fuel Switch	N	N
Existing Fuel	Natural Gas	Natural Gas
Proposed Fuel	Natural Gas	Natural Gas
Current Boiler Efficiency	76.0%	76.0%
Proposed Boiler Efficiency	91.0%	91.0%
Improvement in Boiler Efficiency	15.0%	15.0%
Annual Boiler Fuel Use	13,419	13,419
Adjusted Boiler Usage	12,299	12,299
Percentage of Building Load	45%	45%
Safety Factor	0%	0%
Thermal Savings	2,027	2,027
Proposed Boiler Usage	10,271	10,271
Natural Gas Savings	2,027	2,027
Fuel Oil #2 Savings	-	-
Fuel Oil #4 Savings	-	-
Fuel Oil #6 Savings	-	-
Propane Savings	-	-

Notes:

Replacing the existing boiler with a new, high efficiency unit will reduce operating costs at this location.

Improving the air/fuel ratio will increase overall boiler combustion efficiency.

Note that the boiler efficiency discussed here is the overall boiler thermal efficiency, not just its combustion efficiency. The value of this number will be much lower than for combustion efficiency alone as it includes losses from radiation, blowdown, and other related losses. The value for annual boiler fuel has been adjusted for the effectof other ECMs.

New Non -Condensing Boilers will be Equiped with Control Links

Verona Public Schools
Exhibit D5
ECM 2B - Install Honeywell “Controlinks” Boiler Burner Controller
Boiler Controlinks

ECM DESCRIPTION

Install burner controls on existing burners which optimize fuel to air ratio instantaneously

DATA / ASSUMPTIONS

Heating Hours	3,863	Hours
Controlinks improvement in boiler efficiency:	**5.0%**	
Intellidyne improvement in boiler efficiency:	**2.0%**	

* Utility baseline reduced by 10.5% to account for domestic hot water, science labs, and kitchen usage
* An adjusted baseline is used for the boiler baseline usage as to not double-dip on savings

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify all functions of the boiler control system, safety and operation. Verify air/fuel ratio is consistent through firing range. Provide training of the boiler operators

RECOVERY/SAFETY FACTOR

Safety Factor (Thermal) = **0%**

There is no safety factor as improvement in efficiency is conservative

FORMULAE

$Q_{savings} = (\eta_{BOILER} / (\eta_{BOILER} + \eta_{IMP})) \cdot Fuel_{ADJ}$

Variable	Units	Description
$Q_{savings}$	Therms	Thermal Savings
η_{BOILER}	**%**	Efficiency of Existing Boiler
η_{IMP}	**%**	Improvement in Efficiency
$Fuel_{ADJ}$	Therms	Adjusted Boiler Fuel Usage

*Inputs are blue

Verona Public Schools
Exhibit D5
ECM 2B - Install Honeywell “Controlinks” Boiler Burner Controller
Boiler Controlinks

Building	Label	Units to be Installed	Burner Upgrade Type	Fuel Type
F.N. Brown Elementary School	B1-1	1	Control Links	Natural Gas
F.N. Brown Elementary School	B1-2	1	Control Links	Natural Gas
Forest Avenue Elementary School	B2-1	1	Control Links	Natural Gas
Forest Avenue Elementary School	B2-2	1	Control Links	Natural Gas
H.B. Whitehorne Middle School	B3-1	1	Control Links	Natural Gas
H.B. Whitehorne Middle School	B3-2	1	Control Links	Natural Gas
Brookdale Avenue Elementary School	B6-1	1	Control Links	Natural Gas
Brookdale Avenue Elementary School	B6-2	1	Control Links	Natural Gas
Totals		**8**		

CALCULATIONS

	F.N. Brown Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	H.B. Whitehorne Middle School	Brookdale Avenue Elementary School	Brookdale Avenue Elementary School
Label	B1-1	B1-2	B2-1	B2-2	B3-1	B3-2	B6-1	B6-2
No. of Units to be Installed	1	1	1	1	1	1	1	1
Burner Upgrade	Control Links	Control Links	Control Links	Control Links	Control Links	Control Links	Control Links	Control Links
Fuel Type	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas	Natural Gas
Current Boiler Efficiency	73.6%	73.6%	76.0%	76.0%	73.6%	73.6%	76.0%	76.0%
Improvement in Boiler Efficiency	5%	5%	5%	5%	5%	5%	5%	5%
Percentage of Load	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%	50.0%
Annual Boiler Fuel Use	16,270	16,270	10,230	10,230	24,334	24,334	8,233	8,233
Adjusted Boiler Usage	13,459	13,459	8,642	8,642	19,770	19,770	7,519	7,519
Safety Factor	0%	0%	0%	0%	0%	0%	0%	0%
Annual Energy Savings	428	428	267	267	629	629	232	232

Notes:
Replacing the existing boiler with a new, high efficiency unit will reduce operating costs at this location.
Improving the air/fuel ratio will increase overall boiler combustion efficiency.
New Boiler will be Natural Gas
Note that the boiler efficiency discussed here is the overall boiler thermal efficiency, not just its combustion efficiency. The value of this number will be much lower than for combustion efficiency alone as it includes losses from radiation, blowdown, and other related losses. The value for annual boiler fuel has been adjusted for the effect of other ECMs.
New Non -Condensing Boilers will be Equiped with Control Links

Verona Public Schools
Exhibit D
ECM 2C - Install Premium Efficiency Motors and VFDs
Variable Frequency Drives and Motor Replacements

ECM DESCRIPTION

There are standard efficiency motors and motors that need to be replaced due to poor condition throughout the district. These motors will be replaced with premium high efficiency motors to save electrical energy. In addition some new motors will be equipped with variable frequency drives (VFDs) for additional savings.

DATA / ASSUMPTIONS

Load Factor	**Varies by Building**

*VFD run speed percentages are based on typical VFD curves for hot water / chilled water loops
*Run hours are based on the audit, data logging, and through interviews with facility staff

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and installed motors and operating hours. All existing motors will be measured before removal and new motors after the installation. VFD kW will be measured through the load range and selected motors with VFDs will be monitored for the time period using kW loggers. Equipment operating hours are based on the audit, logging and operating personnel input.

COMMISSIONING

Review installation documents for alignments and vibrations. Start up equipment and measure vibration through the load range along with motor kW. Verify that VFDs are capable of operating in full design range upon the control signal demand.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	**0%**

The safety factor for this ECM is taken at 0 due to some unknown data such as actual existing motor kW loads and operation hours.

Verona Public Schools
Exhibit D
ECM 2C - Install Premium Efficiency Motors and VFDs
Variable Frequency Drives and Motor Replacements

FORMULAE

VFD

$W_{SAVINGSVFD} = W_{PROPOSED} - W_{VFD}$

$W_{VFD} = \sum^{60}_{0} Hp \cdot Lf \cdot \eta \cdot f^{\wedge 2.8} \cdot t_f$

MOTOR

$W_{SAVINGS} = W_{EXISTING} - W_{PROPOSED}$

$W_{EXISTING} = Hp \cdot Lf \cdot \eta \cdot t$
$W_{PROPOSED} = Hp \cdot Lf \cdot \eta \cdot t$

Variable	Units	Description
$W_{savingsVFD}$	kWh	Electrical Savings associated with VFD
$W_{savings}$	kWh	Electrical Savings for Motor Replacement
Hp	HP	Horsepower of motor
t	Hrs	Existing Run Hours
t	Hrs	Proposed Run Hours
Lf	-	Load Factor of motor
η	-	Existing efficiency of motor
η	-	Proposed efficiency of motor
$\sum^{60}_{0}$	-	Summation of all frequences (0 Hz to 60 Hz)
f	-	Frequency of drive, as a percentage of full frequency (60 Hz)
t_f	Hrs	Percentage of time motor will run at a particular frequency
W_{VFD}	kWh	Electrical consumption with VFD
$W_{EXISTING}$	kWh	Existing electrical consumption of motor
$W_{PROPOSED}$	kWh	Proposed electrical consumption of motor

Verona Public Schools
Exhibit D
ECM 2C - Install Premium Efficiency Motors and VFDs
Variable Frequency Drives and Motor Replacements

ASSUMPTIONS / INPUTS

* Inputs are in blue

Building	Equipment Label	Configuration	Qty	HP	Existing Efficiency	Replace Motor	Add VFD
H.B. Whitehorne Middle School	HWP-1.1	Primary	1	5.0	87.5%	Y	Y
H.B. Whitehorne Middle School	HWP-1.2	Standby	1	5.0	87.5%	Y	Y
H.B. Whitehorne Middle School	HWP-2.1	Primary	1	5.0	87.5%	Y	Y
H.B. Whitehorne Middle School	HWP-2.2	Standby	1	5.0	87.5%	Y	Y
Laning Avenue Elementary School	HWP-1	Primary	1	5.0	81.5%	Y	Y
Laning Avenue Elementary School	HWP-2	Standby	1	5	81.5%	Y	Y
Total							

CALCULATIONS (MOTOR)

	H.B. Whitehorne Middle School	**H.B. Whitehorne Middle School**	**H.B. Whitehorne Middle School**	**H.B. Whitehorne Middle School**	**Laning Avenue Elementary School**	**Laning Avenue Elementary School**
Equipment Label	HWP-1.1	HWP-1.2	HWP-2.1	HWP-2.2	HWP-1	HWP-2
Equipment Configuration	Primary	Standby	Primary	Standby	Primary	Standby
Replace Motor	Y	Y	Y	Y	Y	Y
VFD to be Installed	Y	Y	Y	Y	Y	Y
Qty	1	1	1	1	1	1
HP	5.0	5.0	5.0	5.0	5.0	5.0
Run Hours	**1,932**	**1,932**	**1,932**	**1,932**	**1,932**	**1,932**
Load Factor	0.65	0.65	0.65	0.65	0.65	0.65
Existing Motor Efficiency	0.875	0.875	0.875	0.875	0.815	0.815
Proposed Motor Efficiency	0.907	0.907	0.907	0.907	0.907	0.907
Existing kW	2.8	2.8	2.8	2.8	3.0	3.0
Proposed kW	2.7	2.7	2.7	2.7	2.7	2.7
Existing Motor kWh Consumption	5,352	5,352	5,352	5,352	5,746	5,746
Proposed Motor kWh Consumption	5,163	5,163	5,163	5,163	5,163	5,163
Proposed Motor kWh Consumption w/ VFD	2,364	2,364	2,364	2,364	2,364	2,364
Safety Factor	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
kW Savings	0.1	0.1	0.1	0.1	0.3	0.3
kWh Savings	2,988	2,988	2,988	2,988	3,382	3,382

Verona Public Schools
Exhibit D
ECM 2C - Install Premium Efficiency Motors and VFDs
Variable Frequency Drives and Motor Replacements

MOTOR RUN PERCENTAGES AT RESPECTIVE SPEED

30%	0.01	0.01	0.01	0.01	0.01	0.01
40%	0.03	0.03	0.03	0.03	0.03	0.03
50%	0.08	0.08	0.08	0.08	0.08	0.08
60%	0.12	0.12	0.12	0.12	0.12	0.12
70%	0.22	0.22	0.22	0.22	0.22	0.22
80%	0.29	0.29	0.29	0.29	0.29	0.29
90%	0.2	0.2	0.2	0.2	0.2	0.2
100%	0.05	0.05	0.05	0.05	0.05	0.05
Total	1	1	1	1	1	1

KWH CONSUMPTION W/ VFD

30%	1	1	1	1	1	1
40%	10	10	10	10	10	10
50%	52	52	52	52	52	52
60%	134	134	134	134	134	134
70%	390	390	390	390	390	390
80%	767	767	767	767	767	767
90%	753	753	753	753	753	753
100%	258	258	258	258	258	258

30%	0.07	0.07	0.07	0.07	0.07	0.07
40%	0.17	0.17	0.17	0.17	0.17	0.17
50%	0.33	0.33	0.33	0.33	0.33	0.33
60%	0.58	0.58	0.58	0.58	0.58	0.58
70%	0.92	0.92	0.92	0.92	0.92	0.92
80%	1.37	1.37	1.37	1.37	1.37	1.37
90%	1.95	1.95	1.95	1.95	1.95	1.95
100%	2.67	2.67	2.67	2.67	2.67	2.67

Verona Public Schools
Exhibit D
ECM 2D - Domestic Hot Water Heater Replacement
Domestic Hot Water Upgrades

ECM DESCRIPTION

Replacement of Domestic Hot Water Heaters with high efficiency condensing Domestic Hot Water Heaters

DATA / ASSUMPTIONS

*Isolating a storage tank improves the DHW system efficiency by:	3.0%
Current DHW Heater Efficiency	Varies

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify all functions of the boiler control system, safety and operation. Verify air/fuel ratio is consistent through firing range. Provide training of the boiler operators

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0.0%
Safety Factor (Thermal) =	0.0%

No Safety Factor is used because of a minimal of variables

DHW REPLACEMENT CALCULATION

$Q_{savings} = ((\eta_{NEW} - \eta_{OLD}) / \eta_{NEW}) \cdot Fuel_{DHW}$

Variable	Units	Description
$Q_{Savings}$	Therms	Thermal Savings
η_{NEW}	%	Efficiency of Existing DHW Heater
η_{OLD}	%	Efficiency of Proposed DHW Heater
$Fuel_{DHW}$	Therms	Annual DHW Fuel Consumption

*Inputs are blue

Building	Label	DHW Quantity
Brookdale Avenue Elementary School	DHW-6-1	1
Totals		**1**

Verona Public Schools
Exhibit D
ECM 2D - Domestic Hot Water Heater Replacement
Domestic Hot Water Upgrades

A. DOMESTIC HOT WATER HEATER REPLACEMENT

	Brookdale Avenue Elementary School
Label	DHW-6-1
Quantity	1
Fuel Switch	N
Existing Fuel	Natural Gas
Proposed Fuel	Natural Gas
Current DHW System Efficiency	100.0%
Proposed DHW System Efficiency	92.0%
Improvement DHW System Efficiency	-8%
Annual DHW Heater Baseline	867
Percentage of DHW Building Load	50%
Safety Factor	**30%**
Thermal Savings	(659)
Electric Savings	17,780
Natural Gas Savings	(659)
Fuel Oil #2 Savings	-
Fuel Oil #4 Savings	-
Fuel Oil #6 Savings	-
Propane Savings	-

B. STORAGE TANK ISOLATION

Storage Tank Isolation
Current DHW System Efficiency
Improvement in System Efficiency
New System Efficiency
Safety Factor
Electric Savings
Natural Gas Savings
Fuel Oil #2 Savings
Fuel Oil #4 Savings
Fuel Oil #6 Savings
Propane Savings

C. OIL PUMP CALCULATION

Oil Pump Savings
Oil Pump HP
Efficiency
Load Factor
Annual Run Hours
Safety Factor (Run Hours)
Adjusted Run Hours
Electric Savings

Verona Public Schools
Exhibit D
ECM 2E - Heat Pump Replacement
Heat Pump Replacement

ECM DESCRIPTION

Replace existing low efficiency condensing units in respective buildings with new high efficiency condensing units with an EER of 12+

CLARIFICATIONS, DELETIONS

*Run Hours based on occupancy schedule
*Full Load is estimated at (unless stated otherwise) : 97.5 °F
*Run hours are based on chiller cutoff temperature and bin weather data

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and installed chillers and operating hours. All existing chillers will be measured before removal and new motors after the installation.

COMMISSIONING

Start up equipment ensure proper operation

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

The safety factor for this ECM is taken at 0 due to some variances on the run hours and the estimated part load efficiencies of the existing chiller.

FORMULAE

OPTIMIZATION

$W_{SAVINGS} = W_C \cdot \eta_{\%}$

REPLACEMENT

$W_{SAVINGS} = W_C - W_C$

$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$
$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$W_{C\text{-}OCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum_{60}^{105} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

Verona Public Schools
Exhibit D
ECM 2E - Heat Pump Replacement
Heat Pump Replacement

Variable	Units	Description
$W_{SAVINGS}$	kWh	Electrical Savings
W_C	kWh	Existing Heat Pump unit Consumption
W_C	kWh	Proposed Heat Pump unit Consumption
$\eta_{\%}$	%	Efficiency gain due to Heat Pump unit optimization
Σ^{105}_{60}	-	Summation of all bins from 60°F to 105°F
C	Ton	Tonnage of Heat Pump unit
η	-	Existing efficiency of Heat Pump unit (EER)
η	-	Proposed efficiency of Heat Pump unit (EER)
T_{DESIGN}	°F	Design Temperature of Heat Pump unit (Usually 97.5°F)
T_{BIN}	°F	Bin Weather Temperature
T_{OCC}	°F	Temperature of building during occupied hours
T_{UNOCC}	°F	Temperature of building during unoccupied hours
t_{OCC}	Hrs	Existing occupied Bin Hours in respective temperature bin
t_{UNOCC}	Hrs	Existing unoccupied Bin Hours in respective temperature bin

* Inputs are in blue
*Checks against baseline are in purple

Building	Label	Tonnage	Current EER	Proposed EER	Area Serving
F.N. Brown Elementary School	CU-1-3	4.0	8.0	10.5	ComputerRoom
-	-	-	-	-	-
-	-	-	-	-	-
-	-	-	-	-	-
Totals		**4.0**			

CALCULATIONS

	F.N. Brown Elementary School
Label	CU-1-3
Area Serving	ComputerRoom
Condensing Unit Tonnage	4.0
Current EER	8.0
Proposed EER	10.5
Existing Occupied Cooling Setpoint	74.0
Existing Unoccupied Cooling Setpoint	85.0
Current Condensing Unit Consumption	1,537
Percent of Baseline Consumption	**0.8%**
Proposed Condensing Unit Consumption	1,171
Safety Factor	**0%**
Electrical Savings	366

Verona Public Schools
Exhibit D
ECM 2E - Heat Pump Replacement
Heat Pump Replacement

F.N. BROWN ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	-	-	-	-	-	4.0	4.0	-	-	-	-	-
95 to 100	97.5	-	5	-	5	5	0	4.0	4.0	19	1	30	23	7
90 to 95	92.5	-	34	2	36	32	4	4.0	4.0	130	14	216	165	51
85 to 90	87.5	1	100	27	128	96	32	2.3	0.8	220	26	368	281	88
80 to 85	82.5	17	328	92	437	315	122	1.4	-	456	-	683	521	163
75 to 80	77.5	106	270	200	576	267	309	0.6	-	159	-	239	182	57
70 to 75	72.5	226	185	248	659	197	462	-	-	-	-	-	-	-
65 to 70	67.5	245	207	283	735	220	515	-	-	-	-	-	-	-
60 to 65	62.5	348	154	240	742	178	564	-	-	-	-	-	-	-
Total		943	1,283	1,092	3,318	1,310	2,008	12.3	8.8	984	41	1,537	1,171	366

Verona Public Schools
Exhibit D
ECM 2F - Window AC Unit Replacements with Split System
Window AC Replacement

ECM DESCRIPTION

Replace existing low efficiency window units in respective buildings with new high efficiency window units with an EER of 12-

DATA / ASSUMPTIONS

*Run Hours based on occupancy schedule
*Full Load is estimated at (unless stated otherwise) : 97.5 °F
*Run hours are based on chiller cutoff temperature and bin weather data

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and installed chillers and operating hours. All existing chillers will be measured before removal and new motors after the installation

COMMISSIONING

Start up equipment ensure proper operation

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

The safety factor for this ECM is taken at 0 due to some variances on the run hours and the estimated part load efficiencies of the existing chiller

FORMULAE

OPTIMIZATION

$W_{SAVINGS} = W_C \cdot \eta_{\%}$

REPLACEMENT

$W_{SAVINGS} = W_C - W_C$

$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$
$W_C = (W_{C\text{-}OCC} + W_{C\text{-}UNOCC})$

$W_{C\text{-}OCC} = \sum^{105}_{60} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum^{105}_{60} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

$W_{C\text{-}OCC} = \sum^{105}_{60} C \cdot (T_{BIN} - T_{OCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{OCC} \cdot \eta$
$W_{C\text{-}UNOCC} = \sum^{105}_{60} C \cdot (T_{BIN} - T_{UNOCC}) / (T_{BIN} - T_{DESIGN}) \cdot t_{UNOCC} \cdot \eta$

Variable	Units	Description
$W_{SAVINGS}$	kWh	Electrical Savings
W_C	kWh	Existing condensing unit Consumption
W_C	kWh	Proposed condensing unit Consumption
$\eta_{\%}$	%	Efficiency gain due to condensing unit optimization
$\sum^{105}_{60}$	-	Summation of all bins from 60°F to 105°F
C	Ton	Tonnage of condensing unit
η	-	Existing efficiency of condensing unit (EER)
η	-	Proposed efficiency of condensing unit (EER)
T_{DESIGN}	°F	Design Temperature of condensing unit (Usually 97.5°F)
T_{BIN}	°F	Bin Weather Temperature
T_{OCC}	°F	Temperature of building during occupied hours
T_{UNOCC}	°F	Temperature of building during unoccupied hours
t_{OCC}	Hrs	Existing occupied Bin Hours in respective temperature bin
t_{UNOCC}	Hrs	Existing unoccupied Bin Hours in respective temperature bin

Verona Public Schools
Exhibit D
ECM 2F - Window AC Unit Replacements with Split System
Window AC Replacement

* Inputs are in blue
*Checks against baseline are in purple

Building	Label	Qty	Tonnage (Each)	Current EER	Proposed EER	Area Serving
Forest Avenue Elementary School	WU-1-1	1	2.0	9.0	16.0	Library
Forest Avenue Elementary School	WU-1-2	1	2.0	9.0	16.0	Rm 11
Laning Avenue Elementary School	WU-2-1	1	2.4	8.5	22.7	Rm 126
Laning Avenue Elementary School	WU-2-3	1	2.4	8.5	22.7	Rm 128
Laning Avenue Elementary School	WU-2-4	1	2.4	8.5	22.7	Rm 129
Totals			**11.2**			

CALCULATIONS

	Forest Avenue Elementary School	Forest Avenue Elementary School	Laning Avenue Elementary School	Laning Avenue Elementary School	Laning Avenue Elementary School
Label	WU-1-1	WU-1-2	WU-2-1	WU-2-3	WU-2-4
Qty	1.00	1.00	1.00	1.00	1.00
Area Serving	Library	Rm 11	Rm 126	Rm 128	Rm 129
Condensing Unit Tonnage	2.0	2.0	2.4	2.4	2.4
Current EER	9.0	9.0	8.5	8.5	8.5
Proposed EER	16.0	16.0	22.7	22.7	22.7
Existing Occupied Cooling Setpoint	72.0	72.0	72.0	72.0	72.0
Existing Unoccupied Cooling Setpoint	65.0	65.0	65.0	65.0	65.0
Current Condensing Unit Consumption	1,526	1,526	2,180	2,180	2,180
Percent of Baseline Consumption	0.9%	0.9%	0.8%	0.8%	0.8%
Proposed Condensing Unit Consumption	858	858	816	816	816
Electrical Savings	668	668	1,364	1,364	1,364
Safety Factor	5%	5%	5%	5%	5%
Electrical Savings	634	634	1,296	1,296	1,296

FOREST AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	-	-	-	-	-	2.0	2.0	-	-	-	-	-
95 to 100	97.5	-	5	-	5	5	(0)	2.0	2.0	10	(0)	13	8	6
90 to 95	92.5	-	34	2	36	35	1	2.0	2.0	69	3	96	54	42
85 to 90	87.5	1	100	27	128	107	21	1.2	1.4	130	29	212	119	93
80 to 85	82.5	17	328	92	437	359	78	0.8	1.1	296	84	506	285	221
75 to 80	77.5	106	270	200	576	371	205	0.4	0.8	160	158	424	238	185
70 to 75	72.5	226	185	248	659	356	303	0.0	0.5	14	140	205	115	90
65 to 70	67.5	245	207	283	735	396	339	-	0.2	-	52	70	39	30
60 to 65	62.5	348	154	240	742	382	360	-	-	-	-	-	-	-
Total		943	1,283	1,092	3,318	2,011	1,307	6.5	7.8	679	465	1,526	858	668

FOREST AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	-	-	-	-	-	2.0	2.0	-	-	-	-	-
95 to 100	97.5	-	5	-	5	5	(0)	2.0	2.0	10	(0)	13	8	6
90 to 95	92.5	-	34	2	36	35	1	2.0	2.0	69	3	96	54	42
85 to 90	87.5	1	100	27	128	107	21	1.2	1.4	130	29	212	119	93
80 to 85	82.5	17	328	92	437	359	78	0.8	1.1	296	84	506	285	221
75 to 80	77.5	106	270	200	576	371	205	0.4	0.8	160	158	424	238	185
70 to 75	72.5	226	185	248	659	356	303	0.0	0.5	14	140	205	115	90
65 to 70	67.5	245	207	283	735	396	339	-	0.2	-	52	70	39	30
60 to 65	62.5	348	154	240	742	382	360	-	-	-	-	-	-	-
Total		943	1,283	1,092	3,318	2,011	1,307	6.5	7.8	679	465	1,526	858	668

Verona Public Schools
Exhibit D
ECM 2F - Window AC Unit Replacements with Split System
Window AC Replacement

LANING AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	-	-	-	-	-	2.4	2.4	-	-	-	-	-
95 to 100	97.5	-	5	-	5	5	0	2.4	2.4	11	1	17	6	11
90 to 95	92.5	-	34	2	36	32	4	2.4	2.4	78	8	122	46	76
85 to 90	87.5	1	100	27	128	96	32	1.5	1.7	140	54	273	102	171
80 to 85	82.5	17	328	92	437	315	122	1.0	1.3	311	158	662	248	414
75 to 80	77.5	106	270	200	576	267	309	0.5	0.9	138	285	598	224	374
70 to 75	72.5	226	185	248	659	197	462	0.0	0.6	9	256	374	140	234
65 to 70	67.5	245	207	283	735	220	515	-	0.2	-	95	134	50	84
60 to 65	62.5	348	154	240	742	178	564	-	-	-	-	-	-	-
Total		943	1,283	1,092	3,318	1,310	2,008	7.8	9.4	688	857	2,180	816	1,364

LANING AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	-	-	-	-	-	2.4	2.4	-	-	-	-	-
95 to 100	97.5	-	5	-	5	5	0	2.4	2.4	11	1	17	6	11
90 to 95	92.5	-	34	2	36	32	4	2.4	2.4	78	8	122	46	76
85 to 90	87.5	1	100	27	128	96	32	1.5	1.7	140	54	273	102	171
80 to 85	82.5	17	328	92	437	315	122	1.0	1.3	311	158	662	248	414
75 to 80	77.5	106	270	200	576	267	309	0.5	0.9	138	285	598	224	374
70 to 75	72.5	226	185	248	659	197	462	0.0	0.6	9	256	374	140	234
65 to 70	67.5	245	207	283	735	220	515	-	0.2	-	95	134	50	84
60 to 65	62.5	348	154	240	742	178	564	-	-	-	-	-	-	-
Total		943	1,283	1,092	3,318	1,310	2,008	7.8	9.4	688	857	2,180	816	1,364

LANING AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occupied Tons	Unoccupied Tons	Occupied Ton-Hrs	Unoccupied Ton-Hrs	Current Condensing Unit Consumption	Proposed Condensing Unit Consumption	Savings
COOLING												kWh	kWh	kWh
100 to 105	102.5	-	-	-	-	-	-	2.4	2.4	-	-	-	-	-
95 to 100	97.5	-	5	-	5	5	0	2.4	2.4	11	1	17	6	11
90 to 95	92.5	-	34	2	36	32	4	2.4	2.4	78	8	122	46	76
85 to 90	87.5	1	100	27	128	96	32	1.5	1.7	140	54	273	102	171
80 to 85	82.5	17	328	92	437	315	122	1.0	1.3	311	158	662	248	414
75 to 80	77.5	106	270	200	576	267	309	0.5	0.9	138	285	598	224	374
70 to 75	72.5	226	185	248	659	197	462	0.0	0.6	9	256	374	140	234
65 to 70	67.5	245	207	283	735	220	515	-	0.2	-	95	134	50	84
60 to 65	62.5	348	154	240	742	178	564	-	-	-	-	-	-	-
Total		943	1,283	1,092	3,318	1,310	2,008	7.8	9.4	688	857	2,180	816	1,364

Verona Public Schools
Exhibit D
ECM 2G - Walk-In Freezer/Cooler Controllers
Walk-In Freezer/Cooler Controllers

ECM DESCRIPTION

Installation of a refrigeration controller made by intellidyne on walk-in freezers and refrigerators. This will reduce cycling and improve operating efficiency of the compressor.

DATA / ASSUMPTIONS

Assumed compressor and controller savings	15%	
Assumed Run Hours	4,200	Hours

MEASUREMENT AND VERIFICATION

Option A - Measure kW of selected freezer compressors. Logging compressor operation before and after the controller installations. Calculate savings based on measured results.

COMMISSIONING

Test compressors after installation.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

Recovery factor taken at 0 due to few installations and not proven savings record.

FORMULAE

$W_{SAVINGS} = (\ kW_{REFRIG} + kW_{FREEZER}\ ) \cdot t \cdot \delta_{\%SAVINGS}$

Variable	Units	Description
$W_{savings}$	kWh	Electrical Savings for Motor Replacement
kW_{REFRIG}	kW	Horsepower of motor
$kW_{FREEZER}$	kW	Existing Run Hours
t	Hrs	Run hours (assumed)
$\delta_{\%SAVINGS}$	%	Compressor and controller savings (assumed)

*Inputs are blue

Building	Location	No. of Walk-In Refrigators	No. of Walk-In Freezers	kW of Refrigator	kW of Freezer
Verona High School	Kitchen	1	-		2.500
H.B. Whitehorne Middle School	Kitchen	-	1		2.500
-	-	-	-		
-	-	-	-		
Totals	-	1	1	-	5.0

CALCULATIONS

	Verona High School	H.B. Whitehorne Middle School
No. of Walk-In Refrigerators	1	0
No. of Walk-In Freezers	0	1
kW of Refrigerator	-	-
kW of Freezer	2.500	2.500
Run Hours	4,200	4,200
Total Electrical Consumption	-	10,500
Compressor and Controller Savings	15%	15%
Safety Factor	0%	0%
Electrical Savings	-	1,575

Verona Public Schools
Exhibit D
ECM 2H - Kitchen Hood Controllers
Kitchen Hood Replacement

ECM DESCRIPTION

Kitchen hoods in the district's kitchens are ventilated by exhaust fans. Fans are running most of the time at full speed when kitchen is in operation even if there are no activities under the hoods. e new ventilaton control systems will control exhaust fans based on hood exhaust temperatures. The exhaust fan will be equipped with VFDs will control air flows. If the exhaust fan is combined with a make up air unit, then variable air flow will be controlled on both exhaust and make up air fans.

DATA / ASSUMPTIONS

Existing equipment schedule was given by personnel operating the kitchen equipment and with interviews with facility staff

MEASUREMENT AND VERIFICATION

Option A (Both Electric and Fuel) - Measure kW, logging fan operation and calculate energy savings, both electric and fuel, from collected data with fan and make up air information from manufacturer.

COMMISSIONING

Test exhaust fans and make up air units that they operate per design intent, which include simulation of the exhaust temperature driving fan motor speeds. Verify all safety interlocks.

RECOVERY/SAFETY FACTOR

Recovery/Safety Factor (Electric) =	**5%**
Recovery/Safety Factor (Thermal) =	**5%**

Savings calculations are based on weather bin data, make up air flow and operating schedules. A more conservative is used for heating losses due to the uncertainty of the basic operating information in terms of the volume of air being exhausted and other operating perimeters. The heating fuel saving calculations are based upon information provided by the equipment vendor. The exhaust fan electric savings are based on existing fan schedules and proposed fan schedules. Recovery factor of the electric savings is less conservative due to knowledge of technical data and agreed operating schedule.

Verona Public Schools
Exhibit D
ECM 2H - Kitchen Hood Controllers
Kitchen Hood Replacement

FORMULAE

$W_{SAVINGS} = (W_{FAN} - W_{FAN})$
$Q_{SAVINGS} = (Q_{HOOD} - Q_{HOOD}) / \eta_{Boiler}$

$W_{FAN} = \sum_{0\%}^{100\%} HP \cdot Lf \cdot .746 \cdot t_{HOOD}$
$W_{FAN} = \sum_{0\%}^{100\%} (HP \cdot Lf \cdot .746) \cdot RPM_{\%}^{3} \cdot t_{HOOD}$

$Q_{HOOD} = (1.08 \cdot V_{EX} \cdot HD_{OCC} \cdot (t_{HOOD} / t_{HOOD} + t_{OCC})) / (\eta_{sys} \cdot 100{,}000)$
$Q_{HOOD} = (1.08 \cdot V_{EX} \cdot HD_{OCC} \cdot (t_{HOOD} / t_{HOOD} + t_{OCC})) / (\eta_{sys} \cdot 100{,}000)$

$V_{EX} = V_{EX} \cdot RPM_{W}$

Variable	Units	Description
$W_{savings}$	kWh	kWh Savings
$Q_{savings}$	Therms	Thermal Savings
W_{FAN}	kWh	Existing Annual Fan Electricial Consumption
W_{FAN}	kWh	Proposed Annual Fan Electricial Consumption
HP	HP	Horsepower of Exhaust Fan
$\sum_{0\%}^{100\%}$	-	Summation of run times
$RPM_{\%}$	RPM	Percentage of RPM compared to the motors full speed (0% - 100%)
RPM_{W}	RPM	Weighted RPM of Exhaust Fan
Lf	-	Load Factor of motor
η_{sys}	-	Existing system efficiency
V_{EX}	CFM	Current Exhaust Volume
V_{EX}	CFM	Proposed Exhaust Volume
Q_{HOOD}	Therms	Existing Heat Load of Kitchen Hood
Q_{HOOD}	Therms	Proposed Heat Load of Kitchen Hood
T_{OCC}	°F	Existing temperature of space during occupied hours
η_{Boiler}	-	Existing system efficiency
t_{HOOD}	Hrs	Existing Hood Run Hours
t_{OCC}	Hrs	Occupied Bin Hours
HD_{OCC}	Hrs	Existing occupied heating degree hours

Verona Public Schools
Exhibit D
ECM 2H - Kitchen Hood Controllers
Kitchen Hood Replacement

* Inputs are in blue

Building	Kitchen Hood Area (ft^2)	HP of Exhaust Fan Motor	HP of MAU Motor	Annual Run Hours	System Efficiency	Current Exhaust Volume (CFM)
H.B. Whitehorne Middle School	80	3.0	-	2,200	76%	6,000
Verona High School	80	3.0		2,200	76%	6,000
Totals	160	6.0	-			12,000

	H.B. Whitehorne Middle School	Verona High School
Kitchen Hood Area	80	80
HP of Fan Motor	3	3.0
HP Fan MAU Motor	0.0	0.0
Load Factor	75%	75%
Annual Run Hours	2,200	2,200
System Efficiency	76%	76%
Current Exhaust Volume	6,000	6,000
Proposed Exhaust Volume	3,870	3,870
Existing Heat Load	2,397	3,785
Proposed Heat Load	1,546	2,441
Existing Occupied Heating Setpoint	72.0	72.0
Existing Occupied Cooling Setpoint	72.0	72.0
Existing Unoccup. Cooling Setpoint	85.0	85.0
Boiler Efficiency	73.6%	76.0%
Safety Factor	5%	5%
Electrical Savings	2,378	2,378
Thermal Savings	1,098	1,680

Verona Public Schools
Exhibit D
ECM 2H - Kitchen Hood Controllers
Kitchen Hood Replacement

ELECTRICAL CALCULATIONS

H.B. WHITEHORNE MIDDLE SCHOOL

Variable Exhaust Volume Analysis

% Rated RPM	% Run Time	Time Hrs/Yr	Weighted RPM	Existing kWh	Proposed kWh	kWh Savings
100%	10%	220	10%	369	369	0
90%	5%	110	5%	185	135	50
80%	5%	110	4%	185	95	90
70%	15%	330	11%	554	190	364
60%	30%	660	18%	1,108	239	869
50%	35%	770	18%	1,292	162	1,131
40%	0%	-	0%	0	0	0
30%	0%	-	0%	0	0	0
20%	0%	-	0%	0	0	0
10%	0%	-	0%	0	0	0
Total		2,200	**65%**	**3,693**	**1,189**	**2,503**

VERONA HIGH SCHOOL

Variable Exhaust Volume Analysis

% Rated RPM	% Run Time	Time Hrs/Yr	Weighted RPM	Existing kWh	Proposed kWh	kWh Savings
100%	10%	220	10%	369	369	0
90%	5%	110	5%	185	135	50
80%	5%	110	4%	185	95	90
70%	15%	330	11%	554	190	364
60%	30%	660	18%	1,108	239	869
50%	35%	770	18%	1,292	162	1,131
40%	0%	-	0%	0	0	0
30%	0%	-	0%	0	0	0
20%	0%	-	0%	0	0	0
10%	0%	-	0%	0	0	0
Total		2,200	**65%**	**3,693**	**1,189**	**2,503**

Verona Public Schools

Exhibit D

ECM 2I - Steam Trap Replacement/Refurbishment

Steam Trap Retrofit

ECM DESCRIPTION

Steam trap audit identified that there are steam traps that are not currently working or are partially working. Faulty steam traps will be either replaced or repaired.

DATA / ASSUMPTIONS

* Percentage of failed steam traps based on audit	**0.270**	Btu / ft^2 / °F / hr. / inch
*Respective boiler efficiencies are used		
Heating Hours	3,863	Hours

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify function of all steam traps per scope of work

RECOVERY/SAFETY FACTOR

Diversity Factor =	**100%**	Percentage of "lost" steam from orifice size from a failed trap (i.e. Not all all steam will flow through open orifice)
Safety Factor (Thermal) =	**0%**	

The safety factor for this ECM is taken at 0 due to exactness of the existing trap losses

FORMULAE

$Q_{savings} = (q_{loss} \cdot 1{,}194/100{,}000) / \eta$

$q_{loss} = \sum^{TRAPS} q_{trap} \cdot st_{fail\%} \cdot t$

$q_{trap} = 10.1 \cdot d^2 \cdot (p + 14.7)$

Verona Public Schools

Exhibit D

ECM 2I - Steam Trap Replacement/Refurbishment

Steam Trap Retrofit

Variable	Units	Description
$Q_{savings}$	Therms	Thermal Savings
Σ^{TRAPS}	-	Summation of all steam traps
q_{loss}	lb / yr	Annual steam loss through failed office
q_{trap}	lb / hr	Steam loss through failed office
$st_{fail\%}$	%	Percentage of failed steam traps
t	hrs	Annual heating system run hours
p	psig	Pressure of steam through respective system
d	inches	Orifice Diameter
η	%	Boiler Efficiency

* Inputs are in blue

Building	% of Population Failed
F.N. Brown Elementary School	15%
H.B. Whitehorne Middle School	15%

CALCULATIONS

Hours / Yr	Equipment	Steam Trap Type	Steam Pressure (Psi)	Orifice Diameter (inches)	Failed Loss/hr	F.N. Brown Elementary School Qty	H.B. Whitehorne Middle School Qty
3503	Drip	Thermo.	5.0	0.250	12.4		
3503	Drip	F&T	5.0	0.188	7.0		
3503	Hvac	Thermo.	2.0	0.218	8.0		
3503	Hvac	1" F&T	2.0	0.218	8.0	5	2
3503	Hvac	1-1/4" F&T	2.0	0.312	16.4		2
3503	Hvac	1-1/2" F&T	2.0	0.390	25.7		
3503	Hvac	2" F&T	2.0	0.500	42.2		2
3503	UV	Thermo.	2.0	0.250	10.5		
3503	Rad	Thermo.	2.0	0.250	10.5	28	7
3503	Drip	Thermo.	2.0	0.250	10.5	5	7
3503	Drip	F&T	2.0	0.188	6.0		
3503	Hvac	Thermo.	2.0	0.218	8.0		
					Total Traps	38	20
					% of Population Failed	15%	15%
					Failed Strem Traps	6	3
					Steam Loss	203,854	147,542
					Safety Factor	0%	0%
					Annual Steam Losses	2,434	1,762
					Boiler Efficency	73.6%	73.6%
					Annual Heat Input Losses	3,307	2,393

Verona Public Schools
Exhibit D
ECM 3A - Building Management Control Systems
BMS Upgrades

ECM DESCRIPTION

The building managament system for the school district will be upgraded. Where the DDC system exists it will be incorporated into a web-based system. The pnaumatic control system in some buildings will be replaced with new DDC controls. The new DDC system will be a web based type that allows remote access to a personnel from any computer using a security password.

DATA / ASSUMPTIONS

Heating Hours 3,863 Hours

*Schedules and temperatures are based on data logging trends performed throughout the building

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify functions of all installed controllers. Verify that control loops work properly. Verify function of all alarms installed in the system. Verify that all installed control variables and set points can be set and managed remotely

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Savings calculations are based on weather bin data, fresh air flows and temperature setpoints. A more conservative of percent is used for this ECM due to the uncertainty of variables. The heating fuel savings calculations are based upon information provided by the equipment vendor.

FORMULAE

$Q_{SAVINGS} = (HD_{EXISTING} - HD_{PROPOSED} / HD_{EXISTING}) \cdot Fuel_{ADJUSTED}$

$HD_{EXISTING} = \sum^{60}_{-5} (T_{OCC} - T_{BIN}) \cdot t_{OCC} + (T_{UNOCC} - T_{BIN}) \cdot t_{UNOCC}$

$HD_{PROPOSED} = \sum^{60}_{-5} (T_{OCC} - T_{BIN}) \cdot t_{OCC} + (T_{UNOCC} - T_{BIN}) \cdot t_{UNOCC}$

Variable	Units	Description
$Q_{savings}$	Therms	Thermal Savings
$\sum^{60}_{-5}$	-	Summation of all bins from -5°F to 60°F
T_{BIN}	°F	Temperature of respective bin
t_{OCC}	Hrs	Existing occupied Bin Hours in respective temperature bin
t_{UNOCC}	Hrs	Existing unoccupied Bin Hours in respective temperature bin
t_{OCC}	Hrs	Proposed occupied Bin Hours in respective temperature bin
t_{UNOCC}	Hrs	Proposed unoccupied Bin Hours in respective temperature bin
T_{OCC}	°F	Existing temperature of space during occupied hours
T_{UNOCC}	°F	Existing temperature of space during unoccupied hours
T_{OCC}	°F	Proposed temperature of space during occupied hours
T_{UNOCC}	°F	Proposed temperature of space during unoccupied hours
$HD_{EXISTING}$	Hrs	Existing heating degree hours in space
$HD_{PROPOSED}$	Hrs	Proposed heating degree hours in space
$Fuel_{ADJUSTED}$	Therms	Adjusted Boiler Fuel Usage

* Inputs for Section 1 and Section 2 are in blue

	EXISTING									
	Section 1					Section 2				
Building	Percentage of Building	Occupied Heating Temperature (°F)	Unoccupied Heating Temperature (°F)	Occupied Cooling Temperature (°F)	Unoccupied Cooling Temperature (°F)	Percentage of Building	Occupied Heating Temperature (°F)	Unoccupied Heating Temperature (°F)	Occupied Cooling Temperature (°F)	Unoccupied Cooling Temperature (°F)
Laning Avenue Elementary School	90%	72.0	65.0	74.0	85.0	10%	72.0	72.0	74.0	85.0
Brookdale Avenue Elementary School	90%	72.0	65.0	74.0	85.0	10%	72.0	72.0	74.0	85.0
F.N. Brown Elementary School	90%	72.0	65.0	74.0	85.0	10%	72.0	72.0	74.0	85.0
Forest Avenue Elementary School	90%	72.0	65.0	74.0	85.0	10%	72.0	72.0	74.0	85.0
H.B. Whitehorne Middle School	90%	72.0	65.0	72.0	85.0	10%	70.0	70.0	72.0	85.0
Verona High School	90%	72.0	65.0	72.0	85.0	10%	70.0	70.0	72.0	85.0

PROPOSED							
Section 1				Section 2			
Occupied Heating Temperature (°F)	Unoccupied Heating Temperature (°F)	Occupied Cooling Temperature (°F)	Unoccupied Cooling Temperature (°F)	Occupied Heating Temperature (°F)	Unoccupied Heating Temperature (°F)	Occupied Cooling Temperature (°F)	Unoccupied Cooling Temperature (°F)
70.0	60.0	74.0	85.0	70.0	60.0	72.0	85.0
70.0	60.0	74.0	85.0	70.0	60.0	72.0	85.0
70.0	60.0	74.0	85.0	70.0	60.0	72.0	85.0
70.0	60.0	74.0	85.0	70.0	60.0	72.0	85.0
70.0	65.0	72.0	85.0	70.0	60.0	72.0	85.0
70.0	65.0	72.0	85.0	70.0	60.0	72.0	85.0

THERMAL NIGHT SETBACK SAVINGS CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Occupied Bin Hours	1,228	1,527	1,228	2,154	1,599	3,780
Occupied HD-hrs	35,553	45,681	35,553	66,605	48,556	120,677
Annual Fuel Usage	29,820	16,466	32,540	20,460	48,668	66,553
Annual Boiler Usage	27,330	15,038	26,918	17,285	39,541	57,401
Existing Heating Degree-Hrs	104,864	108,593	106,709	112,545	108,275	122,015
Proposed Heating Degree-Hrs	85,931	85,931	85,931	85,931	101,376	101,928
Safety Factor	0%	0%	0%	0%	0%	0%
Thermal Savings	18.1%	20.9%	19.5%	23.6%	6.4%	16.5%
Thermal Savings	4,934	3,138	5,241	4,087	2,520	9,450

Verona Public Schools
Exhibit D
ECM 3A - Building Management Control Systems
BMS Upgrades

ELECTRIC NIGHT SETBACK SAVINGS CALCULATIONS

Annual kWh Usage	258,360	173,800	189,795	177,720	499,500	1,028,940
Annual Cooling kWh Baseline	25,836	17,380	18,980	17,772	99,900	102,894
Existing Cooling Degree-Hrs	5,727	6,056	5,727	6,619	7,493	10,775
Proposed Cooling Degree-Hrs	4,223	4,223	4,223	4,223	5,384	5,803
Safety Factor	0%	0%	0%	0%	0%	0%
Electrical Savings	26.3%	30.3%	26.3%	36.2%	28.2%	46.1%
Electrical Savings	6,783	5,259	4,983	6,432	28,124	47,479

LANING AVENUE ELEMENTARY SCHOOL

							Current Operating Schedule													Proposed Operating Schedule						
	Amb. Temp Bin deg. F	Ave Temp deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Total heating Deg-hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	COOLING																									
LANING AVE	100 to 105	102.5	-	-	-	-	-	-	74.0	85.0	-	-	-	74	85	-	-	-	-	-	-	74.0	85.0	-	-	-
LANING AVE	95 to 100	97.5	-	5	-	5	5	0	74.0	85.0	112	3	115	74	85	112	3	115	115	3	2	74.0	85.0	79	21	99
LANING AVE	90 to 95	92.5	-	34	2	36	32	4	74.0	85.0	601	26	627	74	85	601	26	627	627	23	13	74.0	85.0	421	99	520
LANING AVE	85 to 90	87.5	1	100	27	128	96	32	74.0	85.0	1,291	81	1,372	74	85	1,291	81	1,372	1,372	67	61	74.0	85.0	905	152	1,058
LANING AVE	80 to 85	82.5	17	328	92	437	315	122	74.0	85.0	2,676	-	2,676	74	85	2,676	-	2,676	2,676	221	216	74.0	85.0	1,880	-	1,880
LANING AVE	75 to 80	77.5	106	270	200	576	267	309	74.0	85.0	936	-	936	74	85	936	-	936	936	190	386	74.0	85.0	666	-	666
LANING AVE	70 to 75	72.5	226	185	248	659	197	462	74.0	85.0	-	-	-	74	85	-	-	-	-	144	515	74.0	85.0	-	-	-
LANING AVE	65 to 70	67.5	245	207	283	735	220	515	74.0	85.0	-	-	-	74	85	-	-	-	-	160	575	74.0	85.0	-	-	-
LANING AVE	60 to 65	62.5	348	154	240	742	178	564	74.0	85.0	-	-	-	74	85	-	-	-	-	134	608	74.0	85.0	-	-	-
																			5,727							4,223
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	HEATING																									
LANING AVE	55 to 60	57.5	113	129	118	360	133	227	72.0	65.0	1,933	1,700	3,633	72	72	1,933	3,287	5,220	3,792	96	264	70	60	1,206	659	1,865
LANING AVE	50 to 55	52.5	131	253	181	565	253	312	72.0	65.0	4,941	3,895	8,836	72	72	4,941	6,076	11,018	9,054	181	384	70	60	3,170	2,879	6,049
LANING AVE	45 to 50	47.5	117	180	134	431	182	249	72.0	65.0	4,469	4,350	8,819	72	72	4,469	6,090	10,560	8,993	131	300	70	60	2,947	3,750	6,697
LANING AVE	40 to 45	42.5	169	194	221	584	200	384	72.0	65.0	5,913	8,630	14,543	72	72	5,913	11,315	17,228	14,811	145	439	70	60	3,987	7,683	11,670
LANING AVE	35 to 40	37.5	215	186	247	648	197	451	72.0	65.0	6,793	12,405	19,198	72	72	6,793	15,563	22,356	19,514	144	504	70	60	4,672	11,346	16,017
LANING AVE	30 to 35	32.5	260	111	196	567	129	438	72.0	65.0	5,106	14,227	19,332	72	72	5,106	17,291	22,397	19,639	98	469	70	60	3,658	12,910	16,568
LANING AVE	25 to 30	27.5	144	59	119	322	69	253	72.0	65.0	3,080	9,479	12,560	72	72	3,080	11,249	14,329	12,737	52	270	70	60	2,226	8,763	10,989
LANING AVE	20 to 25	22.5	140	20	69	229	32	197	72.0	65.0	1,565	8,389	9,954	72	72	1,565	9,771	11,336	10,092	26	203	70	60	1,230	7,617	8,846
LANING AVE	15 to 20	17.5	66	21	16	103	26	77	72.0	65.0	1,415	3,660	5,074	72	72	1,415	4,199	5,614	5,128	20	83	70	60	1,048	3,529	4,577
LANING AVE	10 to 15	12.5	26	3	19	48	5	43	72.0	65.0	309	2,248	2,556	72	72	309	2,547	2,856	2,586	4	44	70	60	249	2,074	2,323
LANING AVE	5 to 10	7.5	3	-	1	4	0	4	72.0	65.0	17	215	232	72	72	17	241	258	234	0	4	70	60	17	196	213
LANING AVE	0 to 5	2.5	2	-	-	2	0	2	72.0	65.0	12	114	126	72	72	12	127	139	128	0	2	70	60	12	105	117
LANING AVE	-5 to 0	(2.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
LANING AVE	-10 to -5	(7.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
LANING AVE	-15 to -10	(12.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-						
	Total		1,386	1,156	1,321	3,863	1,228	2,635			35,553	69,312	104,864			35,553	87,756	123,309	106,709	898	2,965			24,421	61,510	85,931

BROOKDALE AVENUE ELEMENTARY SCHOOL

							Current Operating Schedule													Proposed Operating Schedule						
	Amb. Temp Bin deg. F	Ave Temp deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Total heating Deg-hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	COOLING																									
BROOKDALE	100 to 105	102.5	-	-	-	-	-	-	74.0	85.0	-	-	-	74	85	-	-	-	-	-	-	74.0	85.0	-	-	-
BROOKDALE	95 to 100	97.5	-	5	-	5	5	(0)	74.0	85.0	118	(0)	118	74	85	118	(0)	118	118	3	2	74.0	85.0	79	21	99
BROOKDALE	90 to 95	92.5	-	34	2	36	34	2	74.0	85.0	629	15	644	74	85	629	15	644	644	23	13	74.0	85.0	421	99	520
BROOKDALE	85 to 90	87.5	1	100	27	128	100	28	74.0	85.0	1,354	69	1,423	74	85	1,354	69	1,423	1,423	67	61	74.0	85.0	905	152	1,058
BROOKDALE	80 to 85	82.5	17	328	92	437	333	104	74.0	85.0	2,827	-	2,827	74	85	2,827	-	2,827	2,827	221	216	74.0	85.0	1,880	-	1,880
BROOKDALE	75 to 80	77.5	106	270	200	576	298	278	74.0	85.0	1,044	-	1,044	74	85	1,044	-	1,044	1,044	190	386	74.0	85.0	666	-	666
BROOKDALE	70 to 75	72.5	226	185	248	659	246	413	74.0	85.0	-	-	-	74	85	-	-	-	-	144	515	74.0	85.0	-	-	-
BROOKDALE	65 to 70	67.5	245	207	283	735	273	462	74.0	85.0	-	-	-	74	85	-	-	-	-	160	575	74.0	85.0	-	-	-
BROOKDALE	60 to 65	62.5	348	154	240	742	247	495	74.0	85.0	-	-	-	74	85	-	-	-	-	134	608	74.0	85.0	-	-	-
																			6,056							4,223
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	HEATING																									
BROOKDALE	55 to 60	57.5	113	129	118	360	159	201	72.0	65.0	2,309	1,505	3,815	72	72	2,309	2,911	5,220	3,955	96	264	70	60	1,206	659	1,865
BROOKDALE	50 to 55	52.5	131	253	181	565	288	277	72.0	65.0	5,618	3,461	9,079	72	72	5,618	5,400	11,018	9,273	181	384	70	60	3,170	2,879	6,049
BROOKDALE	45 to 50	47.5	117	180	134	431	211	220	72.0	65.0	5,178	3,844	9,022	72	72	5,178	5,382	10,560	9,176	131	300	70	60	2,947	3,750	6,697
BROOKDALE	40 to 45	42.5	169	194	221	584	239	345	72.0	65.0	7,058	7,756	14,815	72	72	7,058	10,170	17,228	15,056	145	439	70	60	3,987	7,683	11,670
BROOKDALE	35 to 40	37.5	215	186	247	648	244	404	72.0	65.0	8,404	11,121	19,525	72	72	8,404	13,952	22,356	19,808	144	504	70	60	4,672	11,346	16,017
BROOKDALE	30 to 35	32.5	260	111	196	567	181	386	72.0	65.0	7,135	12,557	19,692	72	72	7,135	15,261	22,397	19,962	98	469	70	60	3,658	12,910	16,568
BROOKDALE	25 to 30	27.5	144	59	119	322	98	224	72.0	65.0	4,342	8,416	12,758	72	72	4,342	9,987	14,329	12,915	52	270	70	60	2,226	8,763	10,989
BROOKDALE	20 to 25	22.5	140	20	69	229	57	172	72.0	65.0	2,846	7,289	10,135	72	72	2,846	8,489	11,336	10,255	26	203	70	60	1,230	7,617	8,846
BROOKDALE	15 to 20	17.5	66	21	16	103	39	64	72.0	65.0	2,108	3,055	5,163	72	72	2,108	3,506	5,614	5,208	20	83	70	60	1,048	3,529	4,577
BROOKDALE	10 to 15	12.5	26	3	19	48	10	38	72.0	65.0	593	1,997	2,590	72	72	593	2,263	2,856	2,616	4	44	70	60	249	2,074	2,323
BROOKDALE	5 to 10	7.5	3	-	1	4	1	3	72.0	65.0	52	184	236	72	72	52	206	258	238	0	4	70	60	17	196	213
BROOKDALE	0 to 5	2.5	2	-	-	2	1	1	72.0	65.0	37	92	129	72	72	37	102	139	130	0	2	70	60	12	105	117
BROOKDALE	-5 to 0	(2.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
BROOKDALE	-10 to -5	(7.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
BROOKDALE	-15 to -10	(12.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-						
	Total		1,386	1,156	1,321	3,863	1,527	2,336			45,681	61,278	106,958			45,681	77,628	123,309	108,593	898	2,965			24,421	61,510	85,931

Verona Public Schools
Exhibit D
ECM 3A - Building Management Control Systems
BMS Upgrades

F.N. BROWN ELEMENTARY SCHOOL

							Current Operating Schedule													Proposed Operating Schedule						
	Amb. Temp Bin deg. F	Ave Temp deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Total heating Deg-hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	COOLING																									
F.N. BROWN	100 to 105	102.5	-	-	-	-	-	-	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	-	-	74.0	85.0	-	-	-
F.N. BROWN	95 to 100	97.5	-	5	-	5	5	0	74.0	85.0	112	3	115	**74**	**85**	112	3	115	115	3	2	74.0	85.0	79	21	99
F.N. BROWN	90 to 95	92.5	-	34	2	36	32	4	74.0	85.0	601	26	627	**74**	**85**	601	26	627	627	23	13	74.0	85.0	421	99	520
F.N. BROWN	85 to 90	87.5	1	100	27	128	96	32	74.0	85.0	1,291	81	1,372	**74**	**85**	1,291	81	1,372	1,372	67	61	74.0	85.0	905	152	1,058
F.N. BROWN	80 to 85	82.5	17	328	92	437	315	122	74.0	85.0	2,676	-	2,676	**74**	**85**	2,676	-	2,676	2,676	221	216	74.0	85.0	1,880	-	1,880
F.N. BROWN	75 to 80	77.5	106	270	200	576	267	309	74.0	85.0	936	-	936	**74**	**85**	936	-	936	936	190	386	74.0	85.0	666	-	666
F.N. BROWN	70 to 75	72.5	226	185	248	659	197	462	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	144	515	74.0	85.0	-	-	-
F.N. BROWN	65 to 70	67.5	245	207	283	735	220	515	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	160	575	74.0	85.0	-	-	-
F.N. BROWN	60 to 65	62.5	348	154	240	742	178	564	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	134	608	74.0	85.0	-	-	-
																			5,727							**4,223**
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	HEATING																									
F.N. BROWN	55 to 60	57.5	113	129	118	360	133	227	72.0	65.0	1,933	1,700	3,633	72	72	1,933	3,287	5,220	3,792	96	264	70	60	1,206	659	1,865
F.N. BROWN	50 to 55	52.5	131	253	181	565	253	312	72.0	65.0	4,941	3,895	8,836	72	72	4,941	6,076	11,018	9,054	181	384	70	60	3,170	2,879	6,049
F.N. BROWN	45 to 50	47.5	117	180	134	431	182	249	72.0	65.0	4,469	4,350	8,819	72	72	4,469	6,090	10,560	8,993	131	300	70	60	2,947	3,750	6,697
F.N. BROWN	40 to 45	42.5	169	194	221	584	200	384	72.0	65.0	5,913	8,630	14,543	72	72	5,913	11,315	17,228	14,811	145	439	70	60	3,987	7,683	11,670
F.N. BROWN	35 to 40	37.5	215	186	247	648	197	451	72.0	65.0	6,793	12,405	19,198	72	72	6,793	15,563	22,356	19,514	144	504	70	60	4,672	11,346	16,017
F.N. BROWN	30 to 35	32.5	260	111	196	567	129	438	72.0	65.0	5,106	14,227	19,332	72	72	5,106	17,291	22,397	19,639	98	469	70	60	3,658	12,910	16,568
F.N. BROWN	25 to 30	27.5	144	59	119	322	69	253	72.0	65.0	3,080	9,479	12,560	72	72	3,080	11,249	14,329	12,737	52	270	70	60	2,226	8,763	10,989
F.N. BROWN	20 to 25	22.5	140	20	69	229	32	197	72.0	65.0	1,565	8,389	9,954	72	72	1,565	9,771	11,336	10,092	26	203	70	60	1,230	7,617	8,846
F.N. BROWN	15 to 20	17.5	66	21	16	103	26	77	72.0	65.0	1,415	3,660	5,074	72	72	1,415	4,199	5,614	5,128	20	83	70	60	1,048	3,529	4,577
F.N. BROWN	10 to 15	12.5	26	3	19	48	5	43	72.0	65.0	309	2,248	2,556	72	72	309	2,547	2,856	2,586	4	44	70	60	249	2,074	2,323
F.N. BROWN	5 to 10	7.5	3	-	1	4	0	4	72.0	65.0	17	215	232	72	72	17	241	258	234	0	4	70	60	17	196	213
F.N. BROWN	0 to 5	2.5	2	-	-	2	0	2	72.0	65.0	12	114	126	72	72	12	127	139	128	0	2	70	60	12	105	117
F.N. BROWN	-5 to 0	(2.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
F.N. BROWN	-10 to -5	(7.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
F.N. BROWN	-15 to -10	(12.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-						
	Total		1,386	1,156	1,321	3,863	1,228	2,635			35,553	69,312	104,864			35,553	87,756	123,309	**106,709**	898	2,965			24,421	61,510	**85,931**

FOREST AVENUE ELEMENTARY SCHOOL

							Current Operating Schedule													Proposed Operating Schedule						
	Amb. Temp Bin deg. F	Ave Temp deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Total heating Deg-hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	COOLING																									
FOREST AVE	100 to 105	102.5	-	-	-	-	-	-	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	-	-	74.0	85.0	-	-	-
FOREST AVE	95 to 100	97.5	-	5	-	5	5	(0)	74.0	85.0	118	(0)	118	**74**	**85**	118	(0)	118	118	3	2	74.0	85.0	79	21	99
FOREST AVE	90 to 95	92.5	-	34	2	36	35	1	74.0	85.0	638	11	650	**74**	**85**	638	11	650	650	23	13	74.0	85.0	421	99	520
FOREST AVE	85 to 90	87.5	1	100	27	128	107	21	74.0	85.0	1,448	52	1,500	**74**	**85**	1,448	52	1,500	1,500	67	61	74.0	85.0	905	152	1,058
FOREST AVE	80 to 85	82.5	17	328	92	437	359	78	74.0	85.0	3,053	-	3,053	**74**	**85**	3,053	-	3,053	3,053	221	216	74.0	85.0	1,880	-	1,880
FOREST AVE	75 to 80	77.5	106	270	200	576	371	205	74.0	85.0	1,299	-	1,299	**74**	**85**	1,299	-	1,299	1,299	190	386	74.0	85.0	666	-	666
FOREST AVE	70 to 75	72.5	226	185	248	659	356	303	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	144	515	74.0	85.0	-	-	-
FOREST AVE	65 to 70	67.5	245	207	283	735	396	339	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	160	575	74.0	85.0	-	-	-
FOREST AVE	60 to 65	62.5	348	154	240	742	382	360	74.0	85.0	-	-	-	**74**	**85**	-	-	-	-	134	608	74.0	85.0	-	-	-
																			6,619							**4,223**
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	HEATING																									
FOREST AVE	55 to 60	57.5	113	129	118	360	213	147	72.0	65.0	3,088	1,103	4,191	72	72	3,088	2,132	5,220	4,294	96	264	70	60	1,206	659	1,865
FOREST AVE	50 to 55	52.5	131	253	181	565	361	204	72.0	65.0	7,048	2,545	9,592	72	72	7,048	3,970	11,018	9,735	181	384	70	60	3,170	2,879	6,049
FOREST AVE	45 to 50	47.5	117	180	134	431	270	161	72.0	65.0	6,613	2,819	9,432	72	72	6,613	3,947	10,560	9,545	131	300	70	60	2,947	3,750	6,697
FOREST AVE	40 to 45	42.5	169	194	221	584	331	253	72.0	65.0	9,757	5,699	15,455	72	72	9,757	7,471	17,228	15,632	145	439	70	60	3,987	7,683	11,670
FOREST AVE	35 to 40	37.5	215	186	247	648	351	297	72.0	65.0	12,124	8,156	20,280	72	72	12,124	10,232	22,356	20,487	144	504	70	60	4,672	11,346	16,017
FOREST AVE	30 to 35	32.5	260	111	196	567	285	282	72.0	65.0	11,272	9,153	20,425	72	72	11,272	11,125	22,397	20,622	98	469	70	60	3,658	12,910	16,568
FOREST AVE	25 to 30	27.5	144	59	119	322	158	164	72.0	65.0	7,039	6,143	13,182	72	72	7,039	7,290	14,329	13,297	52	270	70	60	2,226	8,763	10,989
FOREST AVE	20 to 25	22.5	140	20	69	229	105	124	72.0	65.0	5,185	5,281	10,466	72	72	5,185	6,150	11,336	10,553	26	203	70	60	1,230	7,617	8,846
FOREST AVE	15 to 20	17.5	66	21	16	103	57	46	72.0	65.0	3,097	2,193	5,290	72	72	3,097	2,517	5,614	5,323	20	83	70	60	1,048	3,529	4,577
FOREST AVE	10 to 15	12.5	26	3	19	48	20	28	72.0	65.0	1,207	1,455	2,662	72	72	1,207	1,649	2,856	2,681	4	44	70	60	249	2,074	2,323
FOREST AVE	5 to 10	7.5	3	-	1	4	2	2	72.0	65.0	109	132	242	72	72	109	149	258	243	0	4	70	60	17	196	213
FOREST AVE	0 to 5	2.5	2	-	-	2	1	1	72.0	65.0	67	65	132	72	72	67	72	139	132	0	2	70	60	12	105	117
FOREST AVE	-5 to 0	(2.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
FOREST AVE	-10 to -5	(7.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-	-	70	60	-	-	-
FOREST AVE	-15 to -10	(12.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	72	72	-	-	-	-	-						
	Total		1,386	1,156	1,321	3,863	2,154	1,709			66,605	44,744	111,349			66,605	56,704	123,309	**112,545**	898	2,965			24,421	61,510	**85,931**

Verona Public Schools
Exhibit D
ECM 3A - Building Management Control Systems
BMS Upgrades

H.B. WHITEHORNE MIDDLE SCHOOL

							Current Operating Schedule													Proposed Operating Schedule						
	Amb. Temp Bin deg. F	Ave Temp deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Total heating Deg-hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	COOLING																									
H.B. WHITEH	100 to 105	102.5	-	-	-	-	-	-	72.0	85.0	-	-	-	**72**	**85**	-	-	-	-	-	-	72.0	85.0	-	-	-
H.B. WHITEH	95 to 100	97.5	-	5	-	5	5	0	72.0	85.0	122	3	125	**72**	**85**	122	3	125	125	3	2	72.0	85.0	85	21	106
H.B. WHITEH	90 to 95	92.5	-	34	2	36	32	4	72.0	85.0	666	26	692	**72**	**85**	666	26	692	692	23	13	72.0	85.0	467	99	566
H.B. WHITEH	85 to 90	87.5	1	100	27	128	96	32	72.0	85.0	1,486	80	1,567	**72**	**85**	1,486	80	1,567	1,567	67	61	72.0	85.0	1,041	152	1,193
H.B. WHITEH	80 to 85	82.5	17	328	92	437	319	118	72.0	85.0	3,354	-	3,354	**72**	**85**	3,354	-	3,354	3,354	223	214	72.0	85.0	2,338	-	2,338
H.B. WHITEH	75 to 80	77.5	106	270	200	576	296	280	72.0	85.0	1,627	-	1,627	**72**	**85**	1,627	-	1,627	1,627	200	376	72.0	85.0	1,099	-	1,099
H.B. WHITEH	70 to 75	72.5	226	185	248	659	257	402	72.0	85.0	129	-	129	**72**	**85**	129	-	129	129	164	495	72.0	85.0	82	-	82
H.B. WHITEH	65 to 70	67.5	245	207	283	735	285	450	72.0	85.0	-	-	-	**72**	**85**	-	-	-	-	182	553	72.0	85.0	-	-	-
H.B. WHITEH	60 to 65	62.5	348	154	240	742	271	471	72.0	85.0	-	-	-	**72**	**85**	-	-	-	-	165	577	72.0	85.0	-	-	-
																			7,493							**5,384**
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	HEATING																									
H.B. WHITEH	55 to 60	57.5	113	129	118	360	164	196	72.0	65.0	2,372	1,473	3,845	70	70	2,045	2,455	4,500	3,911	107	253	70	65	1,332	1,901	3,233
H.B. WHITEH	50 to 55	52.5	131	253	181	565	288	277	72.0	65.0	5,626	3,456	9,082	70	70	5,049	4,839	9,888	9,162	193	372	70	65	3,374	4,652	8,027
H.B. WHITEH	45 to 50	47.5	117	180	134	431	214	217	72.0	65.0	5,237	3,802	9,039	70	70	4,809	4,888	9,698	9,105	141	290	70	65	3,182	5,068	8,250
H.B. WHITEH	40 to 45	42.5	169	194	221	584	246	338	72.0	65.0	7,248	7,612	14,860	70	70	6,757	9,303	16,060	14,980	160	424	70	65	4,402	9,538	13,940
H.B. WHITEH	35 to 40	37.5	215	186	247	648	254	394	72.0	65.0	8,780	10,822	19,601	70	70	8,271	12,789	21,060	19,747	163	485	70	65	5,296	13,339	18,635
H.B. WHITEH	30 to 35	32.5	260	111	196	567	199	368	72.0	65.0	7,857	11,963	19,820	70	70	7,459	13,804	21,263	19,964	121	446	70	65	4,528	14,503	19,031
H.B. WHITEH	25 to 30	27.5	144	59	119	322	108	214	72.0	65.0	4,797	8,033	12,830	70	70	4,581	9,104	13,685	12,915	65	257	70	65	2,772	9,629	12,401
H.B. WHITEH	20 to 25	22.5	140	20	69	229	69	160	72.0	65.0	3,421	6,795	10,216	70	70	3,283	7,595	10,878	10,282	38	191	70	65	1,824	8,101	9,924
H.B. WHITEH	15 to 20	17.5	66	21	16	103	44	59	72.0	65.0	2,378	2,820	5,198	70	70	2,291	3,117	5,408	5,219	26	77	70	65	1,357	3,665	5,022
H.B. WHITEH	10 to 15	12.5	26	3	19	48	12	36	72.0	65.0	723	1,882	2,605	70	70	699	2,061	2,760	2,621	7	41	70	65	382	2,171	2,553
H.B. WHITEH	5 to 10	7.5	3	-	1	4	1	3	72.0	65.0	69	168	237	70	70	67	183	250	239	1	3	70	65	33	199	233
H.B. WHITEH	0 to 5	2.5	2	-	-	2	1	1	72.0	65.0	50	80	130	70	70	48	87	135	130	0	2	70	65	24	103	127
H.B. WHITEH	-5 to 0	(2.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	70	70	-	-	-	-	-	-	70	65	-	-	-
H.B. WHITEH	-10 to -5	(7.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	70	70	-	-	-	-	-	-	70	65	-	-	-
H.B. WHITEH	-15 to -10	(12.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	70	70	-	-	-	-	-						
	Total		1,386	1,156	1,321	3,863	1,599	2,264			48,556	58,907	107,463			45,358	70,225	115,583	**108,275**	1,022	2,841			28,508	72,868	**101,376**

VERONA HIGH SCHOOL

							Current Operating Schedule													Proposed Operating Schedule						
	Amb. Temp Bin deg. F	Ave Temp deg. F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours	Total heating Deg-hours	Occup.Bin Hours	Unocc. Bin Hours	Occup. Indoor temp	Unocc. Indoor temp	Occup. heating Deg-hours	Unocc. heating Deg-hours	Total heating Deg-hours
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	COOLING																									
VERONA HIG	100 to 105	102.5	-	-	-	-	-	-	72.0	85.0	-	-	-	**72**	**85**	-	-	-	-	-	-	72.0	85.0	-	-	-
VERONA HIG	95 to 100	97.5	-	5	-	5	5	-	72.0	85.0	128	-	128	**72**	**85**	128	-	128	128	4	1	72.0	85.0	91	18	109
VERONA HIG	90 to 95	92.5	-	34	2	36	36	0	72.0	85.0	735	1	736	**72**	**85**	735	1	736	736	24	12	72.0	85.0	500	87	587
VERONA HIG	85 to 90	87.5	1	100	27	128	126	2	72.0	85.0	1,958	4	1,962	**72**	**85**	1,958	4	1,962	1,962	73	55	72.0	85.0	1,129	138	1,267
VERONA HIG	80 to 85	82.5	17	328	92	437	431	6	72.0	85.0	4,528	-	4,528	**72**	**85**	4,528	-	4,528	4,528	241	196	72.0	85.0	2,535	-	2,535
VERONA HIG	75 to 80	77.5	106	270	200	576	563	13	72.0	85.0	3,099	-	3,099	**72**	**85**	3,099	-	3,099	3,099	221	355	72.0	85.0	1,214	-	1,214
VERONA HIG	70 to 75	72.5	226	185	248	659	643	16	72.0	85.0	322	-	322	**72**	**85**	322	-	322	322	184	475	72.0	85.0	92	-	92
VERONA HIG	65 to 70	67.5	245	207	283	735	717	18	72.0	85.0	-	-	-	**72**	**85**	-	-	-	-	204	531	72.0	85.0	-	-	-
VERONA HIG	60 to 65	62.5	348	154	240	742	727	15	72.0	85.0	-	-	-	**72**	**85**	-	-	-	-	183	559	72.0	85.0	-	-	-
																			10,775							**5,803**
							Building	Building	Section 1	Section 1	Section 1	Section 1	Section 1	Section 2	Section 2	Section 2	Section 2	Section 2	Building							
	HEATING																									
VERONA HIG	55 to 60	57.5	113	129	118	360	353	7	72.0	65.0	5,113	55	5,168	70	70	4,408	92	4,500	5,102	118	242	70	65	1,470	1,818	3,288
VERONA HIG	50 to 55	52.5	131	253	181	565	554	11	72.0	65.0	10,797	141	10,938	70	70	9,689	198	9,888	10,833	212	353	70	65	3,713	4,410	8,123
VERONA HIG	45 to 50	47.5	117	180	134	431	423	8	72.0	65.0	10,354	147	10,501	70	70	9,509	189	9,698	10,421	155	276	70	65	3,498	4,822	8,320
VERONA HIG	40 to 45	42.5	169	194	221	584	570	14	72.0	65.0	16,820	311	17,131	70	70	15,680	380	16,060	17,024	179	405	70	65	4,912	9,121	14,033
VERONA HIG	35 to 40	37.5	215	186	247	648	633	15	72.0	65.0	21,823	425	22,248	70	70	20,558	502	21,060	22,129	182	466	70	65	5,924	12,807	18,731
VERONA HIG	30 to 35	32.5	260	111	196	567	555	12	72.0	65.0	21,912	398	22,311	70	70	20,803	460	21,263	22,206	134	433	70	65	5,042	14,057	19,100
VERONA HIG	25 to 30	27.5	144	59	119	322	315	7	72.0	65.0	13,998	279	14,277	70	70	13,369	316	13,685	14,218	73	249	70	65	3,110	9,331	12,441
VERONA HIG	20 to 25	22.5	140	20	69	229	225	4	72.0	65.0	11,122	183	11,305	70	70	10,672	205	10,878	11,263	42	187	70	65	2,012	7,932	9,944
VERONA HIG	15 to 20	17.5	66	21	16	103	102	1	72.0	65.0	5,559	48	5,606	70	70	5,355	53	5,408	5,587	27	76	70	65	1,444	3,586	5,030
VERONA HIG	10 to 15	12.5	26	3	19	48	47	1	72.0	65.0	2,785	62	2,848	70	70	2,692	68	2,760	2,839	8	40	70	65	439	2,119	2,558
VERONA HIG	5 to 10	7.5	3	-	1	4	4	0	72.0	65.0	254	4	258	70	70	246	4	250	257	1	3	70	65	36	197	233
VERONA HIG	0 to 5	2.5	2	-	-	2	2	0	72.0	65.0	139	0	139	70	70	135	0	135	139	0	2	70	65	24	103	127
VERONA HIG	-5 to 0	(2.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	70	70	-	-	-	-	-	-	70	65	-	-	-
VERONA HIG	-10 to -5	(7.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	70	70	-	-	-	-	-	-	70	65	-	-	-
VERONA HIG	-15 to -10	(12.5)	-	-	-	-	-	-	72.0	65.0	-	-	-	70	70	-	-	-	-	-						
	Total		1,386	1,156	1,321	3,863	3,780	83			120,677	2,054	122,730			113,116	2,467	115,583	**122,015**	1,132	2,731			31,624	70,304	**101,928**

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

ECM DESCRIPTION

Install CO_2 sensors in large areas to control fresh air intake

DATA / ASSUMPTIONS

Heating Hours 3,863 Hours

*Schedules and temperatures are based on data logging trends performed throughout the building
* Proposed setpoints are used as to not capture thermal savings twice

MEASUREMENT AND VERIFICATION

Option A (Electric) -
Option C (Thermal) - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Simulate function of CO_2 control signal. Test all equipment involved in DCV, which will include but not limited to testing function of fresh air damper response to the CO_2 sensor signal and sequence of operation per design (Override CO_2 signal during the building warm up, etc.).

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Savings calculations are based on weather bin data, fresh air flows and temperature setpoints. A more conservative of 0 percent is used for this ECM due to the uncertainty of variables.

FORMULAE

$$W_{SAVINGS} = \sum_{-5}^{60} [(kW_{FAN} \cdot t_{OCC}) - (kW_{FAN} \cdot (1 - RPM_{-\%})^{2.8}) \cdot t_{OCC}]$$

$$Q_{SAVINGS} = \sum_{-5}^{60} \{ [Q_{LOAD} \cdot t_{OCC} \cdot (1 - OA_{\%OCC})] + [Q_{LOAD} \cdot t_{UNOCC} \cdot (1 - OA_{\%UNOCC})] \} / \eta_{BOILER}$$

$$Q_{LOAD} = 1.08 \cdot CFM_{OA} \cdot (T_{OCC} - T_{BIN}) / 1000$$

Variable	Units	Description
$W_{SAVINGS}$	kWh	Annual kWh Savings
$Q_{SAVINGS}$	Therms	Annual Thermal Savings
Q_{LOAD}	Mmbtu	Thermal Load of unit at respective temperature bin
kW_{FAN}	kW	Total kW of Fan
$\sum_{-5}^{60}$	-	Summation of all bins from -5°F to 60°F
T_{BIN}	°F	Temperature of respective bin
t_{OCC}	Hrs	Proposed occupied Bin Hours in respective temperature bin
t_{UNOCC}	Hrs	Proposed unoccupied Bin Hours in respective temperature bin
$RPM_{-\%}$	%	Percentage of RPM fan will be reduced due to VFD
$OA_{\%OCC}$	%	Percentage Fresh Air Reduction during occupied hours
$OA_{\%UNOCC}$	%	Percentage Fresh Air Reduction during unoccupied hours
CFM_{SUPPLY}	CFM	Total supply CFM of units
CFM_{OA}	CFM	Total outside air CFM of units
T_{OCC}	°F	Proposed occupied Temperature
T_{UNOCC}	°F	Proposed unoccupied Temperature
$T_{OCC/UNOCC}$	°F	Proposed occupied/unoccupied Mode Temperature for controlled unit
η_{BOILER}	%	Boiler Efficiency

* Inputs are in blue

Building	Area Served	Qty	HP (Each)	Supply CFM (Each)	OA CFM (Each)
F.N. Brown Elementary School	Auditorium	1	2	1,500	150
F.N. Brown Elementary School	Auditorium	1	2	1,500	150
F.N. Brown Elementary School	Gym	1	2	1,500	150
Forest Avenue Elementary School	Gym	1	2	1,500	150
Forest Avenue Elementary School	Gym	1	2	1,500	150
Verona High School	Gym New	1	2	1,500	150
Verona High School	Gym New	1	2	1,500	150
Verona High School	Auditorium	1	5	5,000	500
Verona High School	Gym Old	1	2	1,500	150
Verona High School	Gym Old	1	2	1,500	150
H.B. Whitehorne Middle School	Gym	1	2	1,500	150
H.B. Whitehorne Middle School	Gym	1	2	1,500	150
H.B. Whitehorne Middle School	Gym	1	2	1,500	150
H.B. Whitehorne Middle School	Gym	1	2	1,500	150
H.B. Whitehorne Middle School	Auditorium	1	2	2,200	220
H.B. Whitehorne Middle School	Auditorium	1	2	2,200	220
Laning Avenue Elementary School	Multipurpose	1	3	3,000	300
Laning Avenue Elementary School	New Gymnasium	1	2	1,500	150
Laning Avenue Elementary School	New Gymnasium	1	2	1,500	150
Brookdale Avenue Elementary School	Gym	1	2	1,500	150
Brookdale Avenue Elementary School	Gym	1	3	1,500	150
Totals		**15**	**33**	**26,700**	**2,670**

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

	F.N. Brown Elementary School	F.N. Brown Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	Forest Avenue Elementary School	Verona High School	Verona High School	Verona High School	Verona High School	Verona High School
Location	Auditorium	Auditorium	Gym	Gym	Gym	Gym New	Gym New	Auditorium	Gym Old	Gym Old
Quantity	1	1	1	1	1	1	1	1	1	1
HP Motor Total	2	2	2	2	2	2	2	5	2	2
Motor Load Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
kW Motor Total	0.97	0.97	0.97	0.97	0.97	0.97	0.97	2.42	0.97	0.97
CFM Total	1,500	1,500	1,500	1,500	1,500	1,500	1,500	5,000	1,500	1,500
Outside Air Total	150	150	150	150	150	150	150	500	150	150
**Proposed Occupied Heating Setpoint	70.0	70	70	70	70	70	70	70	70	70
**Proposed Unoccup. Heating Setpoint	60.0	60	60	60	60	65	65	65	65	65
**Proposed Occupied Cooling Setpoint	74.0	74	74	74	74	72	72	72	72	72
**Proposed Unoccup. Cooling Setpoint	85.0	85	85	85	85	85	85	85	85	85
Existing Boiler Efficiency	73.6%	73.6%	73.6%	76.0%	76.0%	76.0%	76.0%	76.0%	76.0%	76.0%
Average Fan Speed Reduction	**30%**	**25%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**
Average Occupied Heating Reduction	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**30%**	**20%**	**20%**
Average Unoccupied Heating Reduction	**50%**	**0%**	**40%**	**20%**	**20%**	**20%**	**20%**	**30%**	**20%**	**20%**
Safety Factor	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Electrical Savings	752	659	752	1,320	1,320	2,316	2,316	5,789	2,316	2,316
Thermal Savings	71	9	59	33	33	41	41	205	41	41

	H.B. Whitehorne Middle School	H.B. Whitehorne Middle School	H.B. Whitehorne Middle School	H.B. Whitehorne Middle School	H.B. Whitehorne Middle School	H.B. Whitehorne Middle School	Laning Avenue Elementary School	Laning Avenue Elementary School	Laning Avenue Elementary School	Brookdale Avenue Elementary School	Brookdale Avenue Elementary School
Location	Gym	Gym	Gym	Gym	Auditorium	Auditorium	Multipurpose	New Gymnasium	New Gymnasium	Gym	Gym
Quantity	1	1	1	1	1	1	1	1	1	1	1
HP Motor Total	2	2	2	2	2	2	3	2	2	2	3
Motor Load Factor	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65	0.65
kW Motor Total	0.97	0.97	0.97	0.97	0.97	0.97	1.45	0.97	0.97	0.97	1.45
CFM Total	1,500	1,500	1,500	1,500	2,200	2,200	3,000	1,500	1,500	1,500	1,500
Outside Air Total	150	150	150	150	220	220	300	150	150	150	150
**Proposed Occupied Heating Setpoint	70	70	70	70	70	70	70	70	70	70	70
**Proposed Unoccup. Heating Setpoint	65	65	65	65	65	65	60	60	60	60	60
**Proposed Occupied Cooling Setpoint	72	72	72	72	72	72	74	74	74	74	74
**Proposed Unoccup. Cooling Setpoint	85	85	85	85	85	85	85	85	85	85	85
Existing Boiler Efficiency	73.6%	73.6%	73.6%	73.6%	73.6%	73.6%	76.0%	76.0%	76.0%	76.0%	76.0%
Average Fan Speed Reduction	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**	**30%**
Average Occupied Heating Reduction	**30%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**
Average Unoccupied Heating Reduction	**50%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**	**20%**
Safety Factor	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**	**0%**
Electrical Savings	980	980	980	980	980	980	1,128	752	752	936	1,403
Thermal Savings	89	42	42	42	62	62	66	33	33	33	33

CALCULATIONS

F.N. BROWN ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	133	227	150	0	82	0.0	0.0	1
50 to 55	52.5	131	253	181	565	253	312	150	1	155	0.1	0.2	3
45 to 50	47.5	117	180	134	431	182	249	150	2	112	0.1	0.3	4
40 to 45	42.5	169	194	221	584	200	384	150	3	123	0.1	0.5	9
35 to 40	37.5	215	186	247	648	197	451	150	4	121	0.1	0.8	13
30 to 35	32.5	260	111	196	567	129	438	150	4	79	0.1	1.0	15
25 to 30	27.5	144	59	119	322	69	253	150	5	42	0.1	0.7	10
20 to 25	22.5	140	20	69	229	32	197	150	6	19	0.0	0.6	9
15 to 20	17.5	66	21	16	103	26	77	150	7	16	0.0	0.3	4
10 to 15	12.5	26	3	19	48	5	43	150	8	3	0.0	0.2	2
5 to 10	7.5	3	-	1	4	0	4	150	9	0	0.0	0.0	0
0 to 5	2.5	2	-	-	2	0	2	150	9	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,228	2,635			752	1		71

F.N. BROWN ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	133	227	150	0	72	0.0	0.0	0
50 to 55	52.5	131	253	181	565	253	312	150	1	136	0.1	0.0	1
45 to 50	47.5	117	180	134	431	182	249	150	2	98	0.1	0.0	1
40 to 45	42.5	169	194	221	584	200	384	150	3	108	0.1	0.0	2
35 to 40	37.5	215	186	247	648	197	451	150	4	106	0.1	0.0	2
30 to 35	32.5	260	111	196	567	129	438	150	4	69	0.1	0.0	2
25 to 30	27.5	144	59	119	322	69	253	150	5	37	0.1	0.0	1
20 to 25	22.5	140	20	69	229	32	197	150	6	17	0.0	0.0	1
15 to 20	17.5	66	21	16	103	26	77	150	7	14	0.0	0.0	0
10 to 15	12.5	26	3	19	48	5	43	150	8	3	0.0	0.0	0
5 to 10	7.5	3	-	1	4	0	4	150	9	0	0.0	0.0	0
0 to 5	2.5	2	-	-	2	0	2	150	9	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,228	2,635			659	1		9

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

F.N. BROWN ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	133	227	150	0	82	0.0	0.0	1
50 to 55	52.5	131	253	181	565	253	312	150	1	155	0.1	0.2	3
45 to 50	47.5	117	180	134	431	182	249	150	2	112	0.1	0.2	4
40 to 45	42.5	169	194	221	584	200	384	150	3	123	0.1	0.4	7
35 to 40	37.5	215	186	247	648	197	451	150	4	121	0.1	0.7	11
30 to 35	32.5	260	111	196	567	129	438	150	4	79	0.1	0.8	12
25 to 30	27.5	144	59	119	322	69	253	150	5	42	0.1	0.5	8
20 to 25	22.5	140	20	69	229	32	197	150	6	19	0.0	0.5	7
15 to 20	17.5	66	21	16	103	26	77	150	7	16	0.0	0.2	3
10 to 15	12.5	26	3	19	48	5	43	150	8	3	0.0	0.1	2
5 to 10	7.5	3	-	1	4	0	4	150	9	0	0.0	0.0	0
0 to 5	2.5	2	-	-	2	0	2	150	9	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,228	2,635			752	1		59

FOREST AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	213	147	150	0	130	0.0	0.0	0
50 to 55	52.5	131	253	181	565	361	204	150	1	221	0.1	0.0	2
45 to 50	47.5	117	180	134	431	270	161	150	2	165	0.1	0.1	2
40 to 45	42.5	169	194	221	584	331	253	150	3	203	0.2	0.1	4
35 to 40	37.5	215	186	247	648	351	297	150	4	215	0.3	0.2	6
30 to 35	32.5	260	111	196	567	285	282	150	4	175	0.3	0.3	7
25 to 30	27.5	144	59	119	322	158	164	150	5	97	0.2	0.2	4
20 to 25	22.5	140	20	69	229	105	124	150	6	64	0.1	0.2	4
15 to 20	17.5	66	21	16	103	57	46	150	7	35	0.1	0.1	2
10 to 15	12.5	26	3	19	48	20	28	150	8	12	0.0	0.0	1
5 to 10	7.5	3	-	1	4	2	2	150	9	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	9	1	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	2,154	1,709			1,320	1		33

FOREST AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	213	147	150	0	130	0.0	0.0	0
50 to 55	52.5	131	253	181	565	361	204	150	1	221	0.1	0.0	2
45 to 50	47.5	117	180	134	431	270	161	150	2	165	0.1	0.1	2
40 to 45	42.5	169	194	221	584	331	253	150	3	203	0.2	0.1	4
35 to 40	37.5	215	186	247	648	351	297	150	4	215	0.3	0.2	6
30 to 35	32.5	260	111	196	567	285	282	150	4	175	0.3	0.3	7
25 to 30	27.5	144	59	119	322	158	164	150	5	97	0.2	0.2	4
20 to 25	22.5	140	20	69	229	105	124	150	6	64	0.1	0.2	4
15 to 20	17.5	66	21	16	103	57	46	150	7	35	0.1	0.1	2
10 to 15	12.5	26	3	19	48	20	28	150	8	12	0.0	0.0	1
5 to 10	7.5	3	-	1	4	2	2	150	9	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	9	1	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	2,154	1,709			1,320	1		33

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

VERONA HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	353	7	150	1	216	0.1	0.0	1
50 to 55	52.5	131	253	181	565	554	11	150	2	339	0.2	0.0	3
45 to 50	47.5	117	180	134	431	423	8	150	3	259	0.2	0.0	3
40 to 45	42.5	169	194	221	584	570	14	150	4	349	0.4	0.0	6
35 to 40	37.5	215	186	247	648	633	15	150	4	387	0.6	0.0	8
30 to 35	32.5	260	111	196	567	555	12	150	5	340	0.6	0.0	8
25 to 30	27.5	144	59	119	322	315	7	150	6	193	0.4	0.0	5
20 to 25	22.5	140	20	69	229	225	4	150	7	138	0.3	0.0	4
15 to 20	17.5	66	21	16	103	102	1	150	8	62	0.2	0.0	2
10 to 15	12.5	26	3	19	48	47	1	150	9	29	0.1	0.0	1
5 to 10	7.5	3	-	1	4	4	0	150	9	2	0.0	0.0	0
0 to 5	2.5	2	-	-	2	2	0	150	10	1	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	3,780	83			2,316	3		41

VERONA HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	353	7	150	1	216	0.1	0.0	1
50 to 55	52.5	131	253	181	565	554	11	150	2	339	0.2	0.0	3
45 to 50	47.5	117	180	134	431	423	8	150	3	259	0.2	0.0	3
40 to 45	42.5	169	194	221	584	570	14	150	4	349	0.4	0.0	6
35 to 40	37.5	215	186	247	648	633	15	150	4	387	0.6	0.0	8
30 to 35	32.5	260	111	196	567	555	12	150	5	340	0.6	0.0	8
25 to 30	27.5	144	59	119	322	315	7	150	6	193	0.4	0.0	5
20 to 25	22.5	140	20	69	229	225	4	150	7	138	0.3	0.0	4
15 to 20	17.5	66	21	16	103	102	1	150	8	62	0.2	0.0	2
10 to 15	12.5	26	3	19	48	47	1	150	9	29	0.1	0.0	1
5 to 10	7.5	3	-	1	4	4	0	150	9	2	0.0	0.0	0
0 to 5	2.5	2	-	-	2	2	0	150	10	1	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	3,780	83			2,316	3		41

VERONA HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	353	7	500	4	540	0.4	0.0	6
50 to 55	52.5	131	253	181	565	554	11	500	7	848	1.1	0.0	15
45 to 50	47.5	117	180	134	431	423	8	500	9	647	1.2	0.0	16
40 to 45	42.5	169	194	221	584	570	14	500	12	873	2.1	0.1	28
35 to 40	37.5	215	186	247	648	633	15	500	15	969	2.8	0.1	38
30 to 35	32.5	260	111	196	567	555	12	500	18	850	2.9	0.1	39
25 to 30	27.5	144	59	119	322	315	7	500	20	482	1.9	0.0	26
20 to 25	22.5	140	20	69	229	225	4	500	23	344	1.5	0.0	21
15 to 20	17.5	66	21	16	103	102	1	500	26	156	0.8	0.0	10
10 to 15	12.5	26	3	19	48	47	1	500	28	72	0.4	0.0	5
5 to 10	7.5	3	-	1	4	4	0	500	31	6	0.0	0.0	0
0 to 5	2.5	2	-	-	2	2	0	500	34	3	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	500	36	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	500	39	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	500	42	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	3,780	83			5,789	15		205

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

VERONA HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	353	7	150	1	216	0.1	0.0	1
50 to 55	52.5	131	253	181	565	554	11	150	2	339	0.2	0.0	3
45 to 50	47.5	117	180	134	431	423	8	150	3	259	0.2	0.0	3
40 to 45	42.5	169	194	221	584	570	14	150	4	349	0.4	0.0	6
35 to 40	37.5	215	186	247	648	633	15	150	4	387	0.6	0.0	8
30 to 35	32.5	260	111	196	567	555	12	150	5	340	0.6	0.0	8
25 to 30	27.5	144	59	119	322	315	7	150	6	193	0.4	0.0	5
20 to 25	22.5	140	20	69	229	225	4	150	7	138	0.3	0.0	4
15 to 20	17.5	66	21	16	103	102	1	150	8	62	0.2	0.0	2
10 to 15	12.5	26	3	19	48	47	1	150	9	29	0.1	0.0	1
5 to 10	7.5	3	-	1	4	4	0	150	9	2	0.0	0.0	0
0 to 5	2.5	2	-	-	2	2	0	150	10	1	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	3,780	83			2,316	3		41

VERONA HIGH SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	353	7	150	1	216	0.1	0.0	1
50 to 55	52.5	131	253	181	565	554	11	150	2	339	0.2	0.0	3
45 to 50	47.5	117	180	134	431	423	8	150	3	259	0.2	0.0	3
40 to 45	42.5	169	194	221	584	570	14	150	4	349	0.4	0.0	6
35 to 40	37.5	215	186	247	648	633	15	150	4	387	0.6	0.0	8
30 to 35	32.5	260	111	196	567	555	12	150	5	340	0.6	0.0	8
25 to 30	27.5	144	59	119	322	315	7	150	6	193	0.4	0.0	5
20 to 25	22.5	140	20	69	229	225	4	150	7	138	0.3	0.0	4
15 to 20	17.5	66	21	16	103	102	1	150	8	62	0.2	0.0	2
10 to 15	12.5	26	3	19	48	47	1	150	9	29	0.1	0.0	1
5 to 10	7.5	3	-	1	4	4	0	150	9	2	0.0	0.0	0
0 to 5	2.5	2	-	-	2	2	0	150	10	1	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	3,780	83			2,316	3		41

H.B. WHITEHORNE MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	164	196	150	1	100	0.1	0.1	2
50 to 55	52.5	131	253	181	565	288	277	150	2	177	0.2	0.3	6
45 to 50	47.5	117	180	134	431	214	217	150	3	131	0.2	0.3	7
40 to 45	42.5	169	194	221	584	246	338	150	4	151	0.3	0.6	12
35 to 40	37.5	215	186	247	648	254	394	150	4	156	0.3	0.9	17
30 to 35	32.5	260	111	196	567	199	368	150	5	122	0.3	1.0	17
25 to 30	27.5	144	59	119	322	108	214	150	6	66	0.2	0.7	12
20 to 25	22.5	140	20	69	229	69	160	150	7	42	0.1	0.6	9
15 to 20	17.5	66	21	16	103	44	59	150	8	27	0.1	0.2	4
10 to 15	12.5	26	3	19	48	12	36	150	9	7	0.0	0.2	2
5 to 10	7.5	3	-	1	4	1	3	150	9	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	10	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,599	2,264			980	2		89

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

H.B. WHITEHORNE MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	164	196	150	1	100	0.0	0.0	1
50 to 55	52.5	131	253	181	565	288	277	150	2	177	0.1	0.1	3
45 to 50	47.5	117	180	134	431	214	217	150	3	131	0.1	0.1	3
40 to 45	42.5	169	194	221	584	246	338	150	4	151	0.2	0.2	6
35 to 40	37.5	215	186	247	648	254	394	150	4	156	0.2	0.4	8
30 to 35	32.5	260	111	196	567	199	368	150	5	122	0.2	0.4	8
25 to 30	27.5	144	59	119	322	108	214	150	6	66	0.1	0.3	5
20 to 25	22.5	140	20	69	229	69	160	150	7	42	0.1	0.2	4
15 to 20	17.5	66	21	16	103	44	59	150	8	27	0.1	0.1	2
10 to 15	12.5	26	3	19	48	12	36	150	9	7	0.0	0.1	1
5 to 10	7.5	3	-	1	4	1	3	150	9	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	10	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,599	2,264			980	1		42

H.B. WHITEHORNE MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	164	196	150	1	100	0.0	0.0	1
50 to 55	52.5	131	253	181	565	288	277	150	2	177	0.1	0.1	3
45 to 50	47.5	117	180	134	431	214	217	150	3	131	0.1	0.1	3
40 to 45	42.5	169	194	221	584	246	338	150	4	151	0.2	0.2	6
35 to 40	37.5	215	186	247	648	254	394	150	4	156	0.2	0.4	8
30 to 35	32.5	260	111	196	567	199	368	150	5	122	0.2	0.4	8
25 to 30	27.5	144	59	119	322	108	214	150	6	66	0.1	0.3	5
20 to 25	22.5	140	20	69	229	69	160	150	7	42	0.1	0.2	4
15 to 20	17.5	66	21	16	103	44	59	150	8	27	0.1	0.1	2
10 to 15	12.5	26	3	19	48	12	36	150	9	7	0.0	0.1	1
5 to 10	7.5	3	-	1	4	1	3	150	9	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	10	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,599	2,264			980	1		42

H.B. WHITEHORNE MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	164	196	150	1	100	0.0	0.0	1
50 to 55	52.5	131	253	181	565	288	277	150	2	177	0.1	0.1	3
45 to 50	47.5	117	180	134	431	214	217	150	3	131	0.1	0.1	3
40 to 45	42.5	169	194	221	584	246	338	150	4	151	0.2	0.2	6
35 to 40	37.5	215	186	247	648	254	394	150	4	156	0.2	0.4	8
30 to 35	32.5	260	111	196	567	199	368	150	5	122	0.2	0.4	8
25 to 30	27.5	144	59	119	322	108	214	150	6	66	0.1	0.3	5
20 to 25	22.5	140	20	69	229	69	160	150	7	42	0.1	0.2	4
15 to 20	17.5	66	21	16	103	44	59	150	8	27	0.1	0.1	2
10 to 15	12.5	26	3	19	48	12	36	150	9	7	0.0	0.1	1
5 to 10	7.5	3	-	1	4	1	3	150	9	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	10	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	13	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,599	2,264			980	1		42

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

H.B. WHITEHORNE MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	164	196	220	2	100	0.1	0.1	2
50 to 55	52.5	131	253	181	565	288	277	220	3	177	0.2	0.2	5
45 to 50	47.5	117	180	134	431	214	217	220	4	131	0.2	0.2	5
40 to 45	42.5	169	194	221	584	246	338	220	5	151	0.3	0.4	8
35 to 40	37.5	215	186	247	648	254	394	220	7	156	0.3	0.5	12
30 to 35	32.5	260	111	196	567	199	368	220	8	122	0.3	0.6	12
25 to 30	27.5	144	59	119	322	108	214	220	9	66	0.2	0.4	8
20 to 25	22.5	140	20	69	229	69	160	220	10	42	0.1	0.3	6
15 to 20	17.5	66	21	16	103	44	59	220	11	27	0.1	0.1	3
10 to 15	12.5	26	3	19	48	12	36	220	12	7	0.0	0.1	2
5 to 10	7.5	3	-	1	4	1	3	220	14	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	220	15	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	220	16	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	220	17	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	220	18	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,599	2,264			980	2		62

H.B. WHITEHORNE MIDDLE SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	164	196	220	2	100	0.1	0.1	2
50 to 55	52.5	131	253	181	565	288	277	220	3	177	0.2	0.2	5
45 to 50	47.5	117	180	134	431	214	217	220	4	131	0.2	0.2	5
40 to 45	42.5	169	194	221	584	246	338	220	5	151	0.3	0.4	8
35 to 40	37.5	215	186	247	648	254	394	220	7	156	0.3	0.5	12
30 to 35	32.5	260	111	196	567	199	368	220	8	122	0.3	0.6	12
25 to 30	27.5	144	59	119	322	108	214	220	9	66	0.2	0.4	8
20 to 25	22.5	140	20	69	229	69	160	220	10	42	0.1	0.3	6
15 to 20	17.5	66	21	16	103	44	59	220	11	27	0.1	0.1	3
10 to 15	12.5	26	3	19	48	12	36	220	12	7	0.0	0.1	2
5 to 10	7.5	3	-	1	4	1	3	220	14	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	220	15	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	220	16	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	220	17	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	220	18	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,599	2,264			980	2		62

LANING AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	133	227	300	1	123	0.0	0.0	1
50 to 55	52.5	131	253	181	565	253	312	300	2	233	0.1	0.2	4
45 to 50	47.5	117	180	134	431	182	249	300	4	168	0.1	0.2	5
40 to 45	42.5	169	194	221	584	200	384	300	6	184	0.2	0.4	9
35 to 40	37.5	215	186	247	648	197	451	300	7	181	0.3	0.7	12
30 to 35	32.5	260	111	196	567	129	438	300	9	119	0.2	0.8	13
25 to 30	27.5	144	59	119	322	69	253	300	11	64	0.1	0.5	9
20 to 25	22.5	140	20	69	229	32	197	300	12	29	0.1	0.5	7
15 to 20	17.5	66	21	16	103	26	77	300	14	24	0.1	0.2	4
10 to 15	12.5	26	3	19	48	5	43	300	15	5	0.0	0.1	2
5 to 10	7.5	3	-	1	4	0	4	300	17	0	0.0	0.0	0
0 to 5	2.5	2	-	-	2	0	2	300	19	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	300	20	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	300	22	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	300	23	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,228	2,635			1,128	1		66

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

LANING AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	133	227	150	0	82	0.0	0.0	0
50 to 55	52.5	131	253	181	565	253	312	150	1	155	0.1	0.1	2
45 to 50	47.5	117	180	134	431	182	249	150	2	112	0.1	0.1	2
40 to 45	42.5	169	194	221	584	200	384	150	3	123	0.1	0.2	4
35 to 40	37.5	215	186	247	648	197	451	150	4	121	0.1	0.3	6
30 to 35	32.5	260	111	196	567	129	438	150	4	79	0.1	0.4	7
25 to 30	27.5	144	59	119	322	69	253	150	5	42	0.1	0.3	4
20 to 25	22.5	140	20	69	229	32	197	150	6	19	0.0	0.2	4
15 to 20	17.5	66	21	16	103	26	77	150	7	16	0.0	0.1	2
10 to 15	12.5	26	3	19	48	5	43	150	8	3	0.0	0.1	1
5 to 10	7.5	3	-	1	4	0	4	150	9	0	0.0	0.0	0
0 to 5	2.5	2	-	-	2	0	2	150	9	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,228	2,635			752	1		33

LANING AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	133	227	150	0	82	0.0	0.0	0
50 to 55	52.5	131	253	181	565	253	312	150	1	155	0.1	0.1	2
45 to 50	47.5	117	180	134	431	182	249	150	2	112	0.1	0.1	2
40 to 45	42.5	169	194	221	584	200	384	150	3	123	0.1	0.2	4
35 to 40	37.5	215	186	247	648	197	451	150	4	121	0.1	0.3	6
30 to 35	32.5	260	111	196	567	129	438	150	4	79	0.1	0.4	7
25 to 30	27.5	144	59	119	322	69	253	150	5	42	0.1	0.3	4
20 to 25	22.5	140	20	69	229	32	197	150	6	19	0.0	0.2	4
15 to 20	17.5	66	21	16	103	26	77	150	7	16	0.0	0.1	2
10 to 15	12.5	26	3	19	48	5	43	150	8	3	0.0	0.1	1
5 to 10	7.5	3	-	1	4	0	4	150	9	0	0.0	0.0	0
0 to 5	2.5	2	-	-	2	0	2	150	9	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,228	2,635			752	1		33

BROOKDALE AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	159	201	150	0	98	0.0	0.0	0
50 to 55	52.5	131	253	181	565	288	277	150	1	176	0.1	0.1	2
45 to 50	47.5	117	180	134	431	211	220	150	2	129	0.1	0.1	2
40 to 45	42.5	169	194	221	584	239	345	150	3	147	0.1	0.2	4
35 to 40	37.5	215	186	247	648	244	404	150	4	149	0.2	0.3	6
30 to 35	32.5	260	111	196	567	181	386	150	4	111	0.2	0.3	7
25 to 30	27.5	144	59	119	322	98	224	150	5	60	0.1	0.2	4
20 to 25	22.5	140	20	69	229	57	172	150	6	35	0.1	0.2	4
15 to 20	17.5	66	21	16	103	39	64	150	7	24	0.1	0.1	2
10 to 15	12.5	26	3	19	48	10	38	150	8	6	0.0	0.1	1
5 to 10	7.5	3	-	1	4	1	3	150	9	0	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	9	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,527	2,336			936	1		33

Verona Public Schools
Exhibit D
ECM 3B - Demand Control Ventilation
Demand Control Ventilation

BROOKDALE AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Ave Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Bin Hours	Unoccupied Bin Hours	Outside Air Flowrate CFM	OA Air Load MBH	Annual Fan Electrical Savings	Annual Occupied Heating Savings	Annual Unoccupied Heating Savings	Total Savings Therms
HEATING													
55 to 60	57.5	113	129	118	360	159	201	150	0	146	0.0	0.0	0
50 to 55	52.5	131	253	181	565	288	277	150	1	265	0.1	0.1	2
45 to 50	47.5	117	180	134	431	211	220	150	2	194	0.1	0.1	2
40 to 45	42.5	169	194	221	584	239	345	150	3	220	0.1	0.2	4
35 to 40	37.5	215	186	247	648	244	404	150	4	224	0.2	0.3	6
30 to 35	32.5	260	111	196	567	181	386	150	4	166	0.2	0.3	7
25 to 30	27.5	144	59	119	322	98	224	150	5	90	0.1	0.2	4
20 to 25	22.5	140	20	69	229	57	172	150	6	53	0.1	0.2	4
15 to 20	17.5	66	21	16	103	39	64	150	7	36	0.1	0.1	2
10 to 15	12.5	26	3	19	48	10	38	150	8	9	0.0	0.1	1
5 to 10	7.5	3	-	1	4	1	3	150	9	1	0.0	0.0	0
0 to 5	2.5	2	-	-	2	1	1	150	9	0	0.0	0.0	0
-5 to 0	-2.5	-	-	-	-	-	-	150	10	0	0.0	0.0	0
-10 to -5	-7.5	-	-	-	-	-	-	150	11	0	0.0	0.0	0
-15 to -10	-12.5	-	-	-	-	-	-	150	12	0	0.0	0.0	0
Total		1,386	1,156	1,321	3,863	1,527	2,336			1,403	1		33

Verona Public Schools
Exhibit D
ECM 4A - Building Envelope Improvements
Building Envelope Improvements

ECM DESCRIPTION

Reduce building infiltration by weather stripping doors, sealing roof & wall joints, duct & piping penetrations, skylight perimeters and window corners.

DATA / ASSUMPTIONS

*Crack area determined by survey team

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Visual inspection per scope of work from subcontractor. Inspection might include smoke test.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	0%
Safety Factor (Thermal) =	0%

Recovery factor taken at 10% due to the uncertainty of variables incorporated in the savings calculations

FORMULAE

$Q_{SAVINGS} = ((1.08 \cdot Q_{INF} \cdot HD_{HRS}) / \eta)_{/100,000}$

$Q_{INF} = (A_{CRACK} \cdot v \cdot \delta \cdot \varsigma) / \eta$

$A_{CRACK} = A_{VENTS} + A_{WIN} + A_{RTV} + A_{DOORS} + A_{BULK} + A_{ROOF/WALL}$

Verona Public Schools
Exhibit D
ECM 4A - Building Envelope Improvements
Building Envelope Improvements

Variable	Units	Description
$Q_{SAVINGS}$	kWh	Electrical Savings associated with VFD
Q_{INF}	kWh	Infiltration savings
A_{CRACK}	ft^2	Total square feet of infiltration spaces
v	ft/min	Average wind speed at building location
δ	%	Windspeed Diversity
ς	%	Percentage of crack area to be eliminated
η	%	Heating system efficiency
HD_{HRS}	(Hr-°F)/Yr	Annual heating degree hours
A_{VENTS}	ft^2	Total square feet of infiltration spaces with regards to vents
A_{WIN}	ft^2	Total square feet of infiltration spaces with regards to windows
A_{RTV}	ft^2	Total square feet of infiltration spaces with regards to RTV's
A_{DOORS}	ft^2	Total square feet of infiltration spaces with regards to doors
A_{BULK}	ft^2	Total square feet of infiltration spaces with regards to bulkheads
$A_{ROOF/WALL}$	ft^2	Total square feet of infiltration spaces with regards to the wall roof joint

Very Good
Good
Average
Poor
Loose

ASSUMPTIONS / DATA

Subcontractor Calculations N * If Yes - Please Refer to tab 'Sub BEI Calculation' for details

Building	Building Envelope Improvements (Y/N)	Envelope Tightness	Cooling Savings Applicable (Y/N)
Laning Avenue Elementary School	Y	Average	Y
Brookdale Avenue Elementary School	Y	Average	Y
F.N. Brown Elementary School	Y	Poor	Y
Forest Avenue Elementary School	Y	Loose	Y
H.B. Whitehorne Middle School	Y	Poor	Y
Verona High School	Y	Average	Y

Verona Public Schools
Exhibit D
ECM 4A - Building Envelope Improvements
Building Envelope Improvements

CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Building Envelope Improvements	Y	Y	Y	Y	Y	Y
Envelope Tightness	Average	Average	Poor	Loose	Poor	Average
Tightness Multiplier	0.00028	0.00028	0.0004	0.0006	0.0004	0.00028
Cooling Savings Applicable	Y	Y	Y	Y	Y	Y
Heating Savings Diversity Factor	81%	85%	90%	87%	65%	80%
Flow Factor	20	20	20	20	20	20
(AP)^n	5.16	5.16	5.16	5.16	5.16	5.16
Crack Area	13.0	10.6	15.6	16.7	47.3	33.7
Air Leakage (CFM)	1,343	1,097	1,609	1,718	4,880	3,475
Heating Degree Days	4,843	4,843	4,843	4,843	4,843	4,843
Heating Efficiency Factor	28,900	28,900	28,900	28,900	28,900	28,900
Cooling Savings Diversity Factor	26%	70%	43%	25%	16%	24%
Constant	4.5	4.5	4.5	4.5	4.5	4.5
CFM	1,343	1,097	1,609	1,718	4,880	3,475
Enthalpy	16.0	16.0	16.0	16.0	16.0	16.0
Tons	8.1	6.6	9.7	10.3	29.3	20.8
Constant	1.2	1.2	1.2	1.2	1.2	1.2
CDD	1,242	1,242	1,242	1,242	1,242	1,242
Load factor	70%	70%	70%	70%	70%	70%
kWh	4,396	9,812	8,793	5,569	10,258	10,844
Therms	1,830	1,560	2,427	2,510	5,300	4,640
Electric Safety Factor	0%	0%	0%	0%	0%	0%
Thermal Safety Factor	0%	0%	0%	0%	0%	0%
kWh Savings	4,396	9,812	8,793	5,569	10,258	10,844
Thermal Savings	1,830	1,560	2,427	2,510	5,300	4,640

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Heating	183.00	156	485	251	530	464
Cooling	15.00	12	30	19	35	37
Therms	1,830.00	1,560.00	4,850.00	2,510.00	5,300.00	4,640.00
Kwh	4,396.25	3,517.00	8,792.50	5,568.58	10,257.91	10,844.08

Verona Public Schools
Exhibit D
ECM 4B - Roof Replacement
Roof Replacement

ECM DESCRIPTION

Furnish and install a PVC roofing system as manufactured by Sika Samafil or equal.

DATA / ASSUMPTIONS

Heating Hours 3,863 Hours

*U Factors for the new roof was obtained by manufacturer and product data. U Factors for the existing roof is based on construction type and material

MEASUREMENT AND VERIFICATION

Option C - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify area of new roof installed.

RECOVERY/SAFETY FACTOR

Recovery/Safety Factor (Electric) =	0%
Recovery/Safety Factor (Thermal) =	0%

Savings calculations are based on weather bin data, fresh air flows and temperature setpoints. A more conservative of 0 percent is used for this ECM due to the uncertainty of variables. The heating fuel savings calculations are based upon information provided by the equipment vendor.

FORMULAE

$Q_{SAVINGS} = (Q_C - Q_C) + Q_{INF}$

$Q_{INF} = \sum^{100}_{-5} \left(1.08 \cdot (i_{ROOF} - i_{ROOF}) \cdot (T_{W/S} - T_{BIN}) \cdot l_R \cdot t_{BIN} \right) / _{100,000}$

$Q_C = \sum^{100}_{-5} \left((T_{W/S} - T_{BIN}) \cdot A_{ROOF} \cdot U_{ROOF} \cdot t_{BIN} \right) / _{100,000}$

$Q_C = \sum^{100}_{-5} \left((T_{W/S} - T_{BIN}) \cdot A_{ROOF} \cdot U_{ROOF} \cdot t_{BIN} \right) / _{100,000}$

*Note W/S designates use of either winter building setpoint or summer building setpoint with the appropiate bin

Variable	Units	Description
$Q_{savings}$	Therms	Thermal Savings
Q_C	Therms	Conductive/convective cooling gain and heating loss with existing windows
Q_C	Therms	Conductive/convective cooling gain and heating loss with proposed windows
Q_{INF}	Therms	Infiltration savings with proposed windows
$\sum^{100}_{-5}$	-	Summation of all bins from -5°F to 100°F
T_W	°F	Winter building setpoint
T_S	°F	Summer building setpoint
T_{BIN}	°F	Temperature of respective bin
t_{BIN}	Hrs	Hrs in respective bin
A_{ROOF}	ft^2	Existing unoccupied Bin Hours in respective temperature bin
U_{ROOF}	btu / ft^2 / °F	Existing U-factor of roof
U_{ROOF}	btu / ft^2 / °F	Proposed U-factor of roof
i_{ROOF}	Cfm/ft	Infiltration constant for existing windows
i_{ROOF}	Cfm/ft	Infiltration constant for proposed windows
l_R	ft	Linear feet of curtain wall

* Inputs are in blue

Building	Roof ft^2 Audited	U Factor of Existing Roof	U Factor of Proposed Roof	Infiltration of Existing Roof (CFM / linear ft)	Infiltration of Proposed Roof (CFM / linear ft)	EER of Cooling System (Average)
Forest Avenue Elementary School	27,000	0.10	0.05			10.0
Totals						

Verona Public Schools
Exhibit D
ECM 4B - Roof Replacement
Roof Replacement

	Forest Avenue Elementary School
Roof ft^2 Audited	27,000
U of Existing Roof	0.10
U of Proposed Roof	0.05
Infiltration of Existing Roofs	-
Infiltration of Proposed Roofs	-
Total Linear Ft of Perimeter	100
EER of Cooling System (Average)	10.0
Existing Occupied Heating Setpoint	72.0
Existing Unoccup. Heating Setpoint	65.0
Existing Occupied Cooling Setpoint	74.0
Existing Unoccup. Cooling Setpoint	85.0
Boiler Efficiency	76.0%
Safety Factor	0%
Electrical Savings	3,086
Thermal Savings	1,917

CALCULATIONS

FOREST AVENUE ELEMENTARY SCHOOL

Amb. Temp Bin °F	Avg Temp °F	01-08 Hours	09-16 Hours	17-24 Hours	Total Bin Hours	Occupied Hours	Unoccupied Hours	Roof Square Feet	Existing Occupied Cooling Gain and Heating Loss	Existing Unoccupied Cooling Gain and Heating Loss	Proposed Occupied Cooling Gain and Heating Loss	Proposed Unoccupied Cooling Gain and Heating Loss	Cooling or Heating Savings	Infiltration savings	Total Heating or Cooling Savings	Safety Factor	kWh Saved	Input Therms Saved
COOLING									(MMBTU)	(MMBTU)	(MMBTU)	(MMBTU)	(MMBTU)	(MMBTU)	(MMBTU)			
100 to 105	102.5	-	-	-	-	-	-	27,000	-	-	-	-	-	-	-	0%	-	
95 to 100	97.5	-	5	-	5	5	(0)	27,000	0.4	(0.0)	0.2	(0.0)	0.2	-	0.2	0%	56	
90 to 95	92.5	-	34	2	36	35	1	27,000	2.1	0.0	1.0	0.0	1.1	-	1.1	0%	308	
85 to 90	87.5	1	100	27	128	107	21	27,000	4.7	0.2	2.3	0.1	2.4	-	2.4	0%	712	
80 to 85	82.5	17	328	92	437	359	78	27,000	9.9	-	4.9	-	4.9	-	4.9	0%	1,449	
75 to 80	77.5	106	270	200	576	371	205	27,000	4.2	-	2.1	-	2.1	-	2.1	0%	617	
70 to 75	72.5	226	185	248	659	356	303	27,000	-	-	-	-	-	-	-	0%	-	
65 to 70	67.5	245	207	283	735	396	339	27,000	-	-	-	-	-	-	-	0%	-	
60 to 65	62.5	348	154	240	742	382	360	27,000	-	-	-	-	-	-	-	0%	-	
HEATING																		
55 to 60	57.5	113	129	118	360	213	147	27,000	8.3	0.4	4.2	1.5	5.3	-	5.3	0%		69
50 to 55	52.5	131	253	181	565	361	204	27,000	19.0	0.5	9.5	3.4	12.4	-	12.4	0%		163
45 to 50	47.5	117	180	134	431	270	161	27,000	17.9	0.4	8.9	3.8	12.3	-	12.3	0%		162
40 to 45	42.5	169	194	221	584	331	253	27,000	26.3	0.7	13.2	7.7	20.2	-	20.2	0%		266
35 to 40	37.5	215	186	247	648	351	297	27,000	32.7	0.8	16.4	11.0	26.6	-	26.6	0%		350
30 to 35	32.5	260	111	196	567	285	282	27,000	30.4	0.8	15.2	12.4	26.8	-	26.8	0%		353
25 to 30	27.5	144	59	119	322	158	164	27,000	19.0	0.4	9.5	8.3	17.4	-	17.4	0%		228
20 to 25	22.5	140	20	69	229	105	124	27,000	14.0	0.3	7.0	7.1	13.8	-	13.8	0%		181
15 to 20	17.5	66	21	16	103	57	46	27,000	8.4	0.1	4.2	3.0	7.0	-	7.0	0%		92
10 to 15	12.5	26	3	19	48	20	28	27,000	3.3	0.1	1.6	2.0	3.5	-	3.5	0%		46
5 to 10	7.5	3	-	1	4	2	2	27,000	0.3	0.0	0.1	0.2	0.3	-	0.3	0%		4
0 to 5	2.5	2	-	-	2	1	1	27,000	0.2	0.0	0.1	0.1	0.2	-	0.2	0%		2
-5 to 0	-2.5	-	-	-	-	-	-	27,000	-	-	-	-	-	-	-	0%		-
-10 to -5	-7.5	-	-	-	-	-	-	27,000	-	-	-	-	-	-	-	0%		-
-15 to -10	-12.5	-	-	-	-	-	-	27,000	-	-	-	-	-	-	-	0%		-
Total		2,329	2,439	2,413	7,181	4,165	3,016										3,086	1,917

Verona Public Schools
Exhibit D
ECM 5A - Combined Heat and Power
Combined Heat and Power Plant

ECM DESCRIPTION

Installation of a Combined Heat and Power Plant (CHP). Recoverable heat from the CHP will be used to subsidize the heating requirements of the swimming pool.

DATA / ASSUMPTIONS

*Annual run hours are agreed upon by facility staff
*Annual waste dump hours are taken at 10% of run time
*CHP Natural Gas Consumption and Recoverable Heat Rate provided by the CHP Manufacturer.

MEASUREMENT AND VERIFICATION

Option A (Electric) - The engineering calculations are based on direct kW measurements of the electrical output feed.
Option C (Thermal) - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Verify electrical and natural gas interconnects, as well as, electrical production by multimeter spot measurements. Verify proper exhaust ventilation.

A safety factor of 0.1 is conservative

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) =	10%
Safety Factor (Thermal) =	10%

Verona Public Schools
Exhibit D
ECM 5A - Combined Heat and Power
Combined Heat and Power Plant

FORMULAE

$W_{PRODUCTION} = (kW_{CHP} - KW_{PARA}) \cdot t_{CHP}$

$Q_{NET} = (Q_{CHP} - Q_{DISPLACED})$

$Q_{CHP} = Q_D$

$Q_{DISPLACED} = CHP_{NG\text{-}RATE} \cdot (t_{CHP} + t_{DUMP})$

$Q_D = CHP_{NG\text{-}USEABLE} \cdot (CHP_{RECOVERY} / CHP_{NG\text{-}RATE}) \cdot HEATEXG$

$CHP_{NG\text{-}USEABLE} = CHP_{NG\text{-}RATE} \cdot t_{CHP}$

Variable	Units	Description
$W_{PRODUCTION}$	kWh/yr	Annual Electrical Production of CHP
Q_{NET}	Therms/yr	Net Annual Natural Gas Consumption of CHP
$Q_{DISPLACED}$	Therms/yr	Avoided Boiler Natural Gas Consumption due to CHP Recoverable Heat
Q_D	Therms/yr	Annual CHP Recoverable Heat
kW_{CHP}	kW	CHP kW
kW_{PARA}	kW	CHP Parasitic Load
t_{CHP}	hrs	Annual CHP run time
t_{DUMP}	hrs	Annual CHP waste heat dump
Q_{CHP}	therms/yr	Annual Natural Gas Consumption of CHP
$CHP_{NG\text{-}USEABLE}$	therms/yr	Annual useable Natural Gas available for heating purposes
$CHP_{NG\text{-}RATE}$	therms/hr	Natural Gas Consumption rate for the CHP
$CHP_{RECOVERY}$	therms/hr	Recoverable heat from CHP
HEATEXG	%	Heat Exchanger Efficiency
η_{BOILER}	%	Boiler Efficiency

*Parastic Load, Natural Gas Consumption Rate, and Recoverable Heat Rate based off of Tecogen Literature. If using another manufacturer input fields manually

Building	CHP Plant Electric Output (kW)	Annual Run Hours of Plant	Heat Recovery Efficiency through Heat Exchanger	Parasitic Load* (kW)	Natural Gas Consumption Rate* (therm/hr)	Recoverable Heat Rate* (therm/hr)
Verona High School	65.0	6,312	80%	4.0	7.5	4.4
Total	65.0			4.0		

Verona Public Schools
Exhibit D
ECM 5A - Combined Heat and Power
Combined Heat and Power Plant

Verona Public Schools
Exhibit D
ECM 5A - Combined Heat and Power
Combined Heat and Power Plant

	Verona High School
CHP Plant Electric Output	65.0
Parasitic Load	4.0
Proposed Facility Electric Demand	61.0
Annual hours for CHP Plant	6,312
Annual Waste Heat Dump Hours	-
Annual CHP Plant Electric Output	384,927
Natural Gas Consumption Rate	7.5
Annual CHP Plant Natural Gas Consumption	47,332
Recoverable Heat Rate	4.4
Heat Recovery Efficiency through Heat Exchanger	80%
Recoverable CHP Heat Output	22,221
Boiler Efficiency	76.0%
Annual Displaced Natural Gas Consumption	29,238
kW Safety Factor	**50%**
Safety Factor	**10%**
kW Savings / Month	30.5
Annual kWh Production	346,434
Annual Net Thermal Consumption	(21,018)

Verona Public Schools
Exhibit D
ECM 6A - Computer Power Management
Computer Power Management

ECM DESCRIPTION

Install a centralized personal computer power management system to control computers and monitors.

DATA / ASSUMPTIONS

* Annual Savings for Student Computers	120	kWh/Yr
* Annual Savings for Administrative Computers	110	kWh/Yr

	On		Sleep Mode	
* CRT wattage (Average)	70	W	15	W
* LCD wattage	18	W	5	W

Annual Savings for Administrative Computers and Student Computers are based on previous logging results for computers with similar usage types

MEASUREMENT AND VERIFICATION

Option A - The engineering calculations are based on direct kW measurements of the existing and post software installation computers. All existing computers will be measured before the installation of the computer management software.

COMMISSIONING

Review installation documents for alignments and vibrations. Start up equipment and measure vibration through the load range along with motor kW. Verify that VFDs are capable of operating in full design range upon the control signal demand.

RECOVERY/SAFETY FACTOR

Safety Factor (Electric) = 0%

The safety factor for this ECM is taken at 0 due to some variability in schedule and load changes.

FORMULAE

$$W_{TOTAL} = (W_{CPU} \cdot CPU_{\#}) + (W_{LCD} \cdot CRT_{\#})$$

$$W_{LCD} = (CRT_{\#} \cdot Monitor_{hrs\text{-}SLEEP} \cdot (W_{CRT\text{-}SLEEP} - W_{LCD\text{-}SLEEP}) \cdot Monitor_{\%OFF}) \quad + \quad (CRT_{\#} \cdot Monitor_{hrs\text{-}ON} \cdot (W_{CRT\text{-}ON} - W_{LCD\text{-}ON}))$$

Verona Public Schools
Exhibit D
ECM 6A - Computer Power Management
Computer Power Management

Variable	Units	Description
W_{TOTAL}	kWh	Total Electrical Savings associated with this measure
W_{CPU}	kWh	Electrical Savings associated with computer control
W_{LCD}	kWh	Electrical Savings associated with Monitor Replacement
$CPU_{\#}$	-	Numbers of Computers
$CRT_{\#}$	-	Numbers of CRTs
W_{CRT-ON}	kWh	Wattage of CRT Monitor when ON
$W_{CRT-SLEEP}$	kWh	Wattage of CRT Monitor when in sleep mode
W_{LCD-ON}	kWh	Wattage of LCD Monitor when ON
$W_{LCD-SLEEP}$	kWh	Wattage of LCD Monitor when in sleep mode
$Monitor_{hrs-ON}$	hrs	Annual hours monitor is ON
$Monitor_{hrs-SLEEP}$	hrs	Annual hours monitor is in sleep mode
$Monitor_{\%OFF}$	%	Percentage that monitor is off during sleep mode hours

* Inputs are in blue

Building	# of Student Computers	# of Administrative Computers	# of CRTs to be Replaced
Laning Avenue Elementary School	47		
Brookdale Avenue Elementary School	40		
F.N. Brown Elementary School	48		
Forest Avenue Elementary School	49		
H.B. Whitehorne Middle School	206		
Verona High School	245		
Totals	**635**	**0**	**0**

Verona Public Schools
Exhibit D
ECM 6A - Computer Power Management
Computer Power Management

CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Number of Student Computers	47	40	48	49	206	245
Number of Administrative Computers	-	-	-	-	-	-
Total Number of Computers	47	40	48	49	206	245
Number of CRTs to be Replaced	-	-	-	-	-	-
Monitor On Run Hours	1,080	1,080	1,080	1,080	1,080	1,080
Monitor Sleep Mode Run Hours	3,240	3,240	3,240	3,240	3,240	3,240
Percentage of Monitors Turned off during Unoccupied Hours	65%	65%	65%	65%	65%	65%
kWh Savings (Monitor)	-	-	-	-	-	-
kWh Savings (Computers)	5,640	4,800	5,760	5,880	24,720	29,400
kWh Savings	5,640	4,800	5,760	5,880	24,720	29,400
Recovery Factor	90%	90%	90%	90%	90%	90%
kWh Savings	5,076	4,320	5,184	5,292	22,248	26,460

Verona Public Schools
Exhibit D
ECM 7A - Renewable Energy – Solar Photovoltaic PPA
Photovoltaic System

ECM DESCRIPTION

Installation of a photovoltaic array - reducing grid electricity with a reduction of greenhouse gas emissions.

DATA / ASSUMPTIONS

*1-Axis Tracking System Collection Improvement:	18.6%	
Array Type	Roof Mount	
DC to AC Derate Factor	0.77	
Tilt	0.10	Deg
Azimuth	1.80	Deg

*Emperical studies show an that annual output increases 18.6% with use of one-axis sun tracking
**Assume two weeks of downtime for PV maintenance

Solar radiation at ground level was obtained using the data collected by the National Renewable Energy Laboratory (NREL) via the software Pvwatts.
Proposed technology is only able to convert 77% of the direct current produced at the panel to a usable alternative current for building consumption

MEASUREMENT AND VERIFICATION

Option C - Verification by dedicated electric meter.

COMMISSIONING

Test installed system - measuring the output and verify with calculations for weather conditions. Verify all electrical connections and tie-ins to the grid and the building power.

SAFETY FACTOR

Safety Factor (Electric) = 30%

FORMULAE

$W_{PV} = \sum_{Jan}^{Dec} (Q_{RAD} \cdot A_{PV} \cdot t_{MONTH}) \cdot t_{\%}$

Variable	Units	Description
W_{PV}	kWh	Electrical energy produced by PV array
$\sum_{Jan}^{Dec}$	-	Summation of months
Q_{RAD}	$kWh/m^2/day$	Solar radiation (averaged by month) capable of being collected with the proposed PV technology
A_{PV}	ft^2	Area of proposed system
t_{MONTH}	Days	Days in the month
$t_{\%}$	%	Percentage of operational time

Verona Public Schools
Exhibit D
ECM 7A - Renewable Energy – Solar Photovoltaic PPA
Photovoltaic System

* Inputs are in blue

Building	DC Rating of System	Install 1-Axis Tracking System (Y/N)
Verona High School	200.0	N
Laning Avenue Elementary School	50.0	N
H.B. Whitehorne Middle School	100.0	N
Totals	350.0	

Cell ID	Newark
State	New Jersey
Latitude	40.1 ° N
Longitude	74.2 ° W

Month	Days in Month	**Solar Radiation (kWh/day)	Solar Radiation per 1-kW (kWh)
Jan	31	2.47	76.6
Feb	28	3.12	87.4
Mar	31	3.95	122.5
Apr	30	4.11	123.3
May	31	5.95	184.5
Jun	30	6.35	190.5
Jul	31	5.3	164.3
Aug	31	4.68	145.1
Sep	30	4.82	144.6
Oct	31	3.23	100.1
Nov	30	2.39	71.7
Dec	31	2.11	65.4
Total	**365**	**4.04**	**1,475.9**

CALCULATIONS

	Verona High School	Laning Avenue Elementary School	H.B. Whitehorne Middle School
DC Rating of System	200.0	50.0	100.0
Install 1-Axis Tracking System	N	N	N
Solar Radiation per 1-kW (kWh)	1,476	1,476	1,476
Total AC per Year Generated	295,170	73,793	147,585
Safety Factor	30%	30%	30%
kWh Savings	206,619	51,655	103,310

Verona Public Schools
Exhibit D
ECM 8A - Water Conservation
Water Conservation

ECM DESCRIPTION

Reduce water consumption by replacing older less-efficient toilets, urinals, faucets, sinks and showerheads with more water efficient fixtures.

DATA / ASSUMPTIONS

* Existing flow rates were determined by flushometers during walk-throughs
*Proposed flow rates were determined by manufacturer data

MEASUREMENT AND VERIFICATION

Option C (Thermal)- Savings Calculations are based on regression analysis of utility billing meter data
Option C (Water) - Savings Calculations are based on regression analysis of utility billing meter data

COMMISSIONING

Ensure installation by testing for leaks and proper functionality.

RECOVERY/SAFETY FACTOR

Safety Factor (Thermal) =	50%
Safety Factor (Water) =	0%

Recovery factor taken at 10% due to the variability of fixture usage

FORMULAE

$$Q_{SAVINGS} = [(h_{SAVINGS} \cdot 8.34) \cdot (1000 / 100000)] / \eta_{BOILER}$$

$$h_{SAVINGS} = (h_{Toilet} - h_{Toilet}) + (h_{Urinal} - h_{Urinal}) + (h_{Sink} - h_{Sink}) + (h_{Shower} - h_{Shower})$$

$$h_{Toilet} = (Toilet_{RATE} \cdot Toilet_{USAGE} \cdot Occ_{\%}) / 1{,}000$$
$$h_{Toilet} = (Toilet_{RATE} \cdot Toilet_{USAGE} \cdot Occ_{\%}) / 1{,}000$$

$$h_{Urinal} = (Urinal_{RATE} \cdot Urinal_{USAGE} \cdot Occ_{\%}) / 1{,}000$$
$$h_{Urinal} = (Urinal_{RATE} \cdot Urinal_{USAGE} \cdot Occ_{\%}) / 1{,}000$$

$$h_{Sink} = (Sink_{RATE} \cdot Sink_{USAGE} \cdot Occ_{\%}) / 1{,}000$$
$$h_{Sink} = (Sink_{RATE} \cdot Sink_{USAGE} \cdot Occ_{\%}) / 1{,}000$$

$$h_{Shower} = (Shower_{RATE} \cdot Shower_{USAGE} \cdot Occ_{\%}) / 1{,}000$$
$$h_{Shower} = (Shower_{RATE} \cdot Shower_{USAGE} \cdot Occ_{\%}) / 1{,}000$$

Verona Public Schools
Exhibit D
ECM 8A - Water Conservation
Water Conservation

Variable	Units	Description
$Q_{SAVINGS}$	Therms	Annual Thermal Savings
$h_{SAVINGS}$	kGal	Annual Water Savings
η_{BOILER}	%	Efficiency of Boiler
T_{SINK}	°F	Temperature of Sink Water
T_{SHOWER}	°F	Temperature of Shower Water
T_{CITY}	°F	Temperature of incoming city water
h_{TOILET}	kGal	Existing Toilet Water Usage
h_{TOILET}	kGal	Proposed Toilet Water Usage
h_{Urinal}	kGal	Existing Urinal Water Usage
h_{Urinal}	kGal	Proposed Urinal Water Usage
h_{Sink}	kGal	Existing Sink Water Usage
h_{Sink}	kGal	Proposed Sink Water Usage
h_{Shower}	kGal	Existing Shower Water Usage
h_{Shower}	kGal	Proposed Shower Water Usage
Occ_{DAYS}	-	Equivalent Days of occupied use
$Occ_{\%}$	%	Percentage of occupants that occupy the building daily
Ppl	-	Number of building occupants
$Ur_{\%}$	%	Urinal Usage Factor
$Toilet_{USAGE}$	-	Toilet Usage per day per occupant
$Urinal_{USAGE}$		Urinal Usage per day per occupant
$Sink_{USAGE}$		Sink Usage per day per occupant
$Shower_{USAGE}$		Shower Usage per day per occupant
$Toilet_{RATE}$	Gallons	Existing Gallons per Usage
$Toilet_{RATE}$	Gallons	Proposed Gallons per Usage
$Urinal_{RATE}$	Gallons	Existing Gallons per Usage
$Urinal_{RATE}$	Gallons	Proposed Gallons per Usage
$Sink_{RATE}$	Gallons	Existing Gallons per Usage
$Sink_{RATE}$	Gallons	Proposed Gallons per Usage
$Shower_{RATE}$	Gallons	Existing Gallons per Usage
$Shower_{RATE}$	Gallons	Proposed Gallons per Usage

* Inputs are in blue
*Checks against baseline are in purple

Verona Public Schools
Exhibit D
ECM 8A - Water Conservation
Water Conservation

Subcontractor Calculations N * If Yes - Please Refer to tab 'Sub Water Conservation' for details

Building	Water Conservation	Daily Occupants	Occupied Days
Laning Avenue Elementary School	Y	263	180
Brookdale Avenue Elementary School	Y	130	180
F.N. Brown Elementary School	Y	260	180
Forest Avenue Elementary School	Y	225	180
H.B. Whitehorne Middle School	Y	688	240
Verona High School	Y	690	240
Totals		2,256	

CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Water Conservation	Y	Y	Y	Y	Y	Y
Item						
Daily Occupants	263	130	260	225	688	690
Area of Occupied Facilities	46,477	37,972	38,985	27,750	118,224	120,245
Occupancy Factor	90%	90%	90%	90%	90%	90%
Occupied Days	180	180	180	180	240	240
Occupant Days	42,606	21,060	42,120	36,450	148,608	149,040
Toilet Consumption						
Toilet Usage Rate	0.98	0.98	0.98	0.98	0.98	0.98
Existing Toilet Flow Rate	2.23	1.60	1.74	2.54	2.55	3.50
Existing Annual Toilet Flow	93	33	72	91	371	511
Proposed Toilet Flow Rate	1.5	1.6	1.58	1.48	1.45	1.25
Proposed Annual Toilet Flow	62.6	33.0	65.2	52.9	211.2	182.6
Urinal Consumption						
Urinal Usage Rate	0.98	0.98	0.98	0.98	0.98	0.98
Urinal Usage Factor	50%	30%	30%	50%	50%	50%
Existing Urinal Flow Rate	1	1	1	1	1.13	1
Existing Annual Urinal Flow	21	6	12	18	82	73
Proposed Urinal Flow Rate	0.5	0.5	0.5	0.5	0.5	0.5
Proposed Annual Urinal Flow	10.4	3.1	6.2	8.9	36.4	36.5

Verona Public Schools
Exhibit D
ECM 8A - Water Conservation
Water Conservation

Lavatory/Sink Consumption						
Sink Usage Factor	80%	40%	40%	85%	85%	85%
Existing Sink Flow Rate	0.9	0.7	0.5	1.7	1.1	1.6
Existing Annual Sink Flow	31	6	8	53	136	199
Proposed Sink Flow Rate	0.5	0.5	0.5	0.5	0.5	0.5
Proposed Annual Sink Flow	17	4	8	15	63	63
Shower Consumption						
Shower Usage Factor	-	-	-	-	-	25%
Existing Shower Flow Rate						3
Existing Annual Shower Flow	-	-	-	-	-	112
Proposed Shower Flow Rate	-	-	-	-	-	1.5
Proposed Annual Shower Flow	-	-	-	-	-	56
Kitchen Consumption						
% Persons Eat Breakfast	0%	0%	0%	0%	0%	0%
% Persons Eat Lunch	75%	75%	75%	75%	75%	75%
% Persons Eat Dinner	0%	0%	0%	0%	0%	0%
Breakfast Consumption	0.650	0.650	0.650	0.650	0.650	0.650
Lunch Consumption	0.950	0.950	0.950	0.950	0.950	0.950
Dinner Consumption	1.000	1.000	1.000	1.000	1.000	1.000
Total Meal Consumption	30.36	15.01	30.01	25.97	105.88	106.19
Miscellaneous						
Drinking Water	0.06	0.01	0.01	0.06	0.06	0.06
Cleaning	**0.02**	**0.00**	**0.01**	**0.01**	**0.02**	**0.02**
Campus Area	0	0	0	0	0	0
Garden Area	0.15	0.15	0.15	0.15	0.15	0.15
Total Irrigation	0	0	0	0	0	0
Vehicle Washing	0	0	0	0	0	0
Lab Equipment testing	0	0	0	0	0	0
% of Loss Repaired During Retrofit	0%	0%	0%	0%	0%	0%
Retrofit Water Consumption	4	1	2	2	14	15
Baseline Water Consumption	367	81	169	231	1,364	1,546
Calculated Existing Water Usage	361	79	165	227	1,343	1,502
Water Usage Accounted for (Must be 70% to 100%)	**98.4%**	**97.5%**	**97.4%**	**98.3%**	**98.4%**	**97.2%**
Calculated Proposed Water Usage	306	74	152	143	1,063	946
Water Savings	55	5	13	84	279	557
823.3	74.7	9.6	22.0	90.5	239.9	386.6

Verona Public Schools
Exhibit D
ECM 8A - Water Conservation
Water Conservation

	Thermal Savings						
	City Water Temperature	60	60	60	60	60	60
	Sink Water temperature	120	120	120	120	120	120
	Shower Water Temperature	110	110	110	110	110	110
	Boiler Efficiency	76.0%	76.0%	73.6%	76.0%	73.6%	76.0%
	Thermal Savings	72	7	-	187	366	910
	Actual Thermal Savings	94	9	-	247	497	1,198
	Safety Factor Water	**0%**	**0%**	**0%**	**0%**	**10%**	**25%**
	Safety Factor Thermal	**50%**	**50%**	**50%**	**50%**	**50%**	**50%**
826	Water Savings	55	5	13	84	251	417
	Thermal Savings	47	5	-	123	249	599

Verona Public Schools
Exhibit D
ECM 9A - Demand Response/Permanent Load Reduction
Demand Response

ECM DESCRIPTION

PJM Demand Response Program based on Shedable Load on Peak Demand Curtailment Day

DATA / ASSUMPTIONS

Demand Response Revenue	$ 44,125	/ MW
Customer Share (Typically between 60-70%)	70%	

*Demand Response Savings = Assumed between 1 - 4% Annual Electrical Load
*Assume 2% of Total District Load as Shedable
*Savings is not Guaranteed any savings from program will be considered operational savings only

MEASUREMENT AND VERIFICATION

None - Operational Savings

COMMISSIONING

N/A

RECOVERY/SAFETY FACTOR

N/A

FORMULAE

$\$_{savings} = kWh_{ADJ} \cdot Cust_{\%} \cdot DM_{\%}$

Verona Public Schools
Exhibit D
ECM 9A - Demand Response/Permanent Load Reduction
Demand Response

Variable	Units	Description
$\$_{savings}$	Dollars	Dollar Savings from Demand Response
$DM_{\%}$	%	Demand Response Savings as a percentage of electric baseline
$Cust_{\%}$	%	Customer Percentage of Savings
kWh_{BASE}	kWh	Adjusted Boiler Fuel Usage

* Inputs are in blue

Building	Demand Response Participation (Y/N)
Laning Avenue Elementary School	Y
Brookdale Avenue Elementary School	Y
F.N. Brown Elementary School	Y
Forest Avenue Elementary School	Y
H.B. Whitehorne Middle School	Y
Verona High School	Y

CALCULATIONS

	Laning Avenue Elementary School	Brookdale Avenue Elementary School	F.N. Brown Elementary School	Forest Avenue Elementary School	H.B. Whitehorne Middle School	Verona High School
Demand Response Participation	Y	Y	Y	Y	Y	Y
Average Monthly kW	84	55	55	50	163	243
Permanent Load Shed Reduction (kW)	30.66	26	23	36	67	84
Sheddable Load (kW)						
Percentage of Baseline Demand	36.4%	47.1%	42.1%	71.8%	41.5%	34.4%
$ / MW	$ 44,125	$ 44,125	$ 44,125	$ 44,125	$ 44,125	$ 44,125
Demand Hours / Year	100	100	100	100	100	100
Cost to Run Generator / hr	$ -	$ -	$ -	$ -	$ -	$ -
Cost to Run Generator / yr	$ -	$ -	$ -	$ -	$ -	$ -
Safety Factor	20%	20%	20%	20%	20%	20%
Demand Response Savings	$ 1,353	$ 1,142	$ 1,019	$ 1,580	$ 2,977	$ 3,692
Net Demand Response Savings	$ 1,353	$ 1,142	$ 1,019	$ 1,580	$ 2,977	$ 3,692

APPENDIX 3 CUTSHEETS

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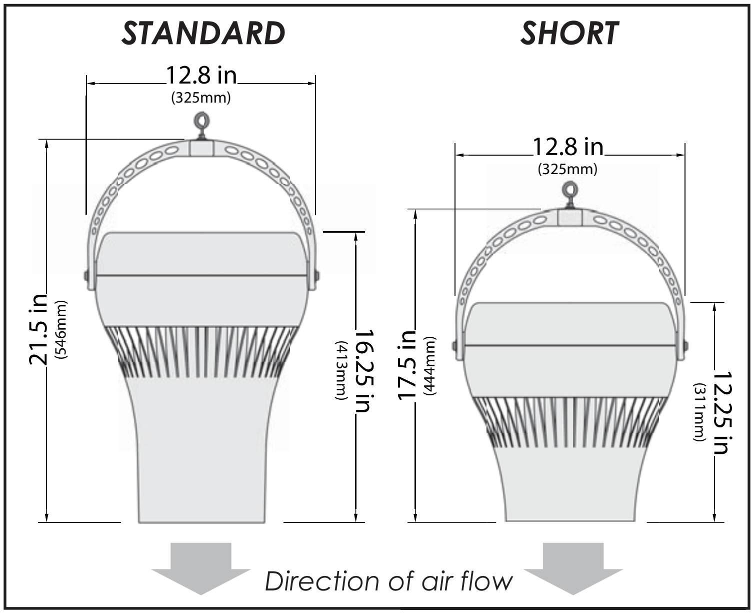
AIR PEAR 15 SUBMITTAL

UP TO 18 FT MOUNTING HEIGHT
MAX COVERAGE 800 FT ²

Print Form

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	*dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
15	120	50/60	0.11/0.14	13.5/17	1230/1260	406	36	7 lb/9 lb	Up to 18 ft.	Up to 800 ft²
15	230	50/60	0.06/0.07	15/17	1230/1260	406	36	7 lb/9 lb	Up to 18 ft.	Up to 800 ft²

**0-static motor data supplied by fan manufacturer. Subject to change at any time.*



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
A (Air Pear)	15	SP (Shaded Pole)	**(Short) SH** **(Standard) STD**	**120** **230**	**(Off White) W** **(Gray) G** **(Black) B**

EXAMPLE: A - 15 - SP - **STD - 120 - W**

- **Color**
- **Voltage (AC)**
- **Nozzle Length**
- Motor Type
- Model
- Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season. Conforms to UL-507, ACAN/CSA-IEC-E60335-1, UL 94 5VA and is ETL listed in USA and Canada.

HOUSING

- *PC/ABS resin*
- *5VA flame resistance rating*

MOTOR

- *Single phase, shaded pole, single speed (variable with optional speed control), axial motor.*
- *Motor is thermally protected. Shutoff is at 230˚ F (110˚ C) & reset is at 195˚ F (90˚ C).*
- *Operating temperature: -4˚ F (-20˚ C) to 158˚ F (70˚ C).*
- *No lubrication required. Bearings are sealed.*
- *6' cord and plug provided for 115V, no plug for 230/227V*

STATOR

- *PC/ABS resin, fixed blade stator*

SAFETY CABLE

- *6' length steel cable (fastened to body)*

WARRANTY

- *Warranty - 3-years parts and workmanship*
- *Money back guarantee - 30 days*
- *Refurbish program after 3-year warranty period*

ACCESSORIES *(additional costs apply)*

Speed Control *(coordinate w/ electrical requirement)*

- ☐ ***TRIAC-120-1.5***:*1.5 Amp, 120V, Up to 9 fans*
- ☐ ***TRIAC-120-5***: *5 Amp, 120V, Up to 34 fans*
- ☐ ***TRIAC-120-15***: *15 Amp, 120V, Up to 105 fans*
- ☐ ***TRIAC-230-8***: *8 Amp, 230V, Up to 113 fans*

Photohydroionization Cell

- ☐ ***PHI-5-C:*** *5" (Short nozzle) - adds 9 watts*
- ☐ ***PHI-9-C:*** *9" (Standard nozzle) - adds 10 watts*

PC/ABS

811 South Sherman Street, Longmont, Colorado 80501, Phone: 303.772.2633, Fax: 303.772.8276, info@theairpear.com, www.theairpear.com
May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

AIRIUS®

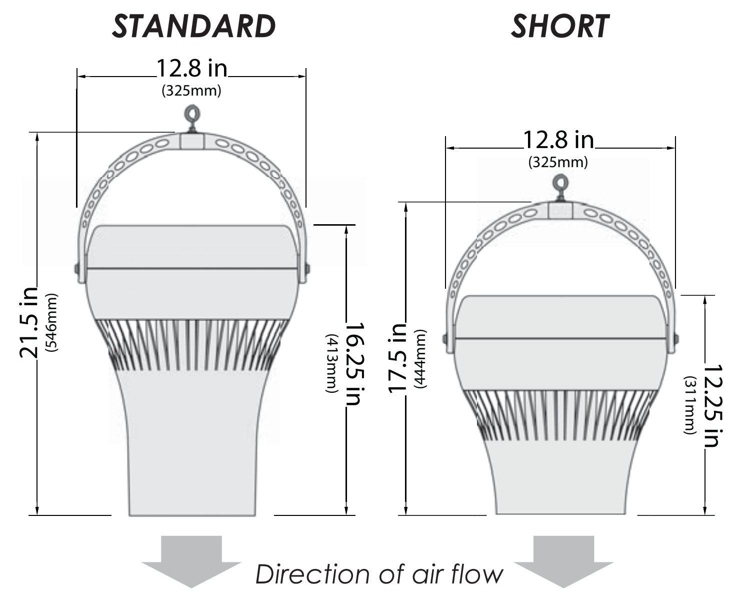
AIR PEAR 25 SUBMITTAL

UP TO 25 FT MOUNTING HEIGHT
MAX COVERAGE 1200 FT ^{2}

Print Form

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	*dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
25	120	50/60	0.30/0.32	30/35	1500/1650	459/547	50	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
25	230	50/60	0.14/0.13	31/33	1450/1650	459/547	50	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²
25	277	50/60	0.13/0.17	35/45	1500/1650	459/547	50	7 lb/9 lb	Up to 25 ft.	Up to 1200 ft²

*0-static motor data supplied by fan manufacturer. Subject to change at any time.



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
A (Air Pear)	25	SP (Shaded Pole)	**(Short) SH** **(Standard) STD**	**120** **230** **277**	**(Off White) W** **(Gray) G** **(Black) B**

EXAMPLE: A - 25 - SP - **STD - 120 - W**

Color
Voltage (AC)
Nozzle Length
Motor Type
Model
Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season. Conforms to UL-507, ACAN/CSA-IEC-E60335-1, UL 94 5VA and is ETL listed in USA and Canada.

HOUSING

- PC/ABS resin
- 5VA flame resistance rating

MOTOR

- Single phase, shaded pole, single speed (variable with optional speed control), axial motor.
- Motor is thermally protected. Shutoff is at 230˚ F (110˚ C) & reset is at 195˚ F (90˚ C).
- Operating temperature: -4˚ F (-20˚ C) to 158˚ F (70˚ C).
- No lubrication required. Bearings are sealed.
- 6' cord and plug provided for 120V, no plug for 230/227V

STATOR

- PC/ABS resin, fixed blade stator

SAFETY CABLE

- 6' length steel cable (fastened to body)

WARRANTY

- Warranty - 3-years parts and workmanship
- Money back guarantee - 30 days
- Refurbish program after 3-year warranty period

ACCESSORIES (additional costs apply)

Speed Control (coordinate w/ electrical requirement)

- ☐ **TRIAC-120-1.5**: 1.5 Amp, 120V, Up to 3 fans
- ☐ **TRIAC-120-5**: 5 Amp, 120V, Up to 14 fans
- ☐ **TRIAC-120-15**: 15 Amp, 120V, Up to 45 fans
- ☐ **TRIAC-230-8**: 8 Amp, 230V, Up to 56 fans
- ☐ **TRIAC-277-5**: 5 Amp, 277V, Up to 28 fans

Photohydroionization Cell

- ☐ **PHI-5-C:** 5" (Short nozzle) - adds 9 watts
- ☐ **PHI-9-C:** 9" (Standard nozzle) - adds 10 watts

PC/ABS

811 South Sherman Street, Longmont, Colorado 80501, Phone: 303.772.2633, Fax: 303.772.8276, info@theairpear.com, www.theairpear.com
May be covered by one or more of the following United States Patents: 7,381,129 B2; D514688 and other patents pending

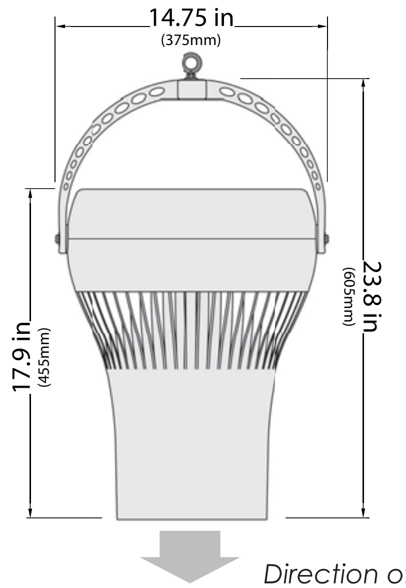
AIR PEAR 45-P4 SUBMITTAL

UP TO 38 FT MOUNTING HEIGHT
MAX COVERAGE 1200 FT ²

Print Form

MODEL	VOLTS 1Ø	HZ	*AMPS	*WATTS	*MAX RPM	*MAX CFM	*dB(A)	WEIGHT	MOUNTING HEIGHT	COVERAGE AREA
45-P4	120	50/60	0.40/0.41	44/46	1400/1650	595/715	58	14 lb	Up to 38 ft.	Up to 1200 ft²
45-P4	230	50/60	0.19/0.2	42/45	1450/1630	595/707	58	14 lb	Up to 38 ft.	Up to 1200 ft²
45-P4	277	50/60	0.19/0.2	42/45	1450/1630	595/707	58	14 lb	Up to 38 ft.	Up to 1200 ft²

*0-static motor data supplied by fan manufacturer. Subject to change at any time.



Direction of air flow

PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
CONFIGURATION	
QUANTITY	

ORDERING LOGIC

Enter part number into the configuration field above

Style	Model	Motor Type	Nozzle Length	Voltage	Color
A (Air Pear)	45	P4 (permanent split capacitor)	(Standard) STD	**120 230 277**	**(Off White) W (Gray) G (Black) B**

EXAMPLE: A - 45 - P4 - STD - **120 - W**

Color
Voltage (AC)
Nozzle Length
Motor Type
Model
Style

DESTRATIFICATION FAN DESCRIPTION

The patented Air Pear Thermal Equalizer creates uniform air temperatures from floor to ceiling for maximum thermal comfort and energy savings up to 35% in the heating season and up to 25% in the cooling season. Conforms to UL-507, ACAN/CSA-IEC-E60335-1, UL 94 5VA and is ETL listed in USA and Canada.

HOUSING

- *PC/ABS resin*
- *5VA flame resistance rating*

MOTOR

- *Permanent Split Capacitor, single speed (variable with optional speed control), axial motor.*
- *Motor is thermally protected. Shutoff is at 275˚ F (135˚ C) & reset is at 255˚ F (125˚ C).*
- *Operating temperature: -13˚ F (-25˚ C) to 158˚ F (70˚ C).*
- *No lubrication required. Bearings are sealed.*
- *6' cord and plug provided for 120V, no plug for 230/277V*

STATOR

- *PC/ABS resin, fixed blade stator*

GUARD GRILLE

- *Steel, phosphated and coated in black plastic*

SAFETY CABLE

- *6' length steel cable (fastened to body)*

WARRANTY

- *Warranty - 3 - years parts and workmanship*
- *Money back guarantee - 30 days*
- *Refurbish program after 3-year warranty period*

ACCESSORIES *(additional costs apply)*

Speed Control (coordinate w/ electrical requirement)

- ☐ ***TRIAC-120-1.5**: 1.5 Amp, 120V, Up to 3 fan*
- ☐ ***TRIAC-120-5**: 5 Amp, 120V, Up to 11 fans*
- ☐ ***TRIAC-120-15**: 15 Amp, 120V, Up to 35 fans*
- ☐ ***TRIAC-230-8**: 8 Amp, 230V, Up to 39 fans*
- ☐ ***TRIAC-277-5**: 5 Amp, 277V, Up to 24 fans*

Photohydroionization Cell

- ☐ ***PHI-9-C:** 9" (Standard nozzle) - adds 10 watts*

PC/ABS

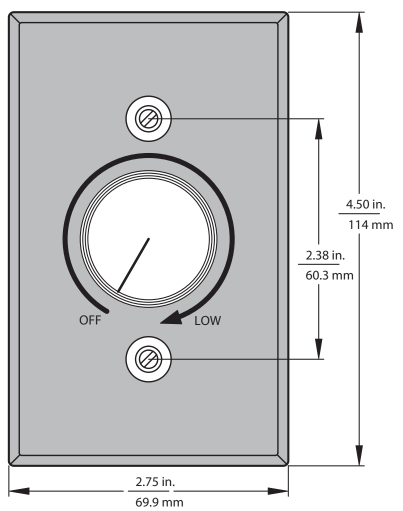
811 South Sherman Street, Longmont, Colorado 80501, Phone: 303.772.2633, Fax: 303.772.8276, info@theairpear.com, www.theairpear.com

TRIAC-120-5 SPEED CONTROL SUBMITTAL

FOR CONTROL OF SINGLE
OR MULTIPLE FANS

Print Form

			FAN QUANTITY ON DEDICATED CIRCUIT					
MODEL	**VOLTAGE**	**AMPS**	**MODEL 10**	**MODEL 15**	**MODEL 25**	**MODEL 45-PSP4**	**MODEL 45-PSP2**	**MODEL 60-PSP4**
TRIAC-120-5	120V	5	37	34	14	11	3	4



PROJECT	
ENGINEER	
ARCHITECT	
CONTRACTOR	
SUBMITTED BY	
DATE	
QUANTITY	

PART NUMBER & QUANTITY

☐ *TRIAC-120-5* *Qty.* _______

TRIAC SPEED CONTROL DESCRIPTION

Airius speed controls are used to vary the speed of shaded pole or permanent split capacitor (PSC) motors (Air Pear or Designer Series 10, 15, 25, 45-P4, 45-P2, or 60-P4). Speed controls for EC motors: refer to the potentiometer submittal. Speed control for EL fans: refer to the FanCenter submittal.

ATTRIBUTES AND CHARACTERISTICS

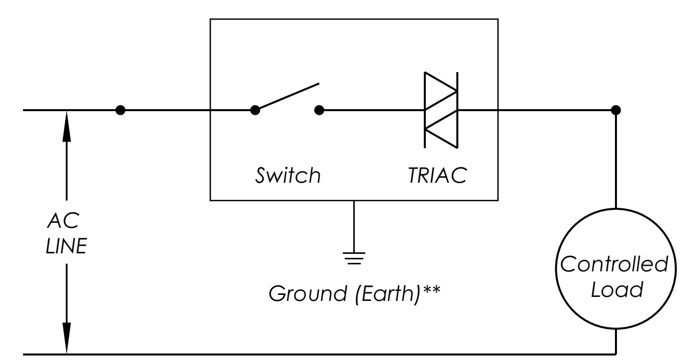
- *Built-in On/Off AC line switch*
- *Minimum speed trimpot*
- *RFI filter (provides RFI and EMI suppression)*
- *All models mount in a standard 2" x 4" electrical wall box*
- *Faceplate (4.5" x 2.75"), knob, screws and wire nuts included*
- *Simple installation by a qualified electrician*
- *Adjust top 50% RPM*
- *Can control multiple fans on a single dedicated circuit*

CODE APPROVAL

- *UL listing/recognition*
- *CSA certified*

WARRANTY

- *Warranty - 1 - years parts and workmanship*



811 South Sherman Street, Longmont, Colorado 80501, Phone: 303.772.2633, Fax: 303.772.8276, info@theairpear.com, www.theairpear.com

Controlling Energy Costs With Best Energy Reduction Tools (BERT)

Executive Summary:

As companies, consumers and the country look for ways to save energy and reduce pollution, increased attention will be focused on new ways of controlling the energy use of the legion of smaller electrical loads which now represent the major source of growth in total energy use. While energy managers have been quick to identify and automate large sources of energy use (like HVAC), controlling many smaller devices spread throughout a building is difficult to do. The promotion of ‘good habits’ like turning off lights and computers may have short term impacts, but sustaining these types of activities over time has proven to be difficult. This paper describes a new approach to facility energy management that leverages a building’s existing WiFi network to control end uses throughout a building. By connecting ‘smart plugs’ to a web-based software interface, energy managers can program schedules by end-use that control energy consumption during times when facilities are not being used. Case studies of university, office, restaurant and residential applications illustrate a range of ways in which the technology can be used. The end uses described in these cases average a 6 month payback. If widely adopted, the control of ‘small use’ devices could save approximately 461 million kWh and 632 million pounds of carbon annually.

Section 1: Introduction

As energy prices increase and companies and organizations place increased focus on the environment, facility energy managers are challenged to find ways of controlling the energy use of an ever-widening variety of electronic devices. While most managers have made significant strides increasing the efficiency and control of major end uses like HVAC, a large portion of each facility’s bill is spent on ‘the little stuff’—computers, lights, and other relatively new electronic devices. This paper describes and documents a new patented technology that utilizes the existing WiFi infrastructure to control devices throughout a facility. Section 2 describes the explosion of electronic devices, which represents both a significant growth area for energy demand as well as a new, untapped opportunity for savings. Section

3 provides an overview of past attempts to control diffuse devices over networks, and provides a glimpse into the future of 'smart' appliances. Section 4 describes a new technology called "BERT", for Best Energy Reduction Technologies. Particular focus is placed on how the software interface allows for the individual control of virtually any device. Section 5 describes how the technology can operate within a university, office, restaurants and in residential applications. Section 6 concludes by documenting the savings potential of the technology in several key sectors, and illustrates the potential for this type of technology to transform how energy use is managed in homes and businesses.

Section 2: The Electronics Explosion: Growth and Savings Opportunity

Despite the increased efficiency of a wide variety of many electronic devices, efficiency gains for many facilities have been countered by a proliferation of new devices. Spending on PCs continues to be strong, growing 22.7% in 2010 according to iSuppli, a company that tracks technology sales. According to the Department of Energy's Building Data Book, total energy use for computers rose 43% between 2006 and 2010. Even more startling is the growth in uncategorized uses, which jumped 663% during the period[1]. The increasing number of peripheral devices, from iPhones, to video conferencing equipment and large format LED and plasma displays all add up. Energy use at work is clearly on the rise, despite the increased efficiency of new equipment. Similar growth is taking place residentially. According to the Nielsen Television Audience Report[2], the number of TV's per household is now 2.86, jumping 43% since 1990. In addition, 88% of homes have a DVD, over 80% of homes have a computer, and of those homes 92% had internet access[3].

A byproduct of the proliferation of devices is phantom load. Phantom load refers to energy that is used when a device is off. This includes energy used by TV's when they're in standby mode (i.e. when they can be turned on with a remote), and energy used by chargers or a laptop's AC adapter. Studies estimate that phantom load now accounts for 6% of all energy use.

This increase in energy consumption has been made worse by increases in price. Recent data from the Department of Energy shows that average electricity prices have increased in all three sectors (commercial, residential, industrial) between 2009-2010[4]. The lifting of rate caps in many states has already lead to dramatic price increases. Electricity rates have already increased 39% in Maryland, 21% in Illinois, and are projected to increase 40-70% in Pennsylvania.

With the increasing number of devices, many facilities managers must rely on people to remember to turn out the lights, or unplug their printers when not in use. However this is easier said than done. A

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[1] http://buildingsdatabook.eren.doe.gov/docs/DataBooks/2009_BEDB_Updated.pdf

[2] http://blog.nielsen.com/nielsenwire/wp-content/uploads/2009/07/tva_2008_071709.pdf
[3] http://blog.nielsen.com/nielsenwire/online_mobile/home-internet-access-continuing-to-grow-but-big-differences-among-demographics/
[4] http://www.eia.doe.gov/cneaf/electricity/epm/epm_sum.html

study conducted by the Alliance for Efficiency found that the impact of behaviorally-based conservation programs wanes within a year, even when education campaigns are ongoing[5].

Section 3: The Device Control Industry: Past, Present and Future

Home automation and control technologies have been around for years, and have the potential to reduce the energy used by a wide variety of devices. Pioneers such as X10 created a communications protocol that used in-home electric wiring to transmit commands to compatible devices. These technologies have advanced over the years to utilize wireless transmission (for example, X10 now uses 310 MHz radio frequency to transmit commands to specially equipped devices within the home.) While significant effort has been put behind these technologies a host of problems have hindered widespread adoption, including unreliability due to wiring impedance, slow response time, and interference with/from other household appliances and devices. Despite the apparent allure of ubiquitous electrical wiring, X10 lacked the ease, reliability and security needed for the product segment to grow.

Individual manufacturers, such as Lutron, have created proprietary high-end home control products intended to provide high levels of control, allowing the programming of lighting 'schemes', and the integrated control of equipment throughout the home. These high cost end-to-end solutions provide an interesting niche product for high end or specialty customers, but do not appeal to the mass market. At the other end of the market, products like Belkin's Conserve[6] Surge With Timer builds a timer into standard surge strip allowing an individual user to set the strip to turn off during select hours.

More recently, the Zigbee suite of proprietary communications protocols has made an appearance in the home control market. Under the Smart Energy 2.0 initiative, Zigbee proponents have created a data standard that they hope will be adopted by a potentially large AMI and Smart Metering industry. While the potential of this utility-driven segment is large, its success will rely on the installations of millions of Zigbee enabled electric meters and related devices.

Section 4: What Makes BERT different?

BERT provides a deceptively simple solution to the device control dilemma. First, BERT was built on a large, reliable, existing networking technology- WIFI. Building the control platform on the existing network has several key benefits:

1. Ubiquity: Virtually all homes and businesses are wifi-enabled. This means that any building that has wi-fi can easily utilize a "Plug and Play" BERT device.

[5] http://www.allianceforwaterefficiency.org/public_education.aspx
[6] http://www.belkin.com/energy/conserve/default.aspx

2. Reliability: WiFi networks have achieved an amazingly high degree of reliability and security. This reliability meaning that the problems of cross-device interference and the lack of security are no longer issues.

3. Cost: Because the wifi network already exists, no special equipment needs to be purchased as would be with proprietary or other standards such as ZigBee. This allows for the lowest total cost solution in the marketplace.

4. Ease of installation and use: The computer-based control software allows devices to be easily programmed or controlled through any computer-enabled device. BERT does not rely on proprietary physical control panels, or specially-wired consoles. Instead BERT takes commands through common MAC, PC or Smart Phone devices consumers and businesses already use.

Figure 4-1 shows how the BERT device works. The Enterprise Application Program (EAP) is installed on one computer on the network, and is used to set schedules, group devices, and monitor activity. On/Off requests are sent through the existing network router using WiFi. Each BERT plug contains a microchip and antenna that communicates with the EAP on a periodic basis. The BERT EAP uses SNMP (Simple Network Management Protocol) to monitor the activity of connected devices (plugs). When a BERT plug receives an “off” command, the module turns off all power supplied to the plug.

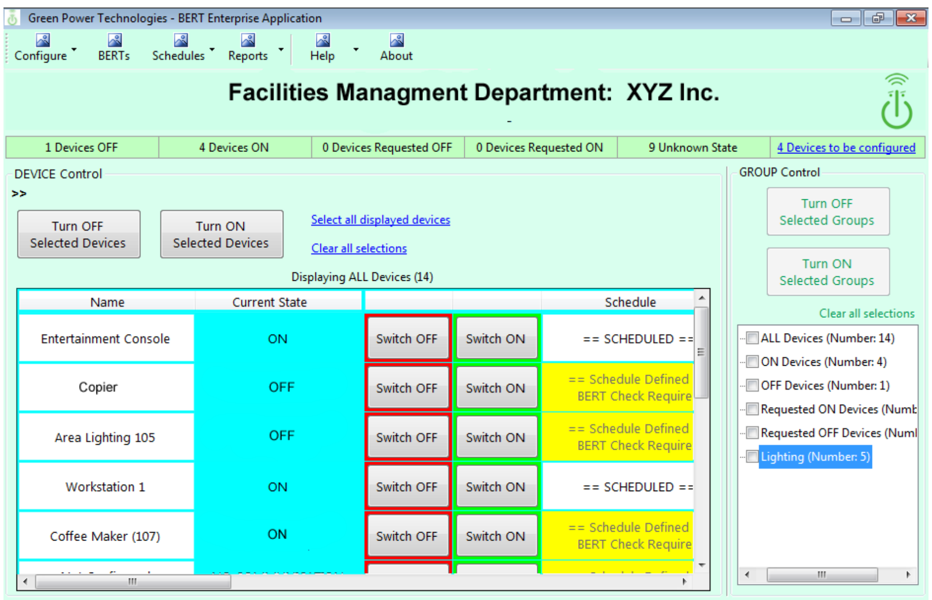
Figure 4-1: BERT System Schematic

The BERT EAP provides a set of tools to configure, schedule and monitor connected BERT devices. The windows based program is installed on a computer within the network (e.g. a facilities manager’s workstation). BERT plug contains a microchip and obtains an IP address from your network. Each BERT device appears on the interface, and individual schedules can be set with multiple on/off periods over a seven day schedule. For example, hallway TV monitors can be programmed to go off at midnight, and on again at 6 am. Multiple TV's can be grouped together to make control and reporting easier. The EAP tracks and reports the status of all devices on the system.

The energy use of each device can also be programmed into the EAP. For example, if the LCD hallway monitor consumes 225 watts of power, then BERT can use this information to track cumulative energy and dollar savings. The BERT reporting interface allows reports for individual devices, groups, or the entire portfolio of devices.

When deviations from standard building schedules occur, devices can be activated in several ways. Most simply, users approaching a BERT device that is it's off state can press a button on the side of the BERT plug and power will be restored to the device. This change of state will be recognized and recorded by the EAP. The device will remain on until the next programmed schedule change. If there are temporary schedule changes for multiple devices, for example if a building is open late for a special event, the facilities manager can turn on/off individual or groups of units remotely. The manager simply selects the designated groups, like Hallway LCD Monitors, and clicks on "Turn On Selected Groups".

Figure 4-2: The BERT EAP Interface



The microprocessors embedded in each BERT plug provide unique protection in the event of a WiFi outage, the shutdown of the management computer, or other interruption. Each BERT unit contains the programmed weekly schedule within the microchip, so if the plug loses contact with the EAP control software it will simply continue to execute its standard schedule.

Section 5: Sample Applications

BERT units can work in a wide variety of applications. This section describes how BERT can operate in university, office, restaurant and residential applications.

University Building:

Temple University's Speakman Hall is an academic building in the middle of campus, and contains a mix of classrooms, public spaces, study areas, and administrative services. The building includes a wide variety of devices that are on 24x7, including hallway announcement TVs, cooled water fountains, office equipment, vending machines, and computer monitors. The building is WiFi enabled. While the University prides itself on having a wide variety of amenities available for students, it also recognizes that many of these amenities use energy round the clock, even when the building is closed during nighttime hours.

Table 5-1: Sample BERT Installation in a University Building

Item Description	Watt Savings	Hours off per day	Number of devices	*Potential energy savings (kWh per year)*
Computer Monitors	65	8	30	5,694
Vending Machine	400	8	2	2,336
Water fountain (cooled)	60	8	24	4,205
Copier	5.26	10	2	38
LCD TV	225	10	12	9,855

Table 5-1 shows modeled energy savings for 70 BERT plugs installed in a single academic building over a 1 year period of time. This application saves 22,128 kWh and $3,983 per year.

Office

An office has 30 workstations (each with a computer, monitor, printer and cell phone charger), a water cooler, copier, and a TV screen in the company lobby. The office manager installs a BERT plug at each workstation, and various other devices. The manager schedules the BERT devices to go off for 12 hours each night, when the office is closed.

Table 5-2: Sample BERT Savings In A Small Office

Item Description	Watt Savings	Hours off per day	Number of devices	*Potential energy savings (kWh)*
Workstation	48.51	12	30	6,374

Water cooler	60	12	1	263
Copier	9.63	10	1	35
LCD TV	225	10	1	821

Table 5-2 shows modeled energy savings for 33 BERT plugs installed in a single office over a 1 year period of time. This application saves 7.493 kWh and $1,349 per year.

Restaurant:

A sports bar features a large number of flat screen TVs so that patrons can view their favorite sporting events from virtually any seat. The restaurant owner configures BERT so that the closing manager can turn off all BERT devices as part of the nightly shut down procedure. BERTS return to service when the opening manager returns in the morning.

Table 5-3: Sample BERT Applications In A Restaurant

Item Description	Watt Savings	Hours off per day	Number of devices	*Potential energy savings (kWh)*
Register Stations	48.51	14	3	744
Bar lighting	65	14	5	1,661
Vending Machines	400	14	4	8,176
LCD TV	225	14	20	22,995

Table 5-3 shows modeled energy savings for 33 BERT plugs installed in a single restaurant over a 1 year period of time. This application saves 33,882 kWh and $6,099 per year in energy.

Residential:

A homeowner buys four BERTS to control a computer workstation, entertainment center, area lighting, and kitchen appliances. The homeowner programs BERTS to be on during the times when family members are typically using the equipment; the coffee maker goes on in the morning, while the computer station is active in both morning and evening hours.

Table 5-4: Sample BERT Residential Application

Item Description	Watt Savings	Hours off per day	Number of devices	*Potential energy savings (kWh)*
Light	60	14	1	307
Entertainment Center	75	16	1	438
Workstation	48	14	1	245
Kitchen	8	20	1	58

Table 5-4 shows modeled energy savings for 4 BERT plugs installed in a single home over a 1 year period of time. This application saves 1,084 kWh and $189 per year in energy.

Section 6: Global Impacts:

The global impacts of the adoption of BERT plugs is significant. For example, one million plugs deployed in applications similar to the ones described above saves 461 million kilowatt hours and over 632 million pounds of carbon per year.

Table 6-1: Potential Energy and Environmental Savings

Number of plugs	1,000,000
Average KWH Savings	461.34
Total KWH Savings	461,335,714
Total Dollar savings	$ 83,040,428
Annual Carbon Savings:	632,029,928 pounds per year

In contrast to existing and emerging technologies described in Section 3, WiFi based devices like BERT provide an immediate opportunity to leverage an enormous existing technology infrastructure to save money, energy and the environment by turning off devices on a controlled, scheduled basis while they are not in use.

BMK SERIES
TECHNICAL DATA SHEET

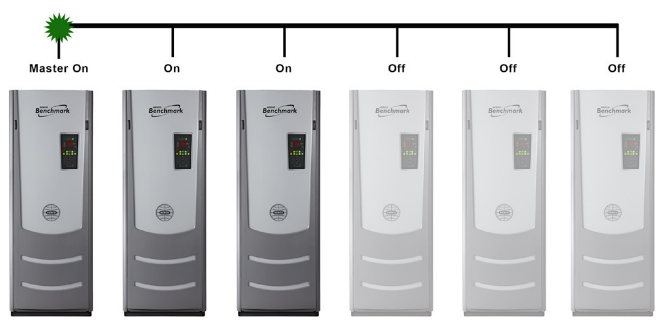
Benchmark 750 - 6000
Condensing Hydronic Boilers

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

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

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

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



FEATURES:

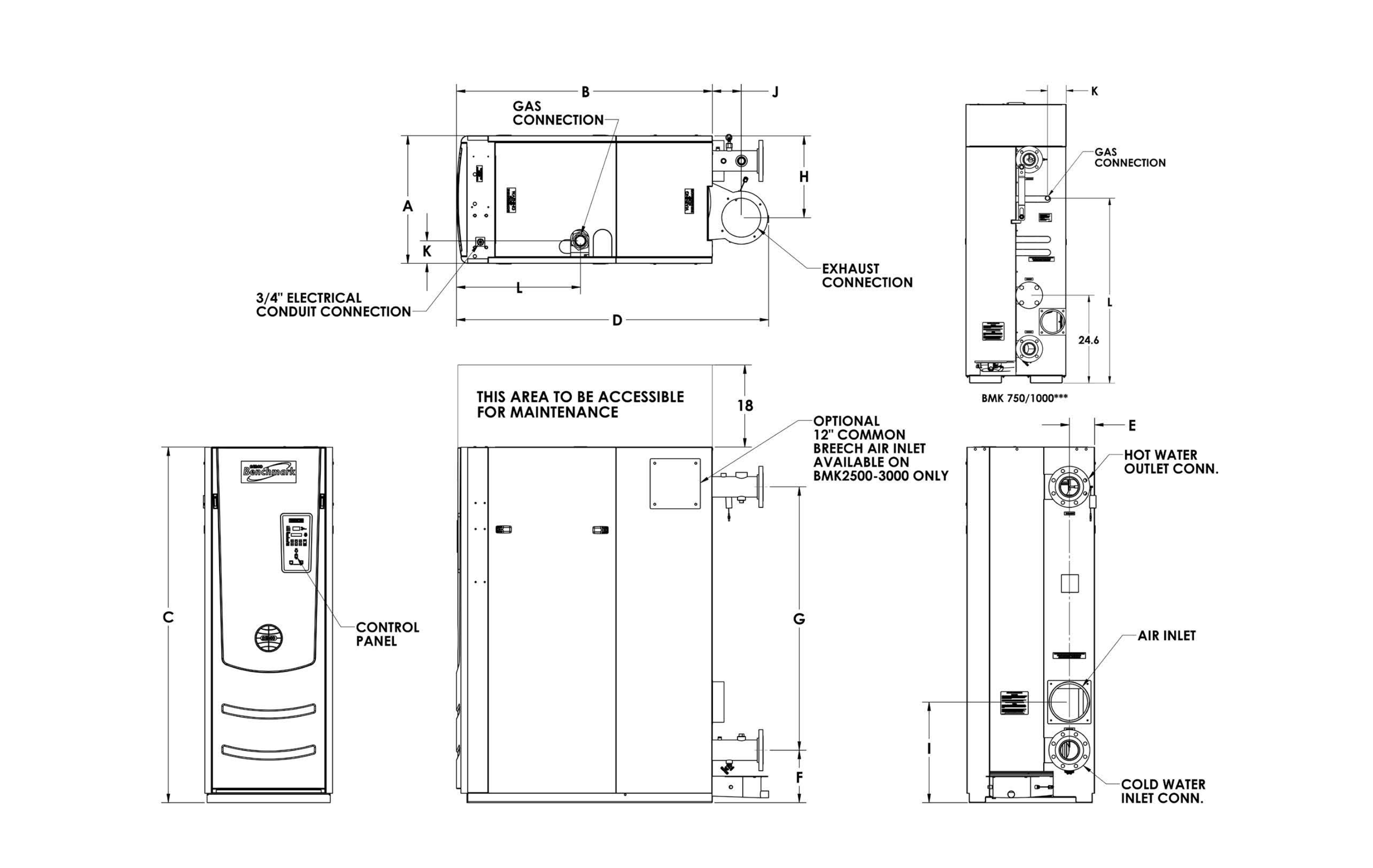
- Natural Gas, Propane, or Dual Fuel (model dependant)
- 20:1 Turndown Ratio (5%) depending on capacity
- Oxygen Level (O_2) Monitoring Standard
- Stainless Steel Fire Tube heat exchanger
- Capable of variable primary flow Installations
- NOx Emissions capable of 9PPM or less @ all firing rates *depending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

RATINGS:

Model Number	Min Input MBH	Max Input MBH	Max Output[a] MBH	Efficiency Range	AHRI Efficiency 80º to 180ºF
BMK 750	50	750	653-720	87%-98%	95.50%
BMK 1000	50	1000	870-960	87%-98%	96.80%
BMK 1500	75	1500	1305-1425	87%-98%	94.60%
BMK 2000	100	2000	1740-1900	87%-98%	94.60%
BMK 2500	167	2500	2175-2360	87%-98%	93.50%
BMK 3000	200	3000	2610-2880	87%-98%	93.50%
BMK 6000**	400	6000	5220-5670	87%-98%	94.50%

[a]Max output dependent upon application - See efficiency curves
**See separate BMK6000 Technical Data Sheet for additional BMK6000 details

DIMENSIONS (INCHES):



Model	(Width) A	(Depth) B	(Height) C	D	E	F	G	H	I	J	K	L
BMK 750	28”	25”	78”	34”	10”	10”	53”	21”	17”	4”	5”	51.8”
BMK 1000	28”	25”	78”	34”	10”	10”	53”	21”	17”	4”	5”	51.8”
BMK 1500	28”	43.6”	78”	58.4”	7”	11.5”	57.8”	18”	22”	8.9”	4.7”	19.5”
BMK 2000	28”	43.6”	78”	58.4”	7”	11.5”	57.8”	18”	22”	8.9”	4.7”	19.5”
BMK 2500	28”	56”	78”	68.4”	5.4”	11.5”	57.8”	18”	22”	6.4”	3.6”	26”
BMK 3000	28”	56”	78”	68.4”	5.4”	11.5”	57.8”	18”	22”	6.4”	3.6”	26”
BMK 6000**	34”	89.3”	79.4”	108.3”	6.2”	42.1”	N/A	15.6”	N/A	10”	28.7”	23.7”

**See separate BMK6000 Technical Data Sheet for additional BMK6000 dimension details
***BMK750/1000 Feature Dual Inlet Connections

SPECIFICATIONS:

	BMK750	BMK1000	BMK1500	BMK2000	BMK2500	BMK3000	BMK 6000**
Boiler Category	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV	ASME Sect.IV
Gas Connections (NPT)	1”	1”	2”	2”	2”	2”	2”
Max. Gas Pressure	14”	14”	14”	14”	14”	14”	2psi
Min. Gas Pressure [1]	4”	4”	4”	4”	4”	4”	14”
Max. Allowed Working Pressure	160 PSIG	160 PSIG	160 PSIG	160 PSIG	160 PSIG	160 PSIG	80 PSIG/150 PSIG Optional
Electrical Req. 120V/1PH/60Hz [2]	13 FLA	13 FLA	16 FLA	16 FLA	N/A	N/A	N/A
Electrical Req. 208V/3PH/60Hz [2]	N/A	N/A	N/A	N/A	10 FLA	10 FLA	19 FLA
Electrical Req. 460V/3PH/60Hz [2]	N/A	N/A	N/A	N/A	5 FLA	5 FLA	12 FLA
Water Connections (Flanged)	3”	3”	4”	4”	4”	4”	6”
Min. Water Flow (GPM)	25	25	25	25	25	25	75
Max. Water Flow (GPM)	175	175	250	350	350	350	600
Water Volume Gallons	16.25	14.25	44	40	58	55	110
Water Pressure Drop	3.0 PSIG @ 100 GPM	3.0 PSIG @ 100 GPM	3.0 PSIG @ 170 GPM	3.0 PSIG @ 170 GPM	3.0 PSIG @ 218 GPM	3.0 PSIG @ 261 GPM	4.0 PSIG @ 500 GPM
Turndown	15:1 (7%)	20:1 (5%)	20:1 (5%)	20:1 (5%)	15:1 (7%)	15:1 (7%)	15:1 (7%)
Vent/Air Intake Connections	6 Inch	6 Inch	6 Inch	8 Inch	8 Inch	8 Inch	14 Inch
Vent Materials	AL29-4C Polypro, CPVC, PVC	AL29-4C Polypro, CPVC, PVC	AL29-4C Polypro	AL29-4C Polypro	AL29-4 Polypro	AL29-4C Polypro	AL29-4C
Type of Gas	Natural Gas, Propane	Natural Gas, Propane	Natural Gas, Propane, Dual Fuel	Natural Gas, Propane, Dual Fuel	Natural Gas, Propane, Dual Fuel	Natural Gas, Propane, Dual Fuel	Natural Gas, Dual Fuel
NOx Emissions <9ppm Capability*	✓	✓	✓	✓	N/A (<20 ppm)	N/A (<20ppm)	✓
Temperature Control Range	50ºF to 190ºF						
Ambient Temperature Range	0ºF to 130ºF						
Standard Listings & Approvals	UL, CUL, CSD-1, ASME, AHRI						
Gas Train Operations	FM Compliant or Factory Installed DBB (IRI) (BMK750-BMK3000 Only) FM Compliant (BMK 6000)						
Weight (dry) lbs.	669	700	1406	1500	2,000	2,170	3,000
Weight (wet) lbs.	802	817	1654	1760	2,332	2,580	3,920
Shipping Weight lbs.	862	900	1606	1700	2,200	2,370	3,800

**See separate BMK6000 Technical Data Sheet for additional BMK6000 details

[1] Values are for Natural Gas FM Compliant gas trains only. See Benchmark Gas Components & Supply Design Guide GF-2030 for Propane, DBB & Dual Fuel gas train minimum gas pressure requirements.

[2] See Benchmark Electrical Power Guide GF-2060 for Service Disconnect Switch amperage requirements.

NOTES:

Represented By:

Specifications subject to change without prior notice. Consult website or contact AERCO.
BMK SERIES 03/2014 NY

WATER HEATERS • BOILERS • PARTS & ACCESSORIES
AERCO INTERNATIONAL, INC.
100 ORITANI DR. • BLAUVELT, NY 10913
(845) 580-8000 • FAX (845) 580-8090
www.aerco.com

CYCLONE® HE

BTX-80

Series 100

GAS-FIRED
C UL US LISTED
CSA Low Lead Compliant
AHRI CERTIFIED® www.ahridirectory.org

The Cyclone® HE is a light-duty, power vent, fully condensing commercial gas water heater with an internal helical heat exchanger, similar to the design of A. O. Smith's industry-leading Cyclone® models. This helical heat exchanger helps Cyclone® HE achieve 90% thermal efficiency and deliver outstanding hot water output.

HELICAL INTERNAL HEAT EXCHANGER
- Completely surrounded by water in tank, provides much greater heat transfer surface than standard straight flue tube
- Operates at 90% thermal efficiency, which saves money on operating costs, increases hot water output compared to standard efficiency water heaters
- Minimizes standby losses by trapping heat in the tank
- Spiral heat exchanger reduces scale and sediment from forming on water-side surface, which can reduce energy efficiency over time

VERSATILE POWER VENT DESIGN
- Vents using inexpensive PVC, CPVC or ABS pipe. Canadian installations require ULC S636 listed PVC or CPVC pipe for venting.
- 2" pipe, vents up to 20 equivalent feet
- 3" pipe, vents up to 60 equivalent feet
- 4" pipe, vents up to 120 equivalent feet

MODULAR BLOWER
- Equipped with 120 volt, 60 Hz electrical system (rating 5 amps or less), 6-foot cord with standard 3-prong connector
- 2" PVC pipe, elbows and condensate drain supplied to connect heat exchanger outlet to blower
- PVC Vent Attenuation Assembly (VAA) supplied for applications where extra-quiet operating environment is essential

HIGH OUPUT WITH SMALL FOOTPRINT
- 22" diameter, combined with 90% efficiency, 50-gallon tank and 76,000 BTU input means Cyclone HE can be installed in less space than a larger 75-gallon unit, with equal or better performance
- Total height is 70-5/8" to top of unit

SIDE-MOUNTED HOT AND COLD RECIRCULATING TAPS
- Allows Cyclone HE to be installed as part of combination space heating/water heating applications, or any system requiring a recirculating hot water loop
- Plugs for the recirculating taps are factory installed

INTELLI-VENT™* GAS CONTROL
- Equipped with long lasting silicon nitride hot surface ignitor – no standing pilot
- Advanced electronics for more precise control of water temperature and easy-to-understand system diagnostics
- 180°F maximum temperature setting

PERMAGLAS® ULTRA COAT™ GLASS LINING
- A. O. Smith exclusive process provides superior protection against corrosion
- Protects all interior tank surfaces including inside and outside of helical heat exchanger

TWO HEAVY-DUTY ANODE RODS
- Provides advanced protection against corrosion

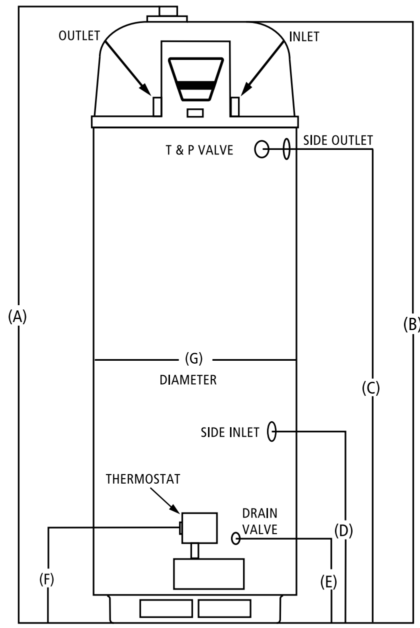
GREEN CHOICE® GAS BURNER
- Patented "Eco-Friendly" design reduces NOx emissions and meets less than 40 ng/j requirements for low NOx

CSA CERTIFIED AND ASME RATED T&P RELIEF VALVE

MAXIMUM HYDROSTATIC WORKING PRESSURE: 150 PSI

CODES AND STANDARDS
- Design-certified by Underwriters' Laboratories according to ANSI Z21.10.3 - 4.3 CSA standards governing storage-type water heaters
- Meets the thermal efficiency and standby loss requirements of the U.S. Department of Energy and Current Edition of ASHRAE/IESNA 90.1

*Intelli-Vent™ is a registered trademark of Emerson Electric Company



FRONT VIEW

THREE-YEAR LIMITED TANK WARRANTY

- For complete warranty details, consult written warranty shipped with heater

SPECIFICATIONS

MODEL NUMBER	BTU INPUT PER HOUR	GALLONS OR LITRES	TANK SIZE	GPH OR LPH	RECOVERY - GALLONS OR LITRES PER HOUR AT DEGREE RISE			LBS. OR KG	SHIPPING WEIGHT
					40°F	100°F	140°F		
					22°C	56°C	78°C		
BTX-80	76,000	Gallons	50	GPH	206	83	59	Lbs.	210
		Litres	189	LPH	780	314	223	Kg	95.3

Manifold Pressure: 4.0 inches w.c. (.99 kPa); All models–Maximum Supply Pressure: 14 inches w.c. (3.48 kPa)
Minimum Supply Pressure Natural Gas: 5.0 inches w.c. (1.24 kPa); Minimum Pressure must be maintained under both load and no-load (dynamic and static) conditions
Approved for installation up to 5300 ft. High alt models available.
Approved for Canada.

Rough-In-Dimensions

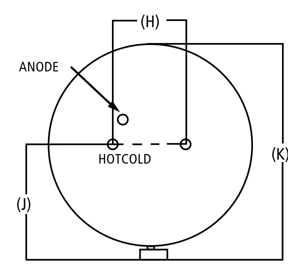
Model	Units	A	B	C	D	E	F	G	H	J	K
BTX-80	Inches	70.62	68.20	51.90	20.90	9.15	12.00	22.00	8.00	15.81	26.92
	cm	179.37	173.23	131.83	53.09	23.24	30.48	55.88	20.32	40.16	68.38

Top/Side Inlet and Outlet: 3/4” NPT
Gas Inlet: 1/2” NPT

Capacity and Gas and Electrical Characteristics

Model	Approximate Capacity		Manifold Pressure			Electrical Characteristics	
	U.S. Gals.	Liters	Gas Type	“WC	kPA	Volts/Hz	Amperes
BTX-80	50	189	Nat.	4.00	0.99	120/60	<5

All models - Maximum Supply Pressure: 14 inches W.C. (3.48kPa)
Minimum Supply Pressure Natural Gas: 5.0 inches W.C. (1.24kPa)
Minimum Pressure must be maintained under both load and no load (static and dynamic) conditions.



TOP VIEW

* INSTALL IN ACCORDANCE WITH LOCAL CODES

SUGGESTED SPECIFICATION

Natural gas water heater(s) shall be A. O. Smith Cyclone HE model # BTX-80, with 90% thermal efficiency, a storage capacity of 50 gallons, an input rating of 76,000 BTUs per hour, a recovery rating of 83 gallons per hour at 100°F rise and a maximum hydrostatic working pressure of 150 psi. Water heater(s) shall be of power vent design, using 2”, 3” or 4” PVC pipe for horizontal and/or vertical vent runs. Water heater(s) shall have: 1: Glasslined steel tank construction and a spiral-shaped heat exchanger placed entirely inside the tank, which shall be glasslined on the flue gas side to protect against acidic condensate. 2: An Intelli-Vent™ gas control system with silicon nitride hot surface ignitor. 3: A 3-year limited warranty against tank leaks. Water heater(s) shall meet the thermal efficiency and standby loss requirements of the U. S. Department of Energy and Current Edition of ASHRAE/IESNA 90.1 and be design-certified by UL (Underwriters Laboratories) according to ANSI Z21.10.3-CSA4.3 standards governing storage tank water heaters.

For Technical Information and Automated Fax Service, call 800-527-1953. A. O. Smith Corporation reserves the right to make product changes or improvements without prior notice.

ControLinks™ Fuel Air Control System

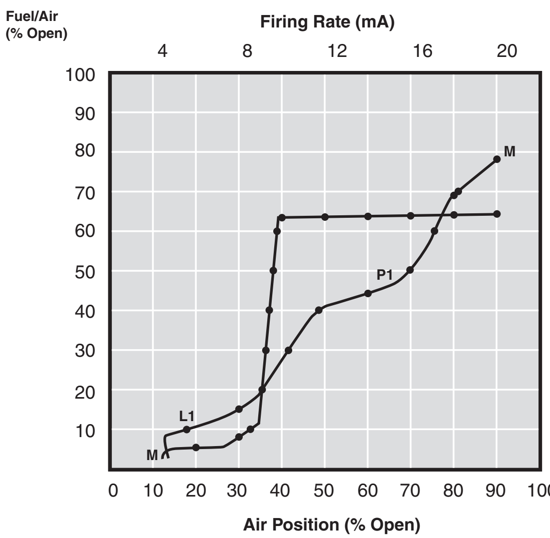
Honeywell

Get superior performance, improved accuracy and fuel efficiency with Honeywell ControLinks™ microprocessor-based fuel air ratio controls on your burner equipment. Control accuracy to 0.1 degrees provides accurate fuel air ratio curves and improves combustion efficiency, which means fuel savings for you. It all adds up to more accuracy and efficiency, as well as less service and downtime.

ControLinks™ Fuel Air Control System

ControLinks™ uses unique air curves and fuel curves, separate light-off points and different minimum and maximum modulation points. Innovative safety features include a unique potentiometer circuit, component anti-swap protection and curve verification algorithms.

Fuel/Air Profile Graph



One-fuel with FGR curve

The new S7999B system display allows you to commission the ControLinks Fuel Air Control System using the touchscreen with four color graphics. This eliminates the need for a laptop or PC for commissioning. Diagnostic information can be accessed for ControLinks and for 7800 SERIES Controls using this display.

To Learn More

For more information about ControLinks Fuel Air Control System, contact your Honeywell Representative, call 1-800-345-6770, ext. 423, or visit customer.honeywell.com.

Automation and Control Solutions

In the U.S.:
Honeywell
1985 Douglas Drive North
Golden Valley, MN 55422-3992

In Canada:
Honeywell Limited
35 Dynamic Drive
Toronto, Ontario M1V 4Z9
www.honeywell.com

63-9165
May 2006

Technical brochures, savings calculator and case studies are also available. Contact your local ControLinks rep for more details.

SYSTEM COMPONENTS:

R7999 FUEL AIR RATIO CONTROL

- Monitors and controls the burner fuel and air ratios to maintain proper combustion
- Provides LED status for power, alarm and motor drives
- Includes fault-annunciating LEDs

ML7999A UNIVERSAL PARALLEL-POSITION ACTUATOR

- Provides 100 lb./in. torque to control combustion air dampers, modulating fuel valves, oil modulation valves and flue gas recirculation (FGR) dampers
- Optimizes burner performance by providing precision potentiometer feedback to the R7999 control

S7999B SYSTEM DISPLAY

- Optional tool that provides an interface for the entire burner/boiler system
- Large, full color, touchscreen display module
- Two additional LEDs indicate CSD power and communications

V5197 Firing Rate Valve

- Accepts 4 – 20 mA signal for firing rate control
- More linear turndown

A7999 PORTABLE COMBUSTION ANALYZER

- Portable diagnostic tool (optional) expedites burner setup

ZM7999 COMMISSIONING SOFTWARE

- Commissioning software via laptop

Q7999 WIRING SUB-BASE

- For ease of installation, all wiring goes to this panel-mounted sub-base

The Following ControLinks Demos And Toolkits Are Also Available:	
Item #	
DSP3822	S7999B System Display Demo
DSP3564	ControLinks Demo
DSP3548	ControLinks Tool Kit

Honeywell

TRANE

Product Catalog

Tracer™ SC System Controller

For Tracer Building Automated Systems

June 2013

BAS-PRC031-EN

Copyright

Trademarks

Table of Contents

TRANE®

Product Introduction

Tracer™ SC allows you to streamline facility management without reinventing the entire system. Adding Tracer SC to your system provides a flexible, cost effective solution for building automation, and managing the facility climate that can extend to lighting and energy consumption.

Accessible from most PCs, tablets and smart phones, Tracer SC eliminates the need for a dedicated computer and monitor so you can manage system performance whenever and wherever it is convenient. Tracer SC controller's simplified, Web-based management tool reduces scheduling, reporting and system application chores to simple "point and click" tasks. The intuitive online tools provide improved efficiencies, increased tenant comfort and reduced energy costs, which result in operational cost-savings and a better bottom line.

Occupant comfort and energy savings

- Tracer SC includes several factory engineered HVAC applications that have been developed by HVAC system experts and tested on tens of thousands of facilities to ensure that your facility operates at its peak performance. These applications provide consistent comfort and improved indoor air quality, while reducing energy requirements.
- For any building owner concerned with energy, indoor air quality, and the environment, Trane EarthWise™ Systems represent a design philosophy whose time has come. EarthWise Systems provide documented sustainability of high efficiency and low emissions over the entire lifetime of the building.
- Tracer Graphical Programming (TGP2) is a powerful graphical program that can be used to customize factory applications or control non-HVAC equipment.

TRANE TRACER BAS OPERATOR SUITE

GET IT ON Google play | Available on the App Store

Access your facility from anywhere

- Tracer SC is web-enabled and accessible from virtually any device with a web browser. All of the most popular device types, operating systems, and browsers are supported.
- The Tracer™ BAS Operator Suite is a mobile app that allows you to monitor and manage buildings from virtually anywhere, giving you greater freedom and constant peace of mind.

ZigBee™

BACnet® TESTING LABORATORY BTL

BACnet is a registered trademark of ASHRAE. ASHRAE does not endorse, approve or test products for compliance with ASHRAE standards. Compliance of listed products to requirements of ASHRAE Standard 135 is the responsibility of the BACnet International. BTL is a registered trademark of the BACnet International.

Support for open, standard protocols

- Open, standard protocols are the key to enabling communication among Trane and non-Trane HVAC equipment, as well as other complementary facility systems. These protocols enable communication across systems and vendors to ensure that your building operates at its best on day one and beyond.
- Tracer SC natively communicates to BACnet® and LonTalk controllers and is listed as a BACnet Building Controller (B-BC) by BACnet International's BACnet Test Labs (BTL).
- Tracer SC supports Trane® Wireless COMM, providing standard wireless BACnet over Zigbee™ building automation between Trane BACnet controllers and zone sensors.

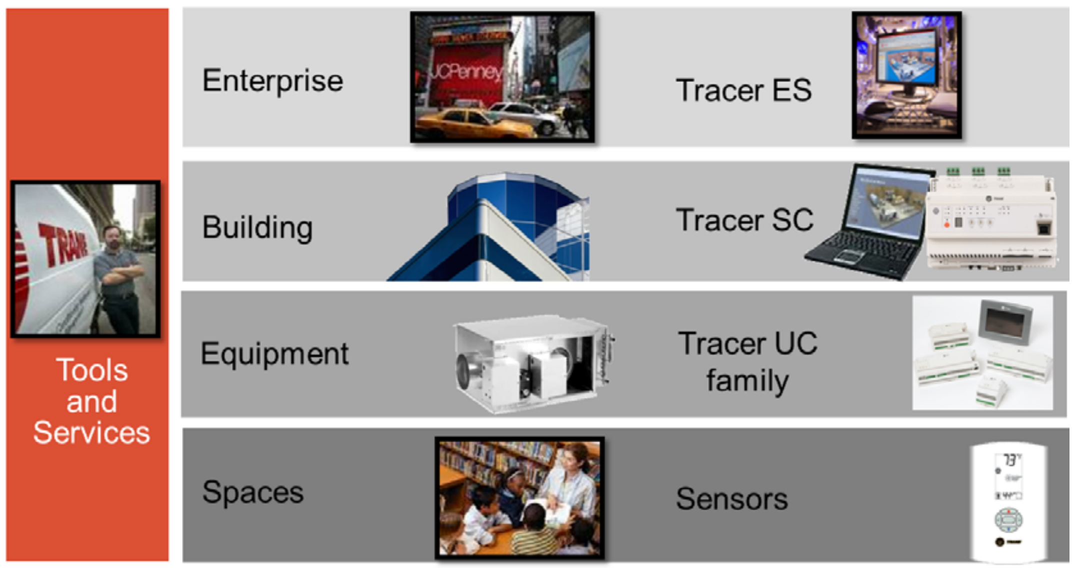
Support for Trane® Wireless COMM

- Trane Wireless Comm brings maximum flexibility to your building automation system.
- For contractors, it significantly simplifies building controls projects by minimizing the engineering, estimating and project management tasks associated with communication link. For building owners, it provides easier and more cost-effective controls upgrades and building expansion projects.
- Trane technology helps prepare your facilities for the future of building information. Trane Wireless Comm runs BACnet protocol over ZigBee building automation standards. Trane Wireless COMM is the first HVAC manufacturer to be Zigbee Certified.

Tracer Building Automation System

From our industry-leading building automation systems to equipment controls and sensors, Trane offers a complete controls portfolio to enable you to operate buildings at peak energy and operational efficiency.

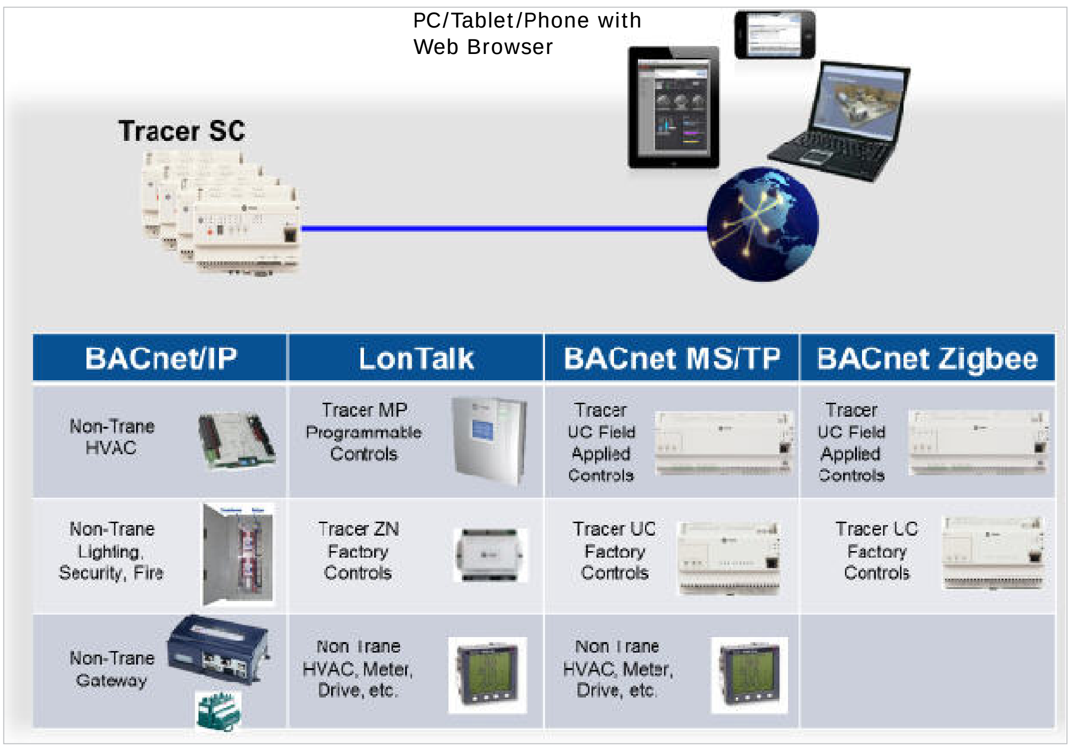
Trane controls are built on open, scalable platforms. They provide options to integrate with your existing equipment and controls, regardless of brand, and give you the latitude to easily expand into other systems within your building, multiple buildings and buildings you'll add in the future.



Tracer SC System Architecture

Tracer SC is at the heart of a Tracer building automation system. Tracer SC provides a web-based front end for your facility that can be accessed with most PCs, tablets and smart phones. Tracer SC includes powerful, factory-engineered applications that are designed to provide the perfect balance of energy efficiency and user comfort. Tracer SC communicates with a variety of Trane and non-Trane controllers using open, standard protocols, including BACnet and LonTalk. A diagram depicting the high-level system architecture is shown in Figure 1.

Figure 1. Tracer building automation system structure

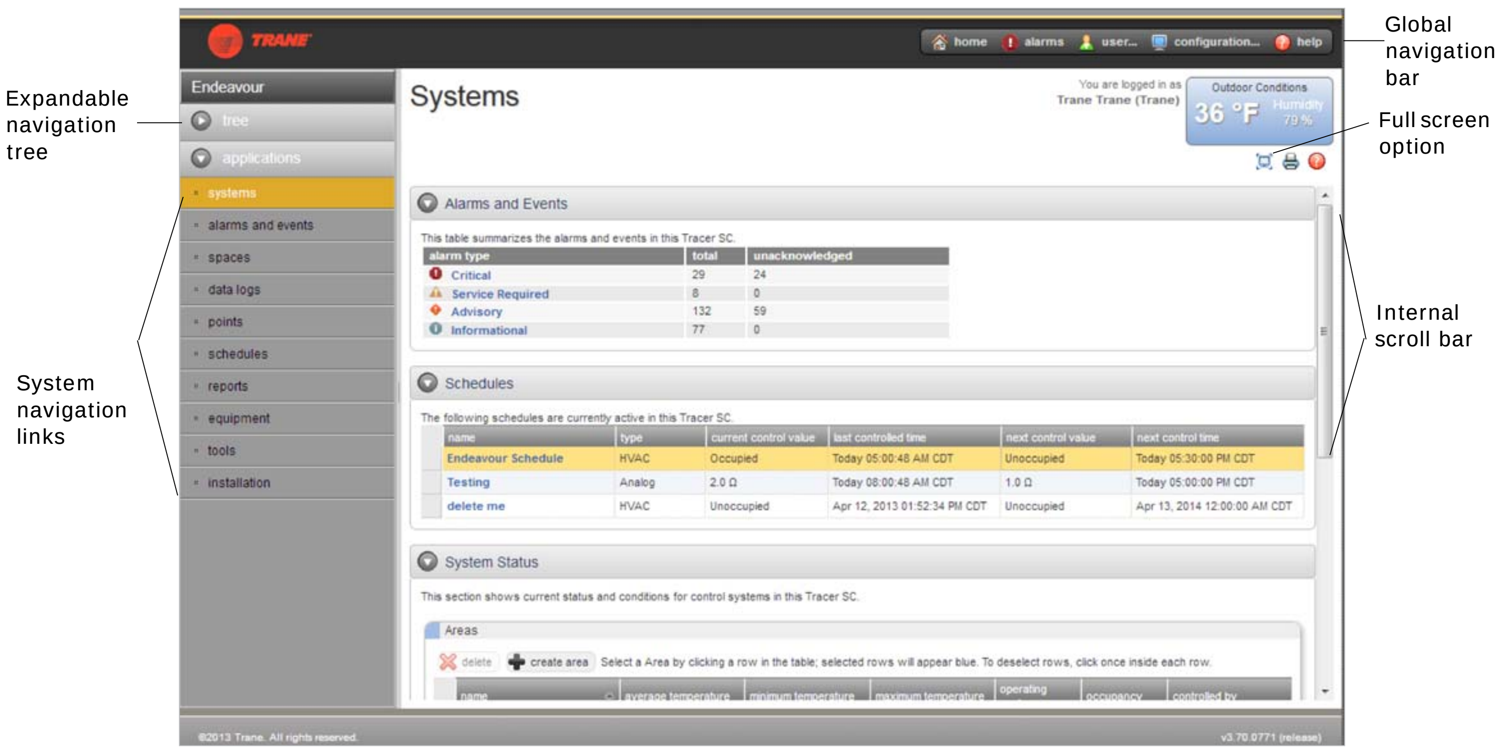


User Interface

The Tracer SC user interface provides an easy way for building operators to set up, operate, and modify a building automation system. The home page (Figure 2) contains system status information and links to navigate to all areas of the system.

The main features of the user interface are described in this section.

Figure 2. Tracer SC user interface



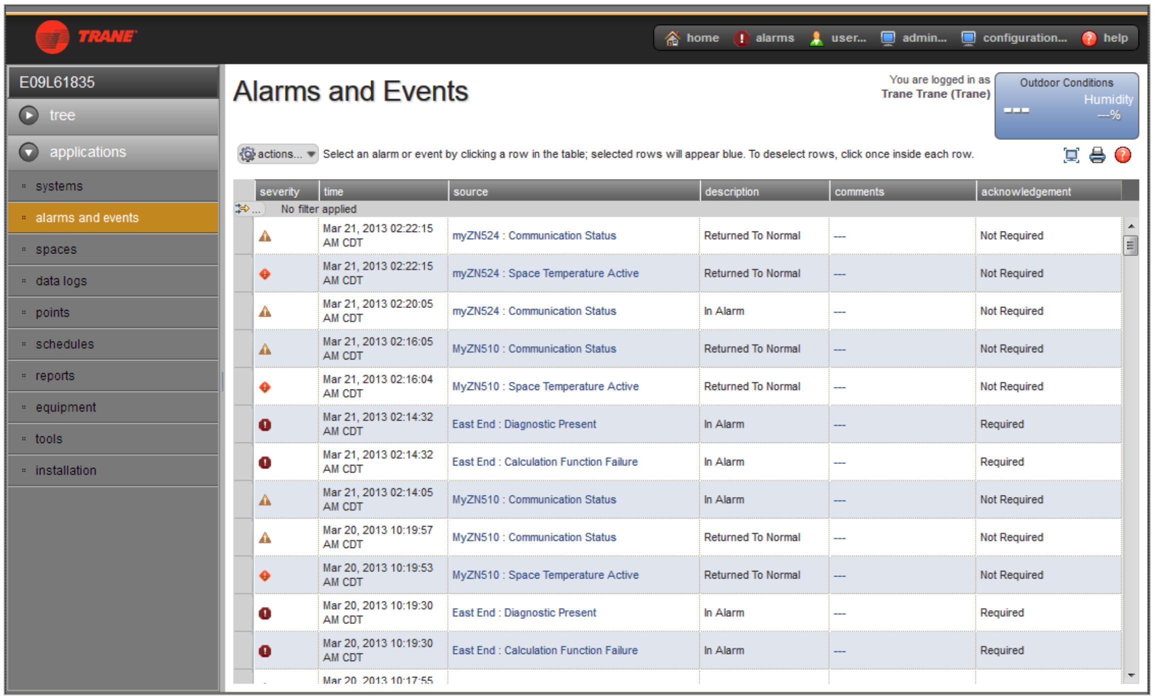
Alarms and Events

Events are occurrences that are detected by a Tracer building automation system. They can include diagnostics, critical operating conditions, as well as routine procedures.

An event that is triggered by the detection of an abnormal or critical operating condition is generally considered to be an alarm. If a critical alarm exists, an alarm icon flashes in the global navigation bar, which remains visible in the right corner of every page of the user interface.

When the system detects an event, data about the event appears in a log on the Alarms and Events page (Figure 3, p. 8). The data displayed in the log includes when and where the event occurred and whether the operator is required to acknowledge it. An operator can also use the log to add comments about events. Column headings can be used to sort and filter events. They can also be removed or exported from the log.

Figure 3. Alarms and Events log



The Alarms and Events log has seven categories that can be used to sort and filter them. The log can be sorted on any of these categories including, for example, by priority. Filtering can be used to view only the alarms from a specific piece of equipment, for example, or those received at a specific time or from a specific alarm category.

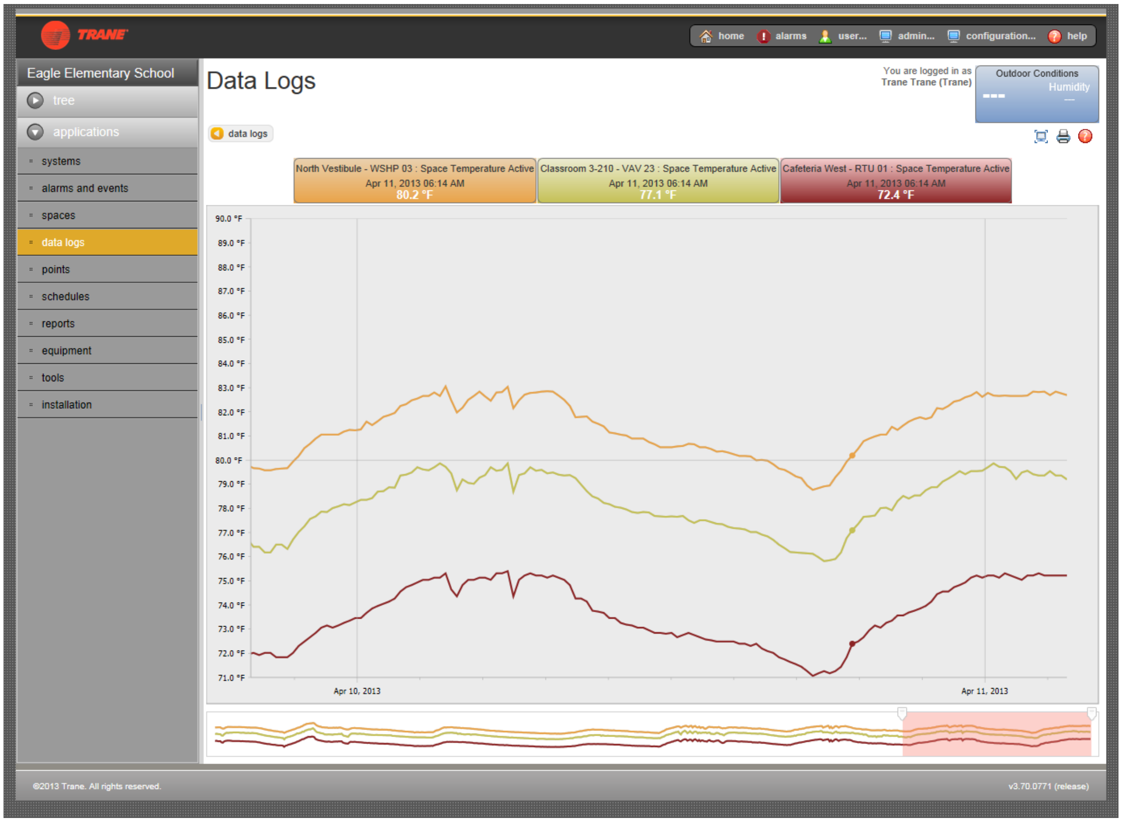
Events can also be routed by e-mail to selected system operators. Event routing rules can be configured so that events respond to specific conditions when they occur.

Data Logs

Data logs, also referred to as trends, allow users to produce a variety of data samples at defined intervals to show the historical and current status of the facility. Data logs record, in real-time, the value of a data point in the system and the time at which the value was recorded.

Data logs can be viewed in real-time, or at a later time. They can also be printed and saved. With the proper security access, system users can configure (create, delete, and update) and manage (clear, enable, and disable) data logs in the system. (See Figure 4, p. 9 for an example of a data log.)

Figure 4. Data Logs example



Schedules

Scheduling is one of a facility's most important energy-saving strategies. It ensures that equipment runs only when needed. Use schedules to:

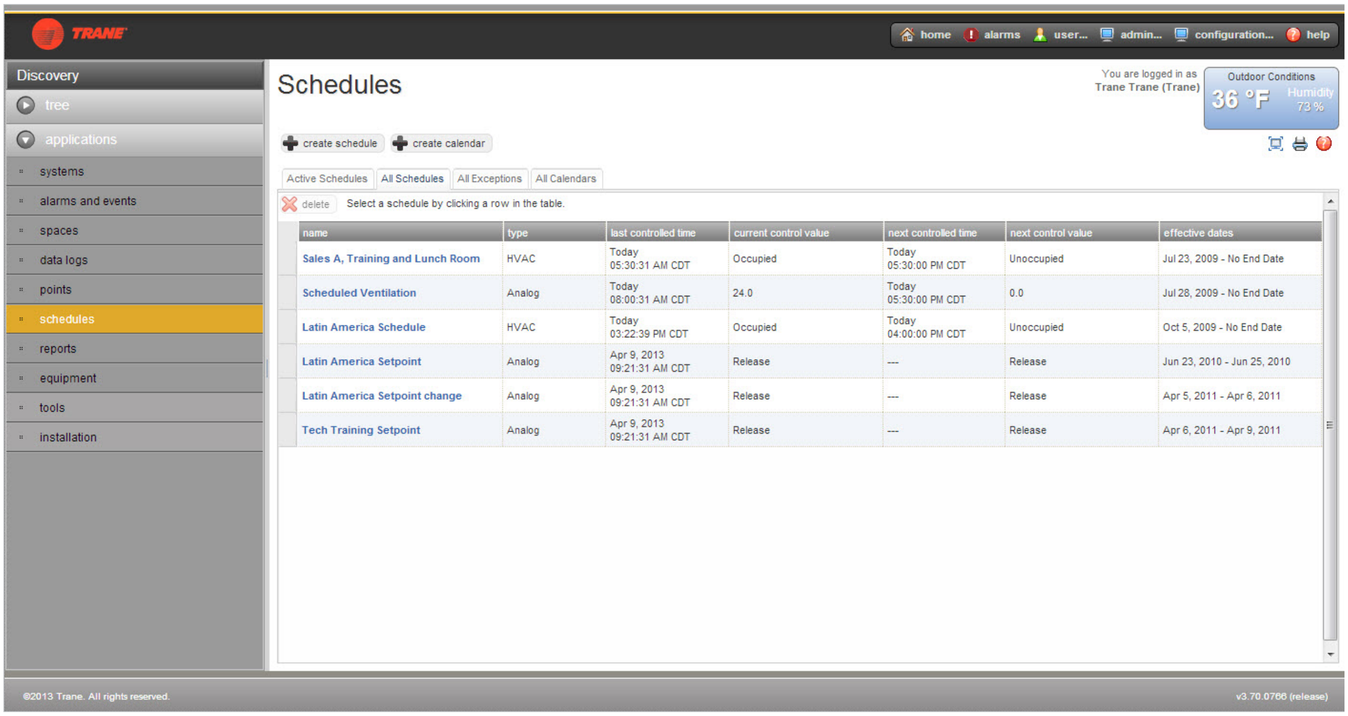
- Keep equipment running at minimal energy-use levels on weekends and holidays
- Create exceptions to the standard schedule
- Perform optimal start and stop of equipment to optimize energy use while maintaining comfort requirements
- Change setpoints at specific times of day

From the home page, you can select:

- All Schedules, which shows all schedules in the system
- Active Schedules, which shows only the active schedules in the system

Figure 5, p. 10 shows an example of an All Schedules page.

Figure 5. Schedules



Overrides

A typical challenge that facility managers have is maintaining the balance between automatic and manual system control. Tracer SC provides multiple methods of overriding equipment, applications and points while also ensuring that the proper balance of automatic and manual system control is kept. These methods include:

Permanent Overrides

The most typical use of a permanent override is through applications. Tracer SC provides the ability to determine which user or application has performed an override to quickly determine who has overridden a setpoint.

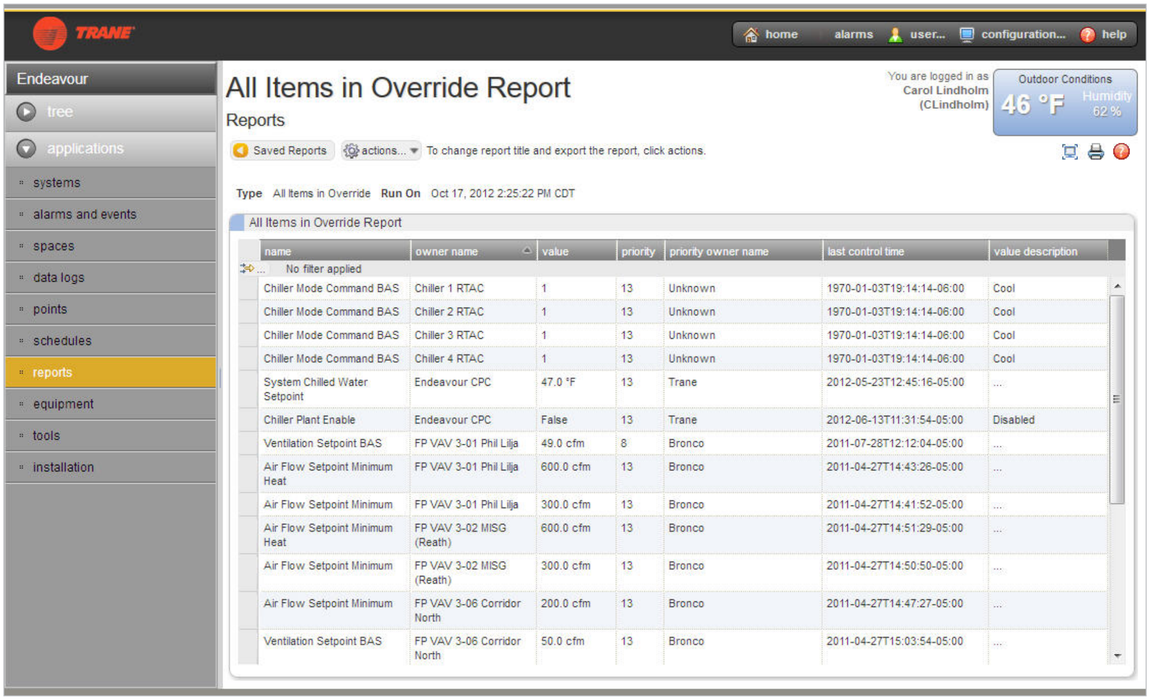
Temporary Overrides

A common challenge in facilities is inadvertent overrides. Tracer SC provides a default override option for users that allow an override to expire after a period of time. This ensures that temporary overrides do not inadvertently become permanent overrides.

All items in Override Report

It can be difficult to track down overrides that have become permanent and are causing a facility to act differently than a facility manager expects. Tracer SC includes a standard report that allows a user to quickly identify all points within the system that have been overridden. See Figure 6, p. 11.

Figure 6. All Items in Override Report



Reports

Standard reports for Trane equipment are available from Tracer SC. These reports provide a valuable source of data that can be used for record-keeping and troubleshooting.

Report types include:

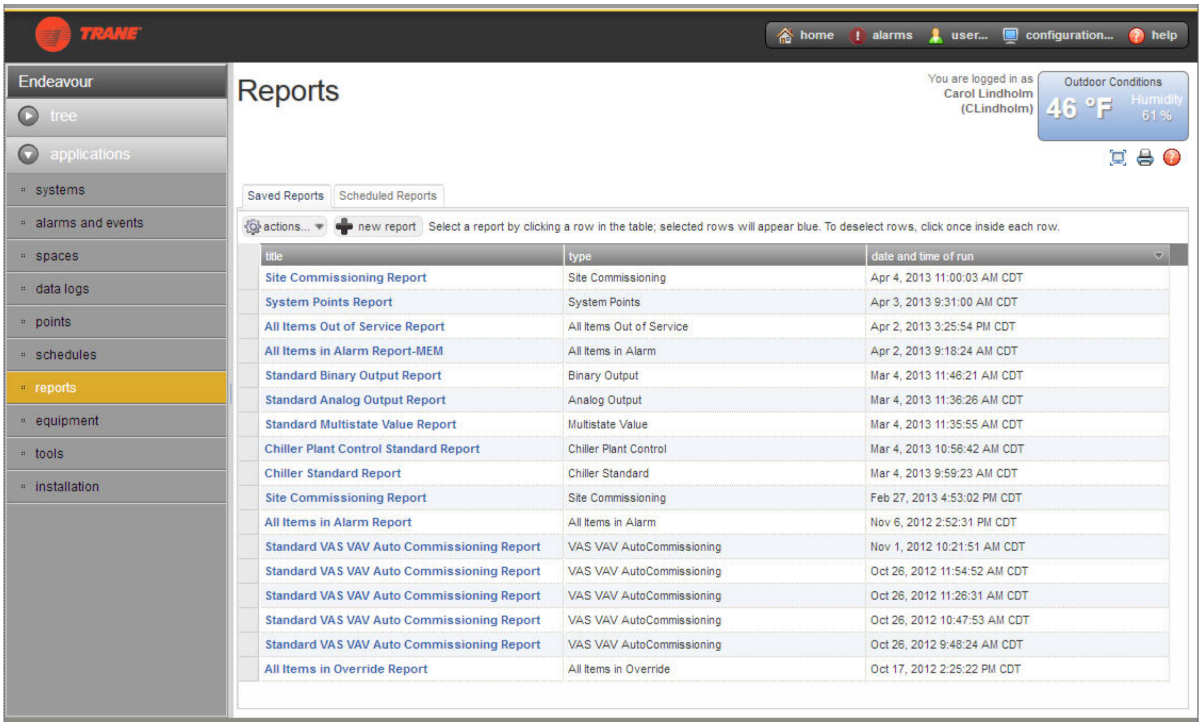
- Site reports
- VAS commissioning reports
- Points reports
- Chiller reports

Report features include:

- Scheduling reports to run during specific date periods and run frequencies
- Specifying file storage options for scheduled reports
- Exporting reports to save to your PC as CSV, HTML, or PDF files
- Editing scheduled reports

See Figure 7, p. 12.

Figure 7. Reports



Graphics and the Tracer Graphics Editor

With the Tracer Graphics Editor (TGE), available through the Tracer TU service tool, users can create, edit, and publish graphics for use on Tracer SC. Graphics on the Tracer SC are used to monitor and control building equipment and applications. They can display data related to climate, lighting, and other controllable operations. They can be used to change setpoints and to override equipment operation.

TGE can be used to align graphical elements, determine which elements appear on top, and perform cut, copy, and paste functions.

Graphics can include:

- Any data that is available in the system as a numerical or text value
- Analog values that can change colors if they deviate from a desired value
- Multiple graphic images in JPEG, GIF, and animated GIF formats
- Visual elements from the building, such as floor plans or exterior views from CAD drawings
- Digital photography in JPG and GIF formats
- Animated images to represent binary and analog values
- Target buttons that provide links to related sources
- User controls including push buttons, check boxes, drop-down list boxes, and entry fields

Graphics can be grouped in a logical way to simulate navigation through the building automation system. See Figure 8, Figure 9, and Figure 10 as examples.

Figure 8. Home page showing graphic of building exterior (example 1)

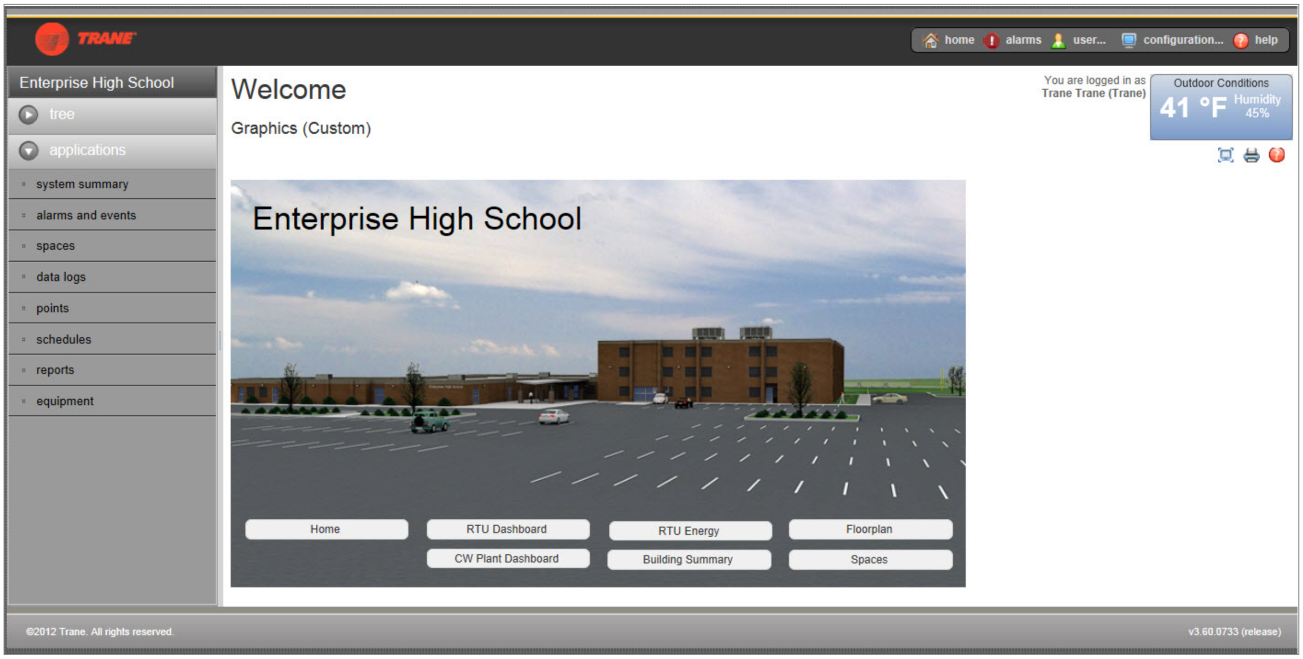
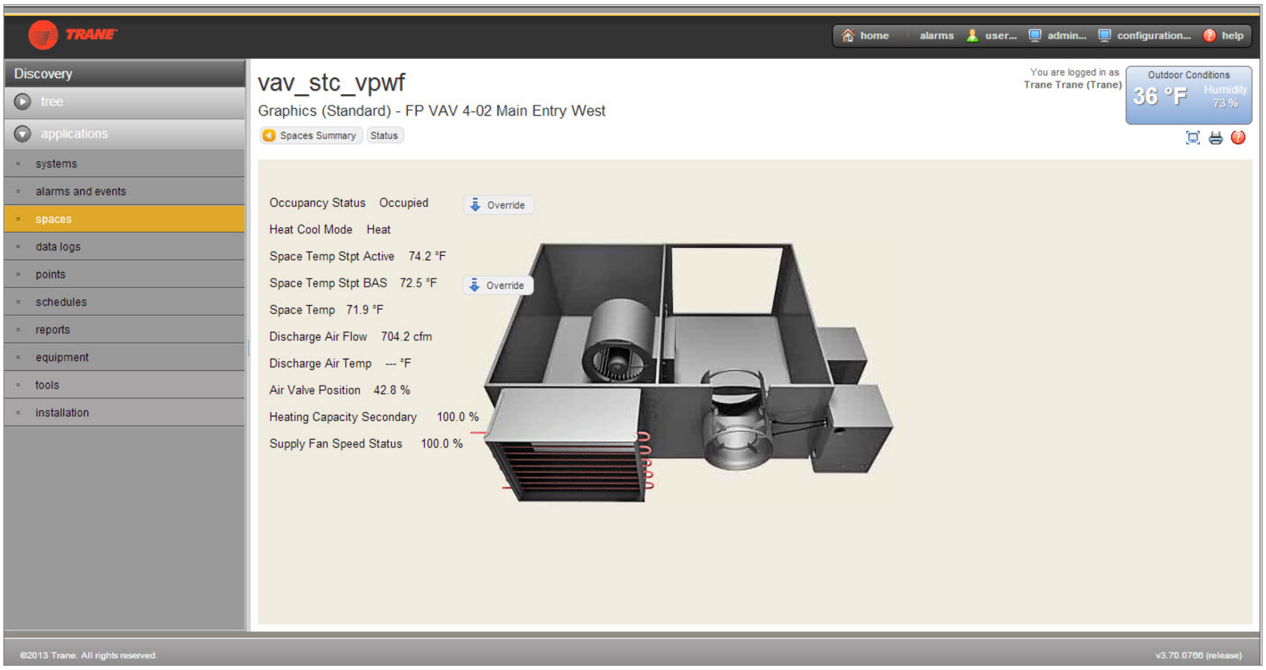


Figure 9. Home page with floor plan graphic (example 2)

Figure 10. Equipment status graphic (example 3)

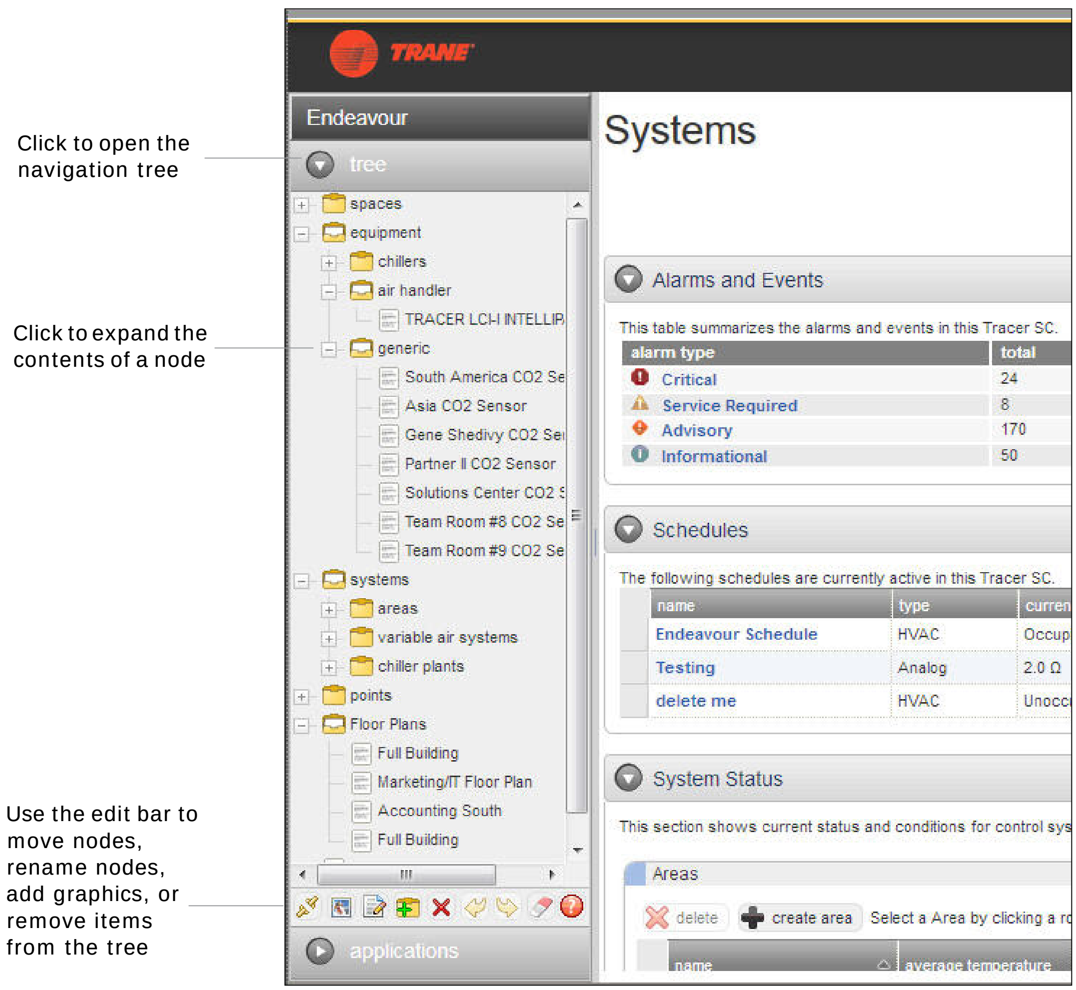


Navigation Tree

The navigation tree contains the logically ordered and grouped content of all the elements of your HVAC system. The navigation tree populates automatically when spaces, systems, points, and equipment are installed. A navigation tree provides an alternate way to navigate through the user interface (Figure 11).

The navigation tree consists of nodes, display text, and icons. You build the tree by choosing display text for nodes, arranging the nodes, and assigning associated graphics to them. The graphics represent equipment and areas of the facility.

Figure 11. Navigation tree example



User Security

A sophisticated password system protects a Tracer system from unauthorized access. Operators are assigned a role, which defines their access rights. Operators have access only to those features which are defined in their roles. Several predefined roles can be selected from the Tracer SC interface and roles can also be customized. An operator with administrative-level security can manage users and roles and has the ability to reset passwords.

System Control

Tracer SC includes a powerful system control engine. Every Tracer SC ships with several factory engineered HVAC applications, support for Trane Earthwise™ Systems, and a powerful custom graphical programming language.

Area Application

The Area application coordinates groups of equipment that represent the tenant or occupant organization within a building, which allows for standard calculations/functions and a simplified user interaction with the facility. The Area application allows users to assign unit controllers, binary outputs, and binary values as members of a common area. The area application can be configured to use multiple algorithms, along with area temperatures and humidity inputs, to make an economizing decision.

The Area application also supports:

- Optimal start/stop
- Humidity pulldown
- Night purge
- Unoccupied heating/cooling set-points
- Unoccupied humidify/dehumidify
- Timed override functions

Additionally, the Area application allows users to efficiently perform a single operation, such as changing a setpoint, creating a schedule, performing an override, and apply it to all members of the area. For more information, see the *"Air Systems for Tracer SC Applications Guide", BAS-APG007-EN*.

Variable Air Systems (VAS)

The Variable-Air-Volume Air System (VAS) coordinates the control of air handlers, rooftop units, and variable air volume terminal units. The Tracer SC VAS includes valuable tools to help manage tasks that were previously problematic and time consuming, such as:

- Coordinating AHU and VAV box operation
- Commissioning VAV boxes
- Scheduling common spaces
- Optimizing ventilation
- Optimizing duct static pressure

For more information, see the *"Air Systems for Tracer SC Applications Guide", BAS-APG007-EN.*

Chilled Plant Control (CPC)

The Chiller Plant Control (CPC) application permits you to configure a chiller plant for optimal efficiency and reliability, and provides a means for you to monitor and control the daily operation. Depending upon the many possible chiller plant configurations and design differences, the CPC application can do the following:

- Provide overall chiller plant status information and alarms to local and remote Tracer SC users
- Enable or disable chiller plants
- Start, stop, and monitor the status of system chilled water pumps
- Calculate individual chilled water setpoints for individual chillers in series chiller plants
- Request when chillers are added or subtracted according to building load requirements and user-specified add and subtract logic

- Rotate chillers according to user-defined intervals
- Remove chillers from the rotation in the event

For more information, see the *"Chiller Plant Control for Tracer SC Application Guide", BAS-APG012-EN*.

Trane EarthWise™ Systems

For any building owner concerned with energy, indoor air quality, and the environment, Trane's EarthWise Systems represent a design philosophy whose time has come. EarthWise and EarthWise Elite Systems, by definition, provide documented sustainability of high efficiency and low emissions over the entire lifetime of the building.

Trane EarthWise Systems include:

- Low Flow, Low Temperature CentraVac™ Chilled Water Systems
- Ice Enhanced, Air-Cooled Chiller Plant
- Intelligent Variable Air System for chilled-water applications
- Intelligent Variable Air System for IntelliPak™ rooftop applications
- Central Geothermal Systems

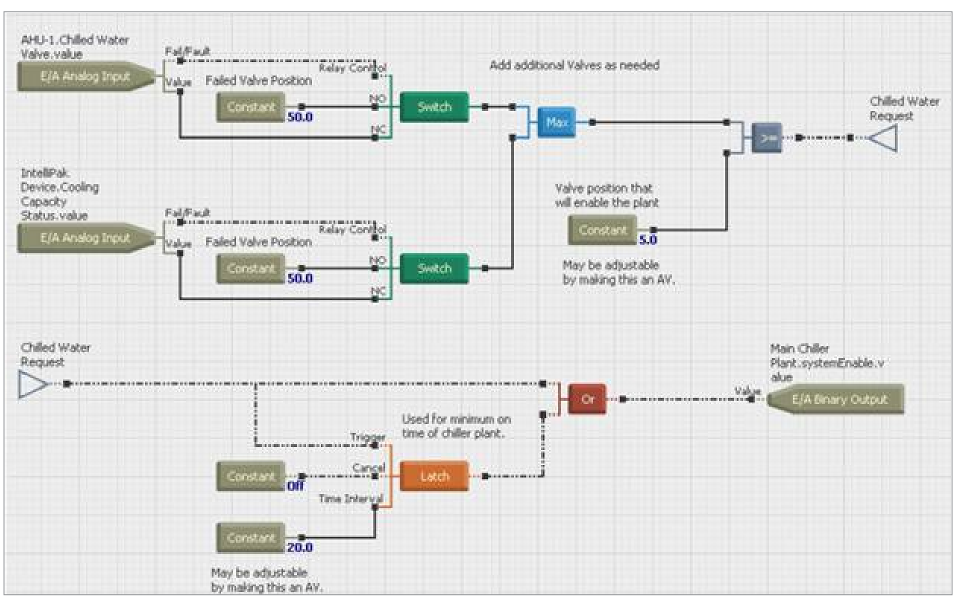
Find out more about EarthWise at http://www.trane.com/Commercial/HvacSystems/1_3_EarthWise.aspx

Tracer Graphical Programming (TGP2)

Tracer Graphical Programming (TGP2) is a powerful graphical program that allows you to customize Tracer system applications. TGP2 routines are typically used for sequencing equipment, calculating setpoints and values, and performing shutdown sequences.

Note: *TGP2 is available through the Tracer™ TU service tool.*

Figure 12. TGP2 example



Unit Control

Unit controllers provide all necessary unit control functions. They operate associated unitary equipment, while ensuring that all built-in safety features are enabled and that diagnostics are issued.

Each controller is designed to operate in stand-alone mode. Therefore, if system control fails, unit operation can continue.

Unit controllers installed on a Tracer SC can be a combination of the following BACnet and LonTalk unit controllers:

BACnet (MS/TP) Unit Controllers Supported by Tracer SC

- Tracer UC210 unit controller for variable-air-volume (VAV) equipment
- Tracer UC400 unit controller for variable-air-volume (VAV) equipment
- Tracer UC400 unit controller for programmable equipment
- Tracer UC800/AdaptiView unit controller for CenTraVac chillers
- BCI-I: BACnet communications interface for IntelliPak system
- BCI-C: BACnet communications interface for chillers
- BCI-R: BACnet communications interface for ReliaTel
- Non-Trane BACnet (MS/TP) devices

Wireless COMM Unit Controllers Support by Tracer SC

- Tracer UC400 unit controller for variable-air-volume (VAV) equipment
- Tracer UC400 unit controller for programmable equipment
- Tracer UC600 unit controller for Air Handler (AHU) equipment
- Tracer UC600 unit controller for programmable equipment

LonTalk Unit Controllers Supported by Tracer SC

- Tracer AH540/541 air-handler controller
- Tracer MP501 multi-purpose controller
- Tracer MP503 input/output module
- Tracer MP580/581 programmable controller
- Tracer VV550/551 VAV controller
- Tracer ZN510/511 zone controller
- Tracer ZN517 unit controller
- Tracer ZN520/521 zone controller
- Tracer ZN523 zone controller
- Tracer ZN524 water-source heat pump unit controller
- Tracer ZN525 zone controller
- Tracer CH530 chiller controller
- Tracer CH532 chiller controller
- LCI-C: LonTalk communications interface for chillers
- LCI-I: LonTalk communications interface for IntelliPak systems
- LCI-R: LonTalk communications interface for ReliaTel systems
- Non-Trane LonTalk devices using SCC, DAC, and chiller profiles; and devices supporting LonTalk standard network generic variables

Resources

The following resources are available for managing Tracer building automation systems:

Tracer SC Installation, setup, and operation

- Tracer SC System Controller Installation and Setup Guide (BAS-SVX31-EN)
- Tracer SC online help
- Tracer SC Installation Instructions (X39641154)
- BACnet Wiring Best Practices and Troubleshooting (BAS-SVX51-EN)
- Expanded Communication Options – FAQs (BAS-PRC073-EN)

Programming

- Tracer Graphical Programming (TGP2) Editor
- Tracer Graphical Programming (TGP2) Application Guide (BAS-APG008) and online help
- Tracer UC400/UC600 with Tracer SC Programming Guide (BAS-SVP06-EN)

HVAC applications

- Tracer SC Air Systems Application Guide (BAS-APG007)
- Tracer SC Chiller Plant Control Application Guide (BAS-APG012)

Service tools

- Tracer TU—Tracer TU Service Tool Getting Started Guide (TTU-SVN01) and online help
- Rover Version 7 Operation and Setup Guide (EMTX-SVX01) and online help

Graphics Tools

- Tracer Graphics Editor (TGE) User Guide (BAS-SVU06-EN)
- Working with Standard Graphic Templates (BAS-SVU15-EN)
- Offline Graphics Creation (BAS-SVU16-EN)
- Centralized Services

Software updates

- Tracer TU Service Tool Getting Started Guide (TTU-SVN01)

Web sites

- MyTraneControls.com: A free online Web site designed to assist Tracer building automation system owners and operators.

Tracer BAS training courses

- The Trane College of Building Automation offers a comprehensive portfolio of technical courses on the operation, installation, and programming of Tracer building automation systems. Refer to http://trane.com/COMMERCIAL/DNA/View.aspx?i=586.

Service, maintenance, troubleshooting

In addition to the resources listed above:

- Trane Product Support
- Warranty information

Specifications

This section contains specifications for Tracer SC system controllers and for Tracer building automation systems.

Table 1. Tracer SC specifications

Client Software Requirements	PC or Mac	Microsoft® Windows XP, Vista, Windows 7: • Internet Explorer™ Version 8.0 or higher • Mozilla Firefox® Version 18.0 or higher • Google Chrome™ Version 25.0 or higher Apple®: • Mozilla Firefox® Version 18.0 or higher • Google Chrome™ Version 25.0 or higher • Safari® 4.0 or higher
	PC Software requirements (Configuration UI only)	• Java™ SE Runtime Environment (JRE) Version 6 or higher • Adobe Flash™ player
	Tablet/Phone	iOS (iPad®/ iPhone®) 5.0 and higher: • Safari is the recommended browser on this platform • Tracer BAS Operator Suite mobile app available for download Android™ 4.0 and higher: • Google Chrome™ is the recommended browser on this platform • Tracer BAS Operator Suite available mobile app for download
	Concurrent Users	• Five
	Supported Languages	• Chinese (Simplified/Traditional) • English • French (Canada/France) • Portuguese (Brazil) • German • Indonesian • Japanese • Korean • Spanish (Latin America) • Thai • Polish • Arabic

Table 1. Tracer SC specifications

Tracer SC system controller	Power requirements	• Nominal rating: 120/230 Vac; 50 or 60 Hz; 1 pH • Maximum current: 24 VDC dedicated circuit breaker
	Operating environment	• Temperature: From –40°F to 122°F (–40°C to 50°C) • Relative humidity: From 10% to 90%, non-condensing
	Storage environment	• Temperature: From –40°F to 158°F (–40°C to 70°C) • Relative humidity: From 5% to 95%, non-condensing
	Agency Listings	UL: • UL-864/UUKL listed (when installed and programmed in accordance with the Engineered Smoke Control System Application Guide, BAS-APG019-EN) • UL-916-PAZX – energy management • CUL-C22.2-signal devices – Canada FCC: • FCC part 15, Class A CE CE: • Emissions EN61326:1998 Class B • Immunity EN61326:1998 • Commercial Safety EN61010-1:2001
	Processor	PowerPC405 Core
	Memory	• FLASH 400 MB • SDRAM 256 MB
	Battery	• No battery required. The clock is maintained for a minimum of three days by the super capacitor. All other programs are backed up by nonvolatile memory.
Protocol Communication	BACnet	Tracer building automation systems communicates with BACnet devices that support: • Communications based on the BACnet ASHRAE/ANSI 135 standard • ENV-1805-1/ENV-13321-1 • 10BASE-T/100BASE-TX dedicated Ethernet (ISO/IEC 8802-3) or Transmission Control Protocol/Internet Protocol (TCP/IP) compatible network Tracer SC is listed by BACnet Test Labs (BTL) as a BACnet Building Controller (B-BC). Listing information can be found at: http://www.bacnetinternational.net
	LonTalk	Tracer building automation systems communicates with LonTalk devices that support: • Communications based on the EIA-709.1 (LonTalk) standard • LonTalk standard network variable types (SNVTs) • FTT-10A or FT-X1 transceivers • Twisted-pair physical media (Level 4 wiring)
	Device Limits	Tracer SC facility (Combination of all protocols) • Up to 240 devices BACnet (Per link/Per facility) • Tracer UC200 Series - 60/240 • Tracer UC400 Series - 60/240 • Tracer UC600 Series- 10/20 • Tracer UC800 Series - 60/240 • BCI Series - 60/240 • Trane Communicating Thermostats - 60/120 • Non-Trane BACnet - 32/240 LonTalk (Per link/Per facility) • AH Series - 120/120 • CH Series - 120/120 • VV Series - 120/120 • ZN Series - 120/120 • MP503 - 120/120 • MP580 - 20/20 • Trane Communicating Thermostats - 120/120 • Non-Trane LON - 120/120 Wireless COMM (Per network/per facility) • WCI - 30/240

Specifications

Table 1. Tracer SC specifications

Medium Enclosure (optional)	NEMA Type	NEMA-1
	Weight	14 lb. (6.5 kg)
	Mounting	Wall-mounted with #10 (5 mm) screws and #10 wall anchors. Mounting surface must be able to support 60 lb. (28 kg)
Large Enclosure (optional)	NEMA Type	NEMA-1
	Weight	50 lb.(23.0 kg)
	Mounting	Wall-mounted with #10 (5 mm) screws and #10 wall anchors. Mounting surface must be able to support 120 lb. (56 kg)

Hardware Components

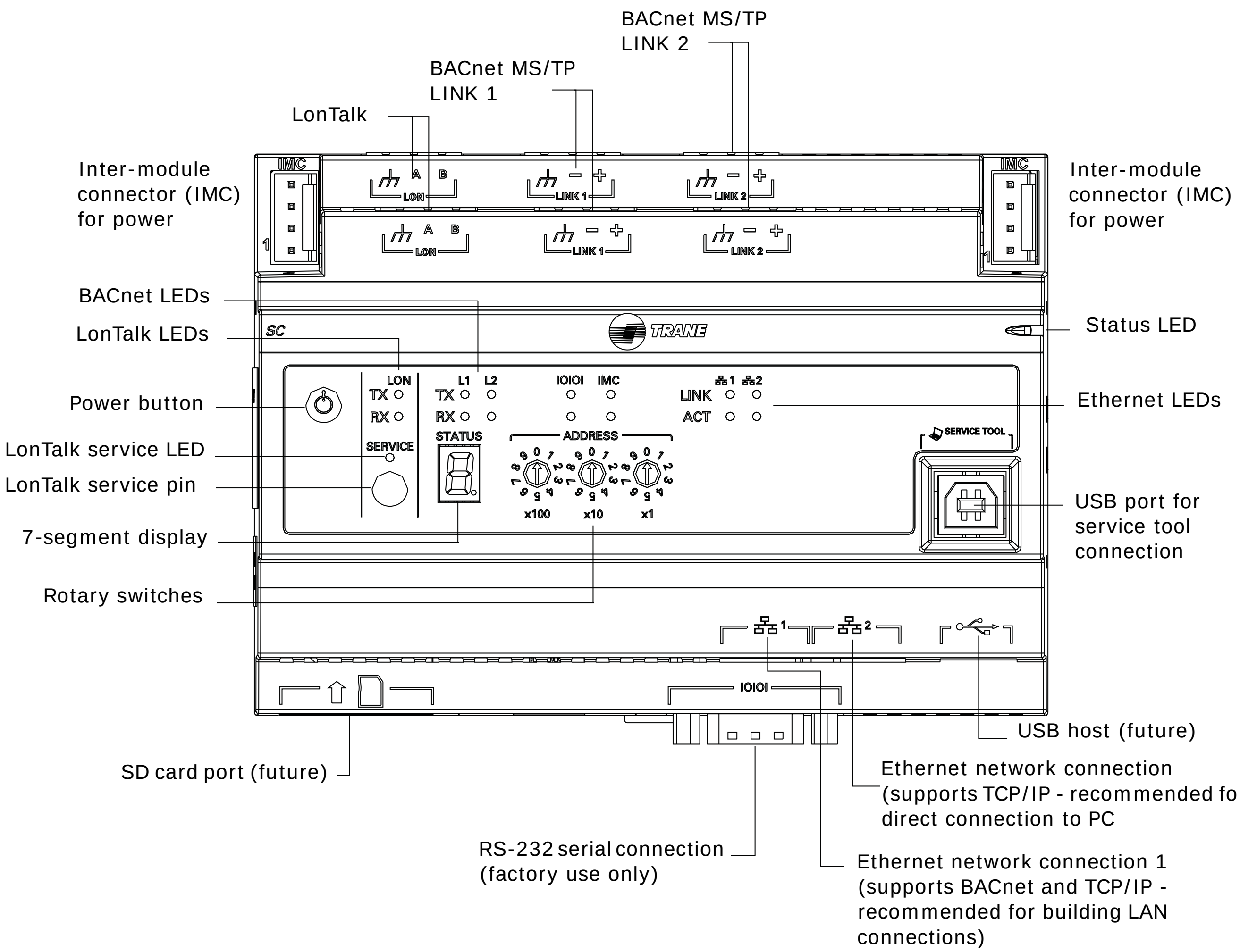
The SC system controller itself and additional hardware options are described in this section.

- Tracer SC system controller components
- Trane PM014 power supply module
- Tracer BACnet terminator
- Medium enclosure
- Large enclosure

Tracer SC System Controller

The Tracer SC system controller components are labeled in Figure 13.

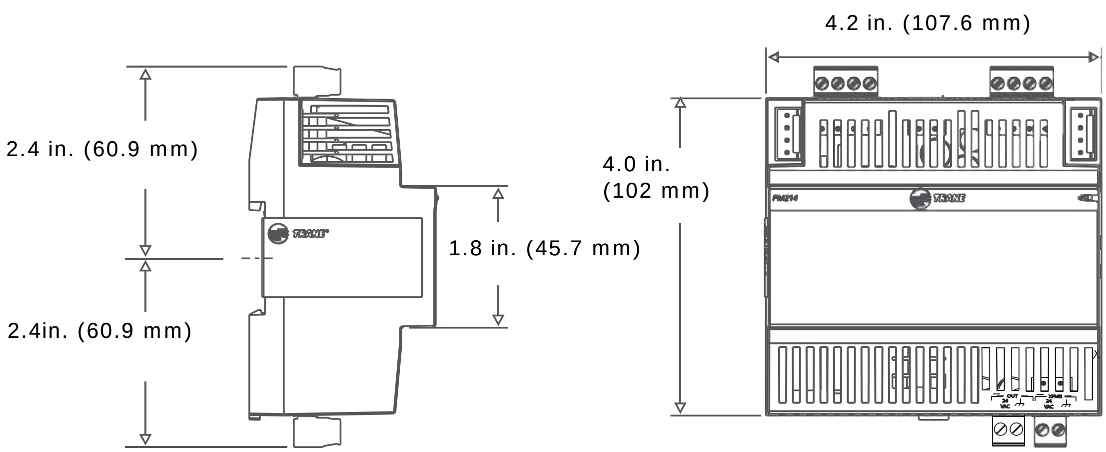
Figure 13. Tracer SC system controller components



Trane PM014 Power Supply Module

The Trane PM014 power supply module provides 24 Vdc for Trane inter-module communication (IMC) buses. IMC buses are used in components of Trane building automation systems, including the Tracer SC system controller. Refer to the *"Power Supply Module Installation, Operation, and Troubleshooting Guide", BAS-SVX33-EN.*

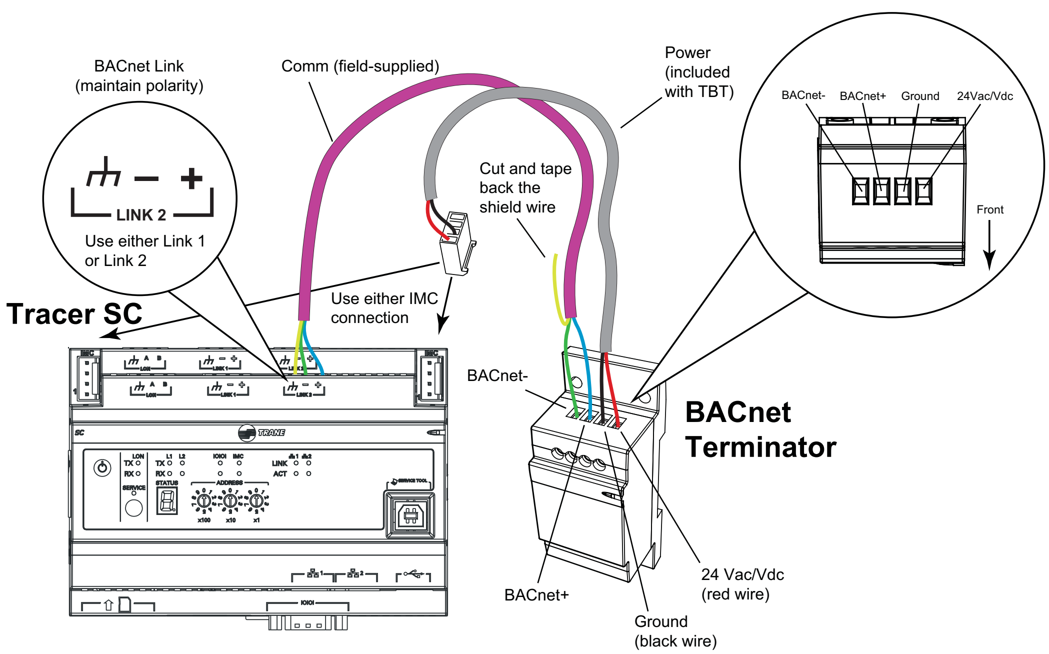
Figure 14. PM014 power supply module (dimensions)



Tracer™ BACnet® Terminator

A Tracer BACnet terminator (*order no. X13651524-01*) is placed at the end of each communication link in order to decrease communication signal degradation. Refer to the "*BACnet Wiring Best Practices and Troubleshooting Guide", BAS-SVX51-EN*.

Figure 15. BACnet terminator (wiring)

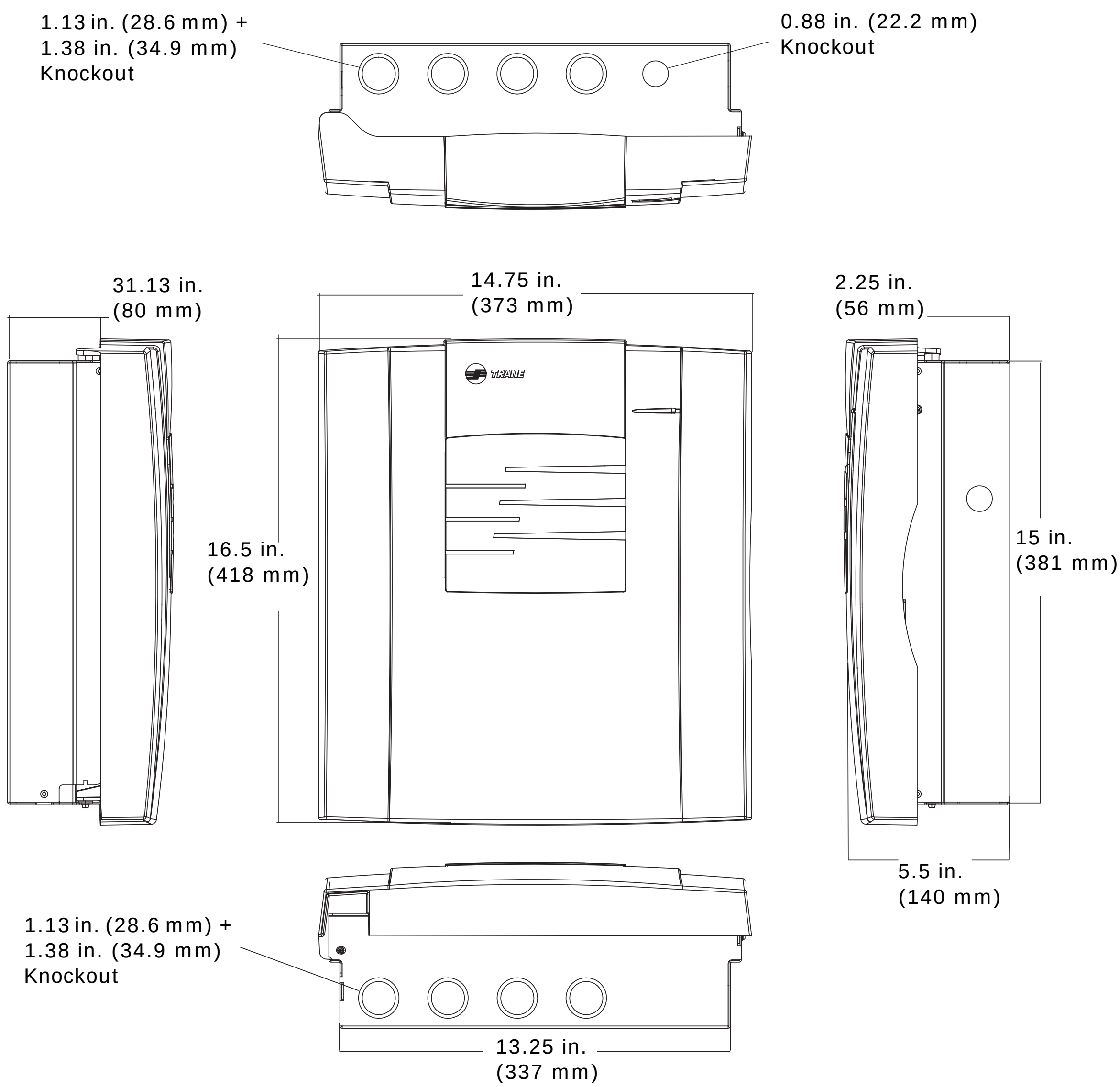


Medium Enclosure (optional)

The medium enclosure for Tracer DIN-mounted controllers is available in the following:

- 120 VAC (*order number: X13651559010*)
- 230 VAC (*order number: X13651560010*)

Figure 16. Medium enclosure (dimensions)

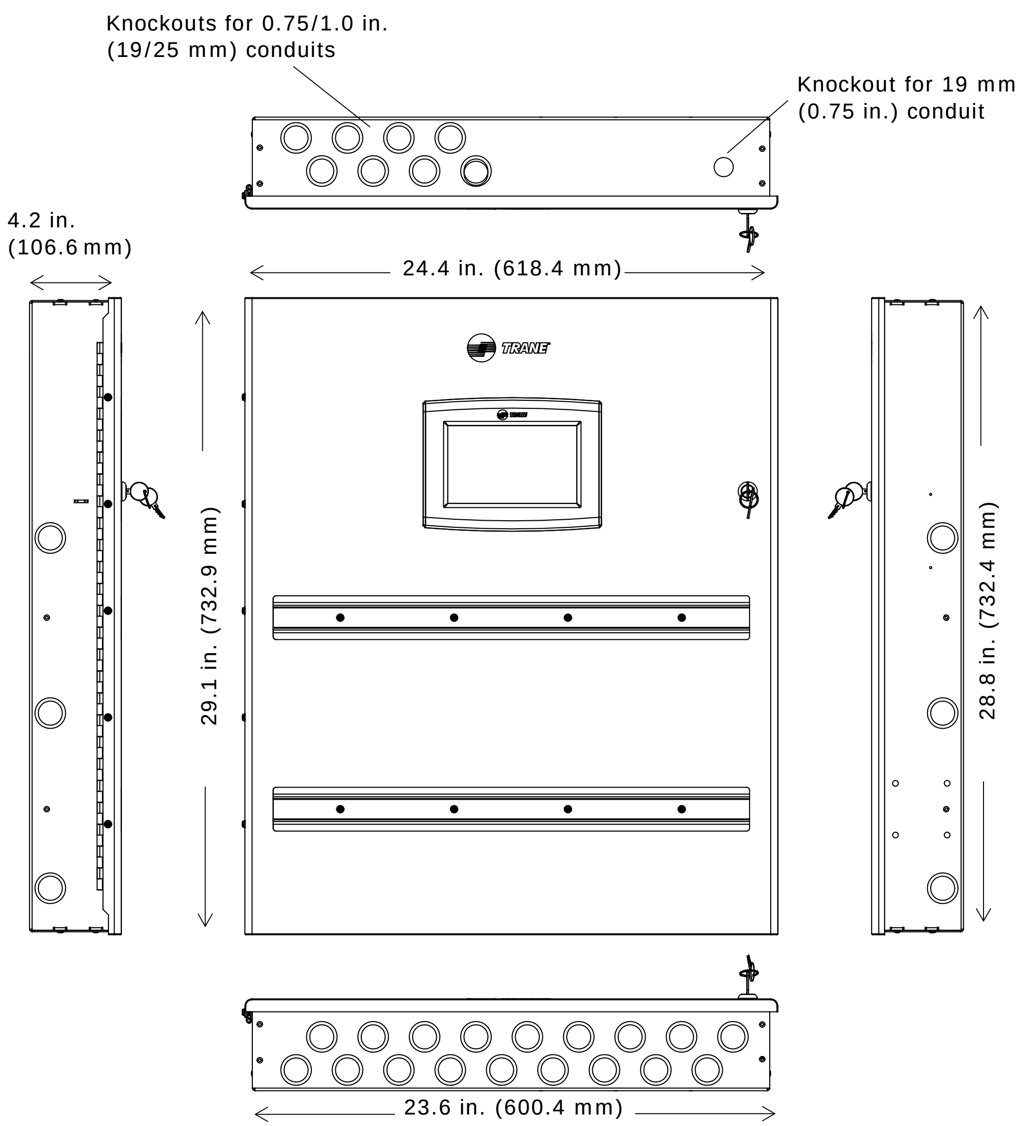


Large Enclosure (optional)

The large enclosure for Tracer DIN-mounted controllers is available in the following:

- 120 VAC
  - solid door *(order number: X1365155201*)
  - display-capable door *(order number: X1365155301)*
- 230 VAC Dual Transformer
  - solid door *(order number: X1365155401*)
  - display-capable door *(order number: X1365155501)*

Figure 17. Large enclosure (dimensions)



Trane optimizes the performance of homes and buildings around the world. A business of Ingersoll Rand, the leader in creating and sustaining safe, comfortable and energy efficient environments, Trane offers a broad portfolio of advanced controls and HVAC systems, comprehensive building services, and parts. For more information, visit www.Trane.com.

Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

BAS-PRC031-EN 10 Jun 2013
Supersedes BAS-PRC031-EN (27 Apr 2013)

Refrigeration

Electrical Economizer

The Power To Save

The *Intellidyne RU* will reduce electric consumption by 10% when installed on commercial refrigeration and freezer systems. *Intellidyne RU* is easily installed by a qualified installer, maintenance free, and guaranteed to save energy.

ENERGY STAR PARTNER

Features

- Dynamic Cycle Management® (DCM) technology is guaranteed to reduce electricity consumption by at least 10%.
- UL listed, “Energy Management Equipment”.
- Increases savings without replacing or upgrading costly system components.
- LED indicators show operating modes.
- Protects compressor against momentary power outages and short cycling.
- Easy installation by a qualified installer.
- No programming or follow-up visits required.
- Maximum year-round efficiency.
- Reduces maintenance and extends compressor life.
- Fail-safe operation.
- 15-year replacement warranty for breakdowns or defects.

INTELLIDYNE LLC
303 Sunnyside Blvd. Suite 75, Plainview, NY 11803

1-866-216-0777
www.intellidynellc.com

Intellidyne®
The Power To Save

Refrigeration

Electrical Economizer

Specifications

Mounting:
In any position via molded 1/2″ electrical fitting
Size:
4″H x 4″W x 2 1/2″D
Operating Humidity:
5% - 95% Non-Condensing
Operating Temperature Range:
-10°F - +120°F
Power Input:
24/115/220 VAC @ 5W
Control Circuit:
24 VAC/DC, 115/220 VAC
Relay Contact:
10A @ 220VAC General Purpose
UL Listed,
"Energy Management Equipment"
Made in U.S.A.

The *Intellidyne RU* is a microprocessor-based, UL listed, electronic control that automatically adjusts the compressor cycles to achieve the greatest efficiency and reduced electrical usage.

The sizing of refrigeration systems is based on a number of factors. When any design considerations are not met, the refrigeration system is oversized for the load and thus less efficient. Intellidyne's patented process analyzes the demands and thermal characteristics of the entire refrigeration system to dynamically modify the compressor cycle pattern. These new patterns result in less frequent and more efficient compressor cycles.

The *Intellidyne RU* improves the electrical efficiency of refrigeration systems by supplementing the antiquated on/off action of the thermostat or pressuretrol with the analysis and control capabilities of a computer.

Intellidyne's patented process uses Dynamic Cycle Management® (DCM) technology to produce electrical energy savings. Our innovative and intelligent algorithms have field proven electrical savings on systems that were properly sized and operating, but also on units that were undersized, and those that had not been properly maintained.

The *Intellidyne RU* works in conjunction with the existing temperature controls, will not void the compressor manufacturer's warranty, and has anti-short-cycling.

Installation by a qualified service technician takes about 45 minutes. The *Intellidyne RU* does not require any programming, adjustments or maintenance.

Economical Efficient Ecological Easy

INTELLIDYNE LLC
303 Sunnyside Blvd. Suite 75, Plainview, NY 11803
1-866-216-0777
www.intellidynellc.com

 Form RU2500rev14.0

IntelliCon®-RU

COMMERCIAL REFRIGERATION ENERGY ECONOMIZER

Description

The *IntelliCon®-RU* is a patented microprocessor-based energy-saving device for commercial refrigeration systems. The *IntelliCon®* reduces electric consumption and lowers compressor run-time by actively managing the compressor cycling pattern, in conjunction with the existing compressor controls. Note that the *IntelliCon®* can not cause the compressor to run when the controls are not calling for cooling. The *IntelliCon®-RU* enhances compressor protection by eliminating compressor short-cycling. This unit is compatible with Intellidyne's Remote Display Unit (model RDU). In addition to Status, the RDU will also indicate total compressor run-time and economizer time.

Electric Ratings

Power Input: 24, 115, 220 VAC ± 10%, 5 Watts Max., 50/60Hz
Control Circuit Input: 24,115,220 VAC ± 10%, 0.1A Max. Burden
Relay Contact: Form B, 10A @ 220 VAC

Environmental Conditions

Indoor Use
Maximum Altitude (2000M)
Rated Ambient Temperature 32 - 120˚F. (0 - 49˚C.)
Maximum Rh 90% non-condensing
Mains Supply Voltage Fluctuations ± 10%
Transient Overvoltage Category (III)
Pollution Degree (2)

Operation

After installation, setting the slide switch on the top of the unit to the 'ON' position activates the device. The lights on the front panel indicate the state of operation of the device and will sequence as the device goes through its operating cycle. Each light indicates one of the possible modes of operation, which are:

STANDBY MODE: The refrigeration unit's control system has shut off the compressor after cooling the space to the desired temperature. The *IntelliCon®-RU* is waiting for the next call for the compressor to start. This occurs for a period of time after the compressor has shut down.

ECONOMIZING: The refrigeration unit's compressor control has requested the compressor to start but the *IntelliCon®-RU* has intervened to delay the start based on information it has gathered from the previous run cycle.

COMPRESSOR ON: The compressor is enabled.

ANTI-SHORT-CYCLE: This is an added compressor protection feature of the device, which ensures at least a thirty-second delay between compressor starts. This light will illuminate whenever the compressor has been turned off and will remain on for the thirty-second protection period. The compressor can not be enabled while this light is lit.

During normal operation, the top three lights will cycle from one state to the next and the anti-short-cycle light will come on for thirty-seconds after the compressor is stopped.

Installation

The *IntelliCon®-RU* is electrically installed in series with the refrigeration unit's compressor control as shown in the wiring diagrams on the reverse side. Check and determine the voltages of the compressor control circuit and power circuit prior to installation. **FOR SAFETY, POWER TO THE UNIT MUST BE DISCONNECTED DURING INSTALLATION.**

Positioning

The unit must be protected from the elements and may be mounted on the equipment either vertically or horizontally. The unit should be mounted directly on the existing electric enclosure via the unit's standard ½" electrical fitting or within the enclosure using an accessory mounting bracket. For mounting in the elements, a rain-tight mounting enclosure is available.

Wiring

All wiring and connections must comply with Local and National Electrical Codes. The unit should be wired as shown in the wiring diagrams on the reverse side. It is important to read all of the instructions carefully. Ensure that POWER TO THE UNIT IS OFF DURING INSTALLATION and that all unused leads are individually taped/insulated.

Checkout

Recheck wiring one last time. Set the *IntelliCon®-RU* slide switch to 'Off/Bypass' and restore power to the compressor. Set the slide switch to 'On'. First, as part of the system check, all four (4) lights on the *IntelliCon®-RU* will be briefly lit and then go out. Next, either the 'STANDBY MODE', or the 'ECONOMIZING' light will activate depending upon the operating state of the refrigeration unit controls. The 'ANTI-SHORT-CYCLE' light will come on and remain on for thirty-seconds. This is normal during power-up. After the thirty-second interval, the 'ANTI-SHORT-CYCLE' light will go out. Next, if the 'ECONOMIZER' light is lit, after a short delay the 'COMPRESSOR ON' light will light and the compressor should start. If this happens, the installation is complete.

If the *IntelliCon®-RU* remains in the 'STANDBY MODE' after the 'ANTI-SHORT-CYCLE' light goes out, it will be necessary to simulate a cooling call to verify proper operation. Note the control thermostat or pressuretrol setting and force a compressor call by temporarily resetting the control. Verify that the *IntelliCon®-RU* has changed modes to either 'ECONOMIZING' or 'COMPRESSOR ON'. This indicates the unit is operating normally. *Make sure to return the compressor control to its' previous setting*. If the *IntelliCon®-RU* does not come out of 'STANDBY MODE' when the unit's control is calling for the compressor to run, the unit is probably miswired; see the WIRING NOTE below.

Service and Troubleshooting

After Installation and Checkout, the *IntelliCon®-RU* requires no maintenance and will provide years of trouble free operation.

The unit may be bypassed at any time by putting the slide switch to the 'Off/Bypass' position. In this position, the unit has no effect on the system and the compressor will function as it did prior to the *IntelliCon®-RU* installation. This allows service personnel to diagnose problems without the *IntelliCon®-RU* interfering.

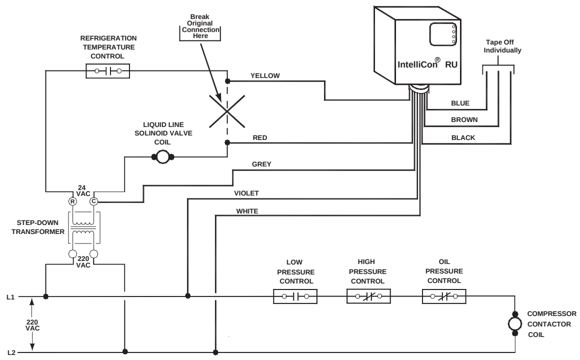
IMPORTANT - READ CAREFULLY

1. **Failure to follow these instructions may result in damage to the system or cause a hazardous condition.**
2. **Installer must be experienced, qualified, and in certain locations, licensed to work on the system that this control is being installed on.**
3. **After installation is complete, follow the check-out procedure as provided in these instructions to confirm proper system operation .**
4. **Intellidyne is not responsible for improper installation or any damages that may result from improper installation.**
5. **Actual wiring may differ from that shown in the diagrams.**
6. **Equipment may have controls not shown.**
7. **Because the *IntelliCon* can operate with different voltages for the power and control circuits, it has separate common wires for these circuits. It is necessary that these wires are connected to the proper commons or the unit will not function properly. *See the wiring diagrams on the reverse side of this sheet for details.***

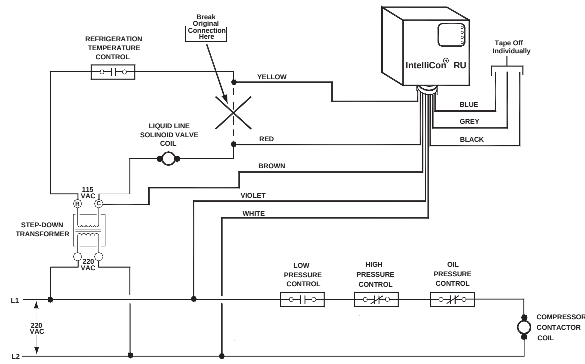
IMPROPER VOLTAGE SELECTION MAY DAMAGE THE UNIT AND VOID THE WARRANTY.

Intellidyne LLC • 303 Sunnyside Blvd., Suite 75 • Plainview, NY 11803 USA • Phone (516) 676-0777 • Fax (516) 676-2640

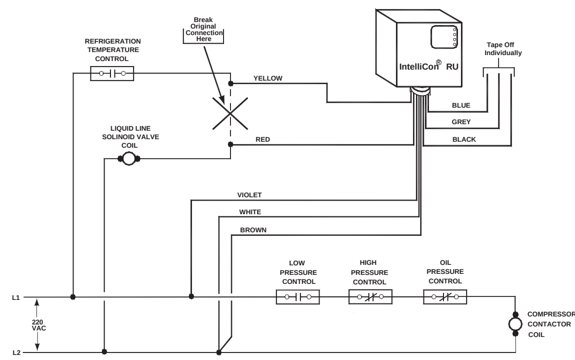
Typical 1Ø or 3Ø Pump-down Type Refrigeration Systems



220 VAC Power, 24 VAC Control

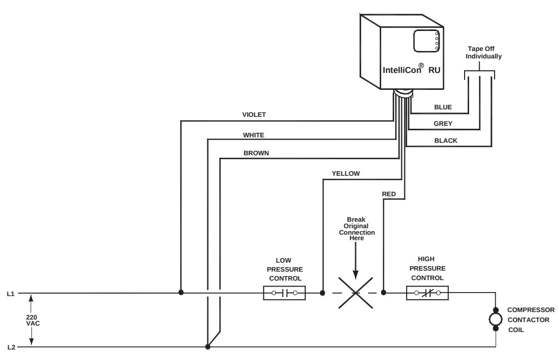


220 VAC Power, 120 VAC Control

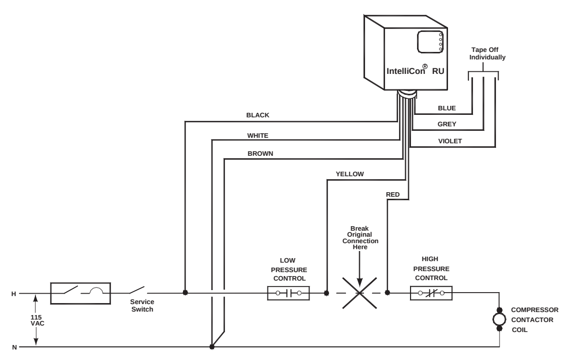


220 VAC Power and Control

Typical 1Ø or 3Ø Pressure Control Type Refrigeration Systems



220 VAC Power and Control



120 VAC Power and Control

Job Information	Technical Data Sheet
Job Name	Honeywell- Verona – F.N. Brown
Date	7/31/2014
Submitted By	Jennifer Olivo
Software Version	01.90
Unit Tag	UV 001

Unit Overview

Model Number	Voltage	Cooling Coil Type	Heating Coil Type
UAEQ7044	460/60/3	DX	Electrical

Physical

Unit		Controls
Arrangement	Weight	Type
Vertical, Floor Mounted	1075 lb	Factory Installed Digital Controls

Electrical

Voltage	Minimum Voltage	Maximum Voltage	Total Unit MCA	Maximum Fuse Size
460/60/3 V/Hz/Phase	414 V	506 V	49.0 A	50 A

Fan

Performance				
Speed	Air Volume CFM	External Static Pressure inH_2O	Motor Power HP	Fan Full Load Current A
High	1500	0.00	0.250	2.70

Evaporator Coil

Cooling Performance							
Capacity		Air Temperature				Total Heat of Rejection Btu/hr	EER
		Entering		Leaving			
Total Btu/hr	Sensible Btu/hr	Dry Bulb °F	Wet Bulb °F	Dry Bulb °F	Wet Bulb °F		
44900	30400	80.0	67.0	61.3	57.7	59531	10.47

Heating Performance				
Total Capacity Btu/hr	Air Temperature Dry Bulb		Total Heat of Absorption Btu/hr	COP
	Entering °F	Leaving °F		
27991	70.0	87.2	13587	1.94

Evaporator Coil

Cooling Performance						
Capacity		Air Temperature				EER
Total Btu/hr	Sensible Btu/hr	Entering Dry Bulb °F	Entering Wet Bulb °F	Leaving Dry Bulb °F	Leaving Wet Bulb °F	
44900	30400	80.0	67.0	61.3	57.7	10.47

Condenser Coil

Performance				
Refrigerant Type	Ambient Temperature			
	Cooling		Heating	
	Dry Bulb °F	Wet Bulb °F	Dry Bulb °F	Wet Bulb °F
R-410A	95.0	70.0	20.0	7.0

Electric Heat

Performance				
Total Capacity Btu/hr	Air Temperature Dry Bulb		Number of Elements	Electric Heater Current A
	Entering °F	Leaving °F		
75067	70.0	116.1	6	28.86

Warranty

Type	
Extended:	Ext. 4 yr. parts - (Entire Unit)

Notes

Accessories

Part Number	Description
105636090	6" EndPnl,A-Ivry,16-5/8D,Solid,Acoustic(A*Q ER GR)
105631718	LVR VERT W/GRILLE SELFC 28HX108L CLR ANOD- W/FLGE
910116774	Wall Stat,ACO,7-Day Prog,2HT/2CL w/wall plt,1-pk

TEL

World leaders in airflow
controls and monitors

Kitchen Hood Controls (VAV)

Product Brochure

Kitchen Hood Controls (VAV)

20% of energy costs are to condition air

The average food service kitchen exchanges inside air for fresh outside air at least 20 times per hour. It sounds like an effective way to keep a kitchen comfortable and safe, but in most situations it is actually a huge drain on energy resources that provides no real health benefits to employees or guests. Roughly 25% of a food service operations energy costs go to conditioning the outside air brought in during these air exchanges, and according to estimates from the American Gas Association, the U.S. food service industry wastes more than $2 billion each year because of excessive ventilation.

Excessive ventilation

Technology is typically the culprit. Until a few years ago, most kitchen ventilation controls consisted of a manual on/off switch and a magnetic relay or motor starter for each fan. Exhaust and make up fans either operated at 100% speed or not at all, and the whir of the exhaust fan was a common sound in the average commercial kitchen – even when cooking equipment was not in use. Manual two speed systems that relied on cools to switch from low to high speed and vice versa offered some energy savings but were seldom used efficiently.

Variable volume control

The TEL kitchen control system has changed all that. With microprocessor based controls whose sensors automatically regulate fan speed based on cooking load, time of day and hood temperature while minimising energy usage. The TEL system includes a temperature sensor installed in the hood exhaust collar, IP sensors on the ends of the hood that detect the presence of smoke or cooking effluent and variable frequency drives (VFD) that control the speed of the fans.

Variable volume hoods reduce running costs and increase equipment life

If you're not using a variable volume hood it is always at maximum design volume when running. The TEL Kitchen control system detects both smoke and temperature rise, increasing the volume when it is needed. Most kitchen hoods require full exhaust performance for only a small percentage of the day. Varying the speed of the fan as the cooking loads change will save money by reducing ventilation needs.

Temperature Electronics Ltd. Unit 2, Wren Nest Road, Glossop SK13 8HB UK
T. +44 (0) 1457 865 635 **F.** +44 (0) 1457 868 843 **E.** sales@tel-uk.com **w.** www.tel-uk.com

Kitchen Hood Controls (VAV)

Benefits go beyond energy savings

Variable volume can also mean:

A significantly quieter kitchen

Even relatively small decreases in speed can reduce the kitchen noise level. When the fans run at 80% speed, the air noise generated at the grease filters decreases more than 20%, when the fans run at 50% speed, the air noise is virtually eliminated. The result: a more pleasant environment for employees and guests (when the hoods are located near customers).

Reduced HVAC equipment wear

Soft-starting the hood fans with a VFD extends belt life, and reducing the outside air load on the kitchen air conditioning units reduces compressor run time and extends life as well (this can also apply to refrigeration units inside the kitchen). In addition, reducing the makeup air decreases the rate at which the filters become dirty and need to be cleaned or replaced.

Decreased grease entrapment

Excessive fan speeds send grease up the duct, into the fan and out to the building roof, and sometimes, into the atmosphere. Slowing down the exhaust fans and reducing the air duct velocity allows the grease to drain back into the hood and into grease cups, where it can be easily disposed if, which reduces the frequency that the hoods and ducts need to be cleaned.

Sample energy calculation

The following calculation was done based on a Kitchen Hood 16 ft x 4 ft in Allentown,PA using a LPHW heating system without cooling and considers the exhaust and supply air fans running at full speed 14 hours per day, 7 days per week, 52 weeks per year.

Hood air volume	Gas Costs	Electricity
4000 cfm	$ 1.07 / Therm	$ 0.088 per kWh

Calculation 1 Based on 16 Hours/day (6.00am- 10.00pm), 7 days / week, 52 weeks / Year (CAV)

Annual Energy Cost $ 17,760.32

Calculation 2 Based on 16 Hours / day (6.00am- 10.00pm), 7 days / week, 48 weeks / Year with variable exhaust and supply volume (VAV)

Annual Energy Cost $ 8,023.54

Potential Annual Energy Cost Savings $ 9,736.78

Key benefits

a. The exhaust volume for a kitchen hood can be significantly reduced.

b. The energy costs of the input air heating and cooling system may be significantly reduced.

c. The carbon footprint will be reduced.

d. A quieter kitchen - Even relatively small decreases in speed can reduce the kitchen noise level. When the fans run at 80 percent speed, the air noise generated at the grease filters decreases more than 20 percent; when the fans run at 50 percent speed, air noise is virtually eliminated. The result: a more pleasant environment for employees and guests (when the hoods are located near customers).

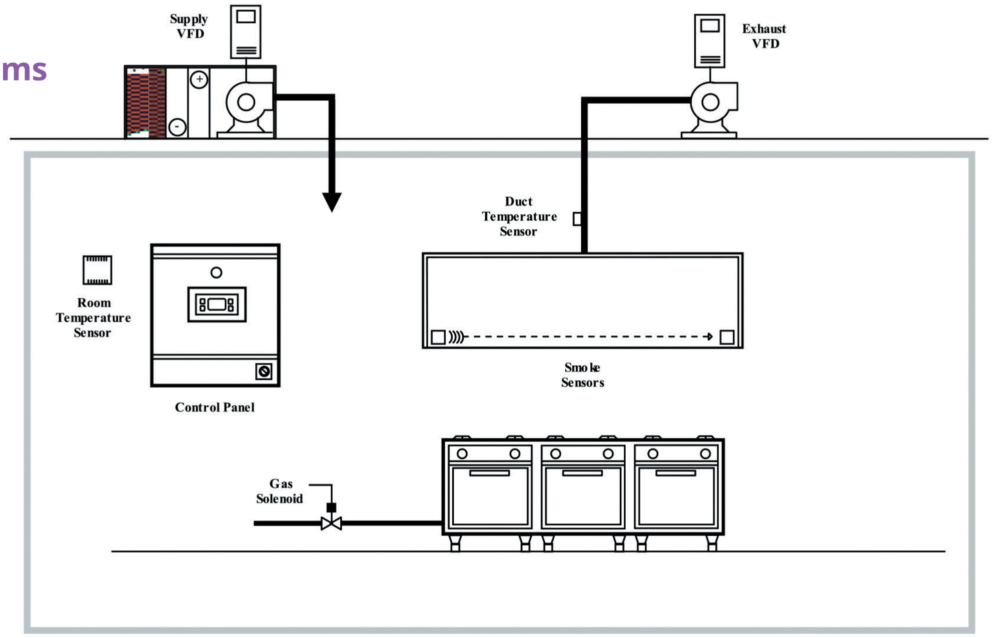
e. Reduced HVAC equipment wear - Soft-starting the hood fans with a VFD extends belt life, reducing the make-up airflow decreases the rate at which the filters become dirty and need to be cleaned or replaced.

f. Decreased grease entrapment - Excessive fan speeds send grease up the duct, into the fan and out to the building roof and, sometimes, even into the atmosphere. Slowing down the exhaust fans and reducing the air duct velocity allows the grease to drain back to the hood and into grease cups, where it can be easily disposed of, which reduces the frequency that the hood and ducts need to be cleaned.

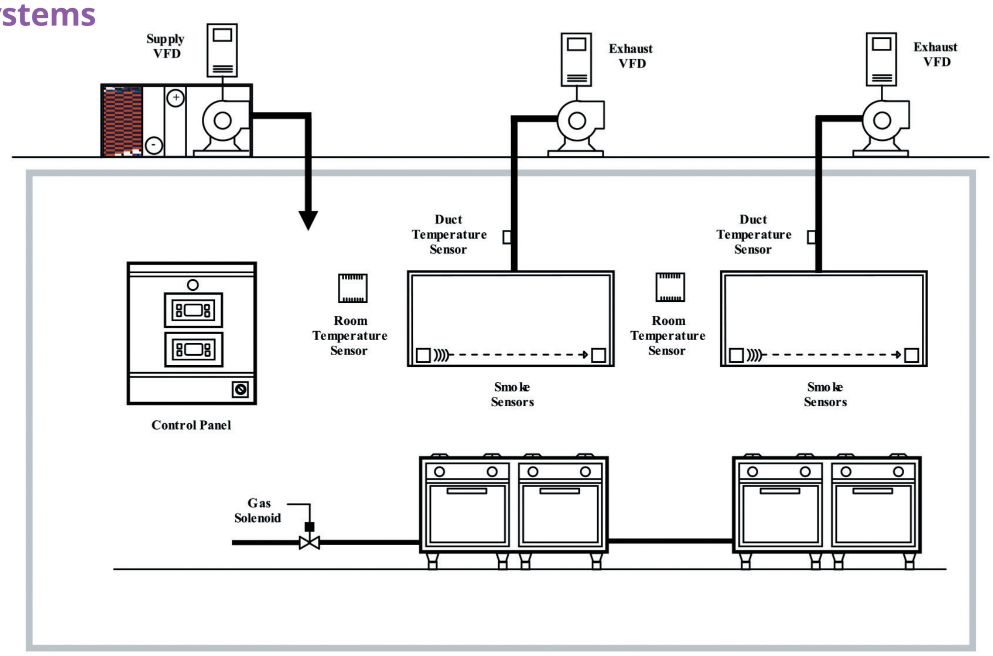
g. The system may be readily linked to a computerized building management system.

Typical Kitchen VAV control system

for single systems



for multiple systems



Kitchen Hood Controls (VAV)

Features

- Single or Multiple Hood control.
- Ventilation On/Off from control panel or Auto On/Off on a time basis (from on board time clock or BMS).
- Up to 3 On/Off time periods per day using on board time clock.
- Can be set for annual time scheduling with holidays and exceptions.
- Measures the duct and room temperatures and uses the differential temperature to control the speed of the exhaust and supply fans to maintain good exhaust with minimum energy consumption.
- Compensates for heat gain in the room from other equipment by controlling to room temperature set point if the room temperature exceeds the set value.
- The smoke detector inside the hood will detect any sudden plumes of smoke and runs the ventilation at maximum speed for a set period of time or until the smoke has cleared.
- Auto Run feature if heat is detected outside of normal hours operation.
- Auto Run On feature to extend the ventilation running period until cooking has finished.
- Remote Emergency pushbutton to override the Automatic controls for a given period of time.
- Max/Auto/Standby operation modes.
- Selectable Metric / Imperial Units
- Modbus RTU and BACnet coms on board for connection to BMS.
- Graphic digital display with indication of ventilation output, temperatures and alarms.
- Pushbutton menu set up with password protection.

Gas interlocking

Cutting off the gas flow in the event of kitchen ventilation failure is now a requirement in most commercial kitchens :-

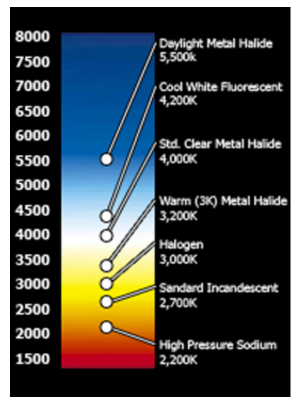
- On installation of a completely new extraction/ ventilation canopy
- On installation of a new pipe run
- On installation of a new cook line or layout
- When fitting any new or replacing any Category B equipment (Ovens/fryers/grills etc)

The optional Gas Interlock system senses the ventilation system pressure and switches off the gas flow if the ventilation fails. The gas flow is also switched off when the ventilation system is switched off from the Kitchen Hood controller.

The TEL kitchen hood VAV system can be supplied with an integrated Gas Interlock system

Spec Sheet

SKU#	120335
Product Name	HP 154W 4700K LED 120 Deg Aluminum Cone High Bay Light
Description	High Bay, 154W, Open, 4700K, 120-277VAC, 24LED, 120deg AL, HP
Estimated Energy Cost ($/yr)**	319.8
Watts (W)	154
Light Output (Lumens)	12300
Efficacy (Lumens/Watt)	79.87
Color Accuracy (CRI)	80
Color Temperature (K)	4700-4900
Lighting Angle/Type	120
Power Factor	0.95
Working Voltage	120-277VAC
LED Count/Type	24
Lens Reflector Style	Aluminum
Operating Temperature (F)	-22 to 158
Mount/Base Type	Hanging Hook
Dimensions (inches)	0.00 L x 0.00 W x 15.00 H x 20.00 DIA
Weight (pounds)	12
Typically Replaces	250-400W MH/HPS Fixture
Typical Life Expectancy (L70 Hours)	50,000
Approvals / Certifications	UL DLC
Photometric Data Available?	No
IES File Available?	No



Features

Traditional style aluminum housing with integrated ultra-efficient brass and thin-fin aluminum heat sink structure; open loop on top for hook for hanging mounting, can accomodate other mounting methods; anodized aluminum Parabolic reflector cone; constant current solid state long 50,000+ hour life; wide input voltage; high shock & vibration resistance; mercury-free; no noise; instant on/off great with occupancy sensors; IEC directives completed: IEC 60598, IEC 61000-3-2:2005, IEC 61347, UL8750; UL listed and DLC listed.

NOTE: The preliminary performance information provided in this notice is pending verification by an independent testing laboratory. Contact your Seesmart representative for more information about photometric and other performance testing information for this product.

** Calculation based on 3 hours/day, $0.11/kWh. Cost depends on rates and use.

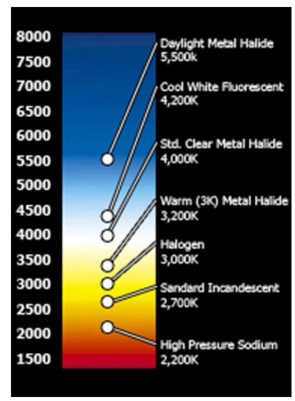
Specifications are valid as of 010-11-19 08:58:30] , but are subject to change.
Confirm latest specifications prior to placing order.

Web: www.seesmartled.com | Tel: 877.578.2536

SEESMART®
EARTH FRIENDLY LED SOLUTIONS

Spec Sheet

SKU#	120346
Product Name	HP 200W 5500K LED 120 Deg Aluminum Cone High Bay Light
Description	High Bay, 200W, Open, 5500K, 120-277VAC, 32LED, 120deg AL, HP
Estimated Energy Cost ($/yr)**	383
Watts (W)	200
Light Output (Lumens)	16495
Efficacy (Lumens/Watt)	82.48
Color Accuracy (CRI)	78
Color Temperature (K)	5500-5900
Lighting Angle/Type	120
Power Factor	0.95
Working Voltage	120-277VAC
LED Count/Type	32
Lens Reflector Style	Aluminum
Operating Temperature (F)	-22 to 158
Mount/Base Type	Hanging Hook
Dimensions (inches)	0.00 L x 0.00 W x 18.00 H x 20.00 DIA
Weight (pounds)	16
Typically Replaces	250-400W MH/HPS Fixture
Typical Life Expectancy (L70 Hours)	50,000
Approvals / Certifications	UL DLC
Photometric Data Available?	No
IES File Available?	No



Features

Traditional style aluminum housing with integrated ultra-efficient brass and thin-fin aluminum heat sink structure; open loop on top for hook for hanging mounting, can accomodate other mounting methods; anodized aluminum Parabolic reflector cone; constant current solid state long 50,000+ hour life; wide input voltage; high shock & vibration resistance; mercury-free; no noise; instant on/off great with occupancy sensors; IEC directives completed: IEC 60598, IEC 61000-3-2:2005, IEC 61347, UL8750; UL listed and DLC listed.

NOTE: The preliminary performance information provided in this notice is pending verification by an independent testing laboratory. Contact your Seesmart representative for more information about photometric and other performance testing information for this product.

** Calculation based on 3 hours/day, $0.11/kWh. Cost depends on rates and use.

Specifications are valid as of 010-11-19 08:58:30] , but are subject to change.
Confirm latest specifications prior to placing order.

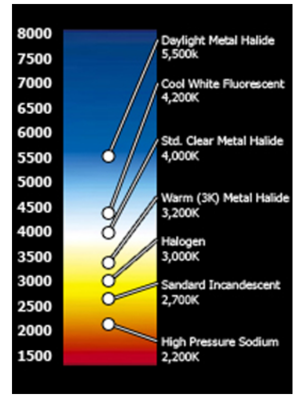
Web: www.seesmartled.com | Tel: 877.578.2536

SEESMART™

EARTH FRIENDLY LED SOLUTIONS

Spec Sheet

SKU#	200732R
Product Name	G2 HP 4 Foot 15W NWC Rotatable SEP Rotatable LED Tube Light
Description	Tube Light, 4 Foot, 15 Watt, NWC, 120-277VAC, Rot, SEP, G2, HP
Estimated Energy Cost ($/yr)**	21.65
Watts (W)	15
Light Output (Lumens)	1800
Efficacy (Lumens/Watt)	120
Color Accuracy (CRI)	85
Color Temperature (K)	4000-4500
Lighting Angle/Type	120
Power Factor	0.98
Working Voltage	120-277VAC
LED Count/Type	64
Lens Reflector Style	Clear
Operating Temperature (F)	-20 to 122
Mount/Base Type	Med Bi-Pin
Dimensions (inches)	48.00 L x 0.00 W x 0.00 H x 1.11 DIA
Weight (pounds)	0.9
Typically Replaces	32-45W T8 Fluorescent
Typical Life Expectancy (L70 Hours)	50000
Approvals / Certifications	UL
Photometric Data Available?	No
IES File Available?	No



Features

Strong yet lightweight aluminum heat sink; ultra-bright, long-life 5630 SMD LEDs; polycarbonate lens; no UV, noise, or flickering; constant-current integrated driver; high shock and vibration resistance; mercury-free; single end power configuration; rotatable end cap; UL listed.

NOTE: The preliminary performance information provided in this notice is pending verification by an independent testing laboratory. Contact your Seesmart representative for more information about photometric and other performance testing information for this product.

** Calculation based on 3 hours/day, $0.11/kWh. Cost depends on rates and use.

CR22™

2′x2′ Architectural LED Troffer

Product Description

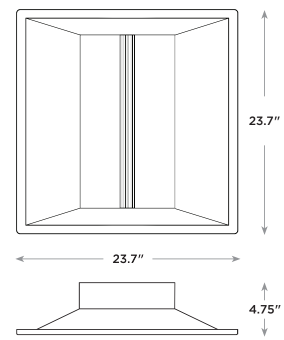
The CR22 Architectural LED troffer delivers up to 100 lumens per watt of exceptional 90 CRI light at both 2000 and 3200 lumen levels. This breakthrough performance is achieved by combining the high efficacy and high-quality light of Cree TrueWhite® Technology with a unique thermal management design. The CR22 High Definition (HD) option delivers enhanced spectrum 80+ CRI color quality. The CR22 product family is available in warm, neutral, cool, or daylight color temperatures and has step, 0-10V, or Lutron EcoSystem® Enabled dimming options. Its compact, lightweight design makes the CR22 perfect for use in commercial new construction or renovated spaces.

Performance Summary

- Utilizes Cree TrueWhite® Technology or High Definition Color
- Active Color Management
- Room-Side Heat Sink
- Assembled in the US & Mexico
- **Efficacy**: 90-100 LPW
- **Delivered Light Output**: 2000, 3200 lumens
- **Input Power**: 22-35 watts
- **CRI**: 90 CRI (Cree TrueWhite® Technology), 80+ CRI (High Definition)
- **CCT**: 3000K, 3500K, 4000K, 5000K
- **Input Voltage**: 120-277 VAC or 347 VAC*
- **Warranty**: 10 Years
- **Lifetime**: Designed to last from 50,000 hours (HD), 75,000 hours (Standard TW), and 100,000 hours (HE TW)
- **Controls**: Step Level to 50%, 0-10V Dimming or Lutron EcoSystem® Enabled to 5%
- **Mounting**: Recessed

*32L- 100 LPW 10V types only- other types require addition of a 347 accessory kit

CR22™



NOTE: Use of Expanded Junction Box will expand the depth to 6.67″ and Emergency Backup will expand the depth to 6.30″. Use of 347V will increase fixture height by 1.4".

Housings & Accessories

Accessories			
CPLCR Chicago Plenum Field Kit **CPLCR-EM** Chicago Plenum Field Kit-Emergency	**CR-347V** 347 Volt **CR-347V-SD** Step Dimming to 50% **SMK-CR22** Surface Mount Kit	**PW-18/4-06-9T/SS-CR** Power Whip **AC5-18/4-72-PD8-JB** Adjustable Cable	**AC5-72-PD8-JB** Adjustable Cable **EJBCR-5PK** Expanded size junction box for through wiring (5 pack)

Ordering Information

Example: CR22-20L-35K-S

CR22					
Product	**Lumen Output**	**Color Temp**	**Voltage**	**Control**	**Options**
CR22	**20L** 22W 2000 lumens – 90 LPW **32L** 32W 3200 lumens – 100 LPW	**30K** 3000 Kelvin **35K** 3500 Kelvin **40K** 4000 Kelvin **50K** 5000 Kelvin	**Blank** 120-277 Volt (Standard) **34**[6] 347 Volt (Optional)	**S** Step Dimming to 50% **10V** 0-10V Dimming to 5% **LES** Lutron EcoSystem® Enabled to 5%	**HD**[7] High Definition Color - CRI 80+ (35W 3200 lumens - 90 LPW) **EB14**[2,4] Emergency Backup - 1400 lumens **EB14 SMK**[2,3,5] Emergency Backup with surface mount kit - 1400 lumens

1. Reference www.cree.com/lighting for recommended dimming control options. 2. Not available in LES types except 32L LES type. 3. Not available with EB14 option. Use EB14 SMK. 4. EB14 not for use with SMK Kits 5. Includes surface mount kit accessory (SMK-CR24). 6. 347V integrated option only available on 32L 100 LPW 10V fixtures. Wattage increases to 33.5W and fixture height increases by 1.4" over standard 120-277V fixtures. 7. HD only available in 32L. Suggested MSRP for the adder over the standard CR Series fixture for the Lutron EcoSystem® Enabled feature is $49. †See www.cree.com/lighting for warranty terms.

Rev. Date 9/17/2013

Product Specifications

CREE TRUEWHITE® TECHNOLOGY

A revolutionary way to generate high-quality white light, Cree TrueWhite® Technology mixes the light from the highest performing red and unsaturated yellow LEDs. This patented approach delivers an exclusive combination of 90+ CRI, beautiful light characteristics, and lifelong color consistency, all while maintaining high luminous efficacy—a true no compromise solution.

HIGH DEFINITION COLOR

High Definition (HD) Color delivers enhanced spectrum 80+ CRI color quality. HD is derived from color mixed and tuned Cree TrueWhite® Technology.

ROOM-SIDE HEAT SINK

An innovative thermal management system designed to maximize cooling effectiveness by integrating a unique room-side heat sink into the diffusing lens. This breakthrough design creates a pleasing architectural aesthetic while conducting heat away from LEDs in a temperature-controlled environment. This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

LUMEN MAINTENANCE FACTORS

- Reference www.cree.com/lighting for detailed lumen maintenance factors.

CONSTRUCTION & MATERIALS

- Durable 20-gauge steel housing with standard troffer access plate for electrical installation.
- Field replaceable light engine integrates LEDs, driver, power supply, thermal management, and optical mixing components.
- One-piece lower reflector finished with a textured high reflectance white polyester powder coating creates a comfortable visual transition from the lens to the ceiling plane.
- Provided t-bar clips and holes for mounting support wires enable recessed or suspended installation.
- Individual fixtures may be mounted end to end for a continuous row of illumination.

  NOTE: Reference www.cree.com/lighting for detailed instructions on field replacement of the light engine.

OPTICAL SYSTEM

- Unique combination of reflective and refractive optical components achieves a uniform, comfortable appearance while eliminating pixelation and color fringing.
- Components work together to optimize distribution, balancing the delivery of high illuminance levels on horizontal surfaces with an ideal amount of light on walls and vertical surfaces. This increases the perception of spaciousness.
- Diffusing lens integrated with upward-facing LED strip eliminates direct view of LEDs while lower reflector balances brightness of lens with the ceiling to create a low-glare high angle appearance.

ELECTRICAL SYSTEM

- Integral, high-efficiency driver and power supply.
- Power Factor = 0.9 nominal
- Input Power: Stays constant over life.
- Input Voltage: 120-277V, 347V- 50/60Hz
- Battery Backup: Consult factory.
- Temperature Rating: Designed to operate in temperatures 0-35 C and below room side and plenum side.
- Total Harmonic Distortion: < 20%

CONTROLS

- Step dimming to 50% comes standard.*
- Optional continuous dimming to 5% with 0-10V DC control protocol.*
- Optional Lutron EcoSystem® Enabled option allows seamless integration with Lutron EcoSystem controls.*

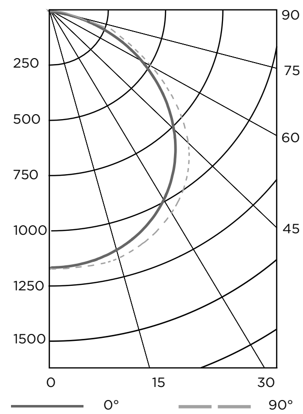
REGULATORY & VOLUNTARY QUALIFICATIONS

- UL924 (EB14 option).
- cULus Listed.
- DLC qualified.**
- Suitable for damp locations.
- Designed for Indoor use.

*Reference www.cree.com/lighting for recommended dimming controls and wiring diagrams.
**Please refer to DLC QPL list for most current information.

Photometry

CR22 BASED ON LTL REPORT TEST #: 24292



Coefficients Of Utilization

RCC %:	80			
RW %:	70	50	30	10
RCR: 0	119	119	119	119
1	110	105	101	98
2	100	92	85	80
3	91	81	73	67
4	84	72	63	57
5	77	64	55	49
6	71	58	49	43
7	66	52	44	38
8	61	48	39	33
9	57	44	36	30
10	53	40	32	27

Effective Floor Cavity Reflectance: 20%

Average Luminance Table (cd/m2)

Vertical Angle	Horizontal Angle 0°	45°	90°
0°	3864	3864	3864
45°	3575	3864	3972
55°	3164	3656	3758
65°	2498	3133	3347
75°	1620	2348	2051
85°	366	252	168

Zonal Lumen Summary

Zone	Lumens	% Lamp	Luminaire
0-30	923	N/A	28.1%
0-40	1527	N/A	46.5%
0-60	2704	N/A	82.5%
0-90	3280	N/A	100%

Reference www.cree.com/lighting for detailed photometric data.

Application Reference

Open Space					
Spacing	Lumens	Wattage	LPW	w/ft²	Average fc
8 x 8	2000L	22W	90	0.35	28
	3200L	32W	100	0.55	44
8 x 10	2000L	22W	90	0.28	23
	3200L	32W	100	0.44	37
10 x 10	2000L	22W	90	0.22	20
	3200L	32W	100	0.35	31
10 x 12	2000L	22W	90	0.19	16
	3200L	32W	100	0.29	25

9′ ceiling: 80/50/20 reflectances; 2.5′ workplane, open room LLF: 1.0 Initial.
Open Space: 50′ x 40′ x 10′

Rev. Date 9/17/2013

CR24™

2′x4′ Architectural LED Troffer

Product Description

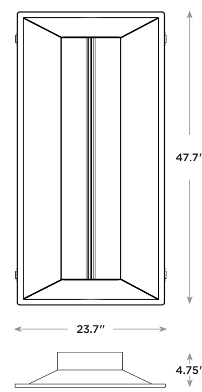
The CR24 Architectural LED High Efficiency (HE) troffer delivers up to 130 lumens per watt of exceptional 90 CRI light at 4000 lumens. This breakthrough performance is achieved by combining the high efficacy and high-quality light of Cree TrueWhite® Technology with a unique thermal management design. The CR24 High Definition (HD) option delivers enhanced spectrum 80+ CRI color quality. The CR24 product family is available in warm, neutral, cool, or daylight color temperatures and has step, 0-10V, or Lutron EcoSystem® Enabled dimming options. Its compact, lightweight design makes the CR24 perfect for use in commercial new construction or renovated spaces.

Performance Summary

- Utilizes Cree TrueWhite® Technology or High Definition Color Quality
- Active Color Management
- Room-Side Heat Sink
- Assembled in the US & Mexico
- **Efficacy**: 90-130 LPW
- **Delivered Light Output**: 2200, 3100, 4000, 5000 lumens
- **Input Power**: 22-50 watts
- **CRI**: 90 CRI (Cree TrueWhite® Technology), 80+ CRI (High Definition)
- **CCT**: 3000K, 3500K, 4000K, 5000K
- **Input Voltage**: 120-277 VAC or 347 VAC*
- **Warranty**: 10 years
- **Lifetime**: Designed to last from 50,000 hours (HD), 75,000 hours (Standard TW), and 100,000 hours (HE TW)
- **Controls**: Step Level to 50%, 0-10V Dimming or Lutron EcoSystem Enabled to 5%[1]
- **Mounting**: Recessed

*40L 100 LPW 10V types only - other types require addition of a 347 accessory kit

CR24™



NOTE: Use of Expanded Junction Box will expand the depth to 6.67″ and Emergency Backup will expand the depth to 6.30″. Use of 347V will increase fixture height by 1.4″.

Housings & Accessories

Accessories			
CPLCR Chicago Plenum Field Kit **CPLCR-EM** Chicago Plenum Field Kit-Emergency	**CR-347V** 347 Volt **CR-347V-SD** Step Dimming to 50% **SMK-24** Surface Mount Kit	**PW-18/4-06-9T/SS-CR** Power Whip **AC5-18/4-72-PD8-JB** Adjustable Cable	**AC5-72-PD8-JB** Adjustable Cable **EJBCR-5PK** Expanded size junction box for through wiring (5 pack)

Ordering Information

Example: CR24-40L-35K-S

CR24					
Product	**Lumen Output**	**Color Temp**	**Voltage**	**Control**	**Options**
CR24	**22L** 22W 2200 lumens – 100 LPW **31L** 34W 31L 3100 lumens – 90 LPW **40L** 40W 40L 4000 lumens – 100 LPW **40L HE** 40L HE 30.5W 4000 lumens – 130 LPW (30K) 32W 4000 lumens – 125 LPW (35K) 33W 4000 lumens – 120 LPW (40K) 34.5W 4000 lumens – 115 LPW (50K) **50L** 50W 50L 5000 lumens – 100 LPW	**30K** 3000 Kelvin **35K** 3500 Kelvin **40K** 4000 Kelvin **50K** 5000 Kelvin	**Blank** 120-277 Volt (Standard) **34**[6] 347 Volt (Optional)	**S** Step Dimming to 50% **10V** 0-10V Dimming to 5% **LES** Lutron EcoSystem® Enabled to 5%	**HD**[7] High Definition Color - CRI 80+ (44W 4000 lumens - 90 LPW) **EB14**[2,4] Emergency Backup - 1400 lumens **EB14 SMK**[2,3,5] Emergency Backup with surface mount kit - 1400 lumens

1. Reference www.cree.com/lighting for recommended dimming control options. 2. Not available in 50L. Not available in LES types except 40L LES type. 3. Not available with EB14 option. Use EB14 SMK. 4. EB14 not for use with SMK Kits 5. Includes surface mount kit accessory (SMK-CR24). 6. 347V integrated option only available on 40L 100 LPW 10V fixtures. Wattage increases to 42W and fixture height increases by 1.4″ over standard 120-277V fixtures. 7. HD only available in 40L.
†See www.cree.com/lighting for warranty terms.

Rev. Date 9/17/2013

Product Specifications

CREE TRUEWHITE® TECHNOLOGY

A revolutionary way to generate high-quality white light, Cree TrueWhite® Technology mixes the light from the highest performing red and unsaturated yellow LEDs. This patented approach delivers an exclusive combination of 90+ CRI, beautiful light characteristics, and lifelong color consistency, all while maintaining high luminous efficacy—a true no compromise solution.

HIGH DEFINITION COLOR

High Definition (HD) Color delivers enhanced spectrum 80+ CRI color quality. HD is derived from color mixed and tuned Cree TrueWhite® Technology.

ROOM-SIDE HEAT SINK

An innovative thermal management system designed to maximize cooling effectiveness by integrating a unique room-side heat sink into the diffusing lens. This breakthrough design creates a pleasing architectural aesthetic while conducting heat away from LEDs in a temperature-controlled environment. This enables the LEDs to consistently run cooler, providing significant boosts to lifetime, efficacy, and color consistency.

LUMEN MAINTENANCE FACTORS

- Reference www.cree.com/lighting for detailed lumen maintenance factors.

CONSTRUCTION & MATERIALS

- Durable 20-gauge steel housing with standard troffer access plate for electrical installation.
- Field replaceable light engine integrates LEDs, driver, power supply, thermal management, and optical mixing components.
- One-piece lower reflector finished with a textured high reflectance white polyester powder coating creates a comfortable visual transition from the lens to the ceiling plane.
- Provided t-bar clips and holes for mounting support wires enable recessed or suspended installation.
- Individual fixtures may be mounted end to end for a continuous row of illumination.

  NOTE: Reference www.cree.com/lighting for detailed instructions on field replacement of the light engine.

OPTICAL SYSTEM

- Unique combination of reflective and refractive optical components achieves a uniform, comfortable appearance while eliminating pixelation and color fringing.
- Components work together to optimize distribution, balancing the delivery of high illuminance levels on horizontal surfaces with an ideal amount of light on walls and vertical surfaces. This increases the perception of spaciousness.
- Diffusing lens integrated with upward-facing LED strip eliminates direct view of LEDs while lower reflector balances brightness of lens with the ceiling to create a low-glare high angle appearance.

ELECTRICAL SYSTEM

- Integral, high-efficiency driver and power supply.
- Power Factor = 0.9 nominal
- Input Power: Stays constant over life.
- Input Voltage: 120-277V, 347V- 50/60Hz
- Battery Backup: Consult factory.
- Temperature Rating: Designed to operate in temperatures 0-35 C and below room side and plenum side.
- Total Harmonic Distortion: < 20%

CONTROLS

- Step dimming to 50% comes standard.*
- Optional continuous dimming to 5% with 0-10V DC control protocol.*
- Optional Lutron EcoSystem® Enabled option allows seamless integration with Lutron EcoSystem controls.*

REGULATORY & VOLUNTARY QUALIFICATIONS

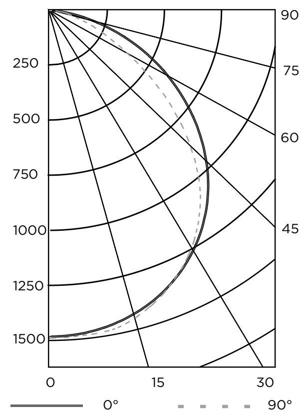
- UL924 (EB14 option).
- cULus Listed.
- DLC qualified.**
- Suitable for damp locations.
- Designed for Indoor use.

*Reference www.cree.com/lighting for recommended dimming controls and wiring diagrams.
**Please refer to DLC QPL list for most current information.

Photometry

CR24-4000L BASED ON LTL REPORT TEST #: 22421

Fixture photometry has been conducted by a NVLAP accredited testing laboratory in accordance with IESNA LM-79-08. IESNA LM-79-08 specifies the entire luminaire as the source resulting in a fixture efficiency of 100%.



Coefficients Of Utilization

RCC %:	80			
RW %:	70	50	30	0
RCR: 0	119	119	119	119
1	109	105	101	97
2	100	92	85	79
3	91	80	72	66
4	83	71	63	56
5	76	64	55	48
6	71	57	48	42
7	65	52	43	37
8	61	47	39	33
9	57	43	35	30
10	53	40	32	27

Effective Floor Cavity Reflectance: 20%

Average Luminance Table (cd/m2)

Horizontal Angle

Vertical Angle	0°	45°	90°
0°	2174	2174	2174
45°	1976	2116	2152
55°	1807	2018	2074
65°	1553	1889	1879
75°	1149	1501	1119
85°	424	62	62

Zonal Lumen Summary

Zone	Lumens	% Lamp	Luminaire
0-30	1,115	27.9%	27.9%
0-40	1,835	45.9%	45.9%
0-60	3,245	81.1%	81.1%
0-90	4,000	100%	100%

Reference www.cree.com/lighting for detailed photometric data.

Application Reference

Open Space					
Spacing	Lumens	Wattage	LPW	w/ft²	Average fc
8 x 8	2200L	22W	100	0.35	30
	4000L	40W	100	0.69	54
	4000L	30.5W	130	0.56	54
	5000L	50W	100	0.78	68
8 x 10	2200L	22W	100	0.28	25
	4000L	40W	100	0.55	45
	4000L	30.5W	130	0.45	45
	5000L	50W	100	0.62	57
10 x 10	2200L	22W	100	0.22	21
	4000L	40W	100	0.44	38
	4000L	30.5W	130	0.36	38
	5000L	50W	100	0.50	48
10 x 12	2200L	22W	100	0.19	17
	4000L	40W	100	0.37	30
	4000L	30.5W	130	0.30	30
	5000L	50W	100	0.42	38

9′ ceiling: 80/50/20 reflectances; 2.5′ workplane, open room. LLF: 1.0 Initial.
Open Space: 50′ x 40′ x 10′

Rev. Date 9/17/2013

CMG Lighting

Commercial Series

PAR30

Family	Product	Field	Color Temp	Finish
DL	P30F	38 60	27K 30K	WH BL

Beam Angle 50%	17º	35º
Field Angle 10%	38º	60º
Power Consumption	12 Watts	
Equivalent Source	75W	60W
Power Factor	>0.80	
Dimming Range*	20-100%	
Color Temperature	2700K (Warm White) 3000K (Natural White)	
CRI	80+	
Lumen Output	550 lm (2700K) 600 lm (3000K)	
Lumens/Watt (Typ)	54	
CBCP	5050	1400
Operating Temp	-20 ~ +40°C	
Storage Temp	-40 ~ +60°C	
AC Input Voltage	120 Volts 60Hz	
Lumen Maintenance	L70 >25,000 hrs	
LED	Lumileds	
Environmental	Contains no lead or mercury No UV or IR emissions	
Warranty	3 years	
Use	Indoor applications	
Weight	300 grams ±5	
Dimensions	3.75"W x 3.75"H	
Base	E26	

Architectural Grade High Power 12 Watt Dimmable Led Replacement Lamp

Produces 60-75 Watts of Incandescent Halogen Light

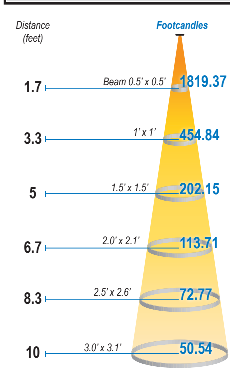
LM-79 and LM-80 Tested

- Robust electronics mounted to a layered (redundant) heat dissipation substrate
- Proprietary optics deliver light to the task
- **Finishes: White, Black, Custom**
- Instant On, No Warm Up, No Flicker
- May Be Controlled by Peripheral Systems and Sensors
- Reduced waste – contractor and earth-friendly packaging for roll-outs and projects

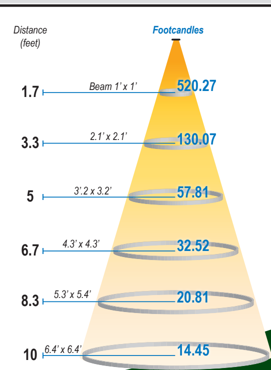
Life Rating Reduced +/- 15% When Used in IC Housings.

Do Not Use in Enclosed Fixtures. Not for use in damp locations.

*Compatible dimmer models:
Lutron TG-600PH-LA; S-600PE; S-600; TGLV-600PR-WH; CT-600PR; D-600PH; MRF2-6ELV; HW/LP-RPM-4A-120; HW/LP-RPM-4U-120; GP (Harrier) Card; HxD-5NE; RRD-6NA; PHPM-WBX with DVF-103P; PHPM-PA with QSG-6D; **Leviton** 6633-P; PRI06; **Legrand** LS1000PWV (consult factory for updated list)



17° beam angle



35° beam angle

CMG Lighting

Commercial Series

PAR38

Family	Product	Field	Color Temp	Finish
DL	P38F	38 60	27K 30K	WH BL

Beam Angle 50%	17º	35º
Field Angle 10%	38º	60º
Power Consumption	17 Watts	
Equivalent Source	90W	
Power Factor	>0.80	
Dimming Range*	20-100%	
Color Temperature	2700K (Warm White) 3000K (Natural White)	
CRI	80+	
Lumen Output	800 lm (2700K) 860 lm (3000K)	
Lumens/Watt (Typ)	57	54
CBCP	7100	1990
Operating Temp	-20 ~ +40°C	
Storage Temp	-40 ~ +60°C	
AC Input Voltage	120 Volts 60Hz	
Lumen Maintenance	L70 >25,000 hrs	
LED	Lumileds	
Environmental	Contains no lead or mercury No UV or IR emissions	
Warranty	3 years	
Use	Indoor applications	
Weight	500 grams ±5	
Dimensions	4.75"W x 4.75"H	
Base	E26	

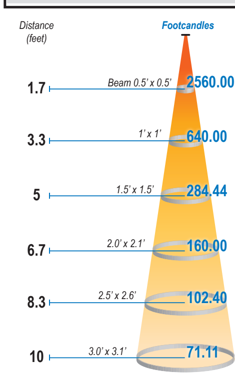
Architectural Grade High Power
17 Watt Dimmable Led Replacement Lamp

Produces 90 Watts of Incandescent Halogen Light

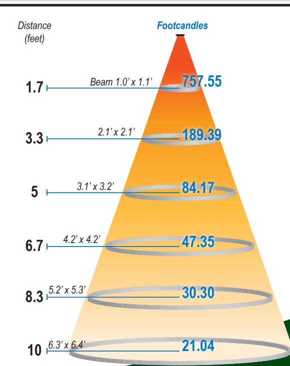
LM-79 and LM-80 Tested

- Robust electronics mounted to a layered (redundant) heat dissipation substrate
- Proprietary optics deliver light to the task
- **Finishes: White, Black, Custom**
- Instant On, No Warm Up, No Flicker
- May Be Controlled by Peripheral Systems and Sensors
- Reduced waste – contractor and earth-friendly packaging for roll-outs and projects

Life Rating Reduced +/- 15% When Used in IC Housings.
Do Not Use in Enclosed Fixture. Not for use in damp locations.
*Compatible dimmer models:
Lutron TG-600PH-LA, S-600PE; S-600; CT-603PG; TGLV-600PR-WH; CT-600PR; D-600PH; MRF-2-6ELV; HW/LP-RPM-4A-120; HW/LP-RPM-4U-120; GP (Harrier) Card; HxD-5NE; **Grafik** Eye QS Main Unit Family; RRD-6NA; PHPM-PA with QSG-6D; **Leviton** 6633-P; PRI06; **Legrand** LS1000PWV (consult factory for updated list)



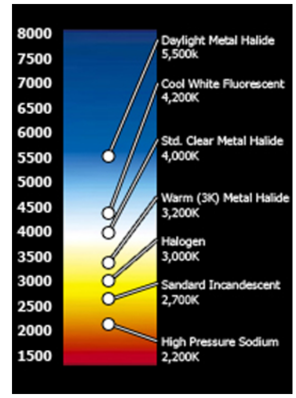
17° beam angle



35° beam angle

Spec Sheet

SKU#	200711
Product Name	G2 HP 2 Foot 8W NWM SEP LED Tube Light
Description	Tube Light, 2 Foot, 8 Watt, NWM, 120-277VAC, SEP, G2, HP
Estimated Energy Cost ($/yr)**	13.45
Watts (W)	8
Light Output (Lumens)	800
Efficacy (Lumens/Watt)	100
Color Accuracy (CRI)	87
Color Temperature (K)	4000-4500
Lighting Angle/Type	120
Power Factor	0.98
Working Voltage	120-277VAC
LED Count/Type	32
Lens Reflector Style	Milky
Operating Temperature (F)	-20 to 122
Mount/Base Type	Med Bi-Pin
Dimensions (inches)	24.00 L x 0.00 W x 0.00 H x 1.11 DIA
Weight (pounds)	0.4
Typically Replaces	20W T8 Fluorescent
Typical Life Expectancy (L70 Hours)	50,000
Approvals / Certifications	UL
Photometric Data Available?	No
IES File Available?	No



Features

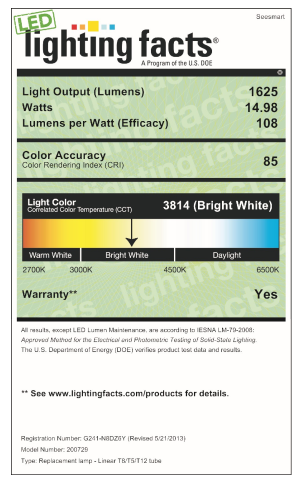
Strong yet lightweight aluminum heat sink; ultra-bright, long-life 5630 SMD LEDs; polycarbonate lens; no UV, noise, or flickering; constant-current integrated driver; high shock and vibration resistance; mercury-free; single end power configuration; UL listed.

NOTE: The preliminary performance information provided in this notice is pending verification by an independent testing laboratory. Contact your Seesmart representative for more information about photometric and other performance testing information for this product.

** Calculation based on 3 hours/day, $0.11/kWh. Cost depends on rates and use.

Spec Sheet

SKU#	200729
Product Name	G2 HP 4 Foot 15W NWM SEP LED Tube Light
Description	Tube Light, 4 Foot, 15 Watt, NWM, 120-277VAC, SEP, G2, HP
Estimated Energy Cost ($/yr)**	21.65
Watts (W)	15
Light Output (Lumens)	1625
Efficacy (Lumens/Watt)	108.33
Color Accuracy (CRI)	85
Color Temperature (K)	4000-4500
Lighting Angle/Type	120
Power Factor	0.98
Working Voltage	120-277VAC
LED Count/Type	64
Lens Reflector Style	Milky
Operating Temperature (F)	-20 to 122
Mount/Base Type	Med Bi-Pin
Dimensions (inches)	48.00 L x 0.00 W x 0.00 H x 1.11 DIA
Weight (pounds)	0.9
Typically Replaces	32-45W T8 Fluorescent
Typical Life Expectancy (L70 Hours)	50,000
Approvals / Certifications	UL DLC
Photometric Data Available?	Yes
IES File Available?	Yes


LED lighting facts®
A Program of the U.S. DOE
Seesmart

Light Output (Lumens)	1625
Watts	14.98
Lumens per Watt (Efficacy)	108
Color Accuracy Color Rendering Index (CRI)	85
Light Color Correlated Color Temperature (CCT)	3814 (Bright White)
Warranty**	Yes

Warm White | Bright White | Daylight
2700K 3000K 4500K 6500K

All results, except LED Lumen Maintenance, are according to IESNA LM-79-2008: *Approved Method for the Electrical and Photometric Testing of Solid-State Lighting.* The U.S. Department of Energy (DOE) verifies product test data and results.

** See www.lightingfacts.com/products for details.

Registration Number: G241-N8DZ6Y (Revised 5/21/2013)
Model Number: 200729
Type: Replacement lamp - Linear T8/T5/T12 tube

Features

Strong yet lightweight aluminum heat sink; ultra-bright, long-life 5630 SMD LEDs; polycarbonate lens; no UV, noise, or flickering; constant-current integrated driver; high shock and vibration resistance; mercury-free; single end power configuration; UL listed.

NOTE: The preliminary performance information provided in this notice is pending verification by an independent testing laboratory. Contact your Seesmart representative for more information about photometric and other performance testing information for this product.

** Calculation based on 3 hours/day, $0.11/kWh. Cost depends on rates and use.

ONLINE CERTIFICATIONS DIRECTORY

OOLV2.E350939
Lamps, Self-ballasted, Light-emitting-diode Type - Component

Page Bottom

Lamps, Self-ballasted, Light-emitting-diode Type - Component

See General Information for Lamps, Self-ballasted, Light-emitting-diode Type - Component

SEESMART INC E350939
4139 GUARDIAN ST
SIMI VALLEY, CA 93063 USA

LED Tube Lamps, Model(s) 200200-200205, 200212-200217

Self-Ballasted LED Tube Lamps, Model(s) 200124 (A), 200125 (A), 200126 (A), 200127 (A), 200128 (A), 200129 (A), 200130 (A), 200131 (A), 200132 (A), 200133 (A), 200134 (A), 200135 (A), 200136 (A), 200137 (A), 200138 (A), 200139 (A), 200140 (A), 200141 (A), 200142 (A), 200143 (A), 200144 (A), 200145 (A), 200146 (A), 200147 (A), 200148 (A), 200149 (A), 200150 (A), 200151 (A), 200152 (A), 200153 (A), 200154 (A), 200155 (A), 200156 (A), 200157 (A), 200158 (A), 200159 (A), 200160 (A), 200161 (A), 200162 (A), 200163 (A), 200164 (A), 200506 (A), 200507 (A), 200508 (A), 200509 (A), 200510 (A), 200511 (A), 200512 (A), 200513 (A), 200514 (A), 200515 (A), 200516 (A), 200517 (A), 200518 (A), 200519 (A), 200520 (A), 200521 (A), 200522 (A), 200523 (A), 200524 (A), 200525 (A), 200526 (A), 200527 (A), 200528 (A), 200529 (A), 200530 (A), 200531 (A), 200532 (A), 200533 (A), 200534 (A), 200535 (A), 200536 (A), 200537 (A), 200538 (A), 200539 (A), 200540 (A), 200541 (A), 200542 (A), 200543 (A), 200544 (A), 200545 (A), 200546 (A), 200547 (A), 200548 (A), 200549 (A), 200550 (A), 200551 (A), 200552 (A), 200553 (A), TP-Tube10-8FT

(A) - May end with the letter A-Z.

Marking: Company name and model designation.
Last Updated on 2012-09-18

Questions? Print this page Terms of Use Page Top

ONLINE CERTIFICATIONS DIRECTORY

OOLV8.E350939
Lamps, Self-ballasted, Light-emitting-diode Type Certified for Canada - Component

Page Bottom

Lamps, Self-ballasted, Light-emitting-diode Type Certified for Canada - Component

See General Information for Lamps, Self-ballasted, Light-emitting-diode Type Certified for Canada - Component

SEESMART INC E350939
4139 GUARDIAN ST
SIMI VALLEY, CA 93063 USA

Self-Ballasted LED Tube Lamps, Model(s) 200124 (A), 200125 (A), 200126 (A), 200127 (A), 200128 (A), 200129 (A), 200130 (A), 200131 (A), 200132 (A), 200133 (A), 200134 (A), 200135 (A), 200136 (A), 200137 (A), 200138 (A), 200139 (A), 200140 (A), 200141 (A), 200142 (A), 200143 (A), 200144 (A), 200145 (A), 200146 (A), 200147 (A), 200148 (A), 200149 (A), 200150 (A), 200151 (A), 200152 (A), 200153 (A), 200154 (A), 200155 (A), 200156 (A), 200157 (A), 200158 (A), 200159 (A), 200160 (A), 200161 (A), 200162 (A), 200163 (A), 200164 (A), 200506 (A), 200507 (A), 200508 (A), 200509 (A), 200510 (A), 200511 (A), 200512 (A), 200513 (A), 200514 (A), 200515 (A), 200516 (A), 200517 (A), 200518 (A), 200519 (A), 200520 (A), 200521 (A), 200522 (A), 200523 (A), 200524 (A), 200525 (A), 200526 (A), 200527 (A), 200528 (A), 200529 (A), 200530 (A), 200531 (A), 200532 (A), 200533 (A), 200534 (A), 200535 (A), 200536 (A), 200537 (A), 200538 (A), 200539 (A), 200540 (A), 200541 (A), 200542 (A), 200543 (A), 200544 (A), 200545 (A), 200546 (A), 200547 (A), 200548 (A), 200549 (A), 200550 (A), 200551 (A), 200552 (A), 200553 (A), TP-Tube10-8FT

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Marking: Company name, model designation and Recognized Component Mark for Canada, c RU.
Last Updated on 2012-09-18

Questions? Print this page Terms of Use Page Top

OOQA2.E354920
Light-emitting-diode Arrays, Modules and Controllers - Component

Page Bottom

Light-emitting-diode Arrays, Modules and Controllers - Component

See General Information for Light-emitting-diode Arrays, Modules and Controllers - Component

SEESMART INC
4139 GUARDIAN ST
SIMI VALLEY, CA 93063 USA

E354920

LED modules, Models 270206, 270203, 270200, 270215.

Marking: Company name, model designation and the Recognized Component Mark .
Last Updated on 2012-04-27

Questions? Print this page Terms of Use Page Top

OOQA8.E354920
Light-emitting-diode Arrays, Modules and Controllers Certified for Canada - Component

Page Bottom

Light-emitting-diode Arrays, Modules and Controllers Certified for Canada - Component

See General Information for Light-emitting-diode Arrays, Modules and Controllers Certified for Canada - Component

SEESMART INC
4139 GUARDIAN ST
SIMI VALLEY, CA 93063 USA

E354920

LED modules, Models 270206, 270203, 270200, 270215.

Marking: Company name, model designation and the Recognized Component Mark for Canada c RU.

Last Updated on 2012-04-27

Questions? Print this page Terms of Use Page Top

ONLINE CERTIFICATIONS DIRECTORY

IFAR.E355293
Light-emitting-diode Retrofit Luminaire Conversion Kits

Page Bottom

Light-emitting-diode Retrofit Luminaire Conversion Kits

See General Information for Light-emitting-diode Retrofit Luminaire Conversion Kits

SEESMART INC
4139 GUARDIAN ST
SIMI VALLEY, CA 93063 USA

E355293

Retrofit Kit Model/Part No.	Retrofitted Luminaire Type or Model/Part No.	Light Source	Rating
LED retrofit luminaire conversion kit			
Model 240001	Enclosed type IC Recessed or Surface Mounted 2'x4' or larger Fluorescent Luminaire	Replaceable-type T8 self-ballasted LED lamp	120 V ac, 0.23 A Max.
Model 200212-200217	Permanently-connected fluorescent	Replaceable-type T8 self-ballasted LED lamp	Rated 100-277 V, 47-63Hz, 0.16 A
Model 200200-200205	Permanently-connected fluorescent	Replaceable-type T8 self-ballasted LED lamp	Rated 100-277 V, 47-63Hz, 0.3 A
SKU #200704-200706	Recessed Type-IC or surface mounted, Max. 4 lamps per fluorescent luminaire	LED Tube Lamps	120-240V, 50/60Hz, 0.2A, 11W
SKU #200700-200703	Recessed Type-IC or surface mounted, Max. 4 lamps per fluorescent luminaire	LED Tube Lamps	120-240V, 50/60Hz, 0.3A, 22W
200722 200723 200724 200725 200726 200727	Permanently-connected fluorescent or incandescent	Non-replaceable type LED Array with driver	100~277Vac, 50/60 Hz, 110 mA,12 W
200728 200729 200730 200731 200732 200733 200734 200735 200736	Permanently-connected fluorescent or incandescent	Non-replaceable type LED Array with driver	100~277Vac, 50/60 Hz, 150 mA,15 W
200737 200738 200739 200740 200741 200742 200743 200744 200745	Permanently-connected fluorescent or incandescent	Non-replaceable type LED Array with driver	100~277Vac, 50/60 Hz, 180 mA,18 W
200746 200747 200748 200749 200750 200751 200752 200753	Permanently-connected fluorescent or incandescent	Non-replaceable type LED Array with driver	100~277Vac, 50/60 Hz, 220 mA,22 W

200754 200755 200756 200757 200758 200759 200760 200761 200762 200763			

Last Updated on 2012-12-19

Questions? Print this page Terms of Use Page Top

When the UL Leaf Mark is on the product, or when the word "Environment" is included in the UL Mark, please search the UL Environment database for additional information regarding this product's certification.

The appearance of a company's name or product in this database does not in itself assure that products so identified have been manufactured under UL's Follow-Up Service. Only those products bearing the UL Mark should be considered to be Listed and covered under UL's Follow-Up Service. Always look for the Mark on the product.

ONLINE CERTIFICATIONS DIRECTORY

IFAM.E349191
Light-emitting-diode Surface-mounted Luminaires

Page Bottom

Light-emitting-diode Surface-mounted Luminaires

See General Information for Light-emitting-diode Surface-mounted Luminaires

SEESMART INC E349191
4139 GUARDIAN ST
SIMI VALLEY, CA 93063 USA

LED surface-mounted luminaire, Model(s) SKU #280065-280066, SKU #280067-280070, SKU #280071-280074

LED surface-mounted luminaires, Model(s) 190033, 190034, 190042, 190043, 190035, 190036, 190044, 190045, 190037, 190038, 190046, 190047, 190039, 190040, 190048, 190049, 190087 (A), 190088 (A), 190089 (A), 190090 (A), 190091 (A), 190092 (A), 190093 (A), 190094 (A), 190095 (A), 190096 (A), 190097 (A), 190098 (A), 190099 (A), 190100 (A), 190101 (A), 190102 (A), 190103 (A), 190104 (A), 190105 (A), 190106 (A), 190107 (A), 190108 (A), 190109 (A), 190110 (A), 190111 (A), 190112 (A), 190113 (A), SKU# 120001

Light-emitting-diode surface-mounted Luminaires, Model(s) SKU #120365-120370, SKU #120389-120400, SKU #120371-120376, SKU #120335-120343, SKU #120353-120358, SKU #120344-120352, SKU #120359-120364, SKU #120377-120388

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Last Updated on 2012-12-10

Questions? Print this page Terms of Use Page Top

ONLINE CERTIFICATIONS DIRECTORY

IFAM7.E349191
Light-emitting-diode Surface-mounted Luminaires Certified for Canada

Page Bottom

Light-emitting-diode Surface-mounted Luminaires Certified for Canada

See General Information for Light-emitting-diode Surface-mounted Luminaires Certified for Canada

SEESMART INC
4139 GUARDIAN ST
SIMI VALLEY, CA 93063 USA

E349191

LED surface-mounted luminaire, Model(s) SKU #280065-280066, SKU #280067-280070, SKU #280071-280074

LED surface-mounted luminaires, Model(s) 190033, 190034, 190042, 190043, 190035, 190036, 190044, 190045, 190037, 190038, 190046, 190047, 190039, 190040, 190048, 190049, 190105 (A), 190106 (A), 190107 (A), 190108 (A), 190109 (A), 190110 (A), 190111 (A), 190112 (A), 190113 (A)

Light-emitting-diode surface-mounted Luminaires, Model(s) SKU #120365-120370, SKU #120389-120400, SKU #120371-120376, SKU #120335-120343, SKU #120353-120358, SKU #120344-120352, SKU #120359-120364, SKU #120377-120388

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Last Updated on 2012-12-10

Questions? Print this page Terms of Use Page Top

ONLINE CERTIFICATIONS DIRECTORY

IEUQ.E324248
Luminaire Conversions, Retrofit

Page Bottom

Luminaire Conversions, Retrofit

See General Information for Luminaire Conversions, Retrofit

SEESMART INC E324248

4139 GUARDIAN ST

SIMI VALLEY, CA 93063 USA

LED tube lamps, Cat. Nos. 200124 (A), 200125 (A), 200126 (A), 200127 (A), 200128 (A), 200129 (A), 200130 (A), 200131 (A), 200132 (A), 200133 (A), 200134 (A), 200135 (A), 200136 (A), 200137 (A), 200138 (A), 200139 (A), 200140 (A), 200141 (A), 200142 (A), 200143 (A), 200144 (A), 200145 (A), 200146 (A), 200147 (A), 200148 (A), 200149 (A), 200150 (A), 200151 (A), 200152 (A), 200153 (A), 200154 (A), 200155 (A), 200156 (A), 200157 (A), 200158 (A), 200159 (A), 200160 (A), 200161 (A), 200162 (A), 200163 (A), 200164 (A), TP-Tube10-8FT, 200506 (A), 200507 (A), 200508 (A), 200509 (A), 200510 (A), 200511 (A), 200512 (A), 200513 (A), 200514 (A), 200515 (A), 200516 (A), 200517 (A), 200518 (A), 200519 (A), 200520 (A), 200521 (A), 200522 (A), 200523 (A), 200524 (A), 200525 (A), 200526 (A), 200527 (A), 200528 (A), 200529 (A), 200530 (A), 200531 (A), 200532 (A), 200533 (A), 200534 (A), 200535 (A), 200536 (A), 200537 (A), 200538 (A), 200539 (A), 200540 (A), 200541 (A), 200542 (A), 200543 (A), 200544 (A), 200545 (A), 200546 (A), 200547 (A), 200548 (A), 200549 (A), 200550 (A), 200551 (A), 200552 (A), 200553 (A).

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Last Updated on 2012-11-16

Questions? Print this page Terms of Use Page Top

ONLINE CERTIFICATIONS DIRECTORY

IEUQ7.E324248
Luminaire Conversions, Retrofit Certified for Canada

Page Bottom

Luminaire Conversions, Retrofit Certified for Canada

See General Information for Luminaire Conversions, Retrofit Certified for Canada

SEESMART INC E324248

4139 GUARDIAN ST

SIMI VALLEY, CA 93063 USA

LED tube lamps, Cat. Nos. 200124 (A), 200125 (A), 200126 (A), 200127 (A), 200128 (A), 200129 (A), 200130 (A), 200131 (A), 200132 (A), 200133 (A), 200134 (A), 200135 (A), 200136 (A), 200137 (A), 200138 (A), 200139 (A), 200140 (A), 200141 (A), 200142 (A), 200143 (A), 200144 (A), 200145 (A), 200146 (A), 200147 (A), 200148 (A), 200149 (A), 200150 (A), 200151 (A), 200152 (A), 200153 (A), 200154 (A), 200155 (A), 200156 (A), 200157 (A), 200158 (A), 200159 (A), 200160 (A), 200161 (A), 200162 (A), 200163 (A), 200164 (A), TP-Tube10-8FT, 200506 (A), 200507 (A), 200508 (A), 200509 (A), 200510 (A), 200511 (A), 200512 (A), 200513 (A), 200514 (A), 200515 (A), 200516 (A), 200517 (A), 200518 (A), 200519 (A), 200520 (A), 200521 (A), 200522 (A), 200523 (A), 200524 (A), 200525 (A), 200526 (A), 200527 (A), 200528 (A), 200529 (A), 200530 (A), 200531 (A), 200532 (A), 200533 (A), 200534 (A), 200535 (A), 200536 (A), 200537 (A), 200538 (A), 200539 (A), 200540 (A), 200541 (A), 200542 (A), 200543 (A), 200544 (A), 200545 (A), 200546 (A), 200547 (A), 200548 (A), 200549 (A), 200550 (A), 200551 (A), 200552 (A), 200553 (A).

(A) May end with the letter A through Z.

Last Updated on 2012-09-10

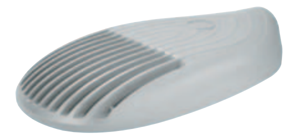
Questions? Print this page Terms of Use Page Top

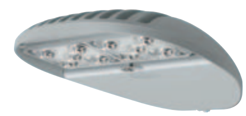
XSP2™

XSP Series LED Street Light – Horizontal Tenon – Type III

Product Description

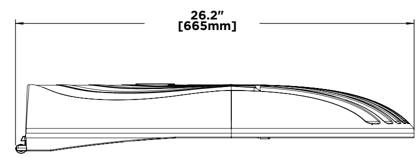
Designed from the ground up as a totally optimized LED street light system, the XSP Series delivers incredible efficiency and is designed to provide L70 lifetime over 100,000 hours without sacrificing application performance. Beyond substantial energy savings and reduced maintenance, Cree achieves better optical control with our NanoOptic® Precision Delivery Grid™ optic than a traditional cobra head luminaire. The Cree XSP Series LED Street Light is the best alternative for traditional street lighting with better payback and better performance.

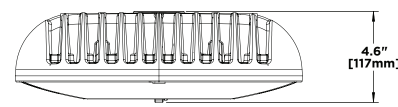


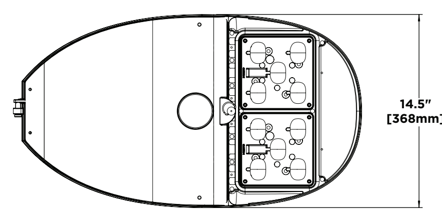


Performance Summary

Utilizes BetaLED® Technology
NanoOptic Precision Delivery Grid optic
CRI: Minimum 70 CRI
CCT: 4000K (+/- 300K), 5700K (+/- 500K)
Warranty: 10 years on luminaire/limited 10 years on Colorfast DeltaGuard® finish
Made in the U.S.A. of U.S. and imported parts







Accessories

Field Installed Accessories
XA-SP2BLS Backlight Control Shield - Provides 1/2 Mounting Height Cutoff **XA-SP2BRDSPK** Bird Spikes

Ordering Information

Example: BXSPA032A-USF

BXSP	**A**	**0**			**A**	**–**			
Product	**Version**	**Mounting**	**Optic**	**Modules**	**Input Power**	**–**	**Voltage**	**Color Options**	**Options**
BXSP	**A**	**0** Horizontal Tenon	**3** Type III **H** Type III w/ BLS	**2** Standard 4000K **B** Standard 5700K **H** High Efficacy 4000K* **P** High Efficacy 5700K*	**A** 101W	–	**U** Universal 120–277V **V** Universal 347–480V**	**S** Silver (Standard) **T** Black **Z** Bronze **B** Platinum Bronze **W** White	**A ROAM® Controls** - Installation of ROAM dimming control module only. Services provided by others. - Includes R option **F Fuse** - When code dictates fusing, use time delay fuse - Not available with V voltage **K Occupancy Control** - Refer to Occupancy Control spec sheet for details **N Utility Label and NEMA Photocell Receptacle** - Includes Q option - Refer to Field Adjustble Output spec sheet for details **Q Field Adjustable Output** - Refer to Field Adjustable Output spec sheet for details **R NEMA Photocell Receptacle** - Photocell by others **U Utility** - Includes exterior wattage label that indicates the maximum available wattage of the luminaire - Includes Q option - Refer to Field Adjustable Output spec sheet for details

* Available Q3 2012. Preliminary data shown.

** 347–480V utilizes magnetic step-down transformer. For input power for 347–480V, refer to the Lumen Output, Electrical, and Lumen Maintenance data table below.

Rev. Date: 9/14/2012

Product Specifications

CONSTRUCTION & MATERIALS
- Die cast aluminum housing
- Tool-less entry
- Mounts on 1.25" IP (1.66" [42mm] O.D.) or 2" IP (2.375" [60mm] O.D.) horizontal tenon (minimum 8" [203mm] in length) and is adjustable +/- 5˚ to allow for fixture leveling (includes two axis T-level to aid in leveling)
- Designed with 0–10V dimming capabilities. Controls by others
- Exclusive Colorfast DeltaGuard® finish features an E-Coat epoxy primer with an ultradurable powder topcoat, providing excellent resistance to corrosion, ultraviolet degradation and abrasion. Standard is silver. Black, bronze, platinum bronze and white are also available

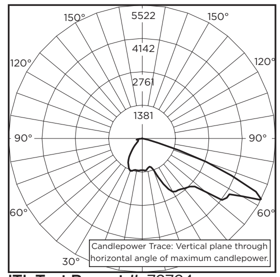
ELECTRICAL SYSTEM
- **Input Voltage:** 120–277V or 347–480V, 50/60Hz
- Class 2 output
- **Power Factor:** > 0.9 at full load
- **Total Harmonic Distortion:** < 20% at full load
- Integral 10kV surge suppression protection standard
- To address inrush current, slow blow fuse or type C/D breaker should be used

REGULATORY & VOLUNTARY QUALIFICATIONS
- cULus Listed
- Suitable for wet locations
- Product qualified on the DesignLights Consortium ("DLC") Qualified Products List ("QPL"). Exceptions apply when N, U, or Q options are ordered - see Field Adjustable Output spec sheet for details.
- Certified to ANSI C136.31-2001, 3G bridge and overpass vibration standards
- 10kV surge suppression protection tested in accordance with IEEE/ANSI C62.41.2
- Meets CALTrans 611 Vibration testing and GR-63-CORE Section 4.4.1/5.4.2 C62.41.2
- Luminaire and finish endurance tested to withstand 5,000 hours of elevated ambient salt fog conditions as defined in ASTM Standard B 117
- RoHS Compliant
- Meets Buy American requirements within ARRA

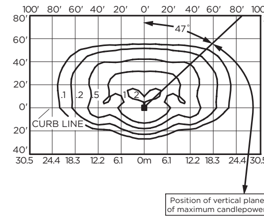
PATENTS
- Visit website for patents that cover these products: Patents http://www.cree.com/patents

Photometry

All published luminaire photometric testing performed to IESNA LM-79-08 standards by Independent Testing Laboratories, a NVLAP certified laboratory.



ITL Test Report #: 72724
BXSPA*32A-U
Initial Delivered Lumens: 7,406



BXSPA*32A-U
Mounting Height: 25' (7.6m)
Initial Delivered Lumens: 7,000
Initial FC at grade.

Lumen Output, Electrical, and Lumen Maintenance Data

Type 3 Distribution

Module	Input Power Designator	4000K Initial Delivered Lumens	4000K BUG Ratings** Per TM-15-11	5700K Initial Delivered Lumens	5700K BUG Ratings** Per TM-15-11	System Watts 120–277V	Total Current 120V	Total Current 208V	Total Current 240V	Total Current 277V	System Watts 347–480V	Total Current 347V	Total Current 480V	50K Hours Calculated Lumen Maintenance Factor @ 15˚C (59˚F)***
Standard	A	7,000	B2 U0 G1	7,700	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%
High Efficacy*	A	9,612	B2 U0 G2	10,680	B2 U0 G2	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%

Type 3 Distribution w/ BLS

Module	Input Power Designator	4000K Initial Delivered Lumens	4000K BUG Ratings** Per TM-15-11	5700K Initial Delivered Lumens	5700K BUG Ratings** Per TM-15-11	System Watts 120–277V	Total Current 120V	Total Current 208V	Total Current 240V	Total Current 277V	System Watts 347–480V	Total Current 347V	Total Current 480V	50K Hours Calculated Lumen Maintenance Factor @ 15˚C (59˚F)***
Standard	A	6,130	TBD	6,742	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%
High Efficacy*	A	8,417	TBD	9,352	TBD	101	0.84	0.50	0.44	0.39	106	0.31	0.22	91%

* Available Q3 2012. Preliminary data shown.
** For more information on the IES BUG (Backlight-Uplight-Glare) Rating visit www.iesna.org/PDF/Erratas/TM-15-11BugRatingsAddendum.pdf
*** Projected L_{70} (6K) Hours: >36,000. For recommended lumen maintenance factor data see TD-13

EPA and Weight

Input Power Designator	Weight 120–277V	Weight 347–480V	EPA 1@90	EPA 2@90	EPA 2@180	EPA 3@90	EPA 4@90
A	26 lbs (12kg)	29 lbs (13.2kg)	0.692	1.140	1.384	1.832	2.280

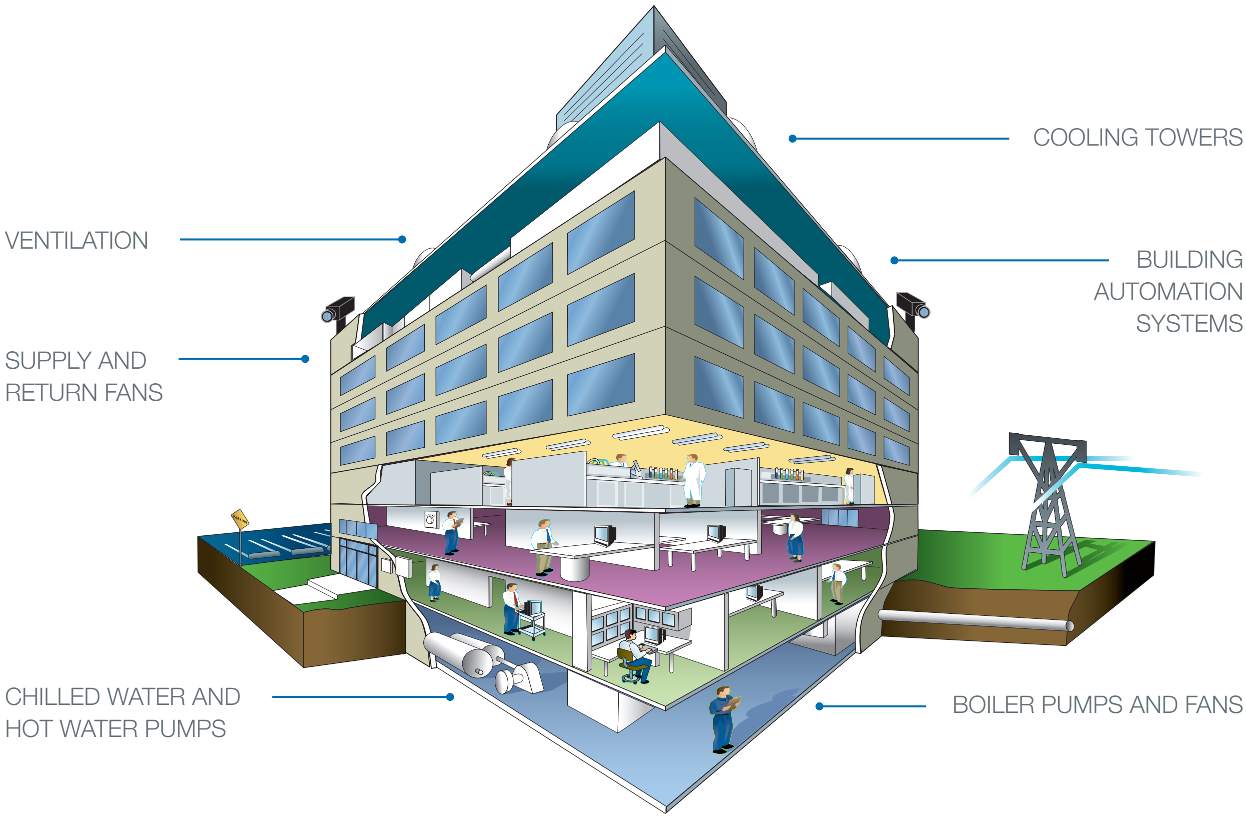
SmartVFD HVAC and BYPASS

Honeywell

The Smart Choice for Energy Savings.

Saving Energy the Smart Way

Buildings consume more than 70 percent of the electricity produced in North America — and roughly half of that is used to circulate air and water. Honeywell SmartVFD HVAC, BYPASS and COMPACT variable frequency drives maximize energy savings by modulating the speed of fans and pumps. VFDs achieve these savings by operating within a building's control system or independently through its internal PID capabilities. Additionally, Honeywell's VFDs are loaded with labor-saving features such as startup wizards, PC programming, and an intuitive graphical interface that allows for faster, more accurate commissioning and reliable maintenance over the life of the drive.



BACKED BY HONEYWELL

Already among the leading names in HVAC variable frequency drives, Honeywell is pleased to deliver the SmartVFD HVAC line — the third generation of Honeywell VFDs. Designed specifically for commercial applications and backed by more than a century of Honeywell's control expertise, you can count on Honeywell's SmartVFD HVAC and BYPASS to deliver long-term service and energy savings for your customer. You simply can't find a commercial building control name with a more proven record than Honeywell.

Honeywell

The Smart Choice for Efficient Investment

It's a common myth that any VFD can easily be applied in a commercial application, but many VFDs are not the right tool for the job. The Honeywell SmartVFD HVAC and BYPASS are designed specifically for commercial buildings to deliver the energy savings that building owners and facility managers need with 98 percent energy efficiency, minimal labor and a fast ROI.

SMARTVFD HVAC – SMART INSTALLATION, SMART COMMISSIONING AND SMART COMMUNICATION

The Honeywell SmartVFD HVAC meets UL and cUL standards which makes installation and commissioning easy for you and energy savings easy for your customers:

Easy Communication

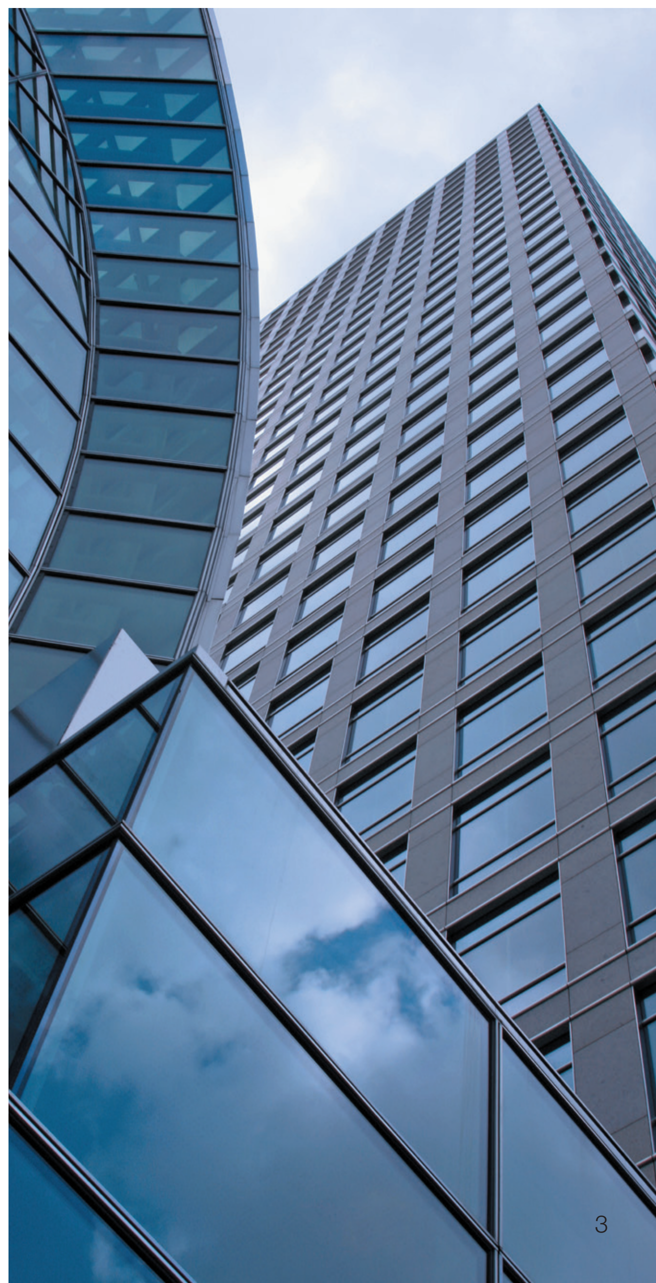
- Start-up Wizards — Set the clock and tell the VFD whether you have a pump or a fan, enter nominal motor information, and you are up and running. PID and multi-pumps wizards are also built in.
- PC Software Wizards — Commissioning, programming and troubleshooting are all a snap with the PC Software Wizards.
- Graphic Interface — The easy-to-use keypad and interface deliver menu-driven programming and monitoring for fast, uniform commissioning. It's also easy for the building owner or manager to learn and use, helping to reduce service calls. Every parameter has a built-in help feature to provide assistance while programming.
- Built-In Communications — With BACnet®, N2 and Modbus built in, your customers will enjoy a lower total installed cost and reliable communications with the building management system.
- Built-In PLC — PC based tools eliminate the need for an expensive external controller.

Built-in Protection

- DC Choke for harmonic protection.
- Standard RFI Filter — Ensures that EMC/RFI requirements are met.
- Bypass Options — Meet specifications and system critical applications with a comprehensive bypass offering.

Smart Software

- Real-Time Clock — Battery included.
- Fire Mode to improve fire safety in the building.
- Motor Switch Ride-Through — Easy, fault-free maintenance.
- Hand-Off-Auto (HOA) control built into the keypad.
- Plenum rated for install flexibility.
- 100 KA Short Circuit Current Rating (SCCR) rated.



Smart Benefits with Easy Commissioning

Honeywell SmartVFD HVAC doesn't just work in the laboratory — it works in the field. From the variety of network protocols that make integration easy, to the guided Startup and PID wizards, the design and technology of SmartVFDs make them true HVAC drives. Intuitive menus assist with commissioning, programming, troubleshooting and overall operation.

COMMUNICATION STANDARD

Integrating Honeywell SmartVFD HVAC into a building management system is a breeze. There's no need for extra cards because it offers a wide range of communications protocols right out of the box, including:

- RS485 – BACnet®, Modbus and N2
- Ethernet – BACnet/IP and Modbus/TCP
- Available options – LonWorks® and DeviceNet

HIGH-RESOLUTION GRAPHIC DISPLAY

It's not just easy on the eyes, it's also easy to use. The menu driven display shows the minimum, maximum and actual values for all parameters and allows easy uploading and downloading of parameters, and has multiple help functions and the manual built-in. In addition, there is a Local/Remote button on the keypad for built in HOA control.

DETERMINE ROOT CAUSE OF FAULTS

With the SmartVFD HVAC, troubleshooting involves very little trouble. The built in, diagnostic screen provides a description for every fault, and the actual values and references are stored at the time of the fault for easy review and problem resolution.

MONITOR SYSTEM PERFORMANCE

The data needed to analyze usage and make adjustments for maximum energy savings is right at your fingertips. Actual electricity consumption in kWh can be monitored using the VFD PC Wizard, and can be conveniently displayed in bar graphs. At any time, the user can see the actual power consumption currently in use — a great tool for managing energy savings.

Honeywell

Smart Configurations

For system critical applications, you must be able to select a bypass that meets the requirements of the specification. The SmartVFD BYPASS is easy to specify, select, install and commission. The SmartVFD BYPASS is UL certified and is the perfect complement to the advanced capabilities of the SmartVFD family — a combination that is both simple and smart.

SMARTVFD BYPASS CONFIGURATIONS

Our five configurations make it easy for you to select the right bypass to complete your drive package. All bundles are available in NEMA 1, NEMA 12 and ventilated NEMA 3R HOA (HAND OFF AUTO).

SmartVFD Disconnect Only

- Adds a fused disconnect to the VFD.

SmartVFD 2-Contactor Bypass

Provides an economical means of bypassing the VFD.

- Freeze/Fire/Smoke Interlock

SmartVFD 3-Contactor Bypass

Commission, service or replace the VFD without affecting the operation of the motor.

- Fused Disconnect
- Freeze/Fire/Smoke Interlock
- VFD is isolated from power with motor running in BYPASS mode
- TEST position powers the VFD without sending power to the motor

SmartVFD 3-Contactor Bypass with Auto-Bypass

The package adds the control capabilities below to the standard three contactor bypass.

- Any VFD fault will automatically send the bypass to BYPASS mode
- A contact closure sends the bypass to BYPASS mode
- Dry contacts indicate when the bypass is in BYPASS mode, alerting the building management system

SLEEKER. SMALLER. SMARTER.

As the latest evolution of the Honeywell VFD line, the SmartVFD BYPASS is sleeker, smaller, lighter and less expensive.

Smart Selection

HVFDSD 3 C 0100 G 1 0 0

Product Family
HVFDSD = Honeywell SmartVFD HVAC
HVFDSB = Honeywell SmartVFD BYPASS

Input Phase
3 = Three Phase (3~in, 3~out)

Nominal Voltage
A = 208/230 Vac Drive Alone, 208 Vac Bypass
B = 230 Vac Bypass
C = 480 Vac
D = 575 Vac

Nominal Horsepower
0007 = .75 Horse Power
0010 = 1 Horse Power
0100 = 10 Horse Power

Options
0 = Drive Only or No Special Options
1 = Auto-Bypass

Contactors
0 = Drive Only
1 = Disconnect Only
2 = Two Contactor Bypass
3 = Three Contactor Bypass

Enclosure Type
1 = NEMA 1
2 = NEMA 12
3 = NEMA 3R

Interface
G = Graphic KeyPad

PICK THE RIGHT VFD FOR THE APPLICATION

- Drives are typically sized to match the horsepower rating of the motor, which will be accurate 95 percent of the time. But for the greatest accuracy, drives should be sized based upon the Full Load Amps or current draw of the motor. The VFD must have a slightly larger current rating maximum.
- The environment the drive will operate in is critical for selection. Honeywell offers NEMA 1, NEMA 12 (for dusty, dirtier environments) and NEMA 3R enclosures (for falling water or rain situations).
- Because of the complexity of VFDs, a clean, conditioned space with temperatures between 14° F and 104° F provides an environment for ideal operation. Heaters are an option in order to keep your VFD at its recommended temperature.
- Honeywell SmartVFD HVAC has a model range from 1.5-250 HP for 460 Vac, 0.75-125 HP for 208/230 Vac.
- Honeywell SmartVFD offers a standard 3-year warranty from the date of purchase.

Find all SmartVFD selection information on the following pages

SmartVFD HVAC Drive Alone

	HP	AMPS	Frame	NEMA 1 Drive Alone	NEMA 12 Drive Alone	NEMA 3R Drive Alone
460 Vac	1.5	3.4	4	HVFDSD3C0015G100	HVFDSD3C0015G200	HVFDSD3C0015G300
	2	4.8	4	HVFDSD3C0020G100	HVFDSD3C0020G200	HVFDSD3C0020G300
	3	5.6	4	HVFDSD3C0030G100	HVFDSD3C0030G200	HVFDSD3C0030G300
	4	8	4	HVFDSD3C0040G100	HVFDSD3C0040G200	HVFDSD3C0040G300
	5	9.6	4	HVFDSD3C0050G100	HVFDSD3C0050G200	HVFDSD3C0050G300
	7.5	12	4	HVFDSD3C0075G100	HVFDSD3C0075G200	HVFDSD3C0075G300
	10	16	5	HVFDSD3C0100G100	HVFDSD3C0100G200	HVFDSD3C0100G300
	15	23	5	HVFDSD3C0150G100	HVFDSD3C0150G200	HVFDSD3C0150G300
	20	31	5	HVFDSD3C0200G100	HVFDSD3C0200G200	HVFDSD3C0200G300
	25	38	6	HVFDSD3C0250G100	HVFDSD3C0250G200	HVFDSD3C0250G300
	30	46	6	HVFDSD3C0300G100	HVFDSD3C0300G200	HVFDSD3C0300G300
	40	61	6	HVFDSD3C0400G100	HVFDSD3C0400G200	HVFDSD3C0400G300
	50	72	7	HVFDSD3C0500G100	HVFDSD3C0500G200	HVFDSD3C0500G300
	60	87	7	HVFDSD3C0600G100	HVFDSD3C0600G200	HVFDSD3C0600G300
	75	105	7	HVFDSD3C0750G100	HVFDSD3C0750G200	HVFDSD3C0750G300
	100	140	8	HVFDSD3C1000G100	HVFDSD3C1000G200	HVFDSD3C1000G300
	125	170	8	HVFDSD3C1250G100	HVFDSD3C1250G200	HVFDSD3C1250G300
	150	205	8	HVFDSD3C1500G100	HVFDSD3C1500G200	HVFDSD3C1500G300
	200	261	9	HVFDSD3C2000G100	HVFDSD3C2000G200	-
	250	310	9	HVFDSD3C2500G100	HVFDSD3C2500G200	-
	HP	AMPS	Frame	NEMA 1 Drive Alone	NEMA 12 Drive Alone	NEMA 3R Drive Alone
208/ 230 Vac	.75	3.7	4	HVFDSD3A0007G100	HVFDSD3A0007G200	HVFDSD3A0007G300
	1	4.8	4	HVFDSD3A0010G100	HVFDSD3A0010G200	HVFDSD3A0010G300
	1.5	6.6	4	HVFDSD3A0015G100	HVFDSD3A0015G200	HVFDSD3A0015G300
	2	8	4	HVFDSD3A0020G100	HVFDSD3A0020G200	HVFDSD3A0020G300
	3	11	4	HVFDSD3A0030G100	HVFDSD3A0030G200	HVFDSD3A0030G300
	5	18	5	HVFDSD3A0050G100	HVFDSD3A0050G200	HVFDSD3A0050G300
	7.5	24	5	HVFDSD3A0075G100	HVFDSD3A0075G200	HVFDSD3A0075G300
	10	31	5	HVFDSD3A0100G100	HVFDSD3A0100G200	HVFDSD3A0100G300
	15	48	6	HVFDSD3A0150G100	HVFDSD3A0150G200	HVFDSD3A0150G300
	20	62	6	HVFDSD3A0200G100	HVFDSD3A0200G200	HVFDSD3A0200G300
	25	75	7	HVFDSD3A0250G100	HVFDSD3A0250G200	HVFDSD3A0250G300
	30	88	7	HVFDSD3A0300G100	HVFDSD3A0300G200	HVFDSD3A0300G300
	40	105	7	HVFDSD3A0400G100	HVFDSD3A0400G200	HVFDSD3A0400G300
	50	140	8	HVFDSD3A0500G100	HVFDSD3A0500G200	HVFDSD3A0500G300
	60	170	8	HVFDSD3A0600G100	HVFDSD3A0600G200	HVFDSD3A0600G300
	75	205	8	HVFDSD3A0750G100	HVFDSD3A0750G200	HVFDSD3A0750G300
	100	261	9	HVFDSD3A1000G100	HVFDSD3A1000G200	-
	125	310	9	HVFDSD3A1250G100	HVFDSD3A1250G200	-

SmartVFD HVAC NEMA 1 Disconnect and SmartVFD BYPASS

	HP	AMPS	Frame	NEMA 1 Fused Disconnect	NEMA 1 2-Contactor Bypass	NEMA 1 3-Contactor Bypass	NEMA 1 3-Cont. Bypass + Auto-Bypass
460 Vac	1.5	3.4	4	HVFDSB3C0015G110	HVFDSB3C0015G120	HVFDSB3C0015G130	HVFDSB3C0015G131
	2	4.8	4	HVFDSB3C0020G110	HVFDSB3C0020G120	HVFDSB3C0020G130	HVFDSB3C0020G131
	3	5.6	4	HVFDSB3C0030G110	HVFDSB3C0030G120	HVFDSB3C0030G130	HVFDSB3C0030G131
	4	8	4	HVFDSB3C0040G110	HVFDSB3C0040G120	HVFDSB3C0040G130	HVFDSB3C0040G131
	5	9.6	4	HVFDSB3C0050G110	HVFDSB3C0050G120	HVFDSB3C0050G130	HVFDSB3C0050G131
	7.5	12	4	HVFDSB3C0075G110	HVFDSB3C0075G120	HVFDSB3C0075G130	HVFDSB3C0075G131
	10	16	5	HVFDSB3C0100G110	HVFDSB3C0100G120	HVFDSB3C0100G130	HVFDSB3C0100G131
	15	23	5	HVFDSB3C0150G110	HVFDSB3C0150G120	HVFDSB3C0150G130	HVFDSB3C0150G131
	20	31	5	HVFDSB3C0200G110	HVFDSB3C0200G120	HVFDSB3C0200G130	HVFDSB3C0200G131
	25	38	6	HVFDSB3C0250G110	HVFDSB3C0250G120	HVFDSB3C0250G130	HVFDSB3C0250G131
	30	46	6	HVFDSB3C0300G110	HVFDSB3C0300G120	HVFDSB3C0300G130	HVFDSB3C0300G131
	40	61	6	HVFDSB3C0400G110	HVFDSB3C0400G120	HVFDSB3C0400G130	HVFDSB3C0400G131
	50	72	7	HVFDSB3C0500G110	HVFDSB3C0500G120	HVFDSB3C0500G130	HVFDSB3C0500G131
	60	87	7	HVFDSB3C0600G110	HVFDSB3C0600G120	HVFDSB3C0600G130	HVFDSB3C0600G131
	75	105	7	HVFDSB3C0750G110	HVFDSB3C0750G120	HVFDSB3C0750G130	HVFDSB3C0750G131
	100	140	8	HVFDSB3C1000G110	HVFDSB3C1000G120	HVFDSB3C1000G130	HVFDSB3C1000G131
	125	170	8	HVFDSB3C1250G110	HVFDSB3C1250G120	HVFDSB3C1250G130	HVFDSB3C1250G131
	150	205	8	HVFDSB3C1500G110	HVFDSB3C1500G120	HVFDSB3C1500G130	HVFDSB3C1500G131
	HP	AMPS	Frame	NEMA 1 Fused Disconnect	NEMA 1 2-Contactor Bypass	NEMA 1 3-Contactor Bypass	NEMA 1 3-Cont. Bypass + Auto-Bypass
208 Vac	.75	3.7	4	HVFDSB3A0007G110	HVFDSB3A0007G120	HVFDSB3A0007G130	HVFDSB3A0007G131
	1	4.8	4	HVFDSB3A0010G110	HVFDSB3A0010G120	HVFDSB3A0010G130	HVFDSB3A0010G131
	1.5	6.6	4	HVFDSB3A0015G110	HVFDSB3A0015G120	HVFDSB3A0015G130	HVFDSB3A0015G131
	2	8	4	HVFDSB3A0020G110	HVFDSB3A0020G120	HVFDSB3A0020G130	HVFDSB3A0020G131
	3	11	4	HVFDSB3A0030G110	HVFDSB3A0030G120	HVFDSB3A0030G130	HVFDSB3A0030G131
	5	18	5	HVFDSB3A0050G110	HVFDSB3A0050G120	HVFDSB3A0050G130	HVFDSB3A0050G131
	7.5	24	5	HVFDSB3A0075G110	HVFDSB3A0075G120	HVFDSB3A0075G130	HVFDSB3A0075G131
	10	31	5	HVFDSB3A0100G110	HVFDSB3A0100G120	HVFDSB3A0100G130	HVFDSB3A0100G131
	15	48	6	HVFDSB3A0150G110	HVFDSB3A0150G120	HVFDSB3A0150G130	HVFDSB3A0150G131
	20	62	6	HVFDSB3A0200G110	HVFDSB3A0200G120	HVFDSB3A0200G130	HVFDSB3A0200G131
	25	75	7	HVFDSB3A0250G110	HVFDSB3A0250G120	HVFDSB3A0250G130	HVFDSB3A0250G131
	30	88	7	HVFDSB3A0300G110	HVFDSB3A0300G120	HVFDSB3A0300G130	HVFDSB3A0300G131
	40	105	7	HVFDSB3A0400G110	HVFDSB3A0400G120	HVFDSB3A0400G130	HVFDSB3A0400G131
	50	140	8	HVFDSB3A0500G110	HVFDSB3A0500G120	HVFDSB3A0500G130	HVFDSB3A0500G131
	60	170	8	HVFDSB3A0600G110	HVFDSB3A0600G120	HVFDSB3A0600G130	HVFDSB3A0600G131
	75	205	8	HVFDSB3A0750G110	HVFDSB3A0750G120	HVFDSB3A0750G130	HVFDSB3A0750G131
	HP	AMPS	Frame	NEMA 1 Fused Disconnect	NEMA 1 2-Contactor Bypass	NEMA 1 3-Contactor Bypass	NEMA 1 3-Cont. Bypass + Auto-Bypass
230 Vac	.75	3.7	4	HVFDSB3B0007G110	HVFDSB3B0007G120	HVFDSB3B0007G130	HVFDSB3B0007G131
	1	4.8	4	HVFDSB3B0010G110	HVFDSB3B0010G120	HVFDSB3B0010G130	HVFDSB3B0010G131
	1.5	6.6	4	HVFDSB3B0015G110	HVFDSB3B0015G120	HVFDSB3B0015G130	HVFDSB3B0015G131
	2	8	4	HVFDSB3B0020G110	HVFDSB3B0020G120	HVFDSB3B0020G130	HVFDSB3B0020G131
	3	11	4	HVFDSB3B0030G110	HVFDSB3B0030G120	HVFDSB3B0030G130	HVFDSB3B0030G131
	5	18	5	HVFDSB3B0050G110	HVFDSB3B0050G120	HVFDSB3B0050G130	HVFDSB3B0050G131
	7.5	24	5	HVFDSB3B0075G110	HVFDSB3B0075G120	HVFDSB3B0075G130	HVFDSB3B0075G131
	10	31	5	HVFDSB3B0100G110	HVFDSB3B0100G120	HVFDSB3B0100G130	HVFDSB3B0100G131
	15	48	6	HVFDSB3B0150G110	HVFDSB3B0150G120	HVFDSB3B0150G130	HVFDSB3B0150G131
	20	62	6	HVFDSB3B0200G110	HVFDSB3B0200G120	HVFDSB3B0200G130	HVFDSB3B0200G131
	25	75	7	HVFDSB3B0250G110	HVFDSB3B0250G120	HVFDSB3B0250G130	HVFDSB3B0250G131
	30	88	7	HVFDSB3B0300G110	HVFDSB3B0300G120	HVFDSB3B0300G130	HVFDSB3B0300G131
	40	105	7	HVFDSB3B0400G110	HVFDSB3B0400G120	HVFDSB3B0400G130	HVFDSB3B0400G131
	50	140	8	HVFDSB3B0500G110	HVFDSB3B0500G120	HVFDSB3B0500G130	HVFDSB3B0500G131
	60	170	8	HVFDSB3B0600G110	HVFDSB3B0600G120	HVFDSB3B0600G130	HVFDSB3B0600G131
	75	205	8	HVFDSB3B0750G110	HVFDSB3B0750G120	HVFDSB3B0750G130	HVFDSB3B0750G131

SmartVFD HVAC NEMA 12 Disconnect and SmartVFD BYPASS

	HP	AMPS	Frame	NEMA 12 Fused Disconnect	NEMA 12 2-Contactor Bypass	NEMA 12 3-Contactor Bypass	NEMA 12 3-Cont. Bypass + Auto-Bypass
460 Vac	1.5	3.4	4	HVFDSB3C0015G210	HVFDSB3C0015G220	HVFDSB3C0015G230	HVFDSB3C0015G231
	2	4.8	4	HVFDSB3C0020G210	HVFDSB3C0020G220	HVFDSB3C0020G230	HVFDSB3C0020G231
	3	5.6	4	HVFDSB3C0030G210	HVFDSB3C0030G220	HVFDSB3C0030G230	HVFDSB3C0030G231
	4	8	4	HVFDSB3C0040G210	HVFDSB3C0040G220	HVFDSB3C0040G230	HVFDSB3C0040G231
	5	9.6	4	HVFDSB3C0050G210	HVFDSB3C0050G220	HVFDSB3C0050G230	HVFDSB3C0050G231
	7.5	12	4	HVFDSB3C0075G210	HVFDSB3C0075G220	HVFDSB3C0075G230	HVFDSB3C0075G231
	10	16	5	HVFDSB3C0100G210	HVFDSB3C0100G220	HVFDSB3C0100G230	HVFDSB3C0100G231
	15	23	5	HVFDSB3C0150G210	HVFDSB3C0150G220	HVFDSB3C0150G230	HVFDSB3C0150G231
	20	31	5	HVFDSB3C0200G210	HVFDSB3C0200G220	HVFDSB3C0200G230	HVFDSB3C0200G231
	25	38	6	HVFDSB3C0250G210	HVFDSB3C0250G220	HVFDSB3C0250G230	HVFDSB3C0250G231
	30	46	6	HVFDSB3C0300G210	HVFDSB3C0300G220	HVFDSB3C0300G230	HVFDSB3C0300G231
	40	61	6	HVFDSB3C0400G210	HVFDSB3C0400G220	HVFDSB3C0400G230	HVFDSB3C0400G231
	50	72	7	HVFDSB3C0500G210	HVFDSB3C0500G220	HVFDSB3C0500G230	HVFDSB3C0500G231
	60	87	7	HVFDSB3C0600G210	HVFDSB3C0600G220	HVFDSB3C0600G230	HVFDSB3C0600G231
	75	105	7	HVFDSB3C0750G210	HVFDSB3C0750G220	HVFDSB3C0750G230	HVFDSB3C0750G231
	100	140	8	HVFDSB3C1000G210	HVFDSB3C1000G220	HVFDSB3C1000G230	HVFDSB3C1000G231
	125	170	8	HVFDSB3C1250G210	HVFDSB3C1250G220	HVFDSB3C1250G230	HVFDSB3C1250G231
	150	205	8	HVFDSB3C1500G210	HVFDSB3C1500G220	HVFDSB3C1500G230	HVFDSB3C1500G231
	HP	AMPS	Frame	NEMA 12 Fused Disconnect	NEMA 12 2-Contactor Bypass	NEMA 12 3-Contactor Bypass	NEMA 12 3-Cont. Bypass + Auto-Bypass
208 Vac	.75	3.7	4	HVFDSB3A0007G210	HVFDSB3A0007G220	HVFDSB3A0007G230	HVFDSB3A0007G231
	1	4.8	4	HVFDSB3A0010G210	HVFDSB3A0010G220	HVFDSB3A0010G230	HVFDSB3A0010G231
	1.5	6.6	4	HVFDSB3A0015G210	HVFDSB3A0015G220	HVFDSB3A0015G230	HVFDSB3A0015G231
	2	8	4	HVFDSB3A0020G210	HVFDSB3A0020G220	HVFDSB3A0020G230	HVFDSB3A0020G231
	3	11	4	HVFDSB3A0030G210	HVFDSB3A0030G220	HVFDSB3A0030G230	HVFDSB3A0030G231
	5	18	5	HVFDSB3A0050G210	HVFDSB3A0050G220	HVFDSB3A0050G230	HVFDSB3A0050G231
	7.5	24	5	HVFDSB3A0075G210	HVFDSB3A0075G220	HVFDSB3A0075G230	HVFDSB3A0075G231
	10	31	5	HVFDSB3A0100G210	HVFDSB3A0100G220	HVFDSB3A0100G230	HVFDSB3A0100G231
	15	48	6	HVFDSB3A0150G210	HVFDSB3A0150G220	HVFDSB3A0150G230	HVFDSB3A0150G231
	20	62	6	HVFDSB3A0200G210	HVFDSB3A0200G220	HVFDSB3A0200G230	HVFDSB3A0200G231
	25	75	7	HVFDSB3A0250G210	HVFDSB3A0250G220	HVFDSB3A0250G230	HVFDSB3A0250G231
	30	88	7	HVFDSB3A0300G210	HVFDSB3A0300G220	HVFDSB3A0300G230	HVFDSB3A0300G231
	40	105	7	HVFDSB3A0400G210	HVFDSB3A0400G220	HVFDSB3A0400G230	HVFDSB3A0400G231
	50	140	8	HVFDSB3A0500G210	HVFDSB3A0500G220	HVFDSB3A0500G230	HVFDSB3A0500G231
	60	170	8	HVFDSB3A0600G210	HVFDSB3A0600G220	HVFDSB3A0600G230	HVFDSB3A0600G231
	75	205	8	HVFDSB3A0750G210	HVFDSB3A0750G220	HVFDSB3A0750G230	HVFDSB3A0750G231
	HP	AMPS	Frame	NEMA 12 Fused Disconnect	NEMA 12 2-Contactor Bypass	NEMA 12 3-Contactor Bypass	NEMA 12 3-Cont. Bypass + Auto-Bypass
230 Vac	.75	3.7	4	HVFDSB3B0007G210	HVFDSB3B0007G220	HVFDSB3B0007G230	HVFDSB3B0007G231
	1	4.8	4	HVFDSB3B0010G210	HVFDSB3B0010G220	HVFDSB3B0010G230	HVFDSB3B0010G231
	1.5	6.6	4	HVFDSB3B0015G210	HVFDSB3B0015G220	HVFDSB3B0015G230	HVFDSB3B0015G231
	2	8	4	HVFDSB3B0020G210	HVFDSB3B0020G220	HVFDSB3B0020G230	HVFDSB3B0020G231
	3	11	4	HVFDSB3B0030G210	HVFDSB3B0030G220	HVFDSB3B0030G230	HVFDSB3B0030G231
	5	18	5	HVFDSB3B0050G210	HVFDSB3B0050G220	HVFDSB3B0050G230	HVFDSB3B0050G231
	7.5	24	5	HVFDSB3B0075G210	HVFDSB3B0075G220	HVFDSB3B0075G230	HVFDSB3B0075G231
	10	31	5	HVFDSB3B0100G210	HVFDSB3B0100G220	HVFDSB3B0100G230	HVFDSB3B0100G231
	15	48	6	HVFDSB3B0150G210	HVFDSB3B0150G220	HVFDSB3B0150G230	HVFDSB3B0150G231
	20	62	6	HVFDSB3B0200G210	HVFDSB3B0200G220	HVFDSB3B0200G230	HVFDSB3B0200G231
	25	75	7	HVFDSB3B0250G210	HVFDSB3B0250G220	HVFDSB3B0250G230	HVFDSB3B0250G231
	30	88	7	HVFDSB3B0300G210	HVFDSB3B0300G220	HVFDSB3B0300G230	HVFDSB3B0300G231
	40	105	7	HVFDSB3B0400G210	HVFDSB3B0400G220	HVFDSB3B0400G230	HVFDSB3B0400G231
	50	140	8	HVFDSB3B0500G210	HVFDSB3B0500G220	HVFDSB3B0500G230	HVFDSB3B0500G231
	60	170	8	HVFDSB3B0600G210	HVFDSB3B0600G220	HVFDSB3B0600G230	HVFDSB3B0600G231
	75	205	8	HVFDSB3B0750G210	HVFDSB3B0750G220	HVFDSB3B0750G230	HVFDSB3B0750G231

SmartVFD HVAC NEMA 3R Disconnect and SmartVFD BYPASS

	HP	AMPS	Frame	NEMA 3R Fused Disconnect	NEMA 3R 2-Contactor Bypass	NEMA 3R 3-Contactor Bypass	NEMA 3R 3-Cont. Bypass + Auto-Bypass
	1.5	3.4	4	HVFDSB3C0015G310	HVFDSB3C0015G320	HVFDSB3C0015G330	HVFDSB3C0015G331
	2	4.8	4	HVFDSB3C0020G310	HVFDSB3C0020G320	HVFDSB3C0020G330	HVFDSB3C0020G331
	3	5.6	4	HVFDSB3C0030G310	HVFDSB3C0030G320	HVFDSB3C0030G330	HVFDSB3C0030G331
	4	8	4	HVFDSB3C0040G310	HVFDSB3C0040G320	HVFDSB3C0040G330	HVFDSB3C0040G331
	5	9.6	4	HVFDSB3C0050G310	HVFDSB3C0050G320	HVFDSB3C0050G330	HVFDSB3C0050G331
	7.5	12	4	HVFDSB3C0075G310	HVFDSB3C0075G320	HVFDSB3C0075G330	HVFDSB3C0075G331
	10	16	5	HVFDSB3C0100G310	HVFDSB3C0100G320	HVFDSB3C0100G330	HVFDSB3C0100G331
	15	23	5	HVFDSB3C0150G310	HVFDSB3C0150G320	HVFDSB3C0150G330	HVFDSB3C0150G331
460 Vac	20	31	5	HVFDSB3C0200G310	HVFDSB3C0200G320	HVFDSB3C0200G330	HVFDSB3C0200G331
	25	38	6	HVFDSB3C0250G310	HVFDSB3C0250G320	HVFDSB3C0250G330	HVFDSB3C0250G331
	30	46	6	HVFDSB3C0300G310	HVFDSB3C0300G320	HVFDSB3C0300G330	HVFDSB3C0300G331
	40	61	6	HVFDSB3C0400G310	HVFDSB3C0400G320	HVFDSB3C0400G330	HVFDSB3C0400G331
	50	72	7	HVFDSB3C0500G310	HVFDSB3C0500G320	HVFDSB3C0500G330	HVFDSB3C0500G331
	60	87	7	HVFDSB3C0600G310	HVFDSB3C0600G320	HVFDSB3C0600G330	HVFDSB3C0600G331
	75	105	7	HVFDSB3C0750G310	HVFDSB3C0750G320	HVFDSB3C0750G330	HVFDSB3C0750G331
	100	140	8	HVFDSB3C1000G310	HVFDSB3C1000G320	HVFDSB3C1000G330	HVFDSB3C1000G331
	125	170	8	HVFDSB3C1250G310	HVFDSB3C1250G320	HVFDSB3C1250G330	HVFDSB3C1250G331
	150	205	8	HVFDSB3C1500G310	HVFDSB3C1500G320	HVFDSB3C1500G330	HVFDSB3C1500G331
	HP	AMPS	Frame	NEMA 3R Fused Disconnect	NEMA 3R 2-Contactor Bypass	NEMA 3R 3-Contactor Bypass	NEMA 3R 3-Cont. Bypass + Auto-Bypass
	.75	3.7	4	HVFDSB3A0007G310	HVFDSB3A0007G320	HVFDSB3A0007G330	HVFDSB3A0007G331
	1	4.8	4	HVFDSB3A0010G310	HVFDSB3A0010G320	HVFDSB3A0010G330	HVFDSB3A0010G331
	1.5	6.6	4	HVFDSB3A0015G310	HVFDSB3A0015G320	HVFDSB3A0015G330	HVFDSB3A0015G331
	2	8	4	HVFDSB3A0020G310	HVFDSB3A0020G320	HVFDSB3A0020G330	HVFDSB3A0020G331
	3	11	4	HVFDSB3A0030G310	HVFDSB3A0030G320	HVFDSB3A0030G330	HVFDSB3A0030G331
	5	18	5	HVFDSB3A0050G310	HVFDSB3A0050G320	HVFDSB3A0050G330	HVFDSB3A0050G331
	7.5	24	5	HVFDSB3A0075G310	HVFDSB3A0075G320	HVFDSB3A0075G330	HVFDSB3A0075G331
208 Vac	10	31	5	HVFDSB3A0100G310	HVFDSB3A0100G320	HVFDSB3A0100G330	HVFDSB3A0100G331
	15	48	6	HVFDSB3A0150G310	HVFDSB3A0150G320	HVFDSB3A0150G330	HVFDSB3A0150G331
	20	62	6	HVFDSB3A0200G310	HVFDSB3A0200G320	HVFDSB3A0200G330	HVFDSB3A0200G331
	25	75	7	HVFDSB3A0250G310	HVFDSB3A0250G320	HVFDSB3A0250G330	HVFDSB3A0250G331
	30	88	7	HVFDSB3A0300G310	HVFDSB3A0300G320	HVFDSB3A0300G330	HVFDSB3A0300G331
	40	105	7	HVFDSB3A0400G310	HVFDSB3A0400G320	HVFDSB3A0400G330	HVFDSB3A0400G331
	50	140	8	HVFDSB3A0500G310	HVFDSB3A0500G320	HVFDSB3A0500G330	HVFDSB3A0500G331
	60	170	8	HVFDSB3A0600G310	HVFDSB3A0600G320	HVFDSB3A0600G330	HVFDSB3A0600G331
	75	205	8	HVFDSB3A0750G310	HVFDSB3A0750G320	HVFDSB3A0750G330	HVFDSB3A0750G331
	HP	AMPS	Frame	NEMA 3R Fused Disconnect	NEMA 3R 2-Contactor Bypass	NEMA 3R 3-Contactor Bypass	NEMA 3R 3-Cont. Bypass + Auto-Bypass
	.75	3.7	4	HVFDSB3B0007G310	HVFDSB3B0007G320	HVFDSB3B0007G330	HVFDSB3B0007G331
	1	4.8	4	HVFDSB3B0010G310	HVFDSB3B0010G320	HVFDSB3B0010G330	HVFDSB3B0010G331
	1.5	6.6	4	HVFDSB3B0015G310	HVFDSB3B0015G320	HVFDSB3B0015G330	HVFDSB3B0015G331
	2	8	4	HVFDSB3B0020G310	HVFDSB3B0020G320	HVFDSB3B0020G330	HVFDSB3B0020G331
	3	11	4	HVFDSB3B0030G310	HVFDSB3B0030G320	HVFDSB3B0030G330	HVFDSB3B0030G331
	5	18	5	HVFDSB3B0050G310	HVFDSB3B0050G320	HVFDSB3B0050G330	HVFDSB3B0050G331
	7.5	24	5	HVFDSB3B0075G310	HVFDSB3B0075G320	HVFDSB3B0075G330	HVFDSB3B0075G331
230 Vac	10	31	5	HVFDSB3B0100G310	HVFDSB3B0100G320	HVFDSB3B0100G330	HVFDSB3B0100G331
	15	48	6	HVFDSB3B0150G310	HVFDSB3B0150G320	HVFDSB3B0150G330	HVFDSB3B0150G331
	20	62	6	HVFDSB3B0200G310	HVFDSB3B0200G320	HVFDSB3B0200G330	HVFDSB3B0200G331
	25	75	7	HVFDSB3B0250G310	HVFDSB3B0250G320	HVFDSB3B0250G330	HVFDSB3B0250G331
	30	88	7	HVFDSB3B0300G310	HVFDSB3B0300G320	HVFDSB3B0300G330	HVFDSB3B0300G331
	40	105	7	HVFDSB3B0400G310	HVFDSB3B0400G320	HVFDSB3B0400G330	HVFDSB3B0400G331
	50	140	8	HVFDSB3B0500G310	HVFDSB3B0500G320	HVFDSB3B0500G330	HVFDSB3B0500G331
	60	170	8	HVFDSB3B0600G310	HVFDSB3B0600G320	HVFDSB3B0600G330	HVFDSB3B0600G331
	75	205	8	HVFDSB3B0750G310	HVFDSB3B0750G320	HVFDSB3B0750G330	HVFDSB3B0750G331

Smart Selection

VFD Pricing/Job Estimating Tools
*For additional tools you can use for the selection and pricing of VFDs, click on the "Commercial Components Estimating Tools" link at **customer.honeywell.com.***

NEMA 1

Frame Size	HP And Voltage		Configuration	Dimensions (in)			Weight (lb)
	208/230 VAC	460 VAC		W	H	D	
4	0.75-3 HP	1.5-7.5 HP	Drive alone	5	12.9	7.5	13.2
			Disconnect	8.9	31.9	10.3	33
			2-Contactor	8.9	31.9	9.6	38
			3-Contactor	8.9	38.9	10.3	44
			3-Contactor with Auto-Bypass	8.9	38.9	10.3	46
5	5 HP 7.5 HP 10 HP	10 HP 15 HP 20 HP	Drive alone	5.7	16.5	8.4	22
			Disconnect	8.9	34.7	10.3	43
			2-Contactor	8.9	34.7	9.6	48/50/50
			3-Contactor	8.9	41.7	10.3/10.3/10.8	55.5/57/59.5
			3-Contactor with Auto-Bypass	8.9	41.7	10.3/10.3/10.8	56/57.5/60
6	15 HP 20 HP	25 HP 30 HP 40 HP	Drive alone	7.7	21.9	9	44.1
			Disconnect	12.4	45.1	11.3	50
			2-Contactor	12.4	45.1	10.1	55/59
			3-Contactor	12.4	55.2	11.3	94.5/98.5/105.5
			3-Contactor with Auto-Bypass	12.4	55.2	11.3	96.5/100.5/107.5
7	25 HP 30 HP 40 HP	50 HP 60 HP 75 HP	Drive alone	9.3	25.4	10.2	82.7
			Disconnect	20.8	51.5	13.2	100
			2-Contactor	20.8	51.5	12.2	169/179/189
			3-Contactor	20.8	59	13.2	175/184/195
			3-Contactor with Auto-Bypass	20.8	59	13.2	177/186/197
8	50 HP 60 HP 75 HP	100 HP 125 HP 150 HP	Drive alone	11.4	38	13.5	154.3
			Disconnect	25	60	16.2	200
			2-Contactor	25	60	15.2	250/265/280
			3-Contactor	25	70	16.2	285/295/331
			3-Contactor with Auto-Bypass	25	70	16.2	287/297/333
9	100-125 HP	200-250 HP	Drive alone	18.9	45.3	14.4	238.1

NEMA 12

Frame Size	HP And Voltage		Configuration	208/230 Vac Dimensions (in) & Weight (lb)				460 Vac Dimensions (in) & Weight (lb)			
	208/230 VAC	460 VAC		W	H	D	lb	W	H	D	lb
4	0.75-3 HP	1.5HP-7.5 HP	Drive alone	5	12.9	7.5	13.2	5	12.9	7.5	13.2
			Disconnect	12	37.5	11	40	12	37.5	11	40
			2-Contactor	16	37.5	11	55	16	37.5	11	53
			3-Contactor	16	37.5	11	55	16	37.5	11	53
			3-Contactor with Auto-Bypass	16	37.5	11	55	16	37.5	11	53
5	5-10 HP	10 HP 15 HP 20 HP	Drive alone	5.7	16.5	8.4	22	5.7	16.5	8.4	22
			Disconnect	12	41	11	72	12	41	11	72
			2-Contactor	16	41/41/45	11	70/70/84	16	41/41/45	11	64/64/76
			3-Contactor	16	41/41/45	11	70/70/84	16	41/41/45	11	64/64/76
			3-Contactor with Auto-Bypass	16	41/41/45	11	70/70/84	16	41/41/45	11	64/64/76
6	15-20 HP	25 HP 30 HP 40 HP	Drive alone	7.7	21.9	9	44.1	7.7	21.9	9	44.1
			Disconnect	12	46.5	13	120	12/12/16	46.5	13	120/120/136
			2-Contactor	16/20	50.5/54.5	13	125/140	16/16/20	50.5/50.5/54.5	13	120/120/136
			3-Contactor	16/20	50.5/54.5	13	125/140	16/16/20	50.5/50.5/54.5	13	120/120/136
			3-Contactor with Auto-Bypass	16/20	50.5/54.5	13	125/140	16/16/20	50.5/50.5/54.5	13	120/120/136
7	25-40 HP	50 HP 60 HP 75 HP	Drive alone	9.3	25.4	10.2	82.7	9.3	25.4	10.2	82.7
			Disconnect	16	50.5	13.5	145/160/175	16	50.5	13.5	145/160/175
			2-Contactor	20/24/30	58.5/65.5/70.5	13.5	160/175/200	20/24/30	58.5/65.5/70.5	13.5	150/165/193
			3-Contactor	20/24/30	58.5/65.5/70.5	13.5	160/175/200	20/24/30	58.5/65.5/70.5	13.5	150/165/193
			3-Contactor with Auto-Bypass	20/24/30	58.5/65.5/70.5	13.5	160/175/200	20/24/30	58.5/65.5/70.5	13.5	150/165/193
8	50-75 HP	100 HP 125 HP 150 HP	Drive alone	11.4	38	13.5	154.3	11.42	38.03	13.5	154.3
			Disconnect	Contact Customer Care				Contact Customer Care			
			2-Contactor								
			3-Contactor								
			3-Contactor with Auto-Bypass								
9	100-125 HP	180-220 HP	Drive alone	18.9	45.3	14.4	238.1	14.37	45.27	18.9	238.1

NEMA 3R

Frame Size	HP And Voltage		Configuration	Dimensions (in)			Weight (lb)
	208/230 VAC	460 VAC		W	H	D	
4	0.75-3 HP	1.5-7.5 HP	Drive alone	20.5	20	10.5	39
			Disconnect	20.5	20	12	43
			2-Contactor	24.5	24	10.5	49
			3-Contactor	24.5	24	12	54
			3-Contactor with Auto-Bypass	24.5	24	12	54
5	5-10 HP	10-20 HP	Drive alone	20.5	24	10.5	58
			Disconnect	20.5	24	12	61
			2-Contactor	24.5	24	10.5	72
			3-Contactor	28.5	30	12	78
			3-Contactor with Auto-Bypass	28.5	30	12	78
6	15-20 HP	25-40 HP	Drive alone	28.5	36	10.5	80
			Disconnect	28.5	36	12	88
			2-Contactor	28.5	36	10.5	118
			3-Contactor	34.5	36	12	124
			3-Contactor with Auto-Bypass	34.5	36	12	124
7	25-40 HP	50-75 HP	Drive alone	28.5	48	12.5	130
			Disconnect	28.5	48	14	149
			2-Contactor	28.5	48	12.5	185
			3-Contactor	40.5	48	14	193
			3-Contactor with Auto-Bypass	40.5	48	14	193
8	50-75 HP	100-150 HP	Drive alone	40.5	60	12.5	299
			Disconnect	40.5	60	14	340
			2-Contactor	40.5	60	12.5	430
			3-Contactor	40.5	60	14	440
			3-Contactor with Auto-Bypass	40.5	60	14	440

Honeywell SmartVFD HVAC and SmartVFD BYPASS are smaller, sleeker and require a smaller footprint than other manufacturers. They are specifically designed for your HVAC application.

Smart Accessories

SmartVFD Accessories

Accessory	Description	Drive Used with
32006630-001/U	LON Communication Card (NXOPTC4)	SMART
HVFDSDOPT1AI2AO/U	1 x AI, 2 x AO (isolated, D- and E- slot compatible)	SMART
HVFDSDOPT1RO5DI/U	1 x RO, 5 x DI (42-240 VAC, D- and E- slot compatible)	SMART
HVFDSDREP2RO1T/U	2 x RO + Thermistor (B- slot compatible)	SMART
HVFDSDOPT2RO1T/U	2 x RO + Thermistor (D- and E- slot compatible)	SMART
HVFDSDOPT3RO/U	3 x RO (D- and E- slot compatible)	SMART
HVFDSDBATTERY/U	Battery Package, 5 pcs, for Real Time Clock	SMART
HVFDSDREP3RO/U	3 x RO (B- slot compatible)	SMART
HVFDSDOPT6DI/U	6 x DI / DO Programmable (D- and E- slot compatible)	SMART
HVFDSDTRAINER/U	SmartVFD HVAC Training Demonstration Kit	SMART
HVFDSDGRAPHICKP/U	SmartVFD HVAC Replacement Graphical Keypad	SMART
HVFDSDMOUNTKIT/U	SmartVFD HVAC Panel Mount Kit for NEMA 12 Install 3 Meter Cable	SMART
HVFDSDNEMA12FR4/U	SmartVFD HVAC NEMA 12 Kit Frame 4	SMART
HVFDSDNEMA12FR5/U	SmartVFD HVAC NEMA 12 Kit Frame 5	SMART
HVFDSDNEMA12FR6/U	SmartVFD HVAC NEMA 12 Kit Frame 6	SMART
HVFDSDFLANGEFR4/U	SmartVFD HVAC Flange Mounting Kit for Frame 4	SMART
HVFDSDFLANGEFR5/U	SmartVFD HVAC Flange Mounting Kit for Frame 5	SMART
HVFDSDFLANGEFR6/U	SmartVFD HVAC Flange Mounting Kit for Frame 6	SMART
HVFDSDFLANGEFR7/U	SmartVFD HVAC Flange Mounting Kit for Frame 7	SMART
HVFDSDFANFR4/U	SmartVFD HVAC Frame 4 Replacement Fan	SMART
HVFDSDFANFR5/U	SmartVFD HVAC Frame 5 Replacement Fan	SMART
HVFDSDFANFR6/U	SmartVFD HVAC Frame 6 Replacement Fan	SMART
HVFDSDFANFR7/U	SmartVFD HVAC Frame 7 Replacement Fan	SMART
HVFDSDINSTALLFR4/U	SmartVFD HVAC Replacement Installation Accessories Frame 4	SMART
HVFDSDINSTALLFR5/U	SmartVFD HVAC Replacement Installation Accessories Frame 5	SMART
HVFDSDINSTALLFR6/U	SmartVFD HVAC Replacement Installation Accessories Frame 6	SMART
HVFDCABLE/U	SmartVFD Compact Commissioning Cable and USB Adaptor	COMPACT & SMART

See the Big Picture

With an optional Micro Communication Adapter (MCA), you can turn your computer into a window to easily setup, operate, monitor and diagnose your SmartVFD drives. Just download the free PC Tool software from customer.honeywell.com, then use the adapter to connect to the drive.

PROGRAMMING AND COMMISSIONING

You'll have it all at your fingertips:

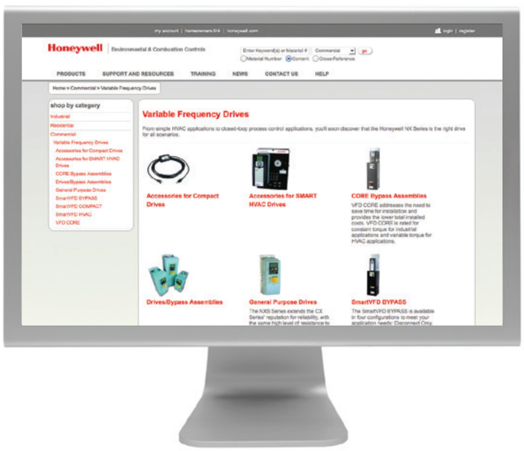
- Upload and download parameters to the SmartVFD drive for viewing and editing with maximum, minimum and default values for each parameter
- Directly control the drive to run it through its paces
- Save parameters for offline editing
- Directly control the drive speed in real time

MONITORING AND DIAGNOSTICS

See it all onscreen:

- Monitor parameters in real time
- Save screen shots and export values to a spreadsheet
- Pause a real-time monitoring window to capture accurate data
- For diagnostic assistance, view detailed active faults, the fault history (up to 40 stored faults), and I/O states

Smart Contacts and Websites



Honeywell Take-Off Service

1. Submit your information in one of the following ways:
   a) E-mail to takeoff.service@honeywell.com (preferred)
   b) Fax toll-free to 1-877-880-3386
2. Include your desired turn-around time
3. Take-Off Service staff will send you a confirmation that your e-mail or fax was received. We always attempt to have your request finished as soon as possible. Please note, however, that the quality of the submitted information largely determines the turn-around time. We will work closely with you to ensure that we have enough information to move forward as quickly as possible.
4. Following take-off completion, a final product schedule spreadsheet will be returned to you that includes:
   - Complete product schedule
   - Base Price
   - Directions on how to order Honeywell products
   - Links to product submittals
   - Quote identification number

Main VFD Website
customer.honeywell.com/VFD

VFD Technical Hotline
763-954-6464 or
888-516-9347 option 4
techmail@honeywell.com

VFD for Consulting Engineer Site
specifyhoneywell.com/product.resources

Literature Ordering for VFD
literature.honeywell.com

Honeywell Promotional Materials
honeywell.promocollection.com

Buildings University Online and Face-to-Face Training
customer.honeywell.com/buildingsuniversity

New Product and Programs Website
beyondinnovation.honeywell.com

Learn More
For more information on Honeywell Variable Frequency Drives, contact your local Honeywell distributor, your Honeywell sales representative, call 1-800-466-3993 or visit **customer.honeywell.com/VFD**.

Automation and Control Solutions

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Golden Valley, MN 55422-3992

In Canada:
Honeywell Limited
35 Dynamic Drive
Toronto, Ontario M1V 4Z9

In Latin America:
Honeywell
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Miami, FL 33178
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67-7505 PM
February 2013

Triple Duty® Valves – Three Valves In One

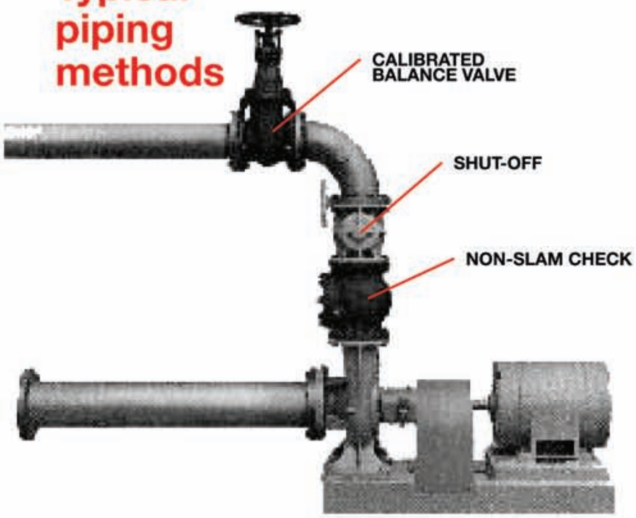
- SHUT-OFF
- CENTER GUIDED NON-SLAM CHECK
- CALIBRATED BALANCE VALVE

Bell & Gossett
a xylem brand

B-821F

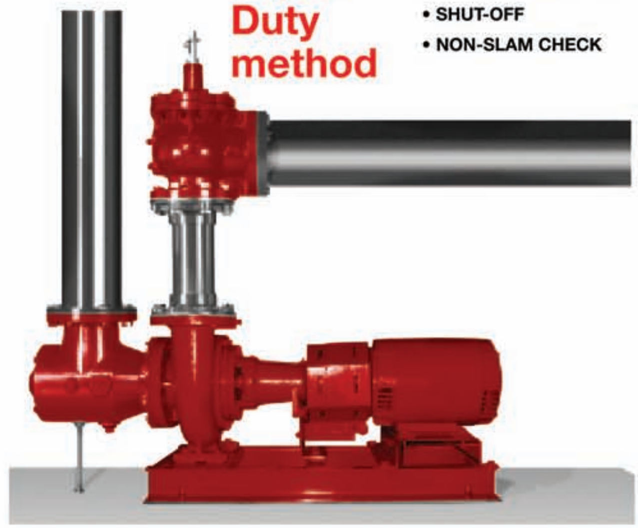
Are you paying for THREE valves when ONE will do the job?

Typical piping methods



Triple Duty method

- CALIBRATED BALANCE
- SHUT-OFF
- NON-SLAM CHECK



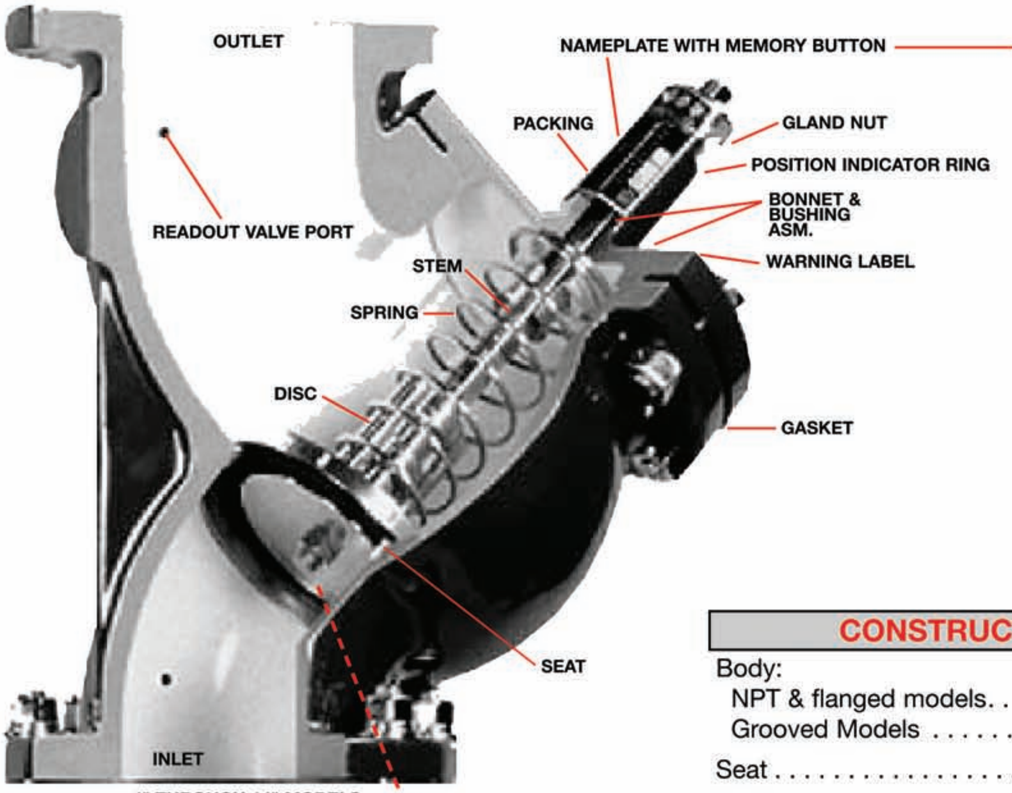
TDV FEATURES	TDV BENEFITS
• Lowest pressure drop	• ***Meets ASHRAE 90.1*** requirements by providing the most energy efficient operation of any similar valve
• 3-Valves in one; center guided non-slam check, calibrated balance and shut-off	• Minimizes cost and reduces installation time
• Maximum range of control (8-9 turns)	• Provides precise flow controls versus 1/4 turn "on-off" throttling valves
• Spring loaded with "soft seat" design	• Assures positive shut-off and prevents valve chatter
• Brass seat, stainless steel stem and bronze disc	• Provides maximum long life protection against aggressive liquids
• Brass read-out valves	• Permits accurate system balance to maximize operating efficiency
• Calibrated nameplate & memory button	• Allows return of valve to the balanced position after shut-off
• Backseating valve stem	• Allows for repacking under full system pressure
• Available in flanged, grooved and NPT connections	• Custom valves that meet your every selection.

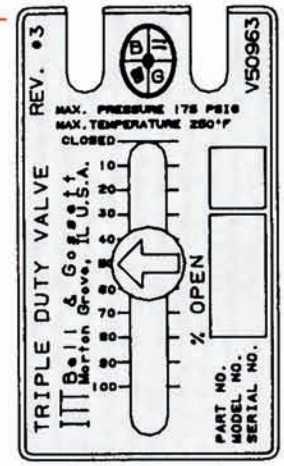
KEY BELL & GOSSETT TDV FEATURES VERSUS THE COMPETITION

Key Features	B&G	Competitor-A	Competitor-T	Competitor-W
1. Lowest Pressure Drop	YES	NO	NO	NO
2. ASHRAE 90.1 Energy Efficient Design	YES	NO	NO	NO
3. 3-Valves in One	YES	YES	NO	NO
4. EPDM Disc Soft Seat Design	YES	NO	NO	NO
5. Repack Under Pressure	YES	YES	NO	NO
6. Brass seat, stainless steel stem & bronze disc	YES	NO	NO	NO
7. Multi-turn Valve (8-9 turns) vs 1/4 turn range of control	YES	YES	NO	NO

Materials of Construction for Flanged & Grooved Models

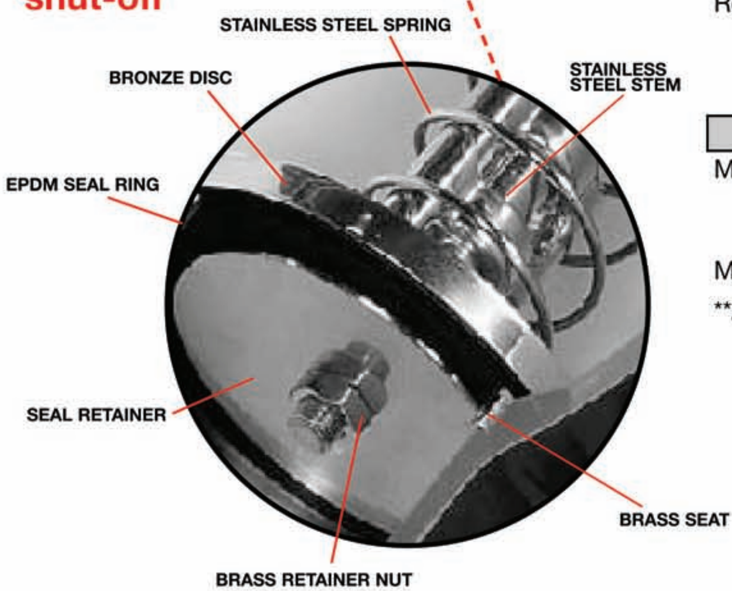
Typical Cross Section View





4" THROUGH 14" MODELS
2", 2½" & 3" MODELS
HAVE A SCREWED BONNET

Soft Seat Valve Disc provides positive shut-off



CONSTRUCTION MATERIAL	
Body:	
NPT & flanged models	Cast iron
Grooved Models	Ductile iron
Seat	Brass
Disc	Bronze with EPDM seat insert
Stem	Stainless Steel
Spring	Stainless Steel
Packing	Teflon-Graphite
Read-Out Valves	Brass

OPERATING DATA	
Maximum working pressure:	
Cast iron models	175 PSIG (1207 kPa)
Ductile iron models	**300 PSIG (2609 kPa)
Maximum operating temperature	250°F (121°C)

**Available in groove connection only

As part of the Federal Energy Policy Act of 1992 (known as EPACT 92), effective October 25, 1997, the U.S. Dept of Energy has established ASHRAE/IES Standard 90.1-1989 as the benchmark for HVAC systems in all new buildings (except low rise residential).

Within ASHRAE 90.1, Section 9.4.10.3 addresses hydronic system balancing and states that hydronic system balancing shall be accomplished in such a manner to first minimize throttling losses. The intent of the code is to substantially reduce the throttling of valves, which waste energy, utilized to balance the system and to apply valves that do not "increase the overall building energy costs."

"Line sizing" the valve to match the distribution piping is the most common method seen today for selecting a valve size.

Unfortunately, this method of oversizing the control valve by "line sizing" results in:

- Higher overall operating costs (higher HP usage)
- Higher "first cost basis" for the valve
- The possibility of damage to the valve seat (wire draw.)

Proper Triple Duty Valve (TDV) sizing should consist of selecting the TDV as a ***true calibrated multiturn balance valve*** (i.e. Cv Rating), not a quarter turn on-off throttle valve. The Cv Rating is defined as the number of gallons of water at 60°F which pass through a device with one pound per square inch pressure differential.

Using a lower Cv can cost the owner money. Tests revealed the following Cv results from *"other manufacturers"* valves compared to the Bell & Gossett TDV.

Cv COMPARISON

4" VALVE	B&G TDV	COMPETITOR-A	COMPETITOR-T	COMPETITOR-W
Published Cv (100% Open)	352	150	290	220

Application note: Bell & Gossett recommends a minimum three (3) ft pressure drop acr

To achieve optimum system performance and economical installation, Triple Duty Valves should be sized, based upon system flow requirements and selecting the Triple Duty Valve with the lowest minimal pressure drop.

For example. The Pressure Drop Comparison chart below was calculated utilizing the Scale #5 on the Bell & Gossett System Sizer Calculator, the above referenced Cv Comparison chart and a system based on 5" steel pipe with a flow of 400 GPM.

oss the valve for accurate flow determination.

PRESSURE DROP COMPARISON

4" VALVE	B&G TDV	COMPETITOR-A	COMPETITOR-T	COMPETITOR-W
Pressure Drop (100% Open)	3'	16'	4.4'	7.6'

Application note: Bell & Gossett recommends a minimum three (3) ft pressure drop across the valve for accurate flow determination.

YEARLY COST OF OPERATION*

VALVE SIZE	B&G TDV	COMPETITOR-A	COMPETITOR-T	COMPETITOR-W
2"	$ 3.88	n/a	$ 12.44	n/a
2.5"	7.78	$ 46.23	8.78	$ 46.25
3"	15.20	70.02	38.51	70.02
4"	44.02	130.69	59.09	130.69
5"	120.25	456.79	256.94	456.79
6"	258.15	792.84	487.72	792.84
8"	956.52	1578.26	1854.10	1578.26
10"	2003.79	2780.93	5051.93	2780.93
12"	4495.91	3156.91	n/a	3156.91
14"	5362.08	n/a	n/a	n/a

**Based upon National Utility Service survey rate of $0.0713/Kwh; complies with ASHRAE standard at max. 4'/100' requirement*

WEIGHT COMPARISON

Valve Size	B&G TDV	Competitor-A	Competitor-T	Competitor-W
2"	24 lbs.	19 lbs.	12.5 lbs.	19 lbs.
2.5"	28 lbs.	40 lbs.	27 lbs.	40 lbs.
3"	39 lbs.	42 lbs.	36 lbs.	42 lbs.
4"	94 lbs.	64 lbs.	67 lbs.	64 lbs.
5"	114 lbs.	95 lbs.	78 lbs.	95 lbs.
6"	186 lbs.	122 lbs.	120 lbs.	122 lbs.
8"	316 lbs.	165 lbs.	176 lbs.	165 lbs.
10"	458 lbs.	508 lbs.	407 lbs.	508 lbs.
12"	662 lbs.	580 lbs.	n/a	580 lbs.
14"	780 lbs.	n/a	n/a	n/a

PERFORMANCE DATA

Valve Pattern	Cv Rating Reference	Cv Rating at 100% of stem rise*									
		3D-2S	3D-2½S	3D-3S	3D-4S	3D-5S	3D-6S	3D-8S	3D-10S	—	—
		3DS-2S	3DS-2½S	3DS-3S	3DS-4S	3DS-5S	3DS-6S	3DS-8S	3DS-10S	3DS-12S	3DS-14S
		3DS-2G	3DS-2½G	3DS-3G	3DS-4G	3DS-5G	3DS-6G	3DS-8G	3DS-10G	3DS-12G	—
ANGLE	A	113	106	241	456	632	863	1239	2330	NA	NA
	B	85	100	202	356	496	733	1135	1998		
STRAIGHT	A	83	116	204	359	502	746	1085	1851	2446	3000
	B	77	117	191	336	497	701	1079	1826	2430	3225

A. Flowmeter Cv for balancing, minimum reading of 3 feet of pressure drop required for accurate flow determination.
B. Cv for calculating pressure drop across across the valve.
NOTE: Maximum recommended pressure drop should not exceed 25 feet.
*Contact your local Bell & Gossett representative for complete performance curve data.
NA (Not available)

TYPICAL SPECIFICATION (All models)

Furnish and install as shown on plans, a (select one: straight, angle or straight-angle) _________ pattern valve designed to perform the functions of a center guided nonslam check valve, shutoff valve and calibrated balancing valve.

The valve shall be of heavy-duty (select one: cast iron [NPT & flanged models only] or ductile iron [grooved models only]) _______iron construction with (select one: NPT connections per ANSI B1.20.1-83 suitable for 175 psi [1207 kPa] working pressure [NPT models only],125 psi [862 kPa] ANSI flanged connections suitable for 175 psi [1207 kPa] working pressure, or standard cut groove connections suitable for working pressures up to 300 psi [2069 kPa] [straight pattern models only]) ________connections for operating temperatures up to 250°F (121°C). The valve shall be fitted with a bronze seat, replaceable bronze disc with EPDM seat insert or stainless steel __________ stem, and chatter preventing stainless steel spring. The valve design shall permit repacking under full system pressure.

Cv rating shall be provided at every 10% increment opening for the straight and angle valve. Manufacturer shall supply the Cv rating for read-out of flow determination and system pressure drop.

The valve shall be equipped with brass readout valves (with integral check valve) to facilitate taking differential pressure readings across the orifice for accurate system balance. The valve shall be produced at an ISO 9001 approved facility.

Each valve shall be Bell & Gossett Model No. 3D-_______, _________pattern Triple Duty Valve.

NOTES

NOTES

Xylem Inc.
8200 N. Austin Avenue
Morton Grove, Illinois 60053
Phone: (847) 966-3700
Fax: (847) 965-8379
www.xyleminc.com/brands/bellgossett

ENVIROair

EMI

SZI Series
Specifications & Submittal Data

24,000 Btuh ~16 SEER Single Zone High-Wall Inverter Heat Pump Split System

Indoor Air Handler Model:

Z	W	H	B	2	4	D	0

- Product: [Z=16SEER Single-Zone DC Inverter]
- Type: [W=High-Wall Cabinet]
- Operation: [H=Heat Pump]
- Revison: [B=2nd]
- Capacity: [24=24,000 Btuh]
- Voltage: [D=208-230v/60Hz/1ph]
- Open: [0=None]

Outdoor Condenser Model:

Z	H	B	2	4	D	0	0

- Product: [Z=16SEER Single-Zone DC Inverter]
- Operation: [H=Heat Pump]
- Revison: [B=2nd]
- Capacity: [24=24,000 Btuh]
- Voltage: [D=208-230v/60Hz/1ph]
- Control: [0=Standard]
- Coil Option: [0=Aluminum/Copper, Std]

AHRI CERTIFIED™ www.ahridirectory.org
Unitary Small HP
AHRI Standard 210/240
Certification applies only when the complete system is listed with AHRI

Order Quantity of System	
	24,000 Btuh ~16 SEER Single Zone High-Wall, Inverter, 230V, Heat Pump Split System

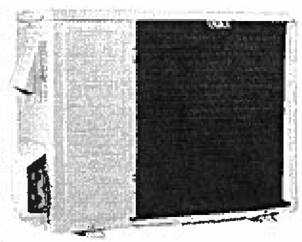
c ETL LISTED us
Intertek

Please select desired accessory quantities, for each system - (max allowed) Part Number			
	Condensate Pump, 208/230V, Wall/Floor Mount, Stand-Alone, 144" lift **(1/Zone or Air Handler) PN 240003106**		Ref Line Set, SZI 24k Btuh, 5/8"x3/8", 8M/26ft, Both Lines Insulated **(See Note Below) PN F0532266A**
	Condensate Pump, 115V, Wall/Floor Mount, Stand-Alone, 144" lift **(1/Zone or Air Handler) PN 240003107**		Ref Line Set, SZI 24k Btuh, 5/8"x3/8", 15M/49ft, Both Lines Insulated **(See Note Below) PN F0532496A**

Note: A Handheld Infrared Remote Control comes with each Air Handler, standard

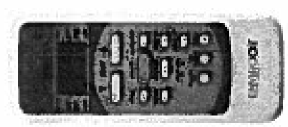
Electrical Specifications

Model #	Volts / Ph / Hz	Fan Motor			Compressor		Rated Current		Min Volt.	MCA	MOCP
		RLA	LRA	Watts	RLA	LRA	Cool A	Heat A			
ZHB24D00	208-230 / 1 / 60	0.53	0.9	136/130	10.2	N/A	10.83	10.54	187	15	20
ZWHB24D0	208-230 / 1 / 60	0.20	N/A	58	-	-					



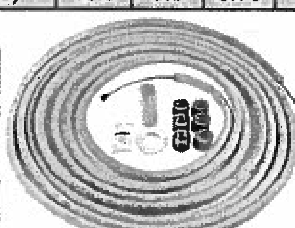
Performance — Heat Pump System with High-Wall Units

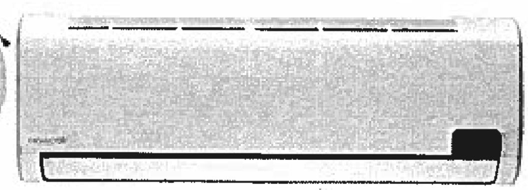
Condenser	Air Handler	Cooling Btuh(kW)	Heating Btuh(kW)	SEER	HSPF	SHR	EER	COP	Refrig.
ZHB24D00	ZWHB24D0	23,000 (5.3)	23,000 (5.3)	16.0	9.0	0.73	9.2	2.78	R-410A



Standard Low Ambient Operating Range

Mode		Outdoor Ambient Temp	Indoor Ambient Temp
Cooling	Max	122°F (50°C) DB	90°F (32°C) DB
	Min	5°F (-15°C) DB	62°F (17°C) DB
Heating	Max	86°F (30°C) DB	86°F (30°C) DB
	Min	5°F (-15°C) DB	32°F (0°C) DB





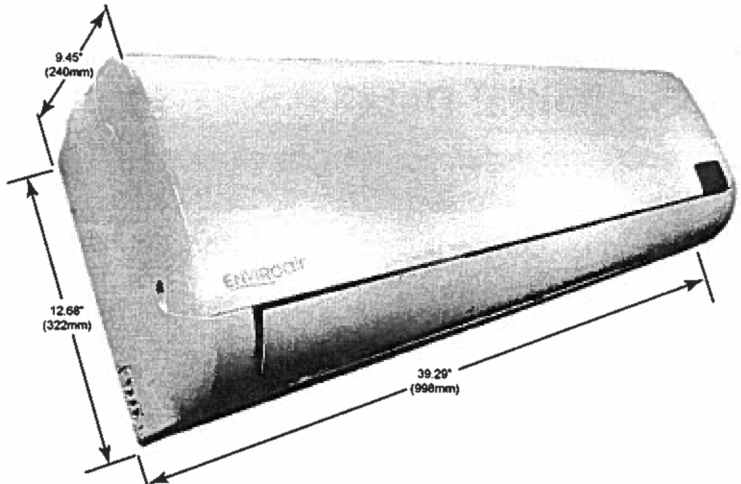
To: Honeywell
Date:
From:
Contact:

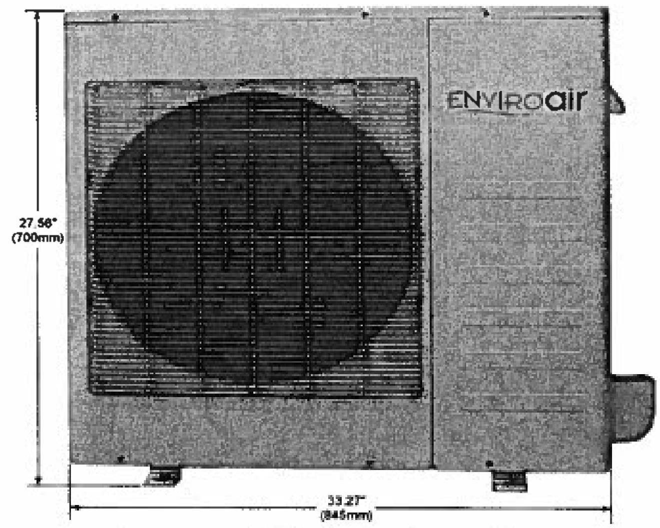
Project: Verona BOE
Customer:
Location: (2) HS Computer Room, FN Brown Comput
Engineer:
Unit Tag#:

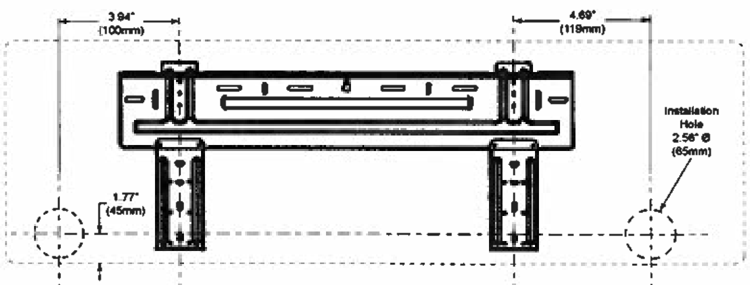
For Your: ☒ Reference ☐ Approval ☐ Construction

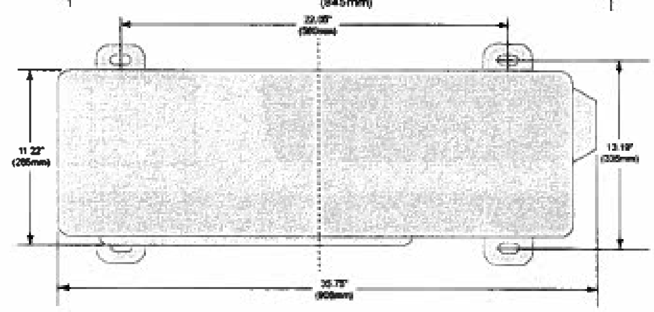
PN 240009913 Rev B (04/25/2014)

Indoor Air Handler & Outdoor Condenser Dimensions





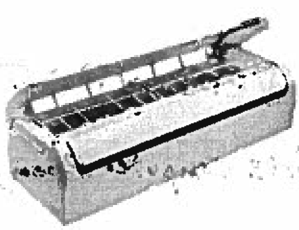


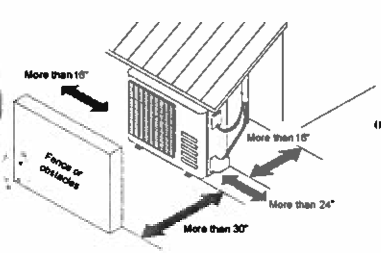


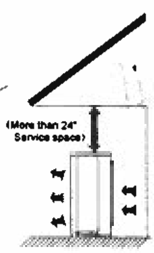
Miscellaneous Product Specifications

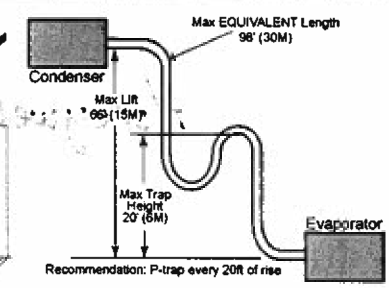
Air Handler Air Flow	660 / 605 / 520 CFM	**Condenser Gas/Liq Connects**	5/8" × 3/8"
Air Handler Sound Level	49 / 47 / 42 dBA	**Power/Control Wiring (max length)**	110ft (4-Wire)
Air Handler Weight (net/gross)	27 / 35 lbs	**Power/Control Wiring (Voltage)**	Line Voltage
Air Handler Gross Dimensions	42.52" × 15.75" × 12.60"	**Power/Control Wiring (Guage)**	Local Code
Air Handler Gas/Liq Connects	5/8" × 3/8"	**Max EQUIVALENT Pipe Length**	98 ft
Air Handler Filter	2 - Washable Mesh	**Max Height Diff (OD unit higher)**	66 ft
Condenser Air Flow	1590 CFM	**Max Height Diff (OD unit lower)**	66 ft
Condenser Sound Level	62 dBA	**Design Pressure (High/Low)**	550 / 340 PSIG
Condenser Weight (net/gross)	107 / 115 lbs	**Refrigerant Line Sets**	Flare - Both Lines Insulated
Condenser Gross Dimensions	37.99" × 29.72" × 15.55"	**Line Set-System Charge**	** 0.322 oz/ft (20 g/m)
Factory Refrig. Charge / Type	* 68.78oz (1950g) / R-410A	**Moisture Removal**	2.5 L/hr
Compressor Oil Type / Volume	Ester Oil VG74 / 500ml	* Total charge for condenser, air handler & 25ft Equivalent length of tubing	
Compressor Mfr / Type	GMCC / Twin-Rotary	** Subtract 25ft from Total Equivalent Length calculation, for factory charge	

ECR International, Inc.
2201 Dwyer Avenue
Utica, New York 13501
Phone: 1.800.325.5279
Web: enviromaster.com









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ENVIROair

EMI

SZI Series
Specifications & Submittal Data

30,000 Btuh ~16 SEER Single Zone High-Wall Inverter Heat Pump Split System

Indoor Air Handler Model: Z W H A 3 0 D 0

- Product: [Z=16SEER Single-Zone DC Inverter]
- Type: [W=High-Wall Cabinet]
- Operation: [H=Heat Pump]
- Revison: [A=1st]
- Capacity: [30=30,000 Btuh]
- Voltage: [D=208-230v/60Hz/1ph]
- Open: [0=None]

Outdoor Condenser Model: Z H A 3 0 D 0 0

- Product: [Z=16SEER Single-Zone DC Inverter]
- Operation: [H=Heat Pump]
- Revison: [A=1st]
- Capacity: [30=30,000 Btuh]
- Voltage: [D=208-230v/60Hz/1ph]
- Control: [0=Standard]
- Coil Option: [0=Aluminum/Copper, Std]

AHRI CERTIFIED™ www.ahridirectory.org Unitary Small HP AHRI Standard 210/240 Certification applies only when the complete system is listed with AHRI

Order Quantity of System	
	30,000 Btuh ~16 SEER Single Zone High-Wall, Inverter, 230V, Heat Pump Split System

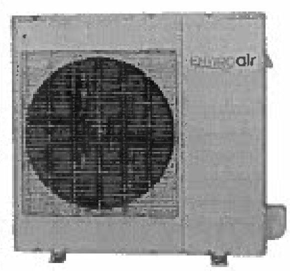
C ETL LISTED US Intertek

Please select desired accessory quantities, for each system - (max allowed) Part Number			
	Condensate Pump, 208/230V, Wall/Floor Mount, Stand-Alone, 144" lift **(1/Zone or Air Handler) PN 240003106**		Ref Line Set, SZI 30k Btuh, 5/8"x3/8", 8M/26ft, Both Lines Insulated **(See Note Below) PN F0532266A**
	Condensate Pump, 115V, Wall/Floor Mount, Stand-Alone, 144" lift **(1/Zone or Air Handler) PN 240003107**		Ref Line Set, SZI 30k Btuh, 5/8"x3/8", 15M/49ft, Both Lines Insulated **(See Note Below) PN F0532496A**

Note: A Handheld Infrared Remote Control comes with each Air Handler, standard

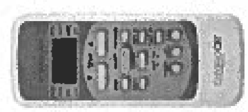
Electrical Specifications

Model #	Volts / Ph / Hz	Fan Motor			Compressor		Rated Current		Min Volt.	MCA	MOCP
		RLA	LRA	Watts	RLA	LRA	Cool A	Heat A			
ZHA30D00	208-230 / 1 / 60	0.75	0.99	157/94	8.85	N/A	13.1	11.0	187	16	25
ZWHA30D0	208-230 / 1 / 60	0.51	0.80	113/87/68	-	-					



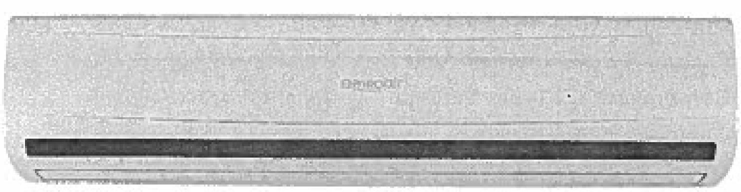
Performance — Heat Pump System with High-Wall Units

Condenser	Air Handler	Cooling Btuh(kW)	Heating Btuh(kW)	SEER	HSPF	SHR	EER	COP	Refrig.
ZHA30D00	ZWHA30D0	30,000 (8.8)	30,000 (8.8)	16.0	9.6	0.73	10.0	3.6	R-410A



Standard Low Ambient Operating Range

Mode		Outdoor Ambient Temp	Indoor Ambient Temp
Cooling	Max	122°F (50°C) DB	90°F (32°C) DB
	Min	5°F (-15°C) DB	62°F (17°C) DB
Heating	Max	86°F (30°C) DB	86°F (30°C) DB
	Min	5°F (-15°C) DB	32°F (0°C) DB



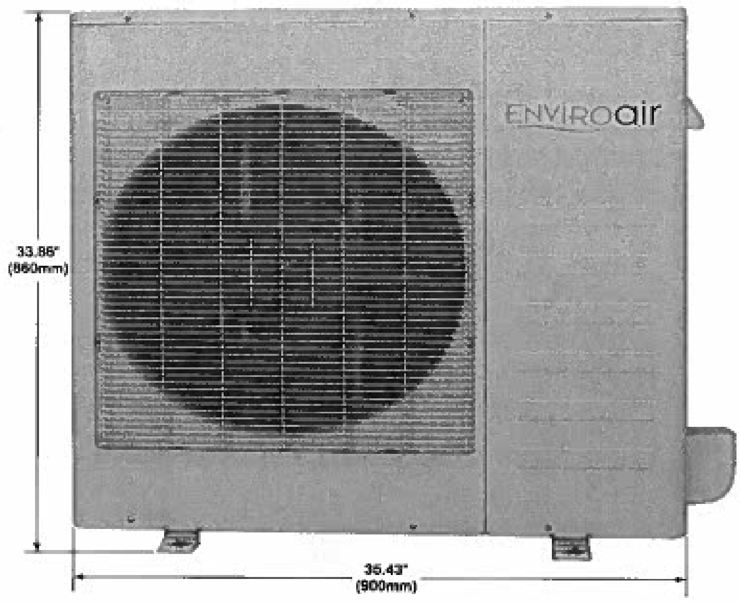
To: Honeywell
Date:
From:
Contact:

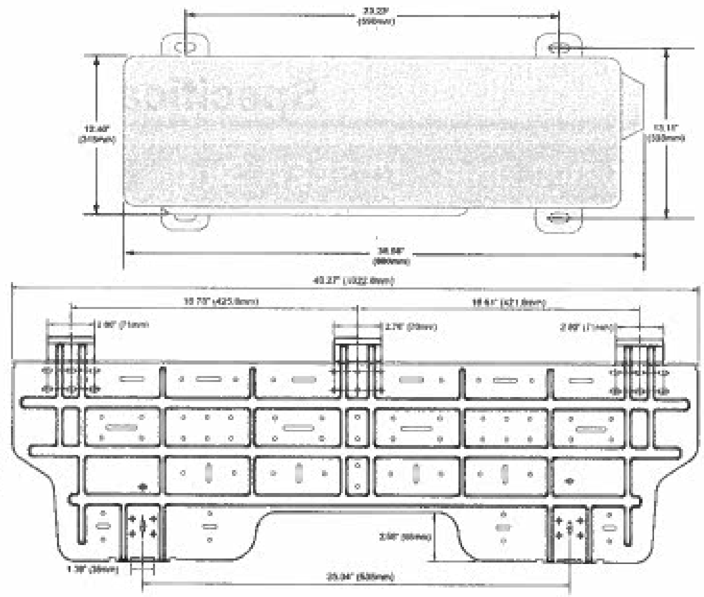
Project: Verona - Forest ES
Customer:
Location: Room 11
Engineer:
Unit Tag#

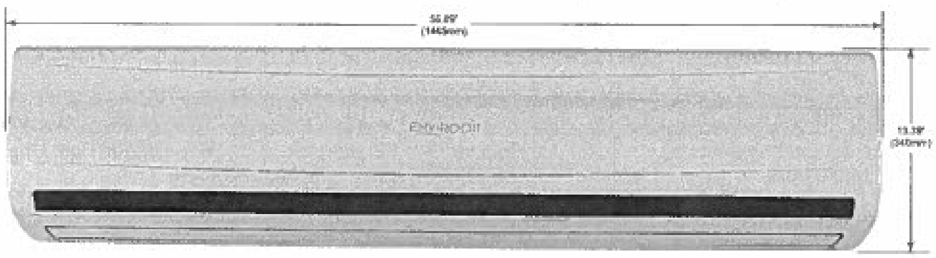
For Your: [X] Reference [ ] Approval [ ] Construction

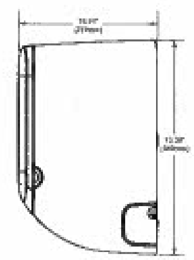
PN 240010416 Rev A (04/28/2014)

Indoor Air Handler & Outdoor Condenser Dimensions







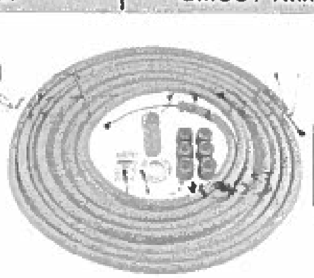


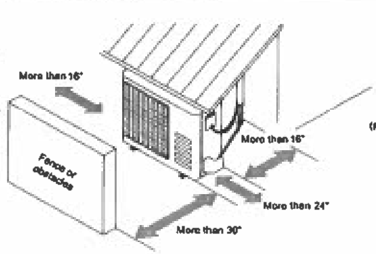
Miscellaneous Product Specifications

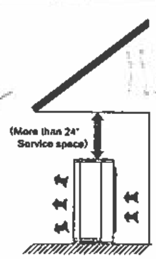
Air Handler Air Flow	970 / 840 / 740 CFM	**Condenser Gas/Liq Connects**	5/8" × 3/8"
Air Handler Sound Level	50 / 47 / 43 dBA	**Power/Control Wiring (max length)**	164 ft (4-Wire, Unshielded)
Air Handler Weight (net/gross)	53 / 71 lbs	**Power/Control Wiring (Voltage)**	Line Voltage
Air Handler Gross Dimensions	60.24" × 16.54" × 14.37"	**Power/Control Wiring (Guage)**	Local Code
Air Handler Gas/Liq Connects	5/8" × 3/8"	**Max EQUIVALENT Pipe Length**	164 ft
Air Handler Filter	2 - Washable Mesh	**Max Height Diff (OD unit higher)**	82 ft
Condenser Air Flow	2060 CFM	**Max Height Diff (OD unit lower)**	82 ft
Condenser Sound Level	59 dBA	**Design Pressure (High/Low)**	550 / 340 PSIG
Condenser Weight (net/gross)	157 / 165 lbs	**Refrigerant Line Sets**	Flare - Both Lines Insulated
Condenser Gross Dimensions	41.06" × 36.02" × 15.55"	**Line Set-System Charge**	** 0.322 oz/ft (20 g/m)
Factory Refrig. Charge / Type	* 89.94oz (2550g) / R-410A	**Moisture Removal**	3.2 L/hr
Compressor Oil Type / Volume	Ester Oil VG74 / 820ml		
Compressor Mfr / Type	GMCC / Twin-Rotary		

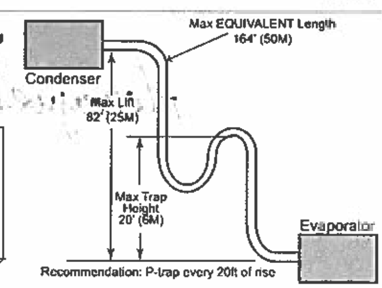
* Total charge for condenser, air handler & 25ft Equivalent length of tubing
** Subtract 25ft from Total Equivalent Length calculation, for factory charge

ECR International, Inc.
2201 Dwyer Avenue
Utica, New York 13501
Phone: 1.800.325.5279
Web: enviromaster.com









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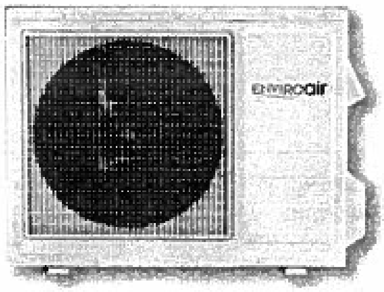
SZI Series Single Zone Systems

ENVIROair

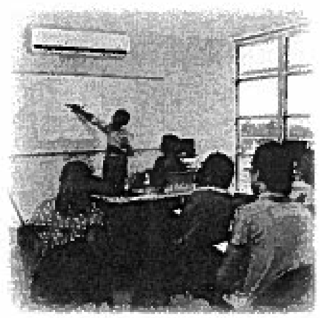


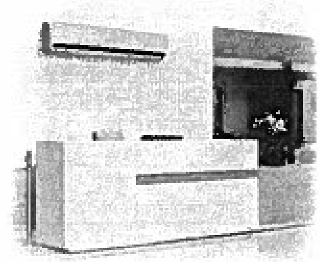
30-36k Btuh

Forest ES Room 11

SZI Series – Specifications *(30k – 36k)*

	Model Indoor Outdoor			SZI Series ZWHA30D0 ZHA30D00	SZI Series ZWHA36D0 ZHA36D00
System Performance	Power supply		V-Ph-Hz	208/230-1-60	208/230-1-60
	Cooling	Nominal Capacity	Btu/h (kW)	30,000 (8.8)	36,000 (10.6)
		Input	W	2931	4000
		SEER	BTU/W	16	14.5
		EER	BTU/W	10	8.8
	Heating	Nominal Capacity	Btu/h (kW)	30,000 (8.8)	36,000 (10.6)
		Input	W	2,442	3,400
		HSPF4	BTU/W	9.6	9.0
	Sensible Heat Ratio (SHR)			0.73	0.68
	Coefficient of Performance (COP)		W/W	3.6	3.0
	Low Ambient Cooling Outdoor Temp		°F	5°F~122°F	5°F~122°F
	Low Ambient Cooling Indoor Temp		°F	62°F~90°F	62°F~90°F
	Low Ambient Heating Outdoor Temp		°F	5°F~86°F	5°F~86°F
	Low Ambient Heating Indoor Temp		°F	32°F~86°F	32°F~86°F
	Low Ambient Dry Mode Outdoor Temp		°F	32°F~122°F	32°F~122°F
	Low Ambient Dry Mode Indoor Temp		°F	> 50°F	> 50°F
	Max Fuse/HACR Breaker		A	25	30
Indoor Unit Specifications	Controls			IR Remote Control	IR Remote Control
	Indoor Air Flow (Hi/Mi/Lo)		CFM	970/840/740	970/840/740
	Indoor Noise Level (Hi/Mi/Lo)		dB(A)	50/47/43	50/46/42
	Indoor Fan Motor FLA		A	0.51	0.78
	Indoor Fan Power Consumption		W	113/87/68	113/87/68
	Dimension (W x H x D)		mm	1,445 x 340 x 277	1,445 x 340 x 277
	Dimension (W x H x D)		inch	56 15/16 x 10 15/16 x 13 3/8	56 15/16 x 10 15/16 x 13 3/8
	Packing (W x H x D)		mm	1,530 x 365 x 420	1,530 x 365 x 420
	Packing (W x H x D)		inch	60 1/4 x 14 3/8 x 16 9/16	60 1/4 x 14 3/8 x 16 9/16
	Net/Gross Weight		lb	52.91/70.55	52.91/70.55
Outdoor Unit Specifications	Outdoor Air Flow		CFM	2060	2240
	Outdoor Noise Level		dB(A)	59	65
	Compressor RLA		A	5.3	5.3
	Outdoor Fan Motor FLA		A	0.31	0.35
	Outdoor Fan Power Consumption		W	157.3/93.8	299/223
	Dimension (W x H x D)		mm	900 x 860 x 315	990 x 965 x 345
	Dimension (W x H x D)		inch	35 7/16 x 33 7/8 x 12 7/16	39 x 38 x 13 5/8
	Packing (W x H x D)		mm	1,043 x 915 x 395	1,120 x 1,100 x 435
	Packing (W x H x D)		inch	41 1/16 x 36 x 15 9/16	44 1/8 x 43 5/16 x 17 1/8
	Net/Gross Weight		lbs	156.53/165.35	167.55/191.8
	Factory Refrigerant Charge (R-410A)		oz	89.94	97.0
	Filed Charge per Foot		oz	0.322	0.322
	Refrigerant Piping	Max Equivalent Length	ft	164	213
		Max Elevation	ft	82	98
		Line Size (Gas x Liquid)	in	3/8 x 1/4 - Flare	1/2 x 1/4 - Flare





$1,940 each

SZI Series Single Zone Systems

ENVIROair

- 14.5 – 17.5 SEER Inverter Technology
- 9k-36k Btuh System Capacities
- 9k / 12k / 18k Energy Star CERTIFIED systems
- Heat Pump with Cooling
- 208V-230V/1ph/60Hz
- Low Ambient Cooling down to 5°F

Qty(2) Verona HS Computer Room & Qty(1) FN Bown

SZI Series – Specifications *(9k – 24k)*

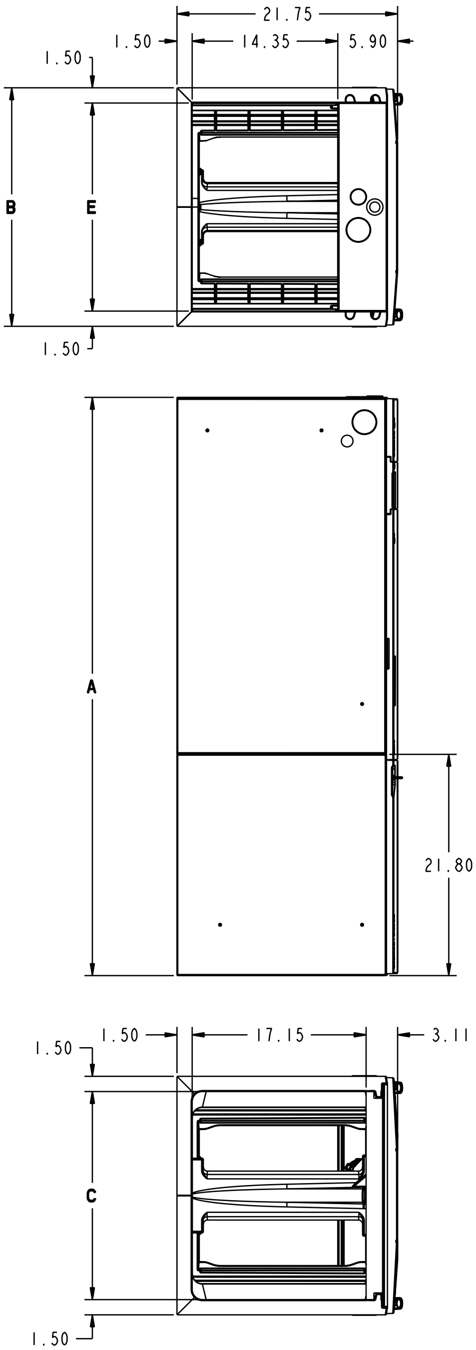
	Model / Indoor / Outdoor			SZI Series ZWHB09D0 ZHB09D00	SZI Series ZWHB12D0 ZHB12D00	SZI Series ZWHB18D0 ZHB18D00	SZI Series ZWHB24D0 ZHB24D00
System Performance	Power supply		V-Ph-Hz	208/230-1-60	208/230-1-60	208/230-1-60	208/230-1-60
	Cooling	Nominal Capacity	Btu/h (kW)	9,000 (2.6)	12,000 (3.5)	18,000 (5.3)	23,000 (6.7)
		Input	W	737	999	1,499	2,490
		SEER	BTU/W	16.4	17.5	17.5	16
		EER	BTU/W	12.2	12	12	9.2
	Heating	Nominal Capacity	Btu/h (kW)	10,700 (3.1)	13,000 (3.8)	18,900 (5.5)	23,000 (6.7)
		Input	W	891	1,108	1,720	2,424
		HSPF4	BTU/W	9.6	9.6	8.8	7.8
	Sensible Heat Ratio (SHR)			0.85	0.84	0.83	0.73
	Coefficient of Performance (COP)		W/W	3.52	3.44	3.22	2.78
	Low Ambient Cooling Outdoor Temp		°F	5°F~122°F	5°F~122°F	5°F~122°F	5°F~122°F
	Low Ambient Cooling Indoor Temp		°F	62°F~90°F	62°F~90°F	62°F~90°F	62°F~90°F
	Low Ambient Heating Outdoor Temp		°F	5°F~86°F	5°F~86°F	5°F~86°F	5°F~86°F
	Low Ambient Heating Indoor Temp		°F	32°F~86°F	32°F~86°F	32°F~86°F	32°F~86°F
	Low Ambient Dry Mode Outdoor Temp		°F	32°F~122°F	32°F~122°F	32°F~122°F	32°F~122°F
	Low Ambient Dry Mode Indoor Temp		°F	> 50°F	> 50°F	> 50°F	> 50°F
	Energy Star Certified			YES	YES	YES	NO
	Max Fuse/HACR Breaker		A	15	15	20	25
Indoor Unit Specifications	Controls			IR Remote Control	IR Remote Control	IR Remote Control	IR Remote Control
	Indoor Air Flow (Hi/Mi/Lo)		CFM	380/330/265	470/435/390	660/605/520	660/605/520
	Indoor Noise Level (Hi/Mi/Lo)		dB(A)	41/37/31	43/41/39	49/45/42	49/45/42
	Indoor Fan Motor FLA		A	0.22	0.28	0.33	0.36
	Indoor Fan Power Consumption		W	43	58.5	82	82
	Dimension (W x H x D)		mm	790 x 265 x 198	920 x 292 x 223	998 x 322 x 240	998 x 322 x 240
	Dimension (W x H x D)		inch	31 1/8 x 10 7/16 x 7 13/16	36 1/4 x 11 1/2 x 8 3/4	39 5/16 x 12 11/16 x 9 7/16	39 5/16 x 12 11/16 x 9 7/16
	Packing (W x H x D)		mm	875 x 335 x 265	1015 x 368 x 295	1080 x 320 x 400	1080 x 320 x 400
	Packing (W x H x D)		inch	34 7/8 x 13 3/16 x 10 7/16	39 15/16 x 14 1/2 x 11 5/8	42 1/2 x 12 5/8 x 15 3/4	42 1/2 x 12 5/8 x 15 3/4
	Net/Gross Weight		lb	16.98/21.16	23.15/29.54	27.12/35.05	27.12/35.05
Outdoor Unit Specifications	Outdoor Air Flow		CFM	1060	1290	1470	1590
	Outdoor Noise Level		dB(A)	53	55	59	62
	Compressor RLA		A	5.7	5.8	9.7	10.2
	Outdoor Fan Motor FLA		A	0.31	0.35	0.74	0.53
	Outdoor Fan Power Consumption		W	75/66	75/66	166/105	136/130
	Dimension (W x H x D)		mm	760 x 590 x 285	760 x 590 x 285	845 x 700 x 320	845 x 700 x 320
	Dimension (W x H x D)		inch	29 15/16 x 23 4/16 x 11 4/16	29 15/16 x 23 4/16 x 11 4/16	33 4/16 x 27 9/16 x 12 5/8	33 4/16 x 27 9/16 x 12 5/8
	Packing (W x H x D)		mm	887 x 645 x 355	887 x 645 x 355	965 x 755 x 395	965 x 755 x 395
	Packing (W x H x D)		inch	34 15/16 x 25 3/8 x 14	34 15/16 x 25 3/8 x 14	38 x 29 3/4 x 15 9/16	38 x 29 3/4 x 15 9/16
	Net/Gross Weight		lbs	71.65/76.94	72.09/77.38	102.51/109.79	107.14/114.42
	Factory Refrigerant Charge (R-410A)		oz	38.8	44.09	58.6	68.78
	Filed Charge per Foot		oz	0.161	0.161	0.322	0.322
	Refrigerant Piping	Max Equivalent Length	ft	82	82	98	98
		Max Elevation	ft	33	33	66	66
		Line Size (Gas x Liquid)	in	3/8 x 1/4 - Flare	1/2 x 1/4 - Flare	5/8 x 3/8 - Flare	5/8 x 3/8 - Flare

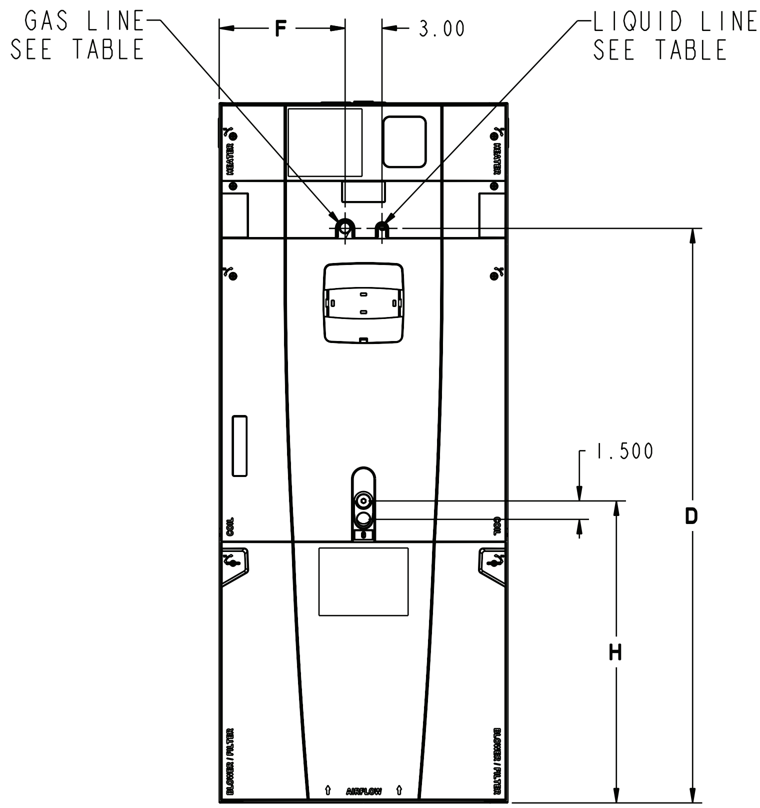
$1,560.00

TAG: ____________________

Submittal

3 Ton
Convertible Air Handler
GAM5A0B36M31SA





MINIMUM UNIT CLEARANCE TABLE		
	TO COMBUSTIBLE MATERIAL (REQUIRED)	SERVICE CLEARANCE (RECOMMENDED)
SIDES	0"	2"
FRONT	0"	21"
BACK	0"	0"
INLET DUCT	0"	
OUTLET DUCT	0"	

MODEL NO.	A	B	C	D	E	F	H	Flow Control	R-410A Gas Line BRAZE	R-410A Liq. Line BRAZE
GAM5A0B36	55.7	21.3	18.4	45.5	18.4	9.2	24.8	TXV/NB	7/8	3/8

PRODUCT SPECIFICATIONS

PRODUCT SPECIFICATIONS	
MODEL	**GAM5A0B36M31SA**
RATED VOLTS/PH/HZ.	208-230/1/60
RATINGS ①	See O.D. Specifications
INDOOR COIL — Type	Plate Fin
Rows — F.P.I.	3 - 14
Face Area (sq. ft.)	5.04
Tube Size (in.)	3/8
Refrigerant Control	EEV
Drain Conn. Size (in.) ②	3/4 NPT
DUCT CONNECTIONS	See Outline Drawing
INDOOR FAN — Type	Centrifugal
Diameter-Width (In.)	11 X 10
No. Used	1
Drive - No. Speeds	Direct - 5
CFM vs. in. w.g.	See Fan Performance Table
No. Motors — H.P.	1 - 1/2
Motor Speed R.P.M.	1050
Volts/Ph/Hz	208-230/1/60
F.L. Amps	4.1
FILTER	
Filter Furnished?	No
Type Recommended	Throwaway
No.-Size-Thickness	1 - 20 X 20 - 1 in.
REFRIGERANT	**R-410A**
Ref. Line Connections	Brazed
Coupling or Conn. Size — in. Gas	7/8
Coupling or Conn. Size — in. Liq.	3/8
DIMENSIONS	H x W x D
Crated (In.)	57-1/4 x 24-1/4 x 25-3/4
Uncrated	55-3/4 x 21-1/4 x 21-3/4
WEIGHT	
Shipping (Lbs.)/Net (Lbs.)	150/142

① These Air Handlers are A.H.R.I. certified with various Split System Air Conditioners and Heat Pumps (AHRI STANDARD 210/240). Refer to the Split System Outdoor Unit Product Data Guides for performance data.

② 3/4" Male Plastic Pipe (Ref.: ASTM 1785-76)

GAM5A0B36M31SAA MINIMUM HEATER AIRFLOW CFM		
Heater	Minimum Air Speed Tap	
	With HP	Without HP
BAYEAAC05BK1AA BAYEAAC05LG1AA	Tap 3	Tap 2
BAYEAAC08BK1AA BAYEAAC08LG1AA	Tap 3	Tap 2
BAYEAAC10BK1AA BAYEAAC10LG1AA	Tap 5	Tap 4
BAYEABC15BK1AA	Tap 5	Tap 4
BAYEABC20BK1AA	-	-
BAYEACC25BK1AA	-	-
SEE AIR HANDLER NAMEPLATE OR PRODUCT DATA FOR EXCEPTIONS		

AIRFLOW PERFORMANCE										
GAM5A0B36M31SAA										
EXTERNAL STATIC (in. w.g.)	AIRFLOW (CFM)									
	Speed Taps - 230 VOLTS					Speed Taps - 208 VOLTS				
	5	4	3	2	1	5	4	3	2	1
0	1438	1387	1197	1013	732	1435	1383	1194	1009	729
0.1	1394	1340	1143	945	552	1388	1334	1137	939	546
0.2	1350	1299	1090	892	413	1341	1291	1082	884	404
0.3	1301	1245	1031	817	305	1289	1233	1019	806	293
0.4	1253	1197	975	751	209	1239	1183	960	737	195
0.5	1205	1151	917	651	-	1188	1134	900	634	-
0.6	1155	1094	837	578	-	1136	1075	817	559	-
0.7	1099	1032	766	499	-	1077	1010	744	476	-
0.8	1039	972	691	453	-	1014	946	666	-	-
0.9	964	889	633	409	-	936	861	605	-	-

NOTES:
1. Values are with wet coil and without filters.
2. Contact your particular filter manufacturer for pressure drop data.
3. Electric heater pressure drop is negligible and is included within the airflow data.
4. Tap 1 is a continuous fan speed tap.

WIRING DATA											
GAM5A0B36M31SAA											
Heater Model No.	No. of Circuits	240 VOLT					208 VOLT				
		Capacity		Heater Amps per Circuit	Minimum Circuit Ampacity	Maximum Overload Protection	Capacity		Heater Amps per Circuit	Minimum Circuit Ampacity	Maximum Overload Protection
		kW	BTUH				kW	BTUH			
No Heater	-	-	-	4.1*	5	15	-	-	4.1*	5	15
BAYEAAC05++	1	4.80	16400	20	30	30	3.60	12300	17.3	27	30
BAYEAAC08++	1	7.68	26200	32	45	45	5.76	19700	27.7	40	40
BAYEAAC10++	1	9.60	32800	40	55	60	7.20	24600	34.6	48	50
circuit 1		9.60	49200	40	55	60	7.20	36900	34.6	48	50
BAYEABC15++											
circuit 2		4.80	49200	20	25	25	3.60	36900	17.3	22	25
Note: * Motor Amps											

Notes:
1. See Product Data or Air Handler nameplate for approved combinations of Air Handlers and Heaters
2. Heater model numbers may have additional suffix digits.

Mechanical Specifications

- Air-Tite II™ cabinet
  - 1% or less air leakage
  - Precision applied - durable door seals
  - Specially designed air seal around refrigerant, condensate and conduit connections
  - Double wall foamed cabinet system
  - ≥ R-4.2 insulating value
  - No loose fiber design
  - Smooth cleanable interior design
  - Sweat eliminating design
  - Composite foamed cabinet doors
  - Water proof cabinet design
  - Integrated horizontal drain pans
  - Modular cabinet with 5/16" allen wrench "quick latch" design
- Multi-position up/down flow horizontal left/right
- Side return option
- Control board protection pocket built into cabinet wall
- Alert port to view control board codes without door removal
- 10 alert codes
- Low voltage terminal connection point
- Quarter turn phillips head door fasteners
- Vortica® blower with polarized plug connections and integrated slide deck for easy removal
- Aluminum coil with integrated slide deck for easy removal and polarized plug connections on coil EEV
- Patented enhanced coil fin
- Electronic Expansion Valve (EEV) with low ambient and low superheat compressor protection
- Dual refrigerant compatible as shipped
- Slide in electric heaters with polarized plug connections (sold as accessory)
- UVC light kit with safety switch and polarized plug connections (sold as accessory)
- Labeled panels and connections
- Molded in 1" standard filter rail
- High efficiency ECM motor
- Soft start fan motor operation
- Built in fan delay modes
- Maximum width of 23.5"
- Compact 20.8" depth with doors removed
- Two tone color
- Fused 24v power
- Safety door switch
- 1-year warranty
- 10-year warranty registered
- Optional extended warranty available

Trane
6200 Troup Highway
Tyler, TX 75707

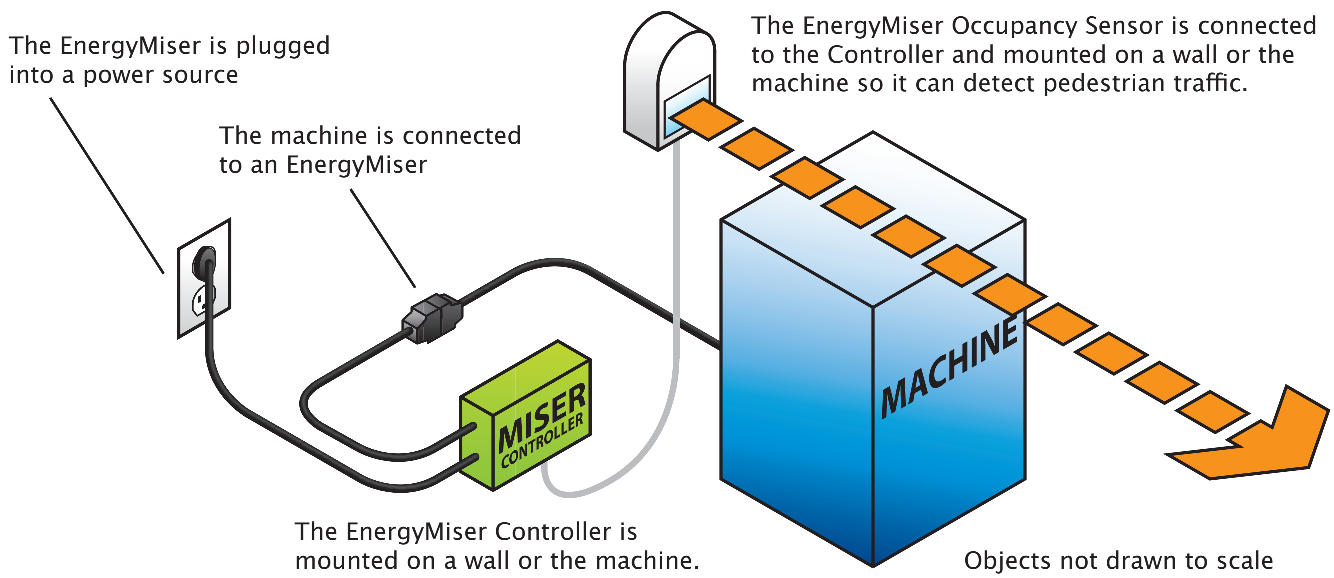
EnergyMisers

EnergyMiser® Products are easy to install devices designed to lower the energy consumption of vending machines, commercial coolers, and other "always on" machines and appliances. No other technology can compete with its price and ease of installation for the immediate energy savings that can be achieved.

- Win and retain accounts by offering energy-efficient technology
- Save clients up to $150 per machine, per year
- Typical return on investment in 12 months
- Easy retrofit field installation
- Reduction in machine energy use an average of 35-45%
- Reduced machine maintenance and longer machine lifespans
- Environmental benefits such as reducing pollution and natural resource use

How EnergyMisers Work

External EnergyMisers use a controller and a machine mounted sensor to monitor room occupancy and temperature. If 15 minutes pass without any pedestrian traffic, the EnergyMiser will power down the machine. The machine is powered back up when people return and at regular intervals to to keep the product cold. External controllers are best suited for low traffic areas.



Internal EnergyMisers use sales based intelligence to power down the cooling system while leaving lighting and controller electronics on. While the cooling system is powered down, the internal EnergyMiser monitors the room's temperature and automatically re-powers the cooling system at regular intervals to keep the product cold. Internal controllers are best suited for high traffic areas.

Who Uses EnergyMisers

Several large retailers such as Wal-Mart and Kroger have installed EnergyMiser Products at their locations. Educational facilities along with the US Government have purchased EnergyMisers through GSA. Also, many utilities offer rebates on the purchase of EnergyMiser products and several have provided customers with EnergyMiser Products at no cost through Turnkey Programs.

EnergyMiser Products

VendingMiser® - for cold drink vending machines
VM150 - Indoor Wall Mount Controller with Occupancy Sensor
VM151 - Indoor Wall Mount Controller with 10' Repeater Cable
VM160 - Outdoor Wall Mount Controller with Occupancy Sensor and Weather-proof Enclosure
VM161 - Outdoor Wall Mount Controller with 10' Repeater Cable and Weather-proof Enclosure
VM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
VM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable
VM180 - Outdoor Controller with EZ Mount Z-Bracket, Occupancy Sensor, and Weatherproof Enclosure
VM181 - Outdoor Controller with EZ Mount L-Bracket, 10' Repeater Cable and Weatherproof Enclosure
VM2iQ - Internal VendingMiser

CoolerMiser™ - for commercial glass-front coolers
CM150 - Indoor Wall Mount Controller with Occupancy Sensor
CM151 - Indoor Wall Mount Controller with 10' Repeater Cable
CM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
CM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable
CM2iQ - Internal CoolerMiser

SnackMiser® - for snack vending machines
SM150 - Indoor Wall Mount Controller with Occupancy Sensor
SM151 - Indoor Wall Mount Controller with 10' Repeater Cable
SM170 - Indoor Controller with EZ Mount Z-Bracket and Occupancy Sensor
SM171 - Indoor Controller with EZ Mount L-Bracket and 10' Repeater Cable

PlugMiser™ - for most major electrical equipment
PM150 - Indoor Wall Mount Controller with Occupancy Sensor
PM151 - Indoor Wall Mount Controller with 10' Repeater Cable
PM190 - Indoor Controller with Leg Mount and Occupancy Sensor

VendingMiser VM150

CoolerMiser CM150

SnackMiser SM150

PlugMiser PM150

Visit www.energymisers.com for more information.

USA Technologies 100 Deerfield Lane, Suite 140, Malvern, PA 19355 • 800.633.0340 • www.usatech.com

Product Catalog

Trane Advantage™ VRF Outdoor Unit

July 2013

VRF-PRC008-EN

Table of Contents

VRF Outdoor Unit

Nomenclature

4	T	V	R	0	0	9	6	B	3	0	0	N	B
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Digit 1 — Refrigerant
4 = R-410a

Digit 2 — Brand Name
T = Trane

Digit 3 — System Type
V = Variable Refrigerant Flow

Digit 4 — Functional Type Outdoor Unit
H = Heat Pump, DC Inverter (VRF)
R = Heat Recovery (3-pipe), DC Inverter (VRF)

Digit 5 — Special Application
0 = Standard

Digit 6, 7, 8 — Nominal Capacity (Btu/h x 1,000)
036= 36,000 Btu/h
048= 48,000 Btu/h
053= 60,000 Btu/h
072= 72,000 Btu/h
096= 96,000 Btu/h
120= 120,000 Btu/h
144= 144,000 Btu/h
168= 168,000 Btu/h
192= 192,000 Btu/h

Digit 9 — Major Development Sequence
B = Second Development Sequence

Digit 10 — Electric Power Supply Characteristics
1 = 208~230/60/1
3 = 208~230/60/3
4 = 460/60/3

Digit 11 — Reserved for Future Use
0 = Not currently used

Digit 12 — Reserved for Future Use
0 = Not currently used

Digit 13 — Region of Sale
N = North America (UL or ETL)

Digit 14 — Minor Design Sequence
B = Second Design Sequence

System Combination Line-up

	TONS	4TVH/R0072B	4TVH/R0096B	4TVH/R0120B	4TVH/R0144B
SINGLE MODULE	6	1			
	8		1		
	10			1	
	12				1
DOUBLE MODULE	14	1	1		
	16	1		1	
	18	1			1
	20			2	
	22			1	1
	24				2
TRIPLE MODULE	26	1	1		1
	28	1		1	1
	30	1			2
	32			2	1
	34			1	2
	36				3

System Features

- 3rd generation compressor technology features all inverter compressors for superior efficiency and reliability
- Dual inverter compressors (available in many models) are designed to equally share load for higher reliability
- Improved vapor injection system increases refrigerant flow rate up to 20% for superior heating performance
- 8,400 RPM (maximum speed) compressor assures quick start cooling and heating performance
- Inverter PCB is refrigerant cooled for improved reliability
- Auto oil balancing eliminates the need for an oil balancing pipe
- Longer pipe lengths are the result of large oil storage capacity and low oil circulation rate
- Asymmetric scroll is designed to minimize frictional loss
- Total harmonic distortion is reduced through adaptive sine wave control
- Intercooler uses a plate heat exchanger for improved heating and cooling efficiency
- Refrigerant pump down and pump out facilitates maintenance and repair
- Automatic refrigerant balancing between indoor units optimize refrigerant distribution for better comfort and performance
- Auto snow blowing function removes accumulated snow when conditions require it
- Special hydrophilic heat exchanger coating minimizes frost build up on the outdoor coils and facilitates the defrost cycle. Anti-corrosion finish provides added protection in harsh environments.
- Optional quiet operation mode for reduced sound levels at night
- 4 and 6 port mode control units are light and compact. Distributed installation flexibility provides superior performance during simultaneous heating and cooling operation
- On systems with multiple outdoor unit modules, rotational defrost cycling assure continuous heating even during defrost cycles
- Trane's auto commission tool allows for quicker system commissioning, with automatic retrieval and storage of test results that can be uploaded wirelessly
- Trane Advantage VRF systems feature self-diagnosis, including system monitoring and error code reporting

Indoor Units

Nomenclature

4	T	V	D	0	0	1	8	B	1	0	0	N	B
1	2	3	4	5	6	7	8	9	10	11	12	13	14

Digit 1 — Refrigerant

4 = R-410a

Digit 2 — Brand Name

T = Trane

Digit 3 — System Type

V = Variable Refrigerant Flow

Digit 4 — Configuration Type

A = High Pressure Static Duct Type
B = Mini 4-Way Cassette
C = 4-Way Cassette
D = Mid Pressure Static Duct Type
E = 1-Way Cassette
L = Slim Duct Type (Low Pressure)
X = Convertible Floor/Ceiling
W = High Wall Type

Digit 5 — Reserved for Future Use

0 = Not currently used

Digit 6, 7, 8 — Nominal Capacity (Btu/h x 1,000)

007= 7,000 Btu/h
009= 9,000 Btu/h
012= 12,000 Btu/h
015= 15,000 Btu/h
018= 18,000 Btu/h
024= 24,000 Btu/h
030= 30,000 Btu/h
036= 36,000 Btu/h
048= 48,000 Btu/h
076= 76,000 Btu/h
096= 96,000 Btu/h

Digit 9 — Major Development Sequence

B = Second Development Sequence

Digit 10 — Electric Power Supply Characteristics

1 = 208~230/60/1

Digit 11 — Reserved for Future Use

0 = Not currently used

Digit 12 — Reserved for Future Use

0 = Not currently used

Digit 13 — Region of Sale

N = North America (UL or ETL)

Digit 14 — Minor Design Sequence

B = Second Design Sequence

Products

Application Matrix

Capacity Type	7.5MBH	9.0MBH	9.5MBH	12MBH	18MBH	20MBH	24MBH	30MBH	36MBH	48MBH	76.8MBH	96MBH
Slim 1 way cassette												
4 way cassette												
Mini 4 way cassette (interior)												
Slim duct												
MSP duct												
HSP duct												
Ceiling												
High Wall												

Controls

Family	Description	Image	Trane Model Number
Integrated System Management	VRF System Controller		TVCTRLTIMD00A0
	VRF Enterprise Management Software		TVCTRLTSTP3P00
	VRF Power Meter Interface Module		TVCTRLTIMB16A0
Building Management System Gateways	VRF System Controller+BACnet		TVCTRLTIMB17A0
	VRF System Controller+LONTalk		TVCTRLTIMB18A0
Centralized Control Systems	VRF Central On/Off Controller		TVCTRLTCMA202D
	VRF System TouchScreen Control		TVCTRLTCMA300T
	VRF Mode Select Switch		TVCTRLTCMC2000
Zone Controllers	VRF Wireless Remote Control		TVCTRLTRDH00UT
	VRF Wired Remote Control		TVCTRLTWRWE10T
	VRF Duct Signal Receiver & Wire		TVCTRLTRKA10N0
Interface Modules	VRF External Contact Interface Module		TVCTRLTIMB14A0
Sensors	VRF Ext. Room Temp Sensor		TVCTRLTRWTA000
	VRF Motion Sensor Mini 4Way		MOTIONSEN4TVB
Commissioning and Utility Kits	VRF Auto-Commissioning Tool		TVCTRLTIMC1000
	VRF Technician Utilities		TVCTRLTIMC0300

Accessories

Family	Description	Image	Trane Model Number
Y- joint	VRF Y-joint <51MBh		4YDK1509B0051A
	VRF Y-joint 51-138MBh		4YDK2512B0138A
	VRF Y-joint 138-160MBh		4YDK2812B0160A
	VRF Y-joint 160-240MBh		4YDK2815B0240A
	VRF Y-joint 240-336MBh		4YDK3419B0336A
	VRF Y-joint 336-468MBh		4YDK4119B0468A
	VRF Y-joint >468MBh		4YDK4422B0999A
Y-joint (High Pressure Gas for HR)	VRF Y-joint HR ≤80MBh		4YDK1500B0080A
	VRF Y-joint HR 80-240MBh		4YDK2500B0240A
	VRF Y-joint HR 240-468MBh		4YDK3100B0468A
	VRF Y-joint HR >468MBh		4YDK3800B0999A
Outdoor T Joint (Outdoor Connection)	VRF T-joint ≤468MBh		4TDK3819B0000A
	VRF T-joint HR ≤468MBh		4TDK3100B0000A
Header Joint	VRF Header Joint 4Units <160MBh		4HJK2512B0159A
	VRF Header Joint 8Units ≤240MBh		4HJK3115B0241A
	VRF Header Joint 8Units >240MBh		4HJK3819B0998A
MCU-KIT	VRF MCU Kit up to 6 IDU		4MCUCUY6NCE000
	VRF MCU Kit up to 4 IDU		4MCUCUY4NCE000
	VRF MCU Kit 2 IDU HSP Only		4MCUCUY2NCE000
EEV Kits (For Wall-mounted & Ceiling indoor unit	VRF EEV 1x 7-15.5& 1x 17-31MBh		4EEVXDA24K132A
	VRF EEV Kit 2Unit 7-15.5MBh		4EEVXDA24K200A
	VRF EEV Kit 2Unit 17-31MBh		4EEVXDA32K200A
	VRF EEV 2x 7-15.5& 1x 17-31MBh		4EEVXDA24K232A
	VRF EEV Kit 3Unit 7-15.5MBh		4EEVXDA24K300A
	VRF EEV 1x 7-15.5& 2x 17-31MBh		4EEVXDA32K224A
	VRF EEV Kit 3Unit 17-31MBh		4EEVXDA32K300A
	VRF EEV Kit 1Unit 7-15.5MBh		4EEVEVA24SA000
	VRF EEV Kit 1Unit 17-31MBh		4EEVEVA32SA000
AHU Kit	VRF AHU Kit 24-30MBh		4EEVAKA40K1025
	VRF AHU Kit 48-60MBh		4EEVAKA40K1050
	VRF AHU Kit 72-90MBh		4EEVAKA64K1075
	VRF AHU Kit 96-112MBh		4EEVAKA64K1100
DRAIN PUMP	VRF Drain Pump Slim Duct		CONDPUMPXVLB01
	VRF Drain Pump MSP 18/24MBh		CONDPUMPXVMB01
	VRF Drain Pump MSP 30/36MBh		CONDPUMPXVMB02
	VRF Drain Pump MSP48/ HSP36-48MBh		CONDPUMPXVDB01
	VRF Drain Pump HSP 76.8/96MBh		CONDPUMPXVHB01
CASSETTE PANEL	VRF Cassette Panel Slim 1Way		TVEPANPC1NUSET
	VRF Cassette Panel Sliding 1Way		TVEPANPC1NUAET
	VRF Cassette Panel Mini 4Way		TVEPANPC4SUSET
	VRF Cassette Panel 4Way		TVEPANPC4NUSET

Outdoor Units

Product Specifications

208~230V Heat Pump Single Modules

Model Name				4TVH0072B300NB		4TVH0096B300NB		4TVH0120B300NB		4TVH0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			6.0		8.0		10.0		12.0	
	System Type			Ducted	Non-ducted	Ducted	Non-ducted	Ducted	Non-ducted	Ducted	Non-ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	72,000	72,000	96,000	96,000	120,000	120,000	144,000	144,000
		Heating	Btu/h	81,000	81,000	108,000	108,000	135,000	135,000	162,000	162,000
	Capacity (Rated)[2]	Cooling	Btu/h	69,000	69,000	92,000	92,000	114,000	114,000	138,000	138,000
		High Temp Heating	Btu/h	77,000	77,000	103,000	103,000	129,000	129,000	154,000	154,000
		Low Temp Heating	Btu/h	51,000	51,000	67,000	67,000	84,000	84,000	100,000	100,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.5	12.9	11.6	13.8	11.1	12.5	10.8	11.2
		IEER	-	20.2	23.0	19.8	27.0	19.6	24.2	18.2	22.7
		COP @ 47°F	-	3.46	4.15	3.60	4.23	3.43	3.97	3.54	3.64
		COP @ 17°F	-	2.49	2.75	2.47	2.90	2.45	2.62	2.23	2.40
		SCHE	-	-	-	-	-	-	-	-	-
Power	MCA		A	28		37.8		43		52.6	
	MOP		A	35		50		50		70	
	SCCR		kA	-		-		-		5.0	
Compressor	Type (Qty.)		-	SSC SCROLL (1)		SSC SCROLL (2)		SSC SCROLL (2)		SSC SCROLL (2)	
	Model Name		-	DS-GB052FBVASG		DS-GB052FBVASG (2)		DS-GB052FBVASG (2)		DS-GB052FBVASG (2)	
	Output		kW each	4.96		4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE		PVE	
	Initial Charge		fl. oz.	77.8		155.5		155.5		155.5	
Fan	Type (Qty.)		-	Propeller (1)		Propeller (2)		Propeller (2)		Propeller (2)	
	Output (Each)		W	400		620		620		620	
	Airflow Rate		CFM	7,240		9,180		9,180		9,535	
	External Static Pressure		In. WG	0.31		0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/8" Braze		3/8" Braze		1/2" Braze		1/2" Braze	
	Gas Pipe		Ø inch	3/4" Braze		7/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	12		16		20		25	
	Total Capacity		-	50 To 130% Of Total Outdoor Unit Capacity							
Refrigerant	Type		-	R410a		R410a		R410a		R410a	
	Factory Charge		lbs.	12.1		16.3		16.3		19.18	
Sound[5]	Sound Pressure		dB(A)	60.0		61.0		61.0		62.0	
	Sound Power		dB(A)	81		81		81		83	
External Dimensions	Net Weight		lbs.	425		624		624		657	
	Shipping Weight		lbs.	461		666		666		699	
	Net Dimensions (WXHXD)		inches	34.65 X 66.73 X 30.12		50.98 X 66.73 X 30,12		50.98 X 66.73 X 30,12		50.98 X 66.73 X 30.12	
	Shipping Dimensions (WXHXD)		inches	37.32 X 75.28 X 32.76		53.66 X 75.28 X 32.76		53.66 X 75.28 X 32.76		53.66 X 75.28 X 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

208~230V Heat Pump Dual Modules

Model Name				4TVH0168B300NB		4TVH0192B300NB		4TVH0216B300NB	
				4TVH0072B300NB + 4TVH0096B300NB		4TVH0072B300NB + 4TVH0120B300NB		4TVH0072B300NB + 4TVH0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			14.0		16.0		18.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	168,000	168,000	192,000	192,000	216,000	216,000
		Heating	Btu/h	189,000	189,000	216,000	216,000	243,000	243,000
	Capacity (Rated)[2]	Cooling	Btu/h	161,000	161,000	183,000	183,000	207,000	207,000
		High Temp Heating	Btu/h	180,000	180,000	206,000	206,000	231,000	231,000
		Low Temp Heating	Btu/h	118,000	118,000	135,000	135,000	151,000	151,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.4	12.1	10.9	11.4	10.6	10.8
		IEER	-	18.8	21.9	18.3	20.7	17.4	19.6
		COP @ 47°F	-	3.46	3.94	3.34	3.83	3.34	3.63
		COP @ 17°F	-	2.43	2.65	2.42	2.59	2.31	2.52
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (3)		SSC Scroll (3)		SSC Scroll (3)	
	Model Name		-	DS-GB052FBVASG (3)		DS-GB052FBVASG (3)		DS-GB052FBVASG (3)	
	Output		kW each	4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	233.4		233.4		233.4	
Fan	Type (Qty.)		-	Propeller (3)		Propeller (3)		Propeller (3)	
	Output (Each)		W	400 + 620 x 2		400 + 620 x 2		400 + 620 x 2	
	Airflow Rate		CFM	7,240 + 9,180		7,240 + 9,180		7,240 + 9,535	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		5/8" Braze		5/8" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	29		33		37	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	28.4		28.4		31.3	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	425 + 624		425 + 624		425 + 657	
	Shipping Weight		lbs.	461 + 666		461 + 666		461 + 699	
	Net Dimensions (WXHXD)		inches	34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12	
	Shipping Dimensions (WXHXD)		inches	37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A outdoor unit T-joint connection
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

Outdoor Units

208~230V Heat Pump Dual Modules (cont.)

Model Name				4TVH0240B300NB		4TVH0264B300NB		4TVH0288B300NB	
				2x 4TVH0120B300NB		4TVH0120B300NB + 4TVH0144B300NB		2x 4TVH0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			20.0		22.0		24.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	240,000	240,000	264,000	264,000	288,000	288,000
		Heating	Btu/h	270,000	270,000	297,000	297,000	324,000	324,000
	Capacity (Rated)[2]	Cooling	Btu/h	228,000	228,000	252,000	252,000	276,000	276,000
		High Temp Heating	Btu/h	258,000	258,000	283,000	283,000	308,000	308,000
		Low Temp Heating	Btu/h	168,000	168,000	184,000	184,000	200,000	200,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.6	11.1	10.1	10.5	10.0	9.5
		IEER	-	17.6	20.2	16.8	19.2	16.4	18.1
		COP @ 47°F	-	3.24	3.65	3.25	3.45	3.25	3.26
		COP @ 17°F	-	2.40	2.54	2.26	2.41	2.12	2.29
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (4)		SSC Scroll (4)		SSC Scroll (4)	
	Model Name		-	DS-GB052FBVASG (4)		DS-GB052FBVASG (4)		DS-GB052FBVASG (4)	
	Output		kW each	4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	311.2		311.2		311.2	
Fan	Type (Qty.)		-	Propeller (4)		Propeller (4)		Propeller (4)	
	Output (Each)		W	620 x 4		620 x 4		620 x 4	
	Airflow Rate		CFM	9180 x 2		9,180 + 9,535		9535 x 2	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 3/8" Braze		1 3/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	41		45		49	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	32.6		35.5		38.4	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	624 x 2		624 + 657		657 x 2	
	Shipping Weight		lbs.	699 x 2		466 + 699		699 x 2	
	Net Dimensions (WXHXD)		inches	(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2	
	Shipping Dimensions (WXHXD)		inches	(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A outdoor unit T-joint connection
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

208~230V Heat Pump Triple Modules

Model Name				4TVH0312B300NB		4TVH0336B300NB		4TVH0360B300NB	
				4TVH0072B300NB + 4TVH0096B300NB + 4TVH0144B300NB		4TVH0072B300NB + 4TVH0120B300NB + 4TVH0144B300NB		4TVH0072B300NB + 2x 4TVH0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			26.0		28.0		30.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	312,000	312,000	336,000	336,000	360,000	360,000
		Heating	Btu/h	351,000	351,000	378,000	378,000	405,000	405,000
	Capacity (Rated)[2]	Cooling	Btu/h	299,000	299,000	321,000	321,000	345,000	345,000
		High Temp Heating	Btu/h	334,000	334,000	360,000	360,000	385,000	385,000
		Low Temp Heating	Btu/h	218,000	218,000	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.3	10.5	-	-	-	-
		IEER	-	17.0	18.6	-	-	-	-
		COP @ 47°F	-	3.20	3.38	-	-	-	-
		COP @ 17°F	-	2.25	2.54	-	-	-	-
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (5)		SSC Scroll (5)		SSC Scroll (5)	
	Model Name		-	DS-GB052FBVASG (5)		DS-GB052FBVASG (5)		DS-GB052FBVASG (5)	
	Output		kW each	4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	390.0		390.0		390.0	
Fan	Type (Qty.)		-	Propeller (5)		Propeller (5)		Propeller (5)	
	Output (Each)		W	400 + 620 x 4		400 + 620 x 4		400 + 620 x 4	
	Airflow Rate		CFM	7,240 + 9,180 + 9,535		7,240 + 9,180 + 9,535		7,240 + (9,535 x2)	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 3/8" Braze		1 3/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For Hr)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	54		58		62	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	47.6		47.6		50.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	425 + 624 + 657		426 + 624 + 657		425 + (657 x2)	
	Shipping Weight		lbs.	461 + 666 + 699		462 + 666 + 699		461 + (699 x2)	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two 4TDK3819B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

208~230V Heat Pump Triple Modules (cont.)

Model Name				4TVH0384B300NB		4TVH0408B300NB		4TVH0432B300NB	
				2x 4TVH0120B300NB + 4TVH0144B300NB		4TVH0120B300NB + 2x 4TVH0144B300NB		3x 4TVH0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			32.0		34.0		36.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	384,000	384,000	408,000	408,000	432,000	432,000
		Heating	Btu/h	432,000	432,000	459,000	459,000	486,000	486,000
	Capacity (Rated)[2]	Cooling	Btu/h	366,000	366,000	390,000	390,000	414,000	414,000
		High Temp Heating	Btu/h	412,000	412,000	437,000	437,000	462,000	462,000
		Low Temp Heating	Btu/h	-	-	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	-	-	-	-	-	-
		IEER	-	-	-	-	-	-	-
		COP @ 47°F	-	-	-	-	-	-	-
		COP @ 17°F	-	-	-	-	-	-	-
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (6)		SSC Scroll (6)		SSC Scroll (6)	
	Model Name		-	DS-GB052FBVASG (6)		DS-GB052FBVASG (6)		DS-GB052FBVASG (6)	
	Output		kW each	4.96		5.96		6.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	466.6		466.6		466.6	
Fan	Type (Qty.)		-	Propeller (6)		Propeller (6)		Propeller (6)	
	Output (Each)		W	620 x 6		620 x 6		620 x 6	
	Airflow Rate		CFM	(9,180 x2) + 9535		9,180 + (2x 9,535)		9535 x 3	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 5/8" Braze		1 5/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For Hr)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	64		64		64	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	51.8		54.7		57.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	(624 x 2) + 657		624 + (657 x2)		657 x 3	
	Shipping Weight		lbs.	(666 x2) + 699		466 + (699 x2)		699 x 3	
	Net Dimensions (WxHxD)		inches	(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3	
	Shipping Dimensions (WxHxD)		inches	(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two 4TDK3819B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

208~230V Heat Recovery Single Modules

Model Name				4TVR0072B300NB		4TVR0096B300NB		4TVR0120B300NB		4TVR0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			6.0		8.0		10.0		12.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	72,000	72,000	96,000	96,000	120,000	120,000	144,000	144,000
		Heating	Btu/h	81,000	81,000	108,000	108,000	135,000	135,000	162,000	162,000
	Capacity (Rated)[2]	Cooling	Btu/h	69,000	69,000	92,000	92,000	114,000	114,000	138,000	138,000
		High Temp Heating	Btu/h	77,000	77,000	103,000	103,000	129,000	129,000	154,000	154,000
		Low Temp Heating	Btu/h	51,000	51,000	67,000	67,000	84,000	84,000	100,000	100,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.5	12.9	11.6	13.8	11.1	12.5	10.8	11.2
		IEER	-	20.2	23.0	19.8	27.0	19.6	24.2	18.2	22.7
		COP @ 47°F	-	3.46	4.15	3.60	4.23	3.43	3.97	3.54	3.64
		COP @ 17°F	-	2.49	2.75	2.47	2.90	2.45	2.62	2.23	2.40
		SCHE	-	25.0	27.9	25.5	30.0	24.2	29.6	23.2	27.1
Power	MCA		A	28		37.8		43		52.6	
	MOP		A	35		50		50		70	
	SCCR		kA	-		-		-		5.0	
Compressor	Type (Qty.)		-	SSC Scroll (1)		SSC Scroll (2)		SSC Scroll (2)		SSC Scroll (2)	
	Model Name		-	DS-GB052FBVASG		DS-GB052FBVASG (2)		DS-GB052FBVASG (2)		DS-GB052FBVASG (2)	
	Output		kW each	4.96		4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE		PVE	
		Initial Charge	fl. oz.	77.8		155.5		155.5		155.5	
Fan	Type (Qty.)		-	Propeller (1)		Propeller (2)		Propeller (2)		Propeller (2)	
	Output (Each)		W	400		620		620		620	
	Airflow Rate		CFM	7,240		9,180		9,180		9,535	
	External Static Pressure		in. WG	0.31		0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/8" Braze		3/8" Braze		1/2" Braze		1/2" Braze	
	Gas Pipe		Ø inch	3/4" Braze		7/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For Hr)		Ø inch	N/A		N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	12		16		20		25	
	Total Capacity		-	50 to 130% of total outdoor unit capacity							
Refrigerant	Type		-	R410A		R410A		R410A		R410A	
	Factory Charge		lbs.	12.1		16.3		16.3		19.18	
Sound[5]	Sound Pressure		dB(A)	60.0		61.0		61.0		62.0	
	Sound Power		dB(A)	81		81		81		83	
External Dimensions	Net Weight		lbs.	430		637		637		672	
	Shipping Weight		lbs.	465		679		679		714	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12		50.98 x 66.73 x 30,12		50.98 x 66.73 x 30,12		50.98 x 66.73 x 30.12	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76		53.66 x 75.28 x 32.76		53.66 x 75.28 x 32.76		53.66 x 75.28 x 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

208~230V Heat Recovery Dual Modules

Model Name				4TVR0168B300NB		4TVR0192B300NB		4TVR0216B300NB	
				4TVR0072B300NB + 4TVR0096B300NB		4TVR0072B300NB + 4TVR0120B300NB		4TVR0072B300NB + 4TVR0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			14.0		16.0		18.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	168,000	168,000	192,000	192,000	216,000	216,000
		Heating	Btu/h	189,000	189,000	216,000	216,000	243,000	243,000
	Capacity (Rated)[2]	Cooling	Btu/h	161,000	161,000	183,000	183,000	207,000	207,000
		High Temp Heating	Btu/h	180,000	180,000	206,000	206,000	231,000	231,000
		Low Temp Heating	Btu/h	118,000	118,000	135,000	135,000	151,000	151,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.4	12.1	10.9	11.4	10.6	10.8
		IEER	-	18.8	21.9	18.3	20.7	17.4	19.6
		COP @ 47°F	-	3.46	3.94	3.34	3.83	3.34	3.63
		COP @ 17°F	-	2.43	2.65	2.42	2.59	2.31	2.52
		SCHE	-	22.7	26.1	22.1	25.9	21.7	24.8
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (3)		SSC Scroll (3)		SSC Scroll (3)	
	Model Name		-	DS-GB052FBVASG (3)		DS-GB052FBVASG (3)		DS-GB052FBVASG (3)	
	Output		kW each	4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	233.4		233.4		233.4	
Fan	Type (Qty.)		-	Propeller (3)		Propeller (3)		Propeller (3)	
	Output (Each)		W	400 + 620 x 2		400 + 620 x 2		400 + 620 x 2	
	Airflow Rate		CFM	7,240 + 9,180		7,240 + 9,180		7,240 + 9,535	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		5/8" Braze		5/8" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For Hr)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	29		33		37	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	28.4		28.4		31.3	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	430 + 637		430 + 637		430 + 672	
	Shipping Weight		lbs.	465 + 679		465 + 679		465 + 714	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

208~230V Heat Recovery Dual Modules (cont.)

Model Name				4TVR0240B300NB		4TVR0264B300NB		4TVR0288B300NB	
				2x 4TVR0120B300NB		4TVR0120B300NB + 4TVR0144B300NB		2x 4TVR0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			20.0		22.0		24.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	240,000	240,000	264,000	264,000	288,000	288,000
		Heating	Btu/h	270,000	270,000	297,000	297,000	324,000	324,000
	Capacity (Rated)[2]	Cooling	Btu/h	228,000	228,000	252,000	252,000	276,000	276,000
		High Temp Heating	Btu/h	258,000	258,000	283,000	283,000	308,000	308,000
		Low Temp Heating	Btu/h	168,000	168,000	184,000	184,000	200,000	200,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.6	11.1	10.1	10.5	10.0	9.5
		IEER	-	17.6	20.2	16.8	19.2	16.4	18.1
		COP @ 47°F	-	3.24	3.65	3.25	3.45	3.25	3.26
		COP @ 17°F	-	2.40	2.54	2.26	2.41	2.12	2.29
		SCHE	-	20.6	25.2	20.1	24.1	19.7	23.0
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (4)		SSC Scroll (4)		SSC Scroll (4)	
	Model Name		-	DS-GB052FBVASG (4)		DS-GB052FBVASG (4)		DS-GB052FBVASG (4)	
	Output		kW each	4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	311.2		311.2		311.2	
Fan	Type (Qty.)		-	Propeller (4)		Propeller (4)		Propeller (4)	
	Output (Each)		W	620 x 4		620 x 4		620 x 4	
	Airflow Rate		CFM	9180 x 2		9,180 + 9,535		9535 x 2	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 3/8" Braze		1 3/8" Braze	
	High Pressure Gas Pipe (For Hr)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	41		45		49	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	32.6		35.5		38.4	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	637 x 2		637 + 672		672 x 2	
	Shipping Weight		lbs.	714 x 2		679 + 714		714 x 2	
	Net Dimensions (WxHxD)		inches	(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2	
	Shipping Dimensions (WxHxD)		inches	(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice

Outdoor Units

208~230V Heat Recovery Triple Modules

Model Name				4TVR0312B300NB		4TVR0336B300NB		4TVR0360B300NB	
				4TVR0072B300NB + 4TVR0096B300NB + 4TVR0144B300NB		4TVR0072B300NB + 4TVR0120B300NB + 4TVR0144B300NB		4TVR0072B300NB + 2x 4TVR0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			26.0		28.0		30.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	312,000	312,000	336,000	336,000	360,000	360,000
		Heating	Btu/h	351,000	351,000	378,000	378,000	405,000	405,000
	Capacity (Rated)[2]	Cooling	Btu/h	299,000	299,000	321,000	321,000	345,000	345,000
		High Temp Heating	Btu/h	334,000	334,000	360,000	360,000	385,000	385,000
		Low Temp Heating	Btu/h	218,000	218,000	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.3	10.5	-	-	-	-
		IEER	-	17.0	18.6	-	-	-	-
		COP @ 47°F	-	3.20	3.38	-	-	-	-
		COP @ 17°F	-	2.25	2.54	-	-	-	-
		SCHE	-	20.1	23.2	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (5)		SSC Scroll (5)		SSC Scroll (5)	
	Model Name		-	DS-GB052FBVASG (5)		DS-GB052FBVASG (5)		DS-GB052FBVASG (5)	
	Output		kW each	4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	390.0		390.0		390.0	
Fan	Type (Qty.)		-	Propeller (5)		Propeller (5)		Propeller (5)	
	Output (Each)		W	400 + 620 x 4		400 + 620 x 4		400 + 620 x 4	
	Airflow Rate		CFM	7,240 + 9,180 + 9,535		7,240 + 9,180 + 9,535		7,240 + (9,535 x2)	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 3/8" Braze		1 3/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For Hr)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	54		58		62	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	47.6		47.6		50.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	430 + 637 + 672		430 + 637 + 672		430 + (672 x2)	
	Shipping Weight		lbs.	465 + 679 + 714		465 + 679 + 714		465 + (714 x2)	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two each 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

208~230V Heat Recovery Triple Modules (cont.)

Model Name				4TVR0384B300NB		4TVR0408B300NB		4TVR0432B300NB	
				2x 4TVR0120B300NB + 4TVR0144B300NB		4TVR0120B300NB + 2x 4TVR0144B300NB		3x 4TVR0144B300NB	
Power Supply				208~230/60/3		208~230/60/3		208~230/60/3	
Performance	Nominal Tons			32.0		34.0		36.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	384,000	384,000	408,000	408,000	432,000	432,000
		Heating	Btu/h	432,000	432,000	459,000	459,000	486,000	486,000
	Capacity (Rated)[2]	Cooling	Btu/h	366,000	366,000	390,000	390,000	414,000	414,000
		High Temp Heating	Btu/h	412,000	412,000	437,000	437,000	462,000	462,000
		Low Temp Heating	Btu/h	-	-	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	-	-	-	-	-	-
		IEER	-	-	-	-	-	-	-
		COP @ 47°F	-	-	-	-	-	-	-
		COP @ 17°F	-	-	-	-	-	-	-
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (6)		SSC Scroll (6)		SSC Scroll (6)	
	Model Name		-	DS-GB052FBVASG (6)		DS-GB052FBVASG (6)		DS-GB052FBVASG (6)	
	Output		kW each	4.96		4.96		4.96	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	466.6		466.6		466.6	
Fan	Type (Qty.)		-	Propeller (6)		Propeller (6)		Propeller (6)	
	Output (Each)		W	620 x 6		620 x 6		620 x 6	
	Airflow Rate		CFM	(9,180 x2) + 9535		9,180 + (2x 9,535)		9535 x 3	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 5/8" Braze		1 5/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For Hr)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	64		64		64	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	51.8		54.7		57.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	(624 x 2) + 657		624 + (657 x2)		657 x 3	
	Shipping Weight		lbs.	(666 x2) + 699		466 + (699 x2)		699 x 3	
	Net Dimensions (WxHxD)		inches	(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3	
	Shipping Dimensions (WxHxD)		inches	(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two each 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Pump Single Modules

Model Name				4TVH0072B400NB		4TVH0096B400NB		4TVH0120B400NB		4TVH0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			6.0		8.0		10.0		12.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	72,000	72,000	96,000	96,000	120,000	120,000	144,000	144,000
		Heating	Btu/h	81,000	81,000	108,000	108,000	135,000	135,000	162,000	162,000
	Capacity (Rated)[2]	Cooling	Btu/h	69,000	69,000	92,000	92,000	114,000	114,000	138,000	138,000
		High Temp Heating	Btu/h	77,000	77,000	103,000	103,000	129,000	129,000	154,000	154,000
		Low Temp Heating	Btu/h	51,000	51,000	67,000	67,000	84,000	84,000	100,000	100,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.5	12.9	11.5	13.9	11.1	12.4	10.8	11.2
		IEER	-	20.2	23.0	19.6	25.1	19.5	23.0	18.2	22.7
		COP @ 47°F	-	3.46	4.15	3.56	4.23	3.43	3.97	3.54	3.64
		COP @ 17°F	-	2.49	2.75	2.45	2.81	2.44	2.53	2.23	2.40
		SCHE	-	-	-	-	-	-	-	-	-
Power	MCA		A	16.4		19		21.7		26.4	
	MOP		A	20		25		30		40	
	SCCR		kA	-		-		-		-	
Compressor	Type (Qty.)		-	SSC Scroll (1)		SSC Scroll (1)		SSC Scroll (1)		SSC Scroll (2)	
	Model Name		-	DS-GB052FAVASG		DS-GB066FAVASG		DS-GB066FAVASG		DS-GB052FAVASG	
	Output		kW	4.96		6.13		6.13		4.96 x 2	
	Oil	Type	-	PVE		PVE		PVE		PVE	
		Initial Charge	fl. oz.	77.8		77.8		77.8		155.5	
Fan	Type (Qty.)		-	Propeller (1)		Propeller (2)		Propeller (2)		Propeller (2)	
	Output (Each)		W	400		620		620		620	
	Airflow Rate		CFM	7,240		9,180		9,180		9,535	
	External Static Pressure		in. WG	0.31		0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/8" Braze		3/8" Braze		1/2" Braze		1/2" Braze	
	Gas Pipe		Ø inch	3/4" Braze		7/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	12		16		20		25	
	Total Capacity		-	50 to 130% of total outdoor unit capacity							
Refrigerant	Type		-	R410A		R410A		R410A		R410A	
	Factory Charge		lbs.	12.1		16.3		16.3		19.18	
Sound[5]	Sound Pressure		dB(A)	60.0		61.0		61.0		62.0	
	Sound Power		dB(A)	81		81		81		83	
External Dimensions	Net Weight		lbs.	437		540		540		672	
	Shipping Weight		lbs.	472		582		582		714	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12		50.98 x 66.73 x 30,12		50.98 x 66.73 x 30,12		50.98 x 66.73 x 30.12	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76		53.66 x 75.28 x 32.76		53.66 x 75.28 x 32.76		53.66 x 75.28 x 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Pump Dual Modules

Model Name				4TVH0168B400NB		4TVH0192B400NB		4TVH0216B400NB	
				4TVH0072B400NB + 4TVH0096B400NB		4TVH0072B400NB + 4TVH0120B400NB		4TVH0072B400NB + 4TVH0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			14.0		16.0		18.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	168,000	168,000	192,000	192,000	216,000	216,000
		Heating	Btu/h	189,000	189,000	216,000	216,000	243,000	243,000
	Capacity (Rated)[2]	Cooling	Btu/h	161,000	161,000	183,000	183,000	207,000	207,000
		High Temp Heating	Btu/h	180,000	180,000	206,000	206,000	231,000	231,000
		Low Temp Heating	Btu/h	118,000	118,000	135,000	135,000	151,000	151,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.3	12.1	10.9	11.2	10.6	10.8
		IEER	-	18.7	21.1	18.2	20.1	17.4	19.6
		COP @ 47°F	-	3,44	3.94	3.34	3.83	3.34	3.63
		COP @ 17°F	-	2.43	2.65	2.42	2.59	2.31	2.52
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (2)		SSC Scroll (2)		SSC Scroll (2)	
	Model Name		-	DS-GB052FAVASG + DS-GB066FAVASG		DS-GB052FAVASG + DS-GB066FAVASG		DS-GB052FAVASG x 2	
	Output		kW	4.96 + 6.13		4.96 + 6.13		4.96 x 3	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	155.5		155.5		233.3	
Fan	Type (Qty.)		-	Propeller (3)		Propeller (3)		Propeller (3)	
	Output (Each)		W	400 + 620 x 2		400 + 620 x 2		400 + 620 x 2	
	Airflow Rate		CFM	7,240 + 9,180		7,240 + 9,180		7,240 + 9,535	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		5/8" Braze		5/8" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	29		33		37	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	28.4		28.4		31.3	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	436 + 540		436 + 540		436 + 672	
	Shipping Weight		lbs.	472 + 582		472 + 582		472 + 714	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A outdoor unit T-joint connection
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Pump Dual Modules (cont.)

Model Name				4TVH0240B400NB		4TVH0264B400NB		4TVH0288B400NB	
				2x 4TVH0120B400NB		4TVH0120B400NB + 4TVH0144B400NB		2x 4TVH0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			20.0		22.0		24.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	240,000	240,000	264,000	264,000	288,000	288,000
		Heating	Btu/h	270,000	270,000	297,000	297,000	324,000	324,000
	Capacity (Rated)[2]	Cooling	Btu/h	228,000	228,000	252,000	252,000	276,000	276,000
		High Temp Heating	Btu/h	258,000	258,000	283,000	283,000	308,000	308,000
		Low Temp Heating	Btu/h	168,000	168,000	184,000	184,000	200,000	200,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.6	10.7	10.1	10.1	10.0	9.9
		IEER	-	17.5	19.2	16.8	18.7	16.4	18.1
		COP @ 47°F	-	3.24	3.65	3.25	3.45	3.25	3.26
		COP @ 17°F	-	2.40	2.54	2.26	2.41	2.12	2.29
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (2)		SSC Scroll (3)		SSC Scroll (4)	
	Model Name		-	DS-GB066FAVASG x 2		DS-GB052FAVASG x 2 + DS-GB066FAVASG		DS-GB052FAVASG x 4	
	Output		kW	6.13 x 2		(4.96 x 2) + 6.13		4.96 x 4	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	155.5		233.3		311.1	
Fan	Type (Qty.)		-	Propeller (4)		Propeller (4)		Propeller (4)	
	Output (Each)		W	620 x 4		620 x 4		620 x 4	
	Airflow Rate		CFM	9180 x 2		9,180 + 9,535		9535 x 2	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 3/8" Braze		1 3/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	41		45		49	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	32.6		35.5		38.4	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	540 x 2		540 + 672		672 x 2	
	Shipping Weight		lbs.	582 x 2		582 + 714		714 x 2	
	Net Dimensions (WxHxD)		inches	(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2	
	Shipping Dimensions (WxHxD)		inches	(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A outdoor unit T-joint connection
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Pump Triple Modules

Model Name				4TVH0312B400NB		4TVH0336B400NB		4TVH0360B400NB	
				4TVH0072B400NB + 4TVH0096B400NB + 4TVH0144B400NB		4TVH0072B400NB + 4TVH0120B400NB + 4TVH0144B400NB		4TVH0072B400NB + 2x 4TVH0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			26.0		28.0		30.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	312,000	312,000	336,000	336,000	360,000	360,000
		Heating	Btu/h	351,000	351,000	378,000	378,000	405,000	405,000
	Capacity (Rated)[2]	Cooling	Btu/h	299,000	299,000	321,000	321,000	345,000	345,000
		High Temp Heating	Btu/h	334,000	334,000	360,000	360,000	385,000	385,000
		Low Temp Heating	Btu/h	218,000	218,000	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.3	10.6	-	-	-	-
		IEER	-	16.9	18.2	-	-	-	-
		COP @ 47°F	-	3.20	3.38	-	-	-	-
		COP @ 17°F	-	2.25	2.51	-	-	-	-
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (4)		SSC Scroll (4)		SSC Scroll (5)	
	Model Name		-	DS-GB052FAVASG x 3 + DS-GB066FAVASG		DS-GB052FAVASG x 3 + DS-GB066FAVASG		DS-GB052FAVASG x 5	
	Output		kW	(4.96 x 3) + 6.13		(4.96 x 3) + 6.13		4.96 x 5	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	311.1		311.1		388.9	
Fan	Type (Qty.)		-	Propeller (5)		Propeller (5)		Propeller (5)	
	Output (Each)		W	400 + 620 x 4		400 + 620 x 4		400 + 620 x 4	
	Airflow Rate		CFM	7,240 + 9,180 + 9,535		7,240 + 9,180 + 9,535		7,240 + (9,535 x2)	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 3/8" Braze		1 3/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	54		58		62	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	47.6		47.6		50.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	437 + 540 + 672		437 + 540 + 672		437 + (672 x2)	
	Shipping Weight		lbs.	472 + 582 + 714		472 + 582 + 714		472 + (714 x2)	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two 4TDK3819B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Pump Triple Modules (cont.)

Model Name				4TVH0384B400NB		4TVH0408B400NB		4TVH0432B400NB	
				2x 4TVH0120B400NB + 4TVH0144B400NB		4TVH0120B400NB + 2x 4TVH0144B400NB		3x 4TVH0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			32.0		34.0		36.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	384,000	384,000	408,000	408,000	432,000	432,000
		Heating	Btu/h	432,000	432,000	459,000	459,000	486,000	486,000
	Capacity (Rated)[2]	Cooling	Btu/h	366,000	366,000	390,000	390,000	414,000	414,000
		High Temp Heating	Btu/h	412,000	412,000	437,000	437,000	462,000	462,000
		Low Temp Heating	Btu/h	-	-	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	-	-	-	-	-	-
		IEER	-	-	-	-	-	-	-
		COP @ 47°F	-	-	-	-	-	-	-
		COP @ 17°F	-	-	-	-	-	-	-
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (4)		SSC Scroll (5)		SSC Scroll (6)	
	Model Name		-	DS-GB052FAVASG x 2 + DS-GB066FAVASG x 2		DS-GB052FAVASG x 4 + DS-GB066FAVASG		DS-GB052FAVASG x 6	
	Output		kW	(4.96 x 2) + (6.13 x 2)		(4.96 x 4) + 6.13		4.96 x 6	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	311.1		388.9		466.6	
Fan	Type (Qty.)		-	Propeller (6)		Propeller (6)		Propeller (6)	
	Output (Each)		W	620 x 6		620 x 6		620 x 6	
	Airflow Rate		CFM	(9,180 x2) + 9535		9,180 + (2x 9,535)		9535 x 3	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 5/8" Braze		1 5/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	N/A		N/A		N/A	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	64		64		64	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	51.8		54.7		57.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	(540 x 2) + 672		540 + (672 x2)		672 x 3	
	Shipping Weight		lbs.	(582 x2) + 714		582 + (714 x2)		714 x 3	
	Net Dimensions (WxHxD)		inches	(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3	
	Shipping Dimensions (WxHxD)		inches	(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two 4TDK3819B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Recovery Single Modules

Model Name				4TVR0072B400NB		4TVR0096B400NB		4TVR0120B400NB		4TVR0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			6.0		8.0		10.0		12.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	72,000	72,000	96,000	96,000	120,000	120,000	144,000	144,000
		Heating	Btu/h	81,000	81,000	108,000	108,000	135,000	135,000	162,000	162,000
	Capacity (Rated)[2]	Cooling	Btu/h	69,000	69,000	92,000	92,000	114,000	114,000	138,000	138,000
		High Temp Heating	Btu/h	77,000	77,000	103,000	103,000	129,000	129,000	154,000	154,000
		Low Temp Heating	Btu/h	51,000	51,000	67,000	67,000	84,000	84,000	100,000	100,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.5	12.9	11.5	13.9	11.1	12.4	10.8	11.2
		IEER	-	20.2	23.0	19.6	25.1	19.5	23.0	18.2	22.7
		COP @ 47°F	-	3.46	4.15	3.56	4.23	3.43	3.97	3.54	3.64
		COP @ 17°F	-	2.49	2.75	2.45	2.81	2.44	2.53	2.23	2.40
		SCHE	-	25.0	27.9	25.5	30.0	24.2	29.6	23.2	27.1
Power	MCA		A	16.4		19		21.7		26.4	
	MOP		A	20		25		30		40	
	SCCR		kA	-		-		-		-	
Compressor	Type (Qty.)		-	SSC Scroll (1)		SSC Scroll (1)		SSC Scroll (1)		SSC Scroll (2)	
	Model Name		-	DS-GB052FAVASG		DS-GB066FAVASG		DS-GB066FAVASG		DS-GB052FAVASG	
	Output		kW	4.96		6.13		6.13		4.96 x 2	
	Oil	Type	-	PVE		PVE		PVE		PVE	
		Initial Charge	fl. oz.	77.8		77.8		77.8		155.5	
Fan	Type (Qty.)		-	Propeller (1)		Propeller (2)		Propeller (2)		Propeller (2)	
	Output (Each)		W	400		620		620		620	
	Airflow Rate		CFM	7,240		9,180		9,180		9,535	
	External Static Pressure		in. WG	0.31		0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/8" Braze		3/8" Braze		1/2" Braze		1/2" Braze	
	Gas Pipe		Ø inch	3/4" Braze		7/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	5/8" Braze		3/4" Braze		7/8" Braze		7/8" Braze	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	12		16		20		25	
	Total Capacity		-	50 to 130% of total outdoor unit capacity							
Refrigerant	Type		-	R410A		R410A		R410A		R410A	
	Factory Charge		lbs.	12.1		16.3		16.3		19.18	
Sound[5]	Sound Pressure		dB(A)	60.0		61.0		61.0		62.0	
	Sound Power		dB(A)	81		81		81		83	
External Dimensions	Net Weight		lbs.	445		553		553		692	
	Shipping Weight		lbs.	481		595		595		734	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12		50.98 x 66.73 x 30,12		50.98 x 66.73 x 30,12		50.98 x 66.73 x 30.12	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76		53.66 x 75.28 x 32.76		53.66 x 75.28 x 32.76		53.66 x 75.28 x 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Recovery Dual Modules

Model Name				4TVR0168B400NB		4TVR0192B400NB		4TVR0216B400NB	
				4TVR0072B400NB + 4TVR0096B400NB		4TVR0072B400NB + 4TVR0120B400NB		4TVR0072B400NB + 4TVR0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			14.0		16.0		18.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	168,000	168,000	192,000	192,000	216,000	216,000
		Heating	Btu/h	189,000	189,000	216,000	216,000	243,000	243,000
	Capacity (Rated)[2]	Cooling	Btu/h	161,000	161,000	183,000	183,000	207,000	207,000
		High Temp Heating	Btu/h	180,000	180,000	206,000	206,000	231,000	231,000
		Low Temp Heating	Btu/h	118,000	118,000	135,000	135,000	151,000	151,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	11.3	12.1	10.9	11.2	10.6	10.8
		IEER	-	18.7	21.1	18.2	20.1	17.4	19.6
		COP @ 47°F	-	3.44	3.94	3.34	3.83	3.34	3.63
		COP @ 17°F	-	2.43	2.65	2.42	2.59	2.31	2.52
		SCHE	-	22.7	26.1	22.1	25.9	21.7	24.8
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (2)		SSC Scroll (2)		SSC Scroll (2)	
	Model Name		-	DS-GB052FAVASG + DS-GB066FAVASG		DS-GB052FAVASG + DS-GB066FAVASG		DS-GB052FAVASG x 2	
	Output		kW	4.96 + 6.13		4.96 + 6.13		4.96 x 3	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	155.5		155.5		233.3	
Fan	Type (Qty.)		-	Propeller (3)		Propeller (3)		Propeller (3)	
	Output (Each)		W	400 + 620 x 2		400 + 620 x 2		400 + 620 x 2	
	Airflow Rate		CFM	7,240 + 9,180		7,240 + 9,180		7,240 + 9,535	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		5/8" Braze		5/8" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 1/8" Braze		1 1/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	7/8" Braze		1 1/8" Braze		1 1/8" Braze	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	29		33		37	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	28.4		28.4		31.3	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	445 + 553		445 + 553		445 + 692	
	Shipping Weight		lbs.	481 + 595		481 + 595		481 + 734	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12		34.65 x 66.73 x 30.12 + 50.98 x 66.73 x 30.12	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76		37.32 x 75.28 x 32.76 + 53.66 x 75.28 x 32.76	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

460V Heat Recovery Dual Modules (cont.)

Model Name				4TVR0240B400NB		4TVR0264B400NB		4TVR0288B400NB	
				2x 4TVR0120B400NB		4TVR0120B400NB + 4TVR0144B400NB		2x 4TVR0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			20.0		22.0		24.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	240,000	240,000	264,000	264,000	288,000	288,000
		Heating	Btu/h	270,000	270,000	297,000	297,000	324,000	324,000
	Capacity (Rated)[2]	Cooling	Btu/h	228,000	228,000	252,000	252,000	276,000	276,000
		High Temp Heating	Btu/h	258,000	258,000	283,000	283,000	308,000	308,000
		Low Temp Heating	Btu/h	168,000	168,000	184,000	184,000	200,000	200,000
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.6	10.7	10.1	10.1	10.0	9.9
		IEER	-	17.5	19.2	16.8	18.7	16.4	18.1
		COP @ 47°F	-	3.24	3.65	3.25	3.45	3.25	3.26
		COP @ 17°F	-	2.40	2.54	2.26	2.41	2.12	2.29
		SCHE	-	20.6	25.2	20.1	24.1	19.7	23.0
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (2)		SSC Scroll (3)		SSC Scroll (4)	
	Model Name		-	DS-GB066FAVASG x 2		DS-GB052FAVASG x 2 + DS-GB066FAVASG		DS-GB052FAVASG x 4	
	Output		kW	6.13 x 2		(4.96 x 2) + 6.13		4.96 x 4	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	155.5		233.3		311.1	
Fan	Type (Qty.)		-	Propeller (4)		Propeller (4)		Propeller (4)	
	Output (Each)		W	620 x 4		620 x 4		620 x 4	
	Airflow Rate		CFM	9180 x 2		9,180 + 9,535		9535 x 2	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	5/8" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 1/8" Braze		1 3/8" Braze		1 3/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	1 1/8" Braze		1 1/8" Braze		1 1/8" Braze	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	41		45		49	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	32.6		35.5		38.4	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	553 x 2		553 + 692		692 x 2	
	Shipping Weight		lbs.	595 x 2		595 + 734		734 x 2	
	Net Dimensions (WxHxD)		inches	(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2		(50.98 x 66.73 x 30.12) x 2	
	Shipping Dimensions (WxHxD)		inches	(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2		(53.66 x 75.28 x 32.76) x 2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

Outdoor Units

460V Heat Recovery Triple Modules

Model Name				4TVR0312B400NB		4TVR0336B400NB		4TVR0360B400NB	
				4TVR0072B400NB + 4TVR0096B400NB + 4TVR0144B400NB		4TVR0072B400NB + 4TVR0120B400NB + 4TVR0144B400NB		4TVR0072B400NB + 2x 4TVR0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			26.0		28.0		30.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	312,000	312,000	336,000	336,000	360,000	360,000
		Heating	Btu/h	351,000	351,000	378,000	378,000	405,000	405,000
	Capacity (Rated)[2]	Cooling	Btu/h	299,000	299,000	321,000	321,000	345,000	345,000
		High Temp Heating	Btu/h	334,000	334,000	360,000	360,000	385,000	385,000
		Low Temp Heating	Btu/h	218,000	218,000	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	10.3	10.6	-	-	-	-
		IEER	-	16.9	18.2	-	-	-	-
		COP @ 47°F	-	3.20	3.38	-	-	-	-
		COP @ 17°F	-	2.25	2.51	-	-	-	-
		SCHE	-	20.1	23.2	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (4)		SSC Scroll (4)		SSC Scroll (5)	
	Model Name		-	DS-GB052FAVASG x 3 + DS-GB066FAVASG		DS-GB052FAVASG x 3 + DS-GB066FAVASG		DS-GB052FAVASG x 5	
	Output		kW	(4.96 x 3) + 6.13		(4.96 x 3) + 6.13		4.96 x 5	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	311.1		311.1		388.9	
Fan	Type (Qty.)		-	Propeller (5)		Propeller (5)		Propeller (5)	
	Output (Each)		W	400 + 620 x 4		400 + 620 x 4		400 + 620 x 4	
	Airflow Rate		CFM	7,240 + 9,180 + 9,535		7,240 + 9,180 + 9,535		7,240 + (9,535 x2)	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 3/8" Braze		1 3/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	1 1/8" Braze		1 1/8" Braze		1 3/8" Braze	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	54		58		62	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	47.6		47.6		50.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	445 + 553 + 692		445 + 553 + 692		445 + (692 x 2)	
	Shipping Weight		lbs.	481 + 595 + 734		481 + 595 + 734		481 + (734 x 2)	
	Net Dimensions (WxHxD)		inches	34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2		34.65 x 66.73 x 30.12 + (50.98 x 66.73 x 30.12) x2	
	Shipping Dimensions (WxHxD)		inches	37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2		37.32 x 75.28 x 32.76 + (53.66 x 75.28 x 32.76) x2	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two each 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

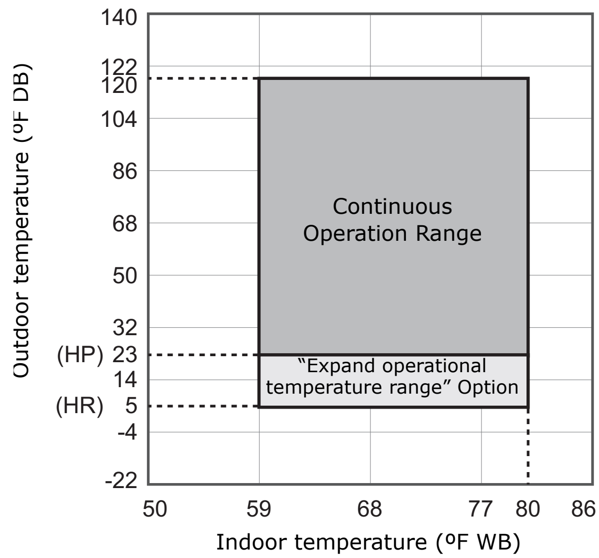
460V Heat Recovery Triple Modules (cont.)

Model Name				4TVR0384B400NB		4TVR0408B400NB		4TVR0432B400NB	
				2x 4TVR0120B400NB + 4TVR0144B400NB		4TVR0120B400NB + 2x 4TVR0144B400NB		3x 4TVR0144B400NB	
Power Supply				460/60/3		460/60/3		460/60/3	
Performance	Nominal Tons			32.0		34.0		36.0	
	System Type			Ducted	Non-Ducted	Ducted	Non-Ducted	Ducted	Non-Ducted
	Capacity (Nominal)[1]	Cooling	Btu/h	384,000	384,000	408,000	408,000	432,000	432,000
		Heating	Btu/h	432,000	432,000	459,000	459,000	486,000	486,000
	Capacity (Rated)[2]	Cooling	Btu/h	366,000	366,000	390,000	390,000	414,000	414,000
		High Temp Heating	Btu/h	412,000	412,000	437,000	437,000	462,000	462,000
		Low Temp Heating	Btu/h	-	-	-	-	-	-
	AHRI -1230 Efficiency Ratings[2]	EER	-	-	-	-	-	-	-
		IEER	-	-	-	-	-	-	-
		COP @ 47°F	-	-	-	-	-	-	-
		COP @ 17°F	-	-	-	-	-	-	-
		SCHE	-	-	-	-	-	-	-
Power	MCA		A	Each individual outdoor unit requires a separate electrical connection. Reference electrical data for each individual outdoor unit.					
	MOP		A						
	SCCR		kA						
Compressor	Type (Qty.)		-	SSC Scroll (4)		SSC Scroll (5)		SSC Scroll (6)	
	Model Name		-	DS-GB052FAVASG x 2 + DS-GB066FAVASG x 2		DS-GB052FAVASG x 4 + DS-GB066FAVASG		DS-GB052FAVASG x 6	
	Output		kW	(4.96 x 2) + (6.13 x 2)		(4.96 x 4) + 6.13		4.96 x 6	
	Oil	Type	-	PVE		PVE		PVE	
		Initial Charge	fl. oz.	311.1		388.9		466.6	
Fan	Type (Qty.)		-	Propeller (6)		Propeller (6)		Propeller (6)	
	Output (Each)		W	620 x 6		620 x 6		620 x 6	
	Airflow Rate		CFM	(9,180 x2) + 9535		9,180 + (2x 9,535)		9535 x 3	
	External Static Pressure		in. WG	0.31		0.31		0.31	
Piping Connections	Liquid Pipe		Ø inch	3/4" Braze		3/4" Braze		3/4" Braze	
	Gas Pipe		Ø inch	1 5/8" Braze		1 5/8" Braze		1 5/8" Braze	
	High Pressure Gas Pipe (For HR)		Ø inch	1 3/8" Braze		1 3/8" Braze		1 3/8" Braze	
	Installation Limits	Max Length[3]	ft.	656 (722)		656 (722)		656 (722)	
		Max Height[4]	ft.	361 (131)		361 (131)		361 (131)	
Indoor Unit Connections	Number Of Connectable Indoor Units		-	64		64		64	
	Total Capacity		-	50 to 130% of total outdoor unit capacity					
Refrigerant	Type		-	R410A		R410A		R410A	
	Factory Charge		lbs.	51.8		54.7		57.5	
Sound[5]	Sound Pressure		dB(A)	-		-		-	
	Sound Power		dB(A)	-		-		-	
External Dimensions	Net Weight		lbs.	553 + (692 x 2)		553 + (692 x 2)		692 x 3	
	Shipping Weight		lbs.	595 + (734 x 2)		595 + (734 x 2)		734 x 3	
	Net Dimensions (WxHxD)		inches	(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3		(50.98 x 66.73 x 30.12) x 3	
	Shipping Dimensions (WxHxD)		inches	(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3		(53.66 x 75.28 x 32.76) x 3	
Operating Temp Range	Cooling		°F	23 ~ 120		23 ~ 120		23 ~ 120	
	Heating		°F	-4 ~ 75		-4 ~ 75		-4 ~ 75	

1. Nominal capacity based on 25 ft. of equivalent refrigerant piping with 0 ft. level difference.
   - Cooling: Indoor temperature 80°F DB, 67°F WB/Outdoor temperature 95°F DB, 75°F WB
   - Heating: Indoor temperature 70°F DB, 60°F WB/Outdoor temperature 47°F DB, 43°F WB
2. Rated per AHRI-1230 Standard conditions (published ratings apply to systems < 300,000 BTU/h)
3. Actual length (equivalent length in parenthesis)
4. If the outdoor unit is installed above the indoor units, the allowable height difference to the furthest indoor unit is 361 ft. (If the height difference exceeds 164 ft., request engineering support from Trane). If the outdoor unit is installed below the below the indoor units, the allowable height difference is 131 ft.
5. Sound pressure was acquired in a dead room. Actual noise level may be different depending on installation conditions.
6. Requires two each 4TDK3819B0000A and 4TDK3100B0000A outdoor unit T-joint connections
7. Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

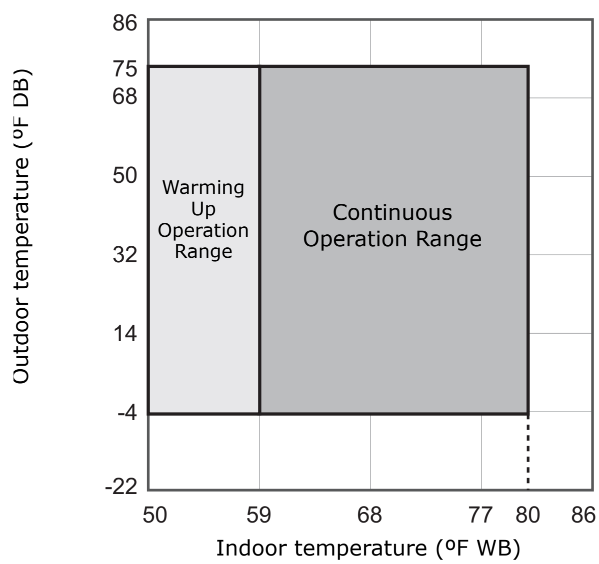
Operation Limit

Cooling



Extend operational temperature range" apples to heat recovery systems in mixed mode condition (some indoor units in heating and some in cooling).

Heating

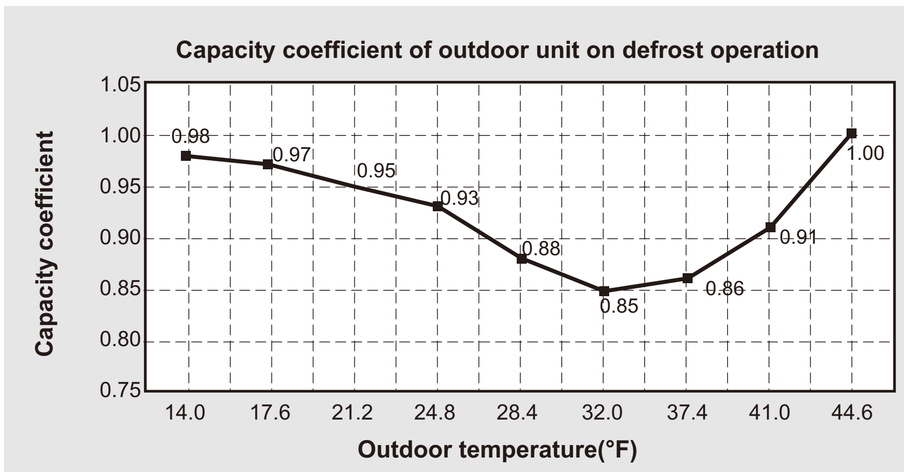


Defrosting Correction Factor

On heating operation, frost can be formed on heat exchanger according to outdoor temperature. (Frost on heat exchanger results in decreasing the performance.) To remove frost on heat exchanger of outdoor unit, defrost operation is carried out periodically. During defrost operation, capacity of outdoor unit may decrease. The decrement is not considered to the individual capacity tables.

Outdoor temperature (°F, WB)	14.0	17.6	21.2	24.8	28.4	32.0	37.4	41.0	44.6
Capacity coefficient	0.98	0.97	0.95	0.93	0.88	0.85	0.86	0.91	1.00

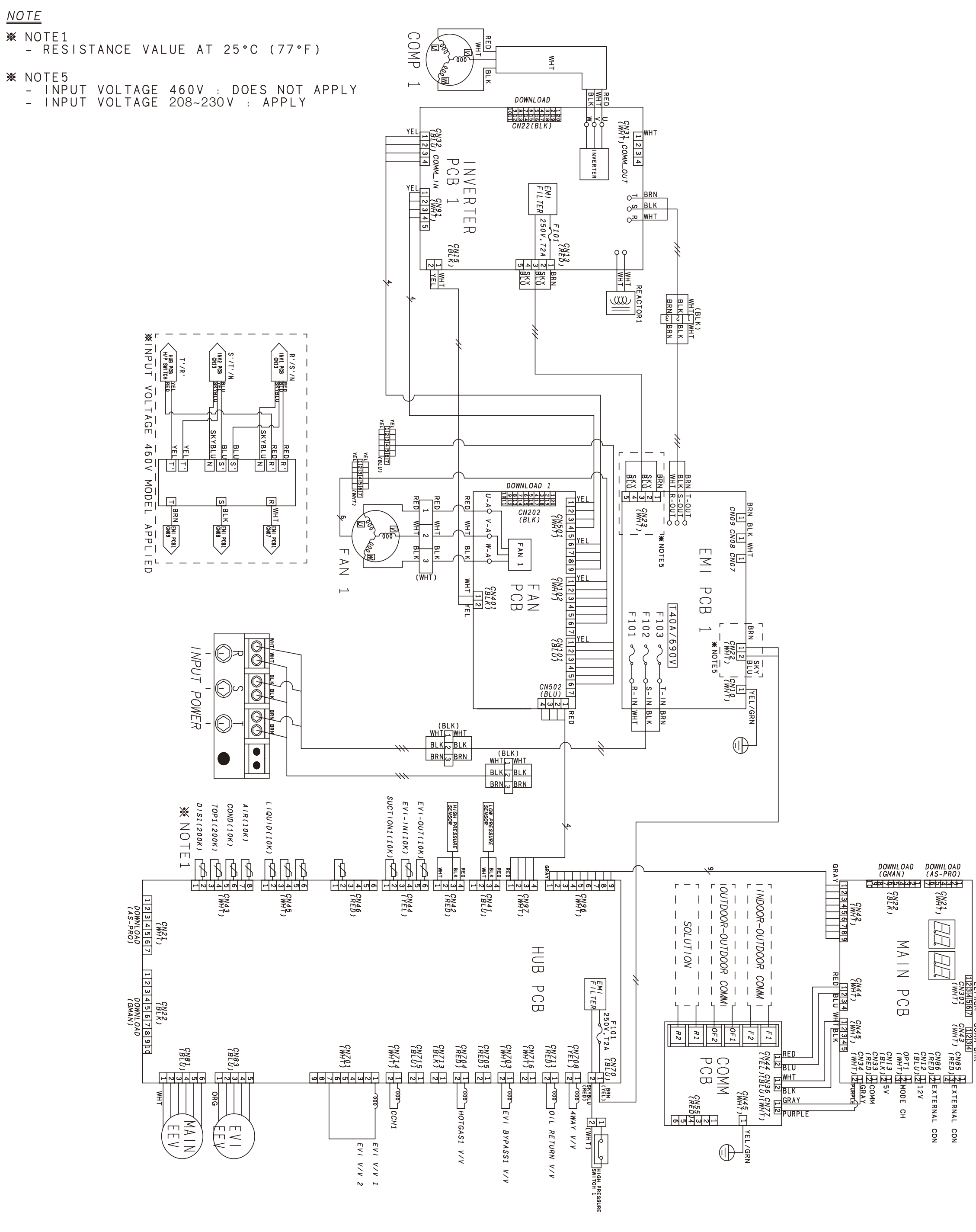
Corrected Heating Capacity = Heating Capacity x Capacity coefficient



Electrical Wiring Diagram

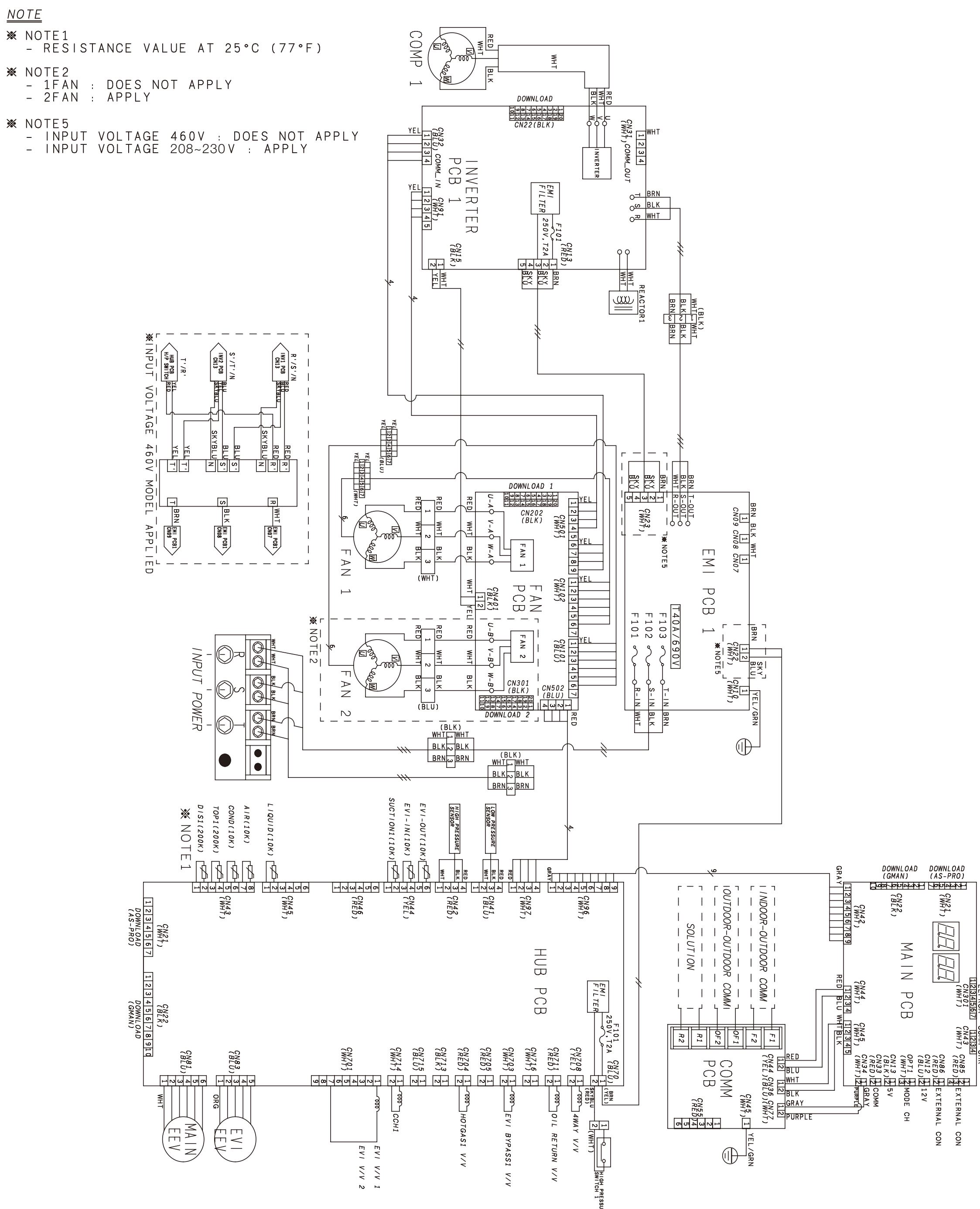
Heat Pump

4TVH0072B300NB, 4TVH0072B400NB



Heat Pump

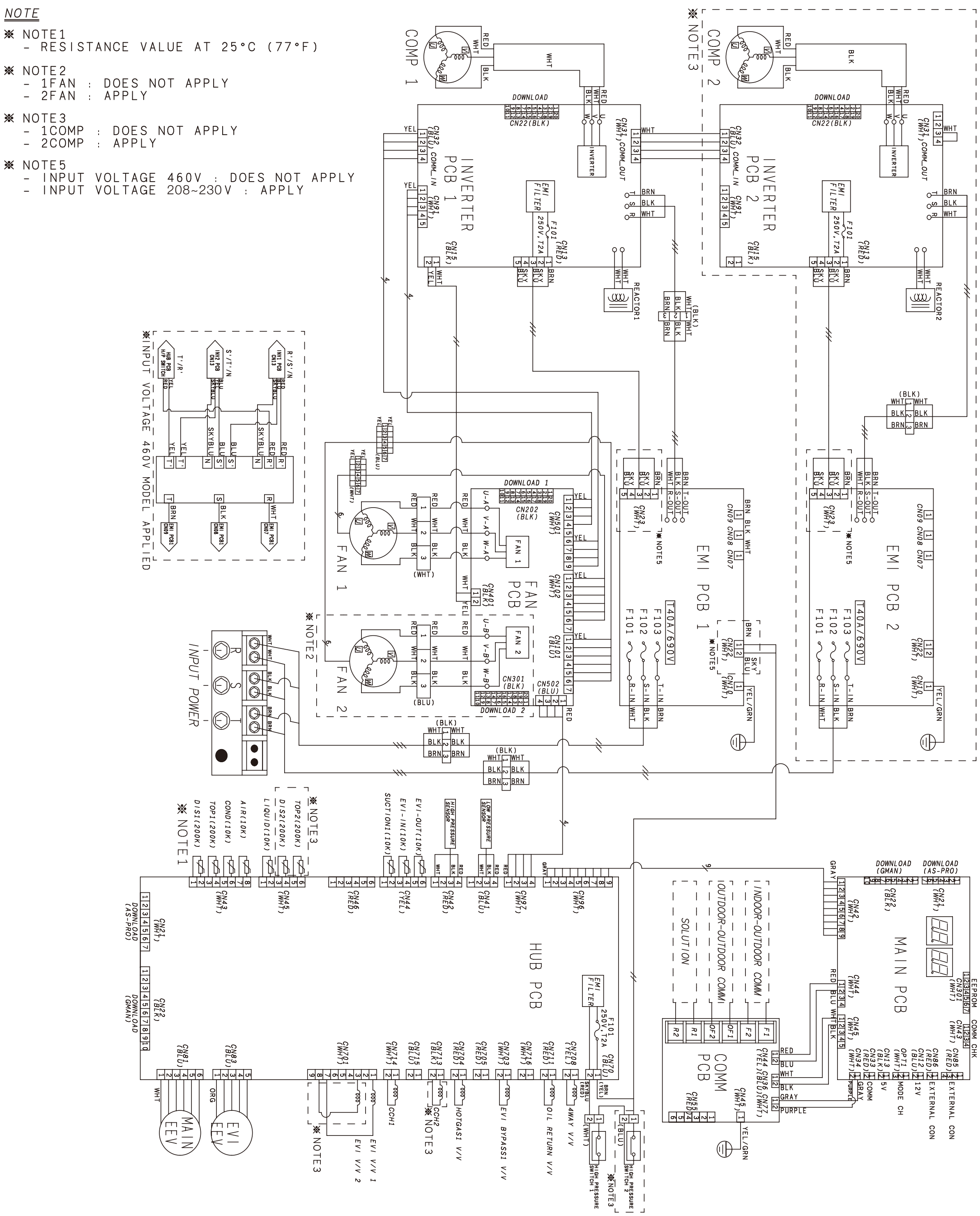
4TVH0096B400NB, 4TVH0120B400NB



Outdoor Units

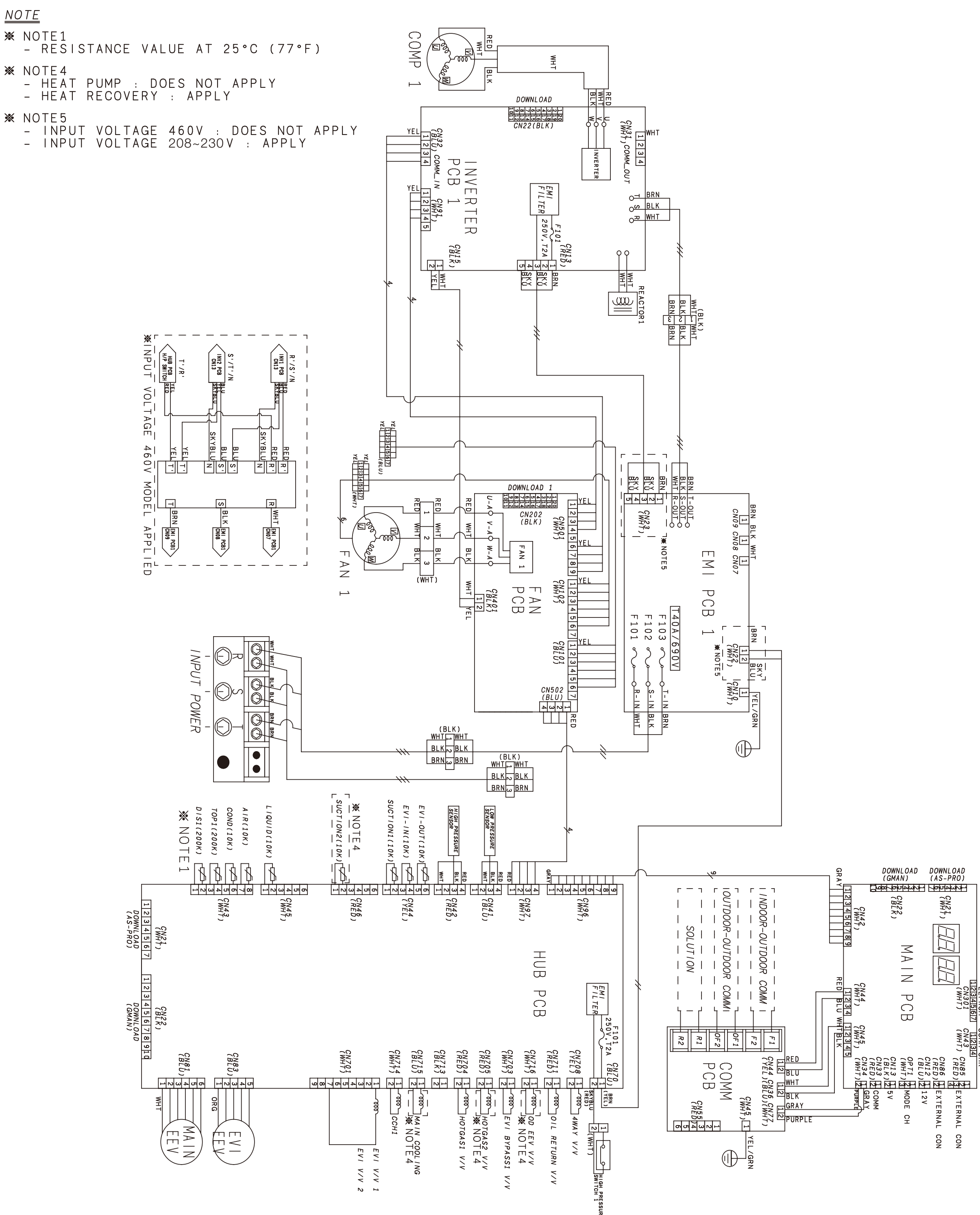
Heat Pump

4TVH0096B300NB, 4TVH0120B300NB, 4TVH0144B300NB, 4TVH0144B400NB



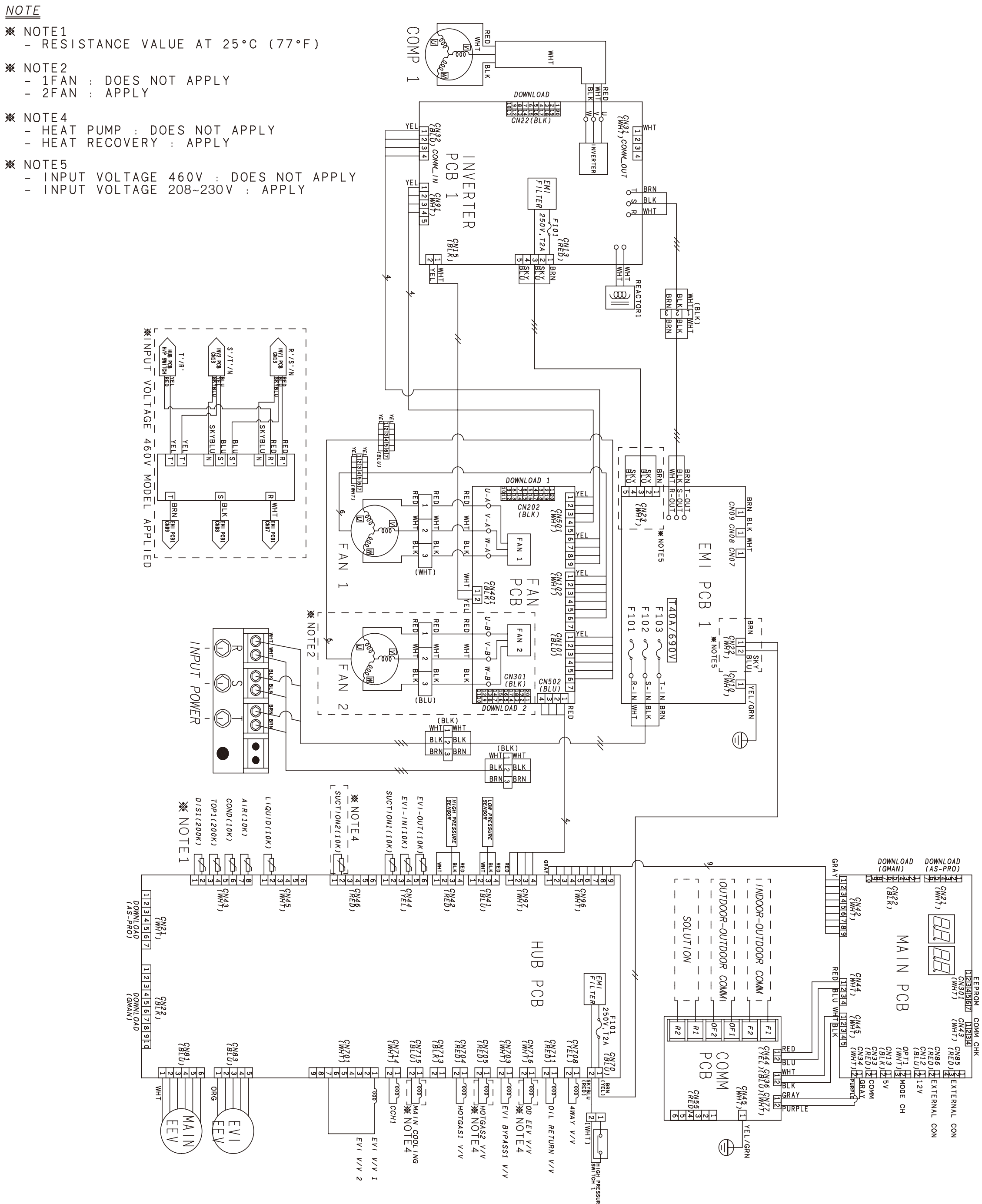
Heat Recovery

4TVR0072B300NB, 4TVR0072B400NB



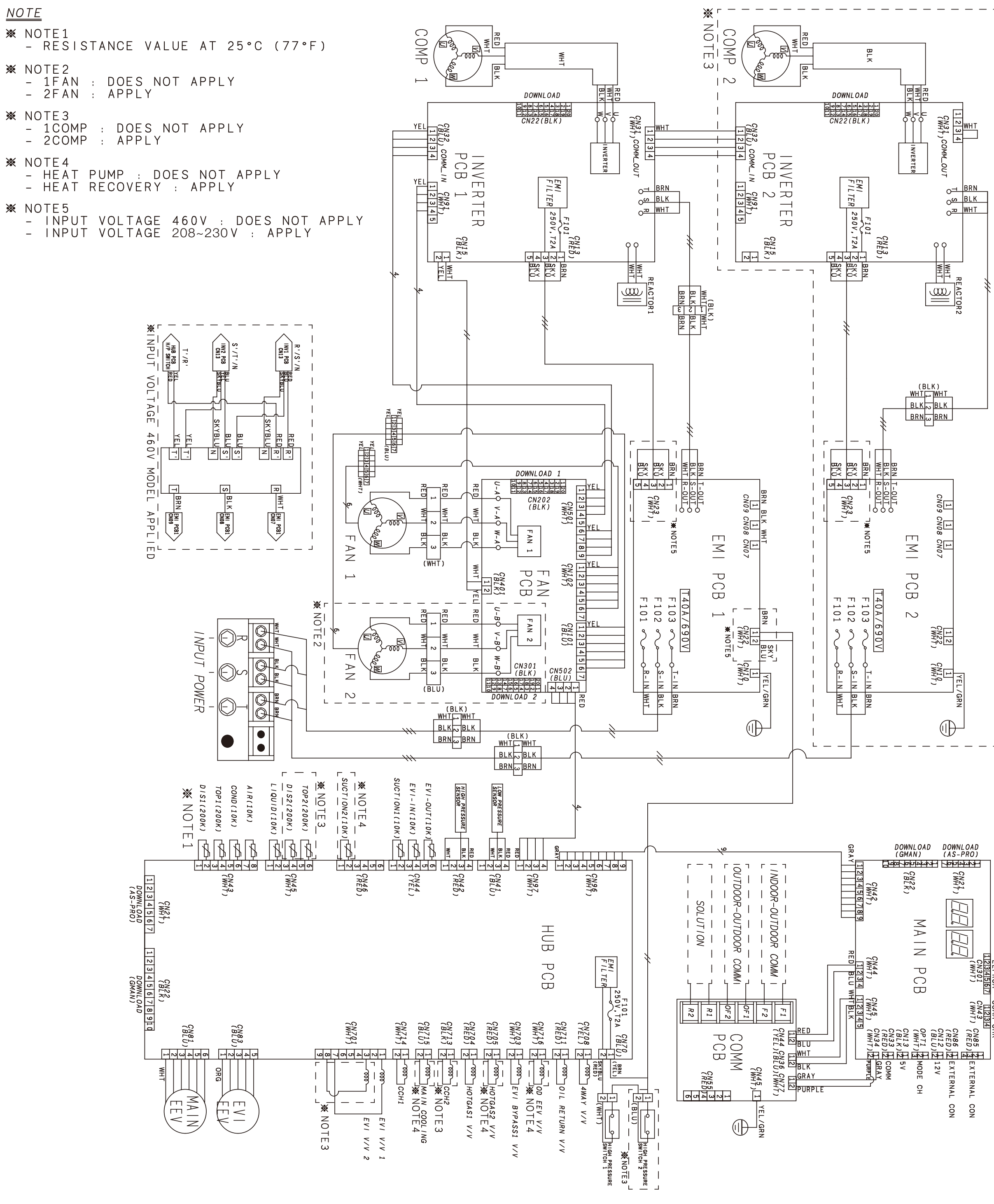
Heat Recovery

4TVR0096B400NB, 4TVR0120B400NB



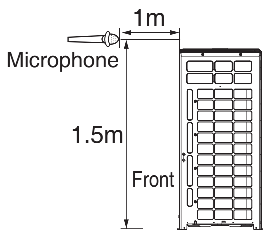
Heat Recovery

4TVR0096B300NB, 4TVR0120B300NB, 4TVR0144B300NB, 4TVR0144B400NB



Sound Levels

Sound Pressure Level



Unit: dB(A)

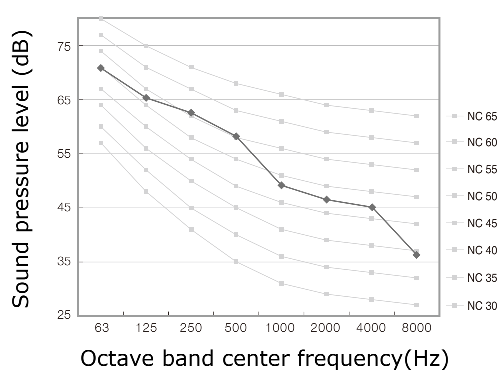
Model	Pressure
4TVH/R0072B3, 4TVH/R0072B4	60
4TVH/R0096B3, 4TVH/R0120B3	61
4TVH/R0096B4, 4TVH/R0120B4	61
4TVH/R0144B3, 4TVH/R0144B4	62

Notes:

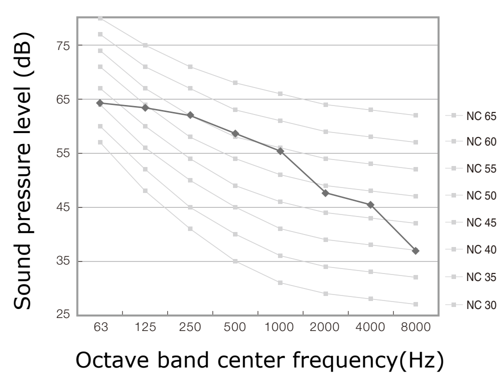
- *Measuring place: Anechoic chamber (conversion value)*
- *These operation values were obtained in an anechoic room. Sound pressure level will vary depending on a range of factors such as the construction of the particular room where the equipment is installed.*
- *Operation sound level may differ depending on operation and ambient conditions.*

NC Curves

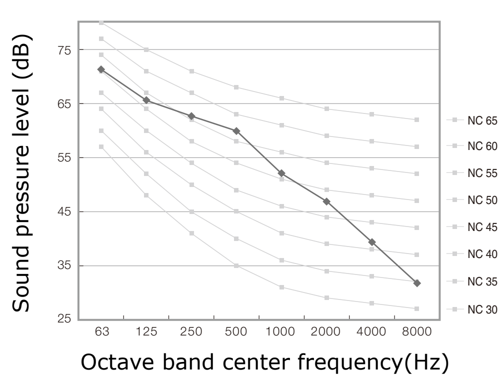
4TVH/R0072B3, 4TVH/R0072B4



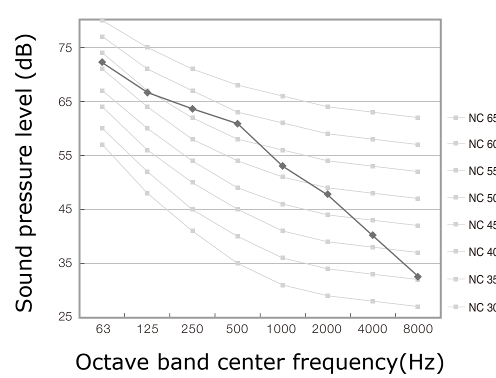
4TVH/R0096B3, 4TVH/R0120B3



4TVH/R0096B4, 4TVH/R0120B4



4TVH/R0144B3, 4TVH/R0144B4



Sound Power

Notes:

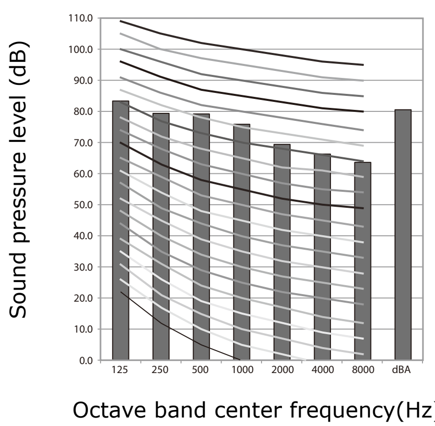
- *dBA = A-weighted sound power level.*
- *Reference power: 1pW*
- *Measured according to ISO 3741.*

Unit: dB(A)

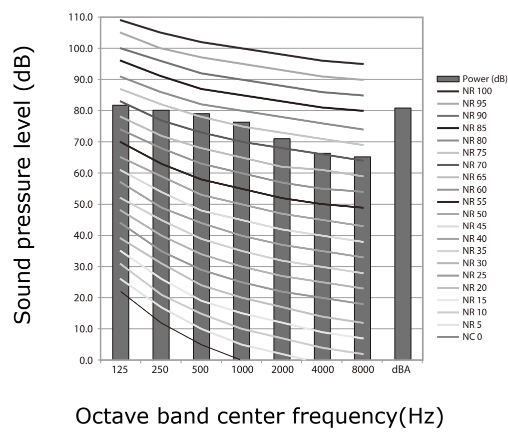
Model	Power
4TVH/R0072B3, 4TVH/R0072B4	81
4TVH/R0096B3, 4TVH/R0120B3	81
4TVH/R0096B4, 4TVH/R0120B4	81
4TVH/R0144B3, 4TVH/R0144B4	83

NR Curves

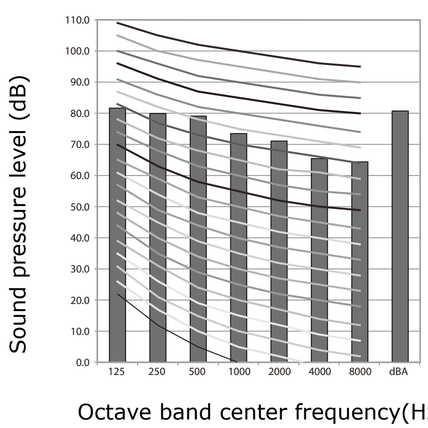
4TVH/R0072B3, 4TVH/R0072B4



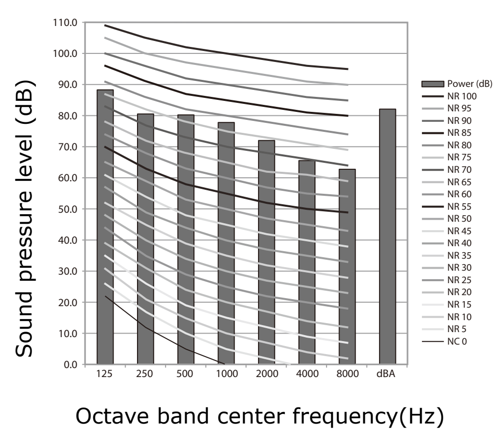
4TVH/R0096B3, 4TVH/R0120B3



4TVH/R0096B4, 4TVH/R0120B4



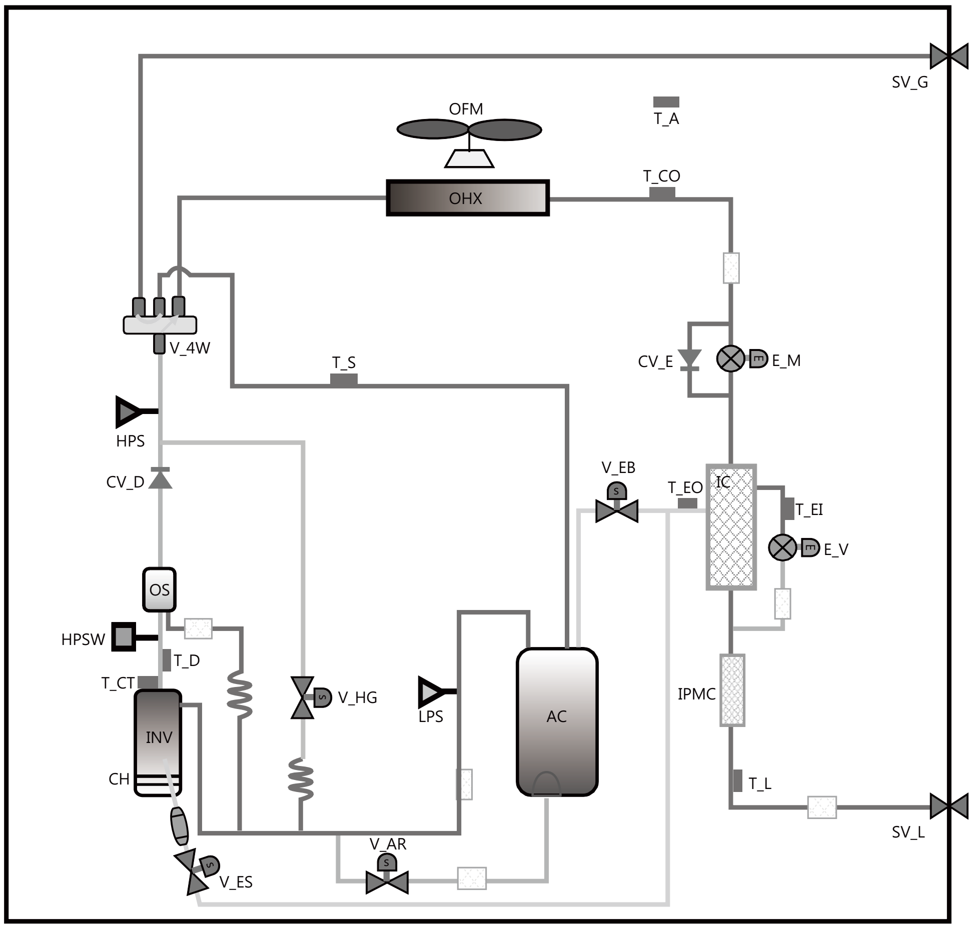
4TVH/R0144B3, 4TVH/R0144B4



Cycle Diagrams

Parts of Outdoor Unit (HP)

4TVH0072B300NB, 4TVH0072B400NB

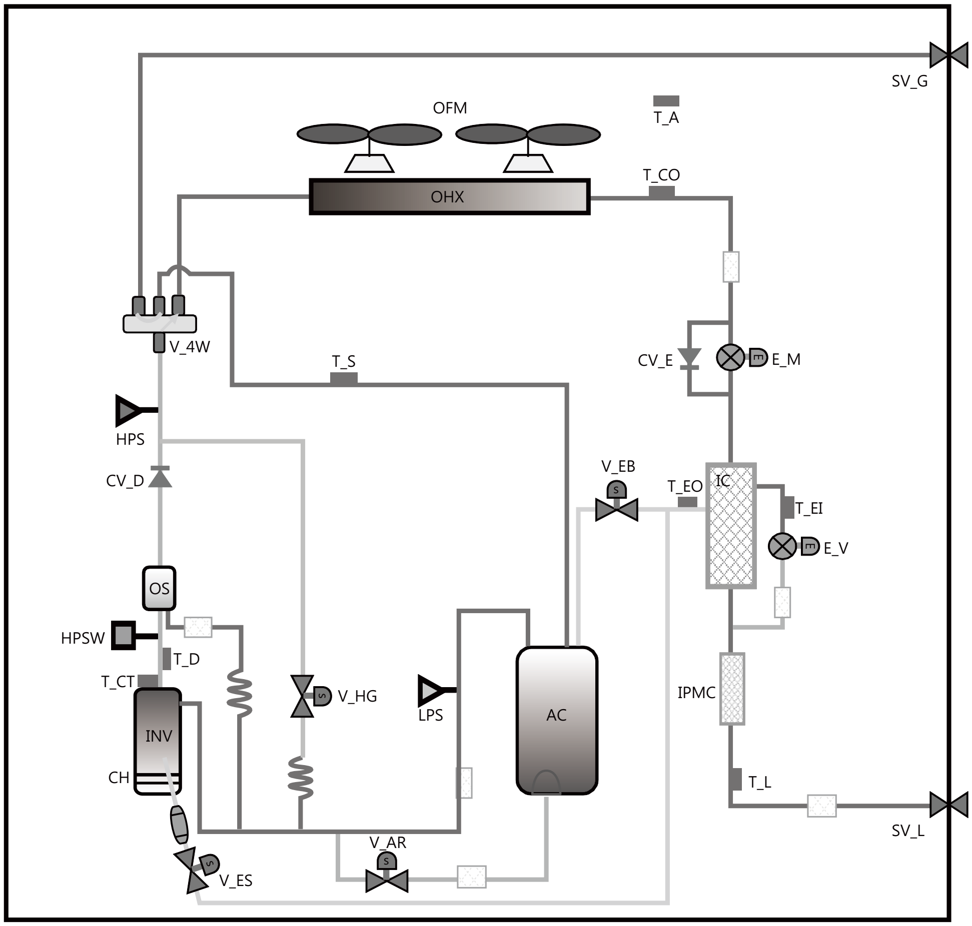


Classification	Description
INV	Inverter Compressor
OFM	Outdoor Fan Motor
OHX	Outdoor Heat Exchanger
AC	Accumulator
OS	Oil Separator
IC	Intercooler
IPMC	IPM Cooler
CH	Crank Case Heater
HPS	High Pressure Sensor
LPS	Low Pressure Sensor
HPSW	High Pressure Switch
E_M	Main EEV
E_EV	EVI EEV
V_ES	EVI Solenoid Valve
V_EB	EVI Bypass Valve

Classification	Description
V_HG	Hot Gas Bypass Valve
V_4W	4way Valve
V_AR	Accumulator Oil Return Valve
CV_E	EEV Bypass Check Valve
CV_D	Discharge Check Valve
T_D	Discharge Temperature Sensor
T_S	Suction Temperature Sensor
T_CO	Condenser Out Temperature Sensor
T_EI	EVI In Temperature Sensor
T_EO	EVI Out Temperature Sensor
T_L	Liquid Tube Temperature Sensor
T_CT	Compressor Top Temperature Sensor
T_A	Ambient Temperature Sensor
SV_G	Gas Pipe Service Valve
SV_L	Liquid Pipe Service Valve

Parts of Outdoor Unit (HP)

4TVH0096B400NB, 4TVH0120B400NB



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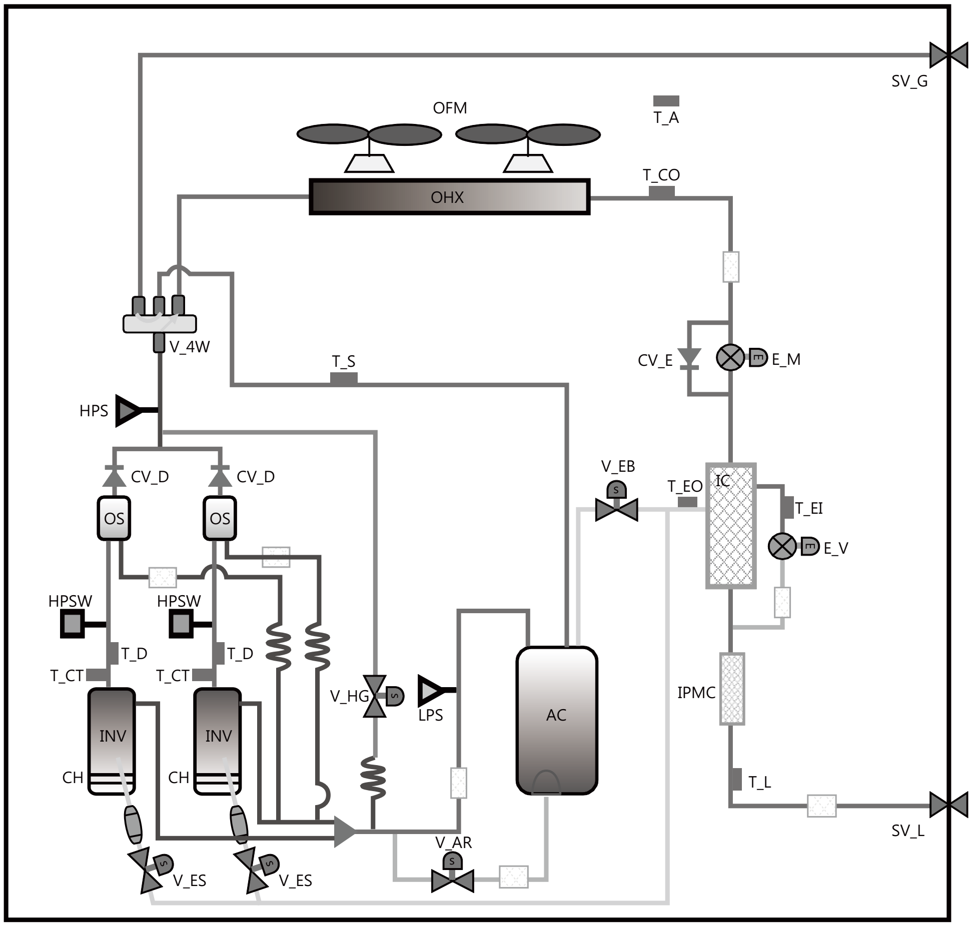
Parts of Outdoor Unit (HP)

4TVH0096B300NB, 4TVH0120B300NB, 4TVH0144B300NB, 4TVH0144B400NB



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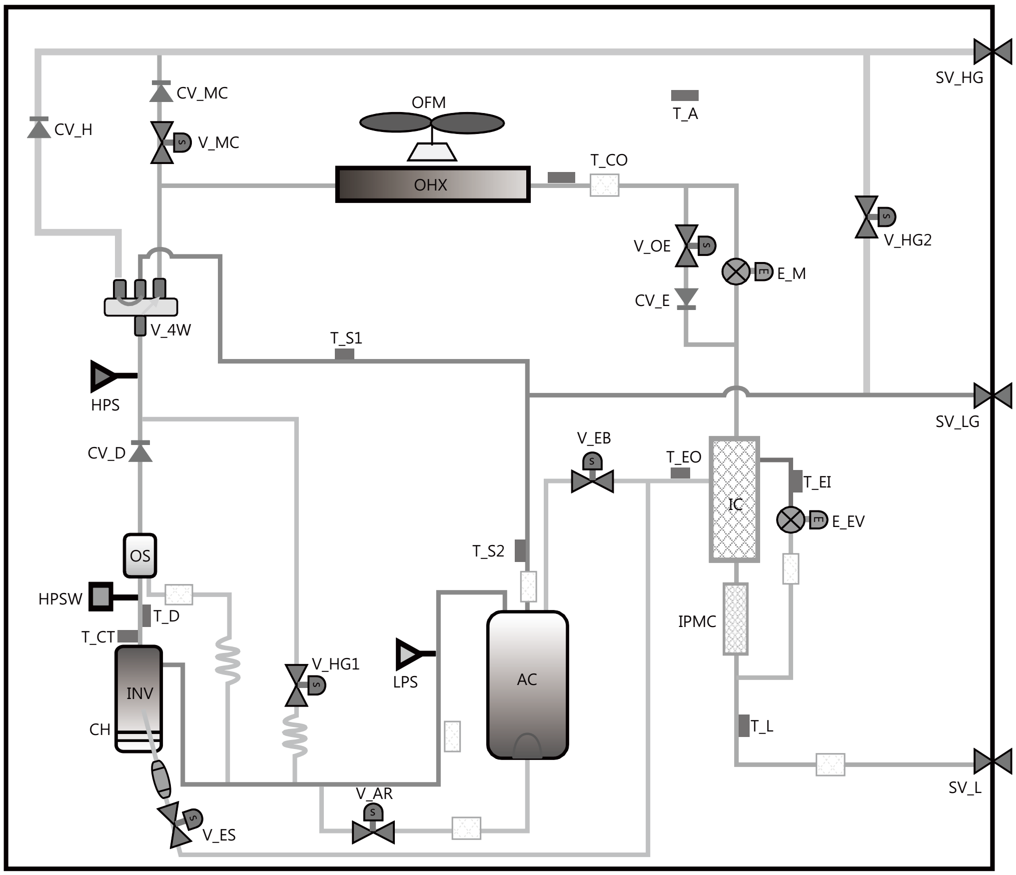
Parts of Outdoor Unit (HR)

4TVR0072B300NB, 4TVR0072B400NB



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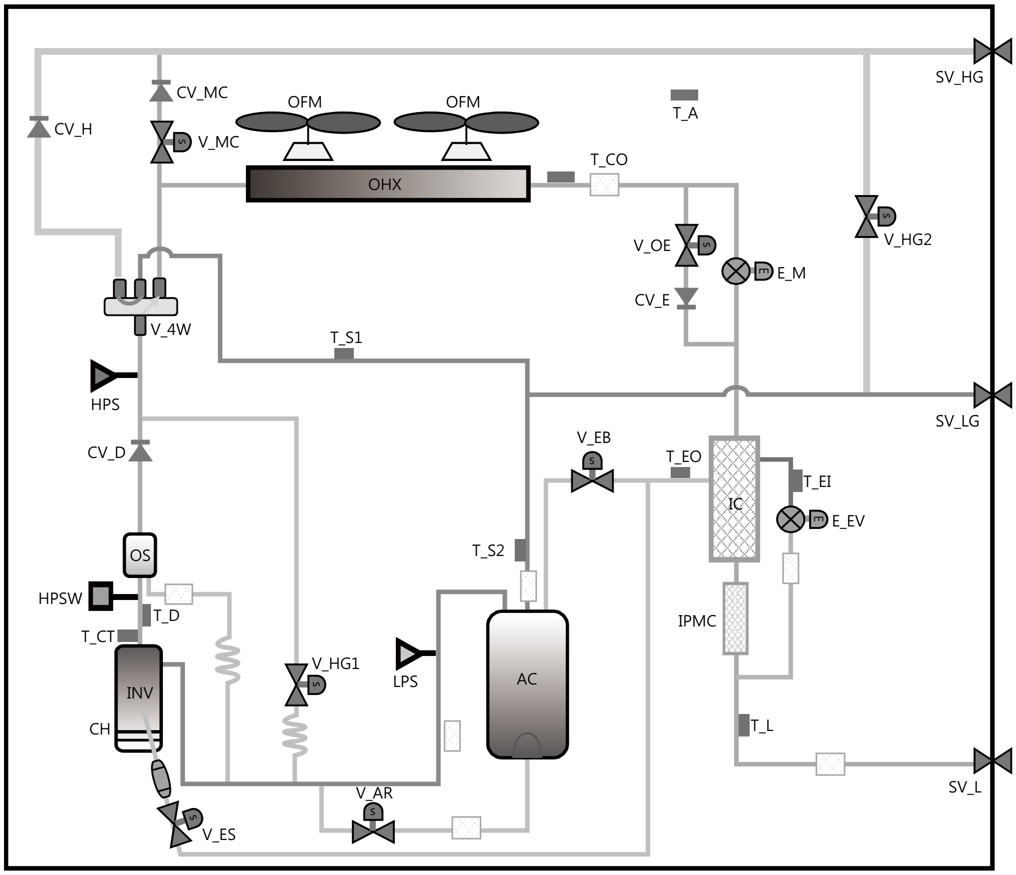
SV_L	Liquid Pipe Service Valve

Parts of Outdoor Unit (HR)

4TVR0096B400NB, 4TVR0120B400NB



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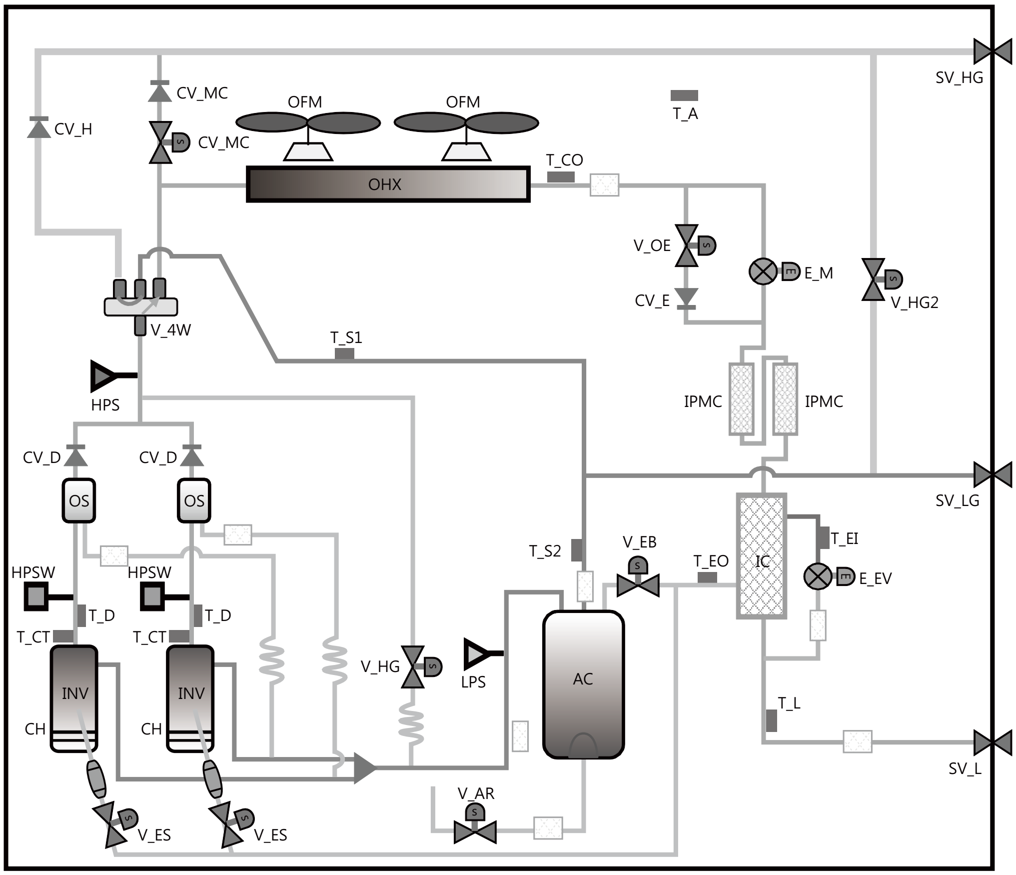
Parts of Outdoor Unit (HR)

4TVR0096B300NB, 4TVR0120B300NB, 4TVR0144B300NB, 4TVR0144B400NB



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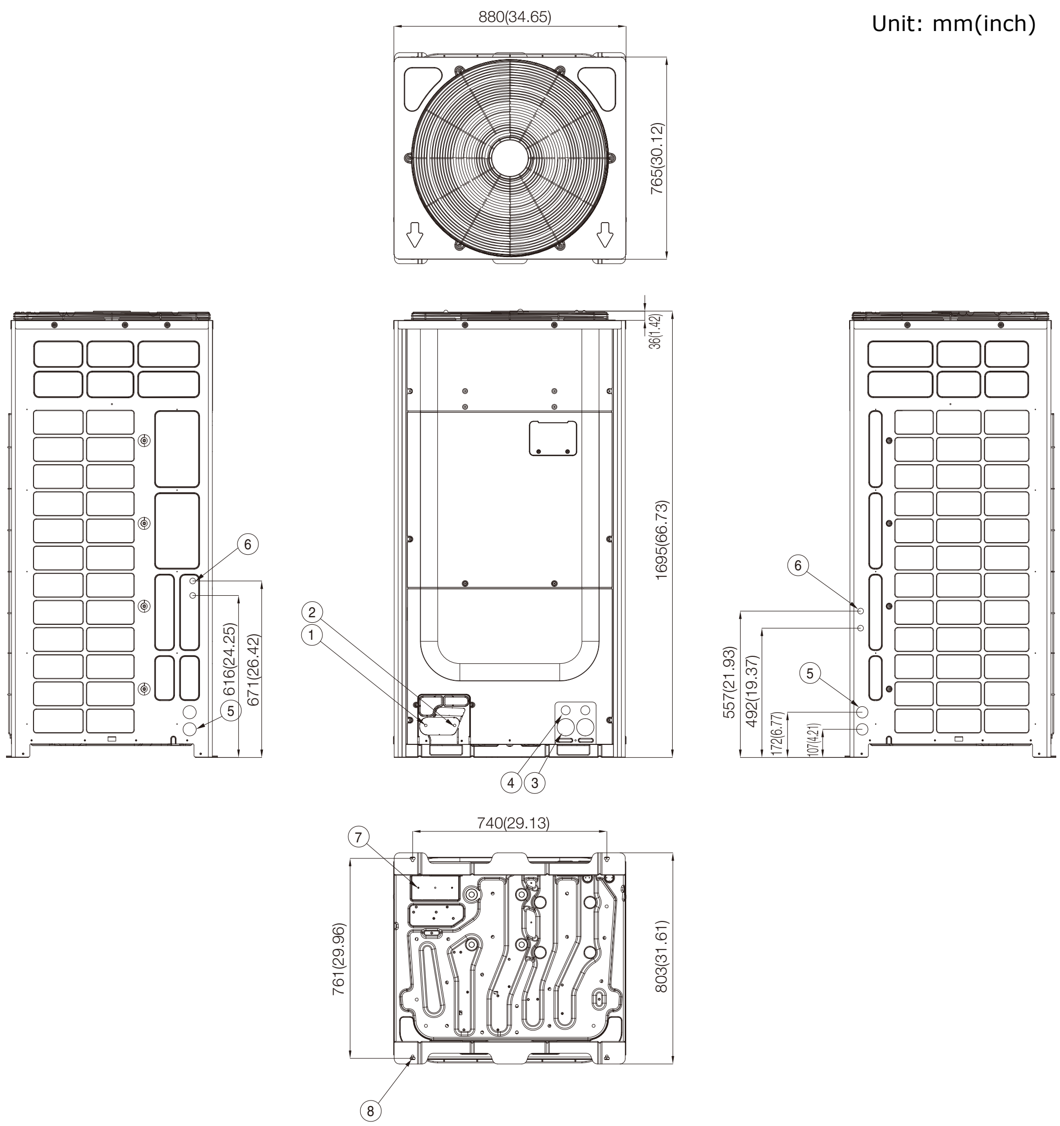
Dimensional Drawings

Heat Pump/Heat Recovery

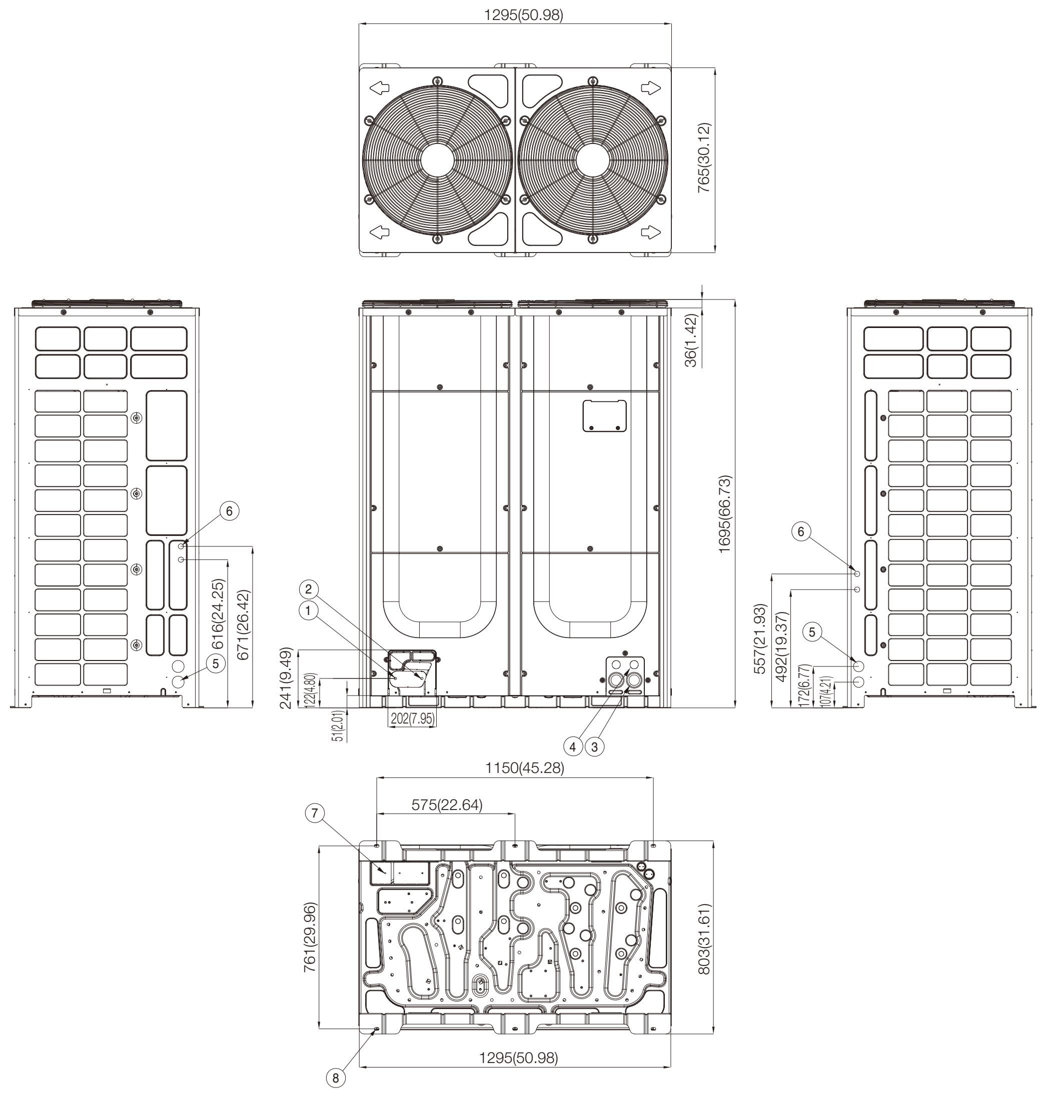
4TVH/R0072B***



No.	Name	Description	No.	Name	Description
1	Gas Ref. Pipe	-	5	Power Wiring Conduit	4(0.16") - Ø43.7(1.72")
2	Liquid Ref. Pipe	-	6	Communication Wiring Conduit	8(0.31") - Ø22.0(0.87")
3	Power Wiring Conduit	2(0.08") - Ø43.7(1.72")	7	Knock-out Hole for Ref. Piping	178 x 76(7" x 3")
4	Communication Wiring Conduit	2(0.08") - Ø34.5(1.36")	8	Anchor Bolt Hole	4(0.16") - Ø12(0.47")

4TVH/R0096B*****, 4TVH/R120B*****, 4TVH/R0144B*****

Unit: mm(inch)



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Trane has a policy of continuous product and product data improvement and reserves the right to change design and specifications without notice.

VRF-PRC008-EN 31 July 2013
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APPENDIX 4 SAFETY MANAGEMENT PLAN

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HSE Safety Management Plan

Prepared by:	Travis Krichman
Signature:	
Date:	5/29/14
HSE Manager:	Steve Serian
Signature:	
Date:	
Customer:	Paul McDevitt
Signature:	
Date:	

NOTE: A SIGNED AND ACCEPTED COPY IS TO BE KEPT ON SITE AND ON CONTRACT FILE.

INTRODUCTION

The Health, Safety & Environmental (HSE) Site Management Plan is an integral part of all work and site specific procedures for all Honeywell operations. Honeywell is committed to developing safety systems which ensure the highest standard of health and safety for all employees. We aim to continually improve the systems of work and strive for best practice in the area of health, safety and environment. Honeywell aims to control risk through the implementation of an effective HSE Site Management Plan and Program.

The objective of this document is to establish a plan for implementing the company safe operations management program. The plan is intended to minimize losses, meet regulatory compliance requirements and to implement site health, safety and environmental regulations established by the Customer.

Honeywell demonstrates its commitment to health and safety by making all levels of management accountable for all health and safety issues. We attribute the success of effective safety systems to the ability to communicate the agreed standards of performance between employees and management. Honeywell's commitment to health, safety and the environment can be viewed at **Attachment 1: Honeywell HSE Commitment Statements**.

1. Plan Deployment

The HSE Plan is one component of Honeywell's Safe Operations Management (SOM) program. The HSE Plan, and its relevant components and references specific to this project, should be reviewed with the Customer, Honeywell representatives and subcontractors/contractors to ensure effective deployment of the SOM program. This includes:

(1) On-site meeting between Customer and Honeywell representative(s) and subcontractors.
(2) Customer and Honeywell representative(s) and subcontractors are briefed and understand the Safety Management Plan:
   a) Site information,
   b) Hazard and risk assessments,
   c) HSE training,
   d) Activity schedules,
   e) Measures of HSE performance.
(3) Plan is to be reviewed on a quarterly basis to ensure Management of Change.
(4) Plan shall be maintained to ensure that relevant information is available to employees, contractors, customers, clients and the public concerning the effects of the Company's activities and materials on the safety and health of people and impact on the environment.
(5) Communication and management systems shall be developed, implemented and maintained throughout each site to facilitate continuous improvement in performance.

(6) Active consultation and communication with employees and contractors in the improvement of health, safety and environmental work.

Honeywell Management Systems are the property of Honeywell and must be maintained in accordance with Honeywell Information Security guidelines. Clients wishing to view any components of the Honeywell Operating System (external to Safe Operations Management) can request to do so by contacting the Honeywell Project Manager, who will assess the request and where deemed appropriate, arrange for viewing of the relevant Honeywell information.

2. Revision Sheet

When changes are made to this document, the revision sheet must be revised and all controlled copies of the document updated and distributed per the Distribution List.

Revision	Date	Description
Initial Draft	5/29/14	Initial document

3. Distribution List

One hard copy will be maintained for the assigned contract on site. Electronic copy can be distributed, upon request.

Copy	Name	Organization & Title	Email Address
1	Sal Corcione	Honeywell Project Manager	Salvatore.Corcione@Honeywell.com
2	Steve Serian	Honeywell HSE Leader	Steven.Serian@Honeywell.com
3	Jim Freeman	Honeywell PM Leader	Jim.Freeman@Honeywell.com
4	Paul McDevitt	Customer Project Manager	pmcdevitt@veronaschools.org
5		Customer HSE Leader	

4. Contents

SECTION 1 – SITE INFORMATION & HSE ADMINISTRATION

5. Contract – Scope of Work Description

Project name:	Verona School District - USB-006454
Customer name and address:	121 Fairview Ave, Verona NJ
Scope of work (summary):	Lighting, Mechanical, Controls, Building Envelope Upgrades
Start Date:	construction begin date tbd
Completion Date:	construction end date tbd

6. Key Project Contacts (List all Honeywell Employees & Contractors)

Honeywell Project Manager	Sal Corcione	732-737-4805 Salvatore.Corcione@Honeywell.com
Honeywell Project Administrator	Travis Krichman	732-600-1654 Travis.Krichman@Honeywell.com
Honeywell Branch Project Manager		
Honeywell Regional HSE Leader	Steve Serian	603-930-0222 Steven.Serian@Honeywell.com
Customer Project Manager	Paul McDevitt	973-239-1845 pmcdevitt@veronaschools.org
Customer HSE Leader		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		
Subcontractor Project Manager		

7. Customer HSE Reporting

Honeywell will report HSE performance to the Customer, if required, as defined in the scope of work and/or contract. Reporting topics may include:

- Customer requested HSE metrics at customer request,
- Incidents/injuries, Safety Observation System events,
- Summary of HSE Project Manager site reviews/audits, Contractor audit results

8. Cardinal Rules – Unacceptable Behaviors & Attitudes

The Cardinal Rules shall be displayed at all Honeywell locations, including field offices and also at designated Honeywell offices within the Customer site. All employees are to adhere to the Cardinal Rules which can be viewed at **Attachment 2: Honeywell Cardinal Rules**.

9. Responsibilities, Authority & Resources

Management & Resources

The Honeywell Project Manager is responsible for the implementation of the Honeywell Health, Safety and Environment Plan requirements and shall maintain and monitor programs aimed at continuous improvement of HSE performance. Appropriate health, safety and environmental support and resources shall be available to assist project and service managers to discharge their responsibilities.

Honeywell Project Manager Responsibilities

Each PM is accountable for implementation of Honeywell's HSE Policy. Specific responsibilities are:

- Supports and promotes jobsite safety through leadership and example.
- Becomes involved in task safety analysis in order to identify any hazards and manage the associated risks prior to work being done.
- Ensures the completion of job hazard analysis prior to the beginning of any work including review and approval.
- Insist upon employee's and subcontractor's compliance with established safety rules, correcting any unsafe acts or conditions, and implementing corrective or disciplinary actions as necessary for the effective functioning of the safety program.
- Ensure all team members are trained in safe work procedures.
- Ensure regular hazard inspections are carried out within areas under their control.
- Verify that employees and subcontractors implement the designated site safe work procedures/systems.
- Ensure approved Honeywell employee protective equipment is issued and proper instruction given as to its use, maintenance and storage.
- Be involved in formal as well as informal safety audits and monitor contractor and site safety performance on a regular basis.
- Ensure that all accidents and injuries are reported and investigated.
- Identify cause of non-compliance and investigate/document actions to correct safe work method deficiencies or rectify inappropriate workplace behaviors, including consultation, counselling, training and/or disciplinary action.
- Preparation and regular review of work procedures.

All Honeywell Employee Responsibilities

Employees have a duty to cooperate in the achievement of a safe and accident free workplace, through:

- Cooperating in fulfilment of the obligations placed on Honeywell International.
- Identify all tasked and prepare risk assessments.
- Working with care for their own safety and that of others who may be affected by their actions
- Reporting unsafe conditions and behaviours.
- Wear and maintain any issued personal protective equipment (PPE) when necessary.
- Assisting in the investigation of any accidents with the objective to prevent recurrence.
- Maintain a safe working environment for all Honeywell/Contractor employees that may be utilized for this project.
- Report all safety issues or events directly to the Honeywell Project Manager.

Subcontractors shall be responsible for complying with all Subcontractor Responsibilities

Subcontractors shall be responsible for complying with all statutory obligations and shall exercise all possible care for the health and safety of their personnel and other persons at the workplace who may be affected by their activities. Subcontractors shall at all times comply with Honeywell's HSE policy and procedures. As a condition of employment all employees are expected to work in a safe and responsible manner. The employee is ultimately responsible for his or her own safety. All contractors shall provide the employee with all the necessary training and PPE, but the employee must make the proper choices when performing an assigned task. Any issues not covered by this Safety Plan should be communicated to the relevant Honeywell representative. The Contractor's personnel will have responsibilities, which include but may not be limited to the following:

- Establishing safety responsibilities for their site personnel including their subcontractors.
- Insisting and ensuring correct and safe practices are used at all times.
- Providing adequate resources, personnel, equipment, time and funds to ensure the objectives of the safety plan are met.
- Completing the required work authorization forms and safety permits for each activity.

- Following safety rules and verbal instructions. Ask superintendent questions when any uncertainty exists.
- Ensuring their site personnel are suitably trained to effectively carry out their HSE responsibilities.
- Using tools in a safe and appropriate manner in accordance with their design; inspecting them for damage prior to each use.
- Ensuring safety auditing and performance reporting requirements specified by Honeywell are met.
- Reporting any unsafe acts or conditions, correcting them whenever possible.
- Reporting all injuries, incidents and near misses immediately, no matter how minor.

Project Employee/Contractor List

The Honeywell Project Manager will maintain the **Attachment 3 Site Project Contractor/Employee List**. All Contractors and Honeywell Employees working on site, listed or not, have a duty to cooperate in the achievement of a safe and accident free workplace.

10. Site Facilities

Honeywell Designated Areas

All designated Honeywell areas, if any, at the customer site must be maintained by Honeywell staff to ensure these facilities are kept in a clean and hygienic condition for the duration of the contract. At a minimum, these areas are to be inspected weekly to identify any workplace hazards or risks and to ensure minimum standards are maintained. If there is a Honeywell office you are required to post the Honeywell Commitment Statement and Cardinal Safety Rules. Depending on local or federal requirements ensure regulatory postings are current.

Security

Honeywell employees must meet all customer security requirements. This may include visitor badges, access training, appropriate regulatory and/or customer documentation, background checks, registry upon arrival and departure, etc. Badges are to be worn above the waist and in a visible position at all times while on site.

11. Honeywell Staff Training

Training needs shall be identified and training delivered to ensure that the project and service managers have the appropriate health, safety and environmental management skills. Honeywell employees shall be instructed in safe systems of work to ensure they work with proper regard for the safety, health, and protection of themselves, others and the environment. The Honeywell Project Manager is responsible for identifying the specific training requirements of their team members and ensuring the required training is undertaken. This training may be either Honeywell internal training, or training specific to the project location provided by the customer, provided the minimum content requirements are met. The minimum required training for the project scope of work is listed in Section 3 of this safety management plan.

12. Contractor Work Authorization & Permits

Contractor Sign-in & Work Authorization

Contractors must complete the Contractor Safety Declaration and Work Authorization Form with required risk assessments and permits prior to commencing work. Low risk work can be undertaken by contractors without direct authorization given that the relevant Honeywell Project Manager is aware of the:

1) Scope of work.
2) Time the work is to be undertaken.
3) Workers performing the work.

Attachment 4: Contractor Safety Declaration & Work Authorization Form
Attachment 5: Safety Permit Applications

13. Accident / Incident Events

Reporting of Accident / Incident Events

Honeywell Employees & Contractors must adhere to the following reporting requirements,

(1) Globally contact the Honeywell Project Manager
(2) Honeywell employees only - Call the HSE Hotline at 1-866-466-1765
(3) Honeywell Project Manager will contact the customer safety manager if required.
(4) The Honeywell HSE Manager must be contacted should any of these events occur.
    a. All injuries and incident events
    b. Release of dangerous goods or hazardous substances to the environment
(5) Certain incidents must also be reported to the relevant local workplace safety or environmental

protection authorities in accordance with local legislation.

Incident Investigation of Accident / Incident Events

Honeywell Representative must follow the following criteria after an accident or incident occurs.

(1) Conduct an incident investigation in accordance with Honeywell injury and incident investigation requirements in consultation with the regional HSE manager and affected employee(s).
(2) Ensure implementation and close out of short and/or long-term corrective actions to prevent re-occurrence.
(3) Present to Honeywell Project Management Leader and HSE Manager all planned corrective actions.

Attachment 6: Incident Investigation Report

14. Safety Observation System Events

Safety Observations must be submitted to the Honeywell Project Manager by any Honeywell employee using the **Attachment 7 Safety Observation Form**. Safety Observation is an unplanned event or condition that could have reasonably resulted in personal injury or illness, equipment or property damage, an environmental excursion, or when a safety control measure is challenged or ignored.

15. Site Evacuation Procedures

The Honeywell site specific **Emergency Response Plan, Attachment 17** shall be prepared, if a customer equivalent response plan is not available. The Honeywell Project Manager shall review and incorporate the emergency response plan into the Safety Management Plan. Either the Honeywell or Customer site specific emergency response plan shall be followed and this plan shall be communicated to all Honeywell employees, contractors, and visitors prior to working at the project site. For any Honeywell-occupied spaces such as a job trailer, leased office space or warehouse used during the course of a project, Honeywell shall complete a Honeywell site specific Emergency Risk Assessment by checking the appropriate boxes, then complete a site specific Emergency Response Plan as explained in the Emergency Response Procedure.

SECTION 2 – SITE RISK ASSESSMENT TOOLS

16. Hazard Reporting

It is the responsibility of all employees to immediately report any unsafe act or condition to the Honeywell Project Manager. Honeywell actively encourages all employees and contractors to report hazards. The strength of our Health, Safety Management Plan relies on the ability of Honeywell employees and contractors to report hazards.
At each site, all hazards that are identified by employees or contractors shall be communicated immediately to the Honeywell Project Manager. In the event that the hazard is considered significant, it must be reported immediately to the appropriate Customer representative.

17. Site Assessment Tools

Identify Site Hazards

Hazards associated with contracted scope of work shall be identified and documented in the **Attachment 8 hazard assessment site inventory**. The Hazard Assessment Site Inventory should include all identified hazards for the scope of work on this contract. The Hazard Assessment is used to prepare task and generic risk assessments or contractor authorizations.

Risk Assessment & Contractor Work Authorization Forms

Each hazard must be assessed according to the risk calculator listed on the **Attachment 9 Risk Assessment Form** to ensure the hazards are categorized as low, medium or high risks. Risk exposure to hazards in the work environment is determined by consequence and severity resulting in a low, medium or high risk level. **[**Click **HERE** for sample Risk Assessments / Safe Work Procedures.**]**

Risk assessments and contractor work authorization forms include a list of control measures which need to be developed and made readily available for the duration of the work. Hazards shall be controlled to ensure that consequent risks are eliminated or reduced as far as is reasonably practicable. Control measures shall be reviewed and monitored for their effectiveness. Continuous consultation should occur with all employees and contractors on site to ensure that hazards are identified and controls implemented.

Control measures will be selected in accordance with both established Field Risk Assessment Forms and the “Hierarchy of Control Measures” aimed at eliminating the hazard or hazardous activity. The most desirable control measure must be selected using the control hierarchy, in this order, elimination, substitution, engineering control, administrative control and personal protective equipment.

Tasks assessed as a high risk will require notifying the Honeywell Project Manager prior to commencement of work. The Honeywell Project Manager will evaluate the task for personal safety issues. All relevant activity check sheets and permits shall be completed in advance, and applicable guidelines, procedures, and/or work instructions will be reviewed and followed prior to and during the performance of the tasks.

Both contract and site specific data should be reviewed for inclusion in the orientation process to ensure key hazards/risks and any expectations in relation to the hazard elimination/risk management are communicated to the relevant employees and contractors.

The Honeywell Project Manager shall ensure that risk assessment and contractor authorization forms are implemented where required and ensure a quality standard of service is provided. Honeywell has developed a list of safety procedures for site work that facilitate compliance to legislative requirements. After the contractor completes the work authorization form the contractor may use previously completed Honeywell and/or the customer field risk assessment forms, provided that the contractor understands the procedure and takes ownership of the field risk assessment forms. All field risk assessment forms need to be reviewed by each employee prior to commencement of work.

Field Risk Assessment Forms identified are assessed for any potential risks of personal injury or injury to others, and property damage or environmental damage. Risk Assessments are separated into generic and task specific functions. The following are only examples and do not include all tasks that may apply at the customer or Honeywell location,

- Generic Field Risk Assessment Forms include common steps that are prepared once and can be used at multiple locations,
  - Climbing a ladder, working from a scaffold, scissor lifts, aerial lifts, man lift, etc.
  - Safe driving to/from customer locations
  - Personnel safety at customer locations, including walking on site
  - Roof Work
  - Mobilization of personnel, equipment or heavy components
  - Working on operating equipment
- Task Specific Field Risk Assessment Forms are prepared for a unique task at the customer site,
  - Equipment specific Lock Out / Tag Out, of electrical, mechanical, hydraulic, pneumatic, gravity, gas tie-ins, refrigerant servicing, etc.
  - Working from heights involving fall protection
  - Demolition of Electrical Cabling, equipment, etc.
  - Working in areas (e.g., installation, demolition) with live power or active control / fiber-optic cable, including junction boxes, where there is a substantial possibility of interrupting a live circuit.

18. Site Specific Field Risk Assessment Form Inventory

The Project Manager is responsible for keeping an inventory of the completed risk assessments and contractor work authorizations for the scope of work of this contract using the table provided in the hazard assessment site survey Attachment 8. This includes specific Field Risk Assessment Forms identified as a result of the completed Risk Assessments and Contractor Work Authorization Forms. All contract personnel are required to be familiar with the procedures and when they are to be used. These procedures must be followed at all times when the identified major risk activity is performed. Full records are to be kept for every major risk activity performed.

SECTION 3 – Site Requirements, HSE Training, Licenses and Competency

19. Customer Site Orientation

General Requirements

All Honeywell employees and contractors working on the customers sites will complete the customer site orientation, if required by the customer. Honeywell contractor orientations shall be managed by the Honeywell Project Manager to ensure that all orientations, including site safety management plan requirements are received and accepted by contractors and Honeywell staff, documented as being completed, and maintained in this plan for all contract personnel as required by Honeywell.

Orientation Schedule

The following orientations must be completed:

Orientation	Orientation Frequency	Key Contact(s)
Contractor Orientation	Prior to commencement of work. Complete **Site Orientation Form Attachment 10** with contractors & their employees Prior to commencement of work. Complete **Attachment 12 Field Safety Checklist** which document potential hazards. Review Contractor Work Authorization Forms with required safety permits.	
Honeywell Employee Orientation	1. Prior to commencement of work and annually. Complete required monthly training modules per **Attachment 11 Training Register**. 2. Document employee having completed Risk Assessment Forms with required safety permits.	

20. HSE Training, Licenses & Certificate of Competency

Honeywell Staff, Contractors and Sub-contractors

Both Honeywell Staff and contractors are required to complete the Attachment 11 Training Register as proof of completion of the required training. Honeywell employees are required to complete **Attachment 15 Vehicle, Tool, & PPE Inspection Checklist**. Additional training requirements may be required by local regulations. If applicable, this must be verified as completed before commencing work at the site. Training must be completed prior to performing site specific task or activities. All contractors and Honeywell employees are required to be currently licensed in accordance with state and local requirements to perform the work and activities associated with the contract scope of work.

SECTION 4 – Site HSE Activity Schedule

21. Honeywell Project Manager HSE Activity Schedule

1) Conduct Safety Inspections:
    a) Attachment 12 Field Safety Checklist – Project Manager to complete prior to starting work onsite and annually.
    b) **Attachment 13 Behavioural Observation Checklist** – Project Manager to complete periodically to assess Honeywell field employees during scheduled construction.
    c) **Attachment 14 Contractor Safety Checklist** – Project Manager to complete periodically to assess Contractor safety compliance.
2) Attend Customer safety meetings and audits, as scheduled.
3) Report Safety Observations to the HSE Manager and Customer.
4) Document and approve all Risk Assessments, Contractor Work Authorizations and required safety permits.

SECTION 5 – Site HSE Performance

22. HSE Metrics

The following HSE metrics will be documented and maintained during project construction,

- Attendance at weekly contractor safety meetings.
- Number of safety audits performed and completed.
- Number (and %) of safety audit items in conformance with requirements.
- Number and types of injuries, illnesses, and safety observation events noted during the project.

SECTION 6 – Contract Forms and Tools

23. Contract Forms and Tools

Contracts Forms, Tools and Procedures

The following list includes all pertinent safety forms for the use of initiating and maintaining safe work practices as described in this Safety Management Plan. These forms are also included in the following pages of this section.

Attachment No.	Document Name	Time to Complete:	Frequency	Responsible to Complete
–	Safety Management Plan (SMP)	Start of contract	Once for each phase/contract	Honeywell PM
1	HSE Commitment Statements	Start of contract	Once with SMP	Honeywell PM (Post on-site)
2	HSE Cardinal Rules	Start of contract	Once with SMP	Honeywell PM (Post on-site)
3	Site Employee/Contractor list	Booking Date – Before Installation	Update as needed throughout project duration	Honeywell PM
4	Contractor Work Authorization Form	Booking Date – Before Installation	Update as needed throughout project duration	All Subcontractors
5	Safety Permit Applications	Before performing task that requires it.	As required throughout installation	Contractor / Honeywell Field Employees
6	Incident Investigation Report Form	Within 24 hours of incident.	As required throughout project duration	Honeywell PM
7	Safety Observation Form	Throughout Project Duration	Monthly	All Honeywell Employees
8	Hazard Assessment Site Inventory	Booking Date – Before Installation	Update as needed throughout project duration	Honeywell PM
9	Risk Assessment Form	Booking Date – Before Installation	Update as needed throughout project duration	Honeywell Field Employees
10	Site Orientation Form	Booking Date – Before Installation	Once with SMP	Honeywell PM
11	Training Register	Booking Date – Before Installation	Once with SMP	Honeywell PM
12	Field Safety Checklist	Booking Date – Before Installation	Done once for each trade, Update as needed throughout project duration	Honeywell PM
13	Behavioral Observation Checklist	Throughout installation	Monthly while Honeywell field employees are working	Honeywell PM
14	Contractor Safety Checklist	Throughout installation	Monthly while subcontractors are working	Honeywell PM
15	Vehicle, Tool, & PPE Inspection Checklist	Throughout project duration	Quarterly	Honeywell PM/Employees
16	Site Specific Emergency Plan	Booking Date – Before Install	Once with SMP	Honeywell PM

SMP Attachment 1: HSE HBS Commitment Statement

Sustainable Opportunity Policy
Honeywell's Commitment to Health, Safety and the Environment

By integrating health, safety and environmental considerations into all aspects of our business, we protect our employees, our communities and the environment, achieve sustainable growth and accelerated productivity, drive compliance with all applicable regulations and develop technologies that expand the sustainable capacity of our world. Our health, safety and environmental management systems reflect our values and help us meet our business objectives.

- We protect the safety and health of our employees, and minimize the environmental footprint of our operations through efforts to prevent illness, injury and pollution.
- We actively promote and develop opportunities for expanding sustainable capacity by increasing fuel efficiency, improving security and safety, and reducing emissions of harmful pollutants.
- We are committed to compliance with all of our health, safety, environmental and legal requirements everywhere we operate.
- Our commitment to health, safety and the environment is an integral aspect of our design of products, processes and services, and of the lifecycle management of our products.
- Our management systems apply a global standard that provides protection of both human health and the environment during normal and emergency situations.
- We identify, control and endeavour to reduce emissions, waste and inefficient use of resources and energy.
- We are open with stakeholders and work within our communities to advance laws, regulation and practices that safeguard the public.
- We abide by the company's own strict standards in cases where local laws are less stringent.
- Our senior leadership and individual employees are accountable for their role in meeting our commitments.
- We measure and periodically review our progress and strive for continuous improvement.

These are our commitments to health, safety, and the environment, and to creating Sustainable Opportunity everywhere we operate.

Dave Cote
Chairman and CEO
01/01/2011

Paul Orzeske
President HBS
01/31/2011

SMP Attachment 2: Honeywell Cardinal Rules

No Employee/Contractor may:

1. Engage in horseplay or conduct that endangers or injures employees, risks damage or actually does damage to company and/or customer property or the environment.
2. Bring into any company and/or customer site: firearms, explosives, or weapons of any type.
3. Bypass or operate equipment without guards, safety devices, or control equipment without following company and/or customer established procedures and protocols.
4. Disassemble, enter or perform servicing, changeover or maintenance on equipment without properly de-energizing and safeguarding all power sources according to the applicable lock-out/tag-out policy.
5. Violate a life safety permit procedure (confined space, hot work, line breaking and fall protection).
6. Knowingly place her/himself or another person in physical danger, conceal a safety hazard or unlawful chemical release to the environment, or fail to promptly obtain attention for a personal injury or chemical spill.
7. Possess or be under the influence of illegal drugs (not prescribed by a Physician of for their own use) or alcohol while on a customer site, company-owned and/or company-operated facility.

The actions listed above have been found to have such great potential for serious injury or damage that any employee that engages in such actions may be subject to discipline, up to and including termination from the company or removal from the project site, regardless of previous performance. This policy is intended to protect the employee and his/her co-workers.

All employees are expected to understand and adhere to these Cardinal Rules and to request assistance in questionable situations. Further, all employees are encouraged to question the safety and environmental performance of all operations and become involved in improving them.

Project Manager Signature: Travis Kirchman Project Supervisor 2/5/14

SMP Attachment 4: Contractor Safety Declaration & Work Authorization Form

Contractor Safety Declaration

As a duly authorized and designated representative and agent of ________________________________ , hereafter called "Contractor/Subcontractor", I hereby certify and agree for myself and for and on behalf of Contractor /Subcontractor:

I have visited the project site ____ and visually inspected the general and local conditions which could affect the Contractor /Subcontractor Work. Any failure of the Contractor /Subcontractor to reasonably ascertain from a visual inspection of the site, the general and local conditions which could affect the Contractor /Subcontractor Work, will not relieve the Contractor/Subcontractor from its responsibility to properly complete the Contractor /Subcontractor Work without additional expense to Honeywell. In addition, I have read and agree to comply with all the Terms and Conditions as specified in the written contract.

1. I have already instructed or will immediately instruct all such agents and employees with respect to such conditions and/or hazards and the proper safety precautions to be observed in regard there to;

2. I certify that all necessary, adequate and operative protective clothing and equipment have been or will be immediately issued to all such agents and employees, together with full instructions and training for their use at Contractor's cost;

3. I certify that all Honeywell Safety and Work Specific procedures as specified in the Honeywell Contractors Safety Guide, including those addressing employee personal protective equipment (PPE), Life Critical Tasks and tool and equipment requirements will be put into effect; and that all such agents and employees will be properly supervised to insure compliance in the use of PPE, procedures and equipment and in the strict observance of safety rules and regulations;

4. I certify that all such agents and employees have completed the identified and required training and that proof of such training has been submitted to Honeywell representative. If such identified training has not been completed I agree to complete such training as identified and required to a standard equivalent or exceeding Honeywell standards.

5. I certify that I will participate in the Honeywell program to observe and monitor all such agents and employees for compliance to specified Safety Procedures and work practices as defined or required by any and all governmental regulations and laws.

6. At a minimum, I certify that Contractor /Subcontractor employees have been trained and/or briefed for the following applicable programs (identified with x), in accordance with local laws/regulations,

☐ General safety rules and regulations
☐ Specific safety requirements
☐ Confined space entry
☐ Eye and face protection
☐ Hearing protection
☐ Burning, welding and cutting
☐ Utility line hazards/precautions
☐ Chemical line hazards/precautions
☐ Workplace chemical hazards
☐ other (specify)

☐ General protective clothing and equipment requirements
☐ Lockout and tagout
☐ Line breaking
☐ Excavation
☐ Respiratory protection
x_ Honeywell Contractor HSE Guide
____
____
____

Date: _____________ ____
Signature of Contractor's/Subcontractor's Representative

Date: _____________ ____
Signature of Honeywell Representative

Honeywell Use Only: **HID #:**

PRELIMINARY SAFETY DETAILS	*Honeywell Use Only: Work Authorisation Form Expiry : (Max 12 months) HSE Signed:*				
Site		Contractor		Phone	
Name (PM responsible for the work)		Job / PO / SR Number			
Names of other workers		Honeywell Project Manager			
Scope of Work		Project Duration			
Location of Work					

1. Will you be using sub-contractors?		Yes □	No □	*You must inform the Honeywell Works Supervisor of all sub-contractors you intend to use.*
2. Are all workers inducted to site & aware of first aid & emergency procedures?		Yes □	No □→	*If **No**, Do Not Proceed. Contact The Honeywell Project Manager*
3. Are workers familiar with the work area and specific hazards in the work area(s)?		Yes □	No □→	
4. Are tools, plant and equipment in good order (plant maintained, electrical equip. tagged, etc)?	No Plant/Tools□	Yes □	No □→	
5. Are workers aware of the safety requirements for the job & licensed where required?		Yes □	No □→	

If the Scope of Works changes Honeywell must be contacted prior to undertaking the new works

HAZARD ID, RISK ASSESSMENT & CONTROLS

Identify the Hazards ✓ **applicable**	**Assess the Risk** ✓ **applicable**	When assessing risks use these risk levels:	Minor Potential for minor injury / first aid treatment Moderate Potential for lost time injury / medical treatment Major Potential for death or serious injury
		Detail Risk Control Measures to Be Used	**Responsible Person**
□ Exposure to live electrical circuit	**Major*** □	List controls to eliminate or minimize risks.	List who is responsible for ensuring the controls are in place and are
□ Fall > 1.8m	**Moderate*** □	Refer to relevant procedure or JSA.	
□ Line Breaking	**Minor** □		
□ Confined Space Entry	** Detail Risk Controls & Responsibilities. Direct Authorisation required from the Honeywell Work Supervisor prior to commencing works.*		
□ Asbestos			
□ Traffic / Mobile Plant			
□ Chemicals / Fumes / Dusts			
□ Noise / Vibration			
□ Public exposure to hazards			
□ Spill to Environment			
OTHER			
OTHER			

MANDATORY SAFETY PERMITS & SYSTEM ISOLATIONS
Safety Permits must be obtained and approved before commencing the following works. If not listed below use "other" section. (✓ applicable):

Other (not listed) — List any Risk Control Safety permits not listed below here.

□ Hot Works	□ Live Electrical	□ Confined Space Access	□ Line Breaking	□ Roof/Ceiling Access	□ Equipment Isolation	□ Fire / EVAC Impairment	□ Penetration in fire rating material

6. Will the work cause interruption/isolation of site utilities (water, gas, electricity)?	No □	Yes □→	*If **Yes**, contact the Honeywell Works Supervisor*
7. Will you need to isolate systems or services (medical gas, UPS, security, comms, etc)?	No □	Yes □→	

If Yes to Q7 or Q8, what is the extent and impact of the isolation(s) / interruption?	

CONTRACTOR DECLARATION

I confirm that all necessary Health, Safety and Environment protection measures and precautions as detailed in this form will be taken to ensure the health and safety of workers and others who may be affected by the work. I also confirm the workers undertaking this work are competent, and where required, licensed to carry out the tasks.

Contractor Signature		**Date**	

SMP Attachment 3: Site Employee Contractor List

Badge #	Employer	Name	Phone Number	Supervisor

SMP Attachment 5: Safety Permit Applications (Contractor & Honeywell Employee)

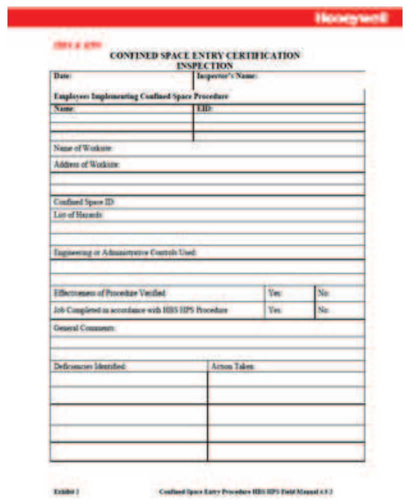
The permits listed below are required when called for by a risk assessment or contractor work authorization and must be documented and kept with the SMP. Permits not included or shown below may still be applicable, as determined by the Honeywell PM. Contractors may also use their own permits if approved and accepted by Honeywell PM.

Line Breaking, roof/ceiling access, Equipment Isolation, Fire/EVAC Impairment, Penetration in Fire Rated Material, Others

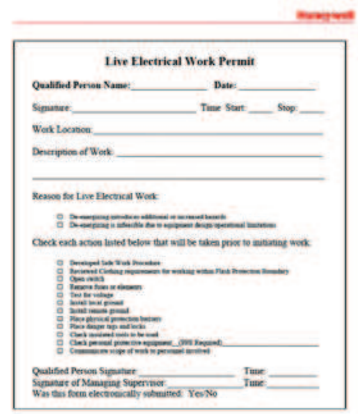
(Click on images below for PDF file attachment)

Hot Work Permit

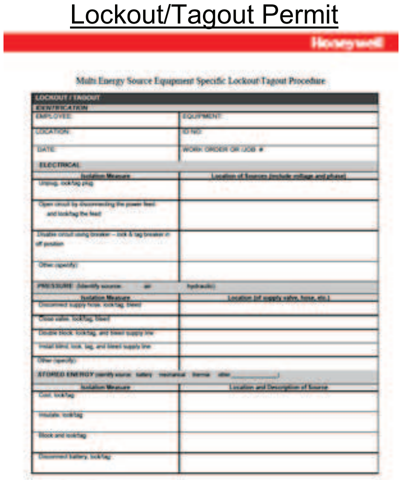
Confined Space Permit & Cert.



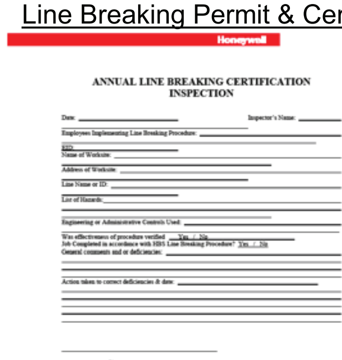
Live Electrical Permit



Lockout/Tagout Permit



Line Breaking Permit & Cert.



SMP Attachment 6: Incident Investigation Report – Filed per Occurrence

Part 1: BASIC INFORMATION (Complete and return to HBS HSE Hotline within 24 hours)		
Name of person reporting (if not the Supervisor)	Date of report	
Name and address of location	Region/Business Site Code (LID)	Supervisor's name Supervisor's telephone number

Claimant / Accident Information			
Full Name of injured party Employee ID #	Address of injured party Home phone: Work phone:		Is the injured party ☐ Male ☐ Female
	Employee's typical work schedule:		
Date of Hire Job title Employment status	Days worked ☐ Mon ☐ Tue ☐ Wed ☐ Thu ☐ Fri ☐ Sat ☐ Sun	Time begins/ends to work	Contractor? ☐ Yes ☐ No If YES, please complete: Name and address of Temporary Agency/ Contractor: Contact: Phone number:

Date of accident Time of Accident ☐AM☐ PM	Employer notified on what date	Name of place where incident occurred Address where incident occurred	Was there lost time? ☐ Yes ☐ No If yes, Last day worked

Briefly describe the incident	
Were authorities contacted? (police, fire, ambulance) ☐ Yes ☐ No If YES, who	Was a report number given? ☐ Yes ☐ No If YES, list number
Were any safeguards provided? ☐ Yes ☐ No Were they in use at the time of the incident? ☐ Yes ☐ No	
NATURE OF INCIDENT:	
TYPE OF INCIDENT:	
PART OF BODY:	

Medical Care Information	
Name and address of treating physician	Name and address of treating hospital/clinic
Phone number of treating physician	Phone number of treating hospital/clinic
Date employee first visited the doctor	What treatment was given (please check)
Describe diagnosis / medical treatment the doctor provided (List prescribed medications if any)	
Physical restrictions noted by the medical provider during the initial visit?	

Witness Information	
Name and address of a witness to the incident	Phone number where witness can be reached
Comments from witness Nº 1	
Name and address of a witness to the incident	Phone number where witness can be reached
Comments from witness Nº 2	
Anything related to the incident you would like to add	

<table>
<tr><th colspan="4">Part 2: INCIDENT INVESTIGATION (Complete & return to the HBS Regional HSE Leader within 5 days)</th></tr>
<tr><td colspan="4">Root Cause Analysis</td></tr>
<tr><td>Why did the incident happen?
(Direct Cause)</td><td colspan="3"></td></tr>
<tr><td>Why did this occur?
(Contributing Cause)</td><td colspan="3"></td></tr>
<tr><td>Why did that occur?
(Contributing Cause)</td><td colspan="3"></td></tr>
<tr><td>ADDITIONAL COMMENTS:</td><td colspan="3"></td></tr>
<tr><td>PRIMARY ROOT CAUSE:</td><td colspan="3"></td></tr>
<tr><td>SECONDARY/CONTRIBUTING ROOT CAUSE(S)</td><td colspan="3"></td></tr>
<tr><td>Please explain or if additional information is meaningful, please describe:</td><td colspan="3"></td></tr>
</table>

List corrective and preventative actions:			
Corrective Action	Responsible Person	Target Date	Completion Date

SMP Attachment 7: Safety Observation Form

SAFE OBSERVATION SYSTEM (SOS) REPORT FORM

A SOS is an unplanned event or condition that could have reasonably resulted in personal injury or illness, equipment or property damage, or an environmental excursion. Some examples include: Unsafe Conditions, Unsafe behavior, Events where injury could have occurred but did not, Events where property damage resulted or could have resulted, Events where a control measure was challenged or ignored.

1	SOS Title:						
2	Reporting Employee Name:			Employee EID:			
3	Name of Person responsible for closure:			Employee EID:			
4	Supervisor name:			Supervisor EID:			
5	Name of Contract	Contract Number	6	Address:			
7	Describe the SOS (what happened) / (Do *not use individual names if you have seen an unsafe practice)*:						
8	Honeywell HBS	9	Country: America	10	Region:	11	State:
12	Date SOS Observed:	DD/MM/YYYY					
13	Or select only one recommended time period for closing corrective action:	☐ One week ☐ Two weeks ☐ One month ☐ Three months ☐ Six months ☐ Twelve months					
14	Describe the corrective action:						
15	Date SOS to be closed (meet AOP goal):	DD/MM/YYYY					
16	Consequence of occurrence (select only one):	☐ Catastrophic (fatality) ☐ Major (hospitalisation) ☐ Serious (medical treatment/recordable) ☐ Minor (first aid) ☐ Negligible	17	Likelihood of Recurrence (select only one):	☐ Almost certain (>2 times/year) ☐ Highly likely (once per year ☐ Likely (once every three years) ☐ Unlikely (once every five years) ☐ Remote (once every ten years)		
18	Type of Hazard: (select only one):	☐ Contact in / between / under ☐ Contact with electricity ☐ Contact with sharp object ☐ Exposure to chemical (gas, dust, fume) ☐ Exposure to extreme temp. (hot/cold) ☐ Exposure to noise ☐ Exposure to low oxygen		☐ Fall from elevation ☐ Lifting / Repetitive Motion / Ergonomic exposure ☐ Liquid Splash / Contact struck against ☐ Slip / Trip / Fall (same level) ☐ Struck by ☐ Vehicle ☐ Another kind of hazard			
19	Type of SOS (select only one):	☐ Unsafe Behavior	☐ Unsafe Condition	☐ Incident with property damage	☐ Incident without property damage		
20	Location of Safety Observation (select only one):	☐ Manufacturing plant / Mill ☐ Honeywell Office ☐ Customer Office ☐ Hospital ☐ School ☐ Mechanical Room		☐ Laboratory ☐ Residence ☐ Warehouse ☐ Roof ☐ Computer Room / Control Room ☐ Vehicle ☐ Other			
21	Honeywell Risk Calculator (select only one):	☐ Major	☐ Moderate	☐ Minor			
22	Status:	☐ Open	☐ Closed				
23	Manager / Lead Signature:			Date:	DD/MM/YYYY		
	REMEMBER SAFETY IS EVERYONE'S RESPONSIBILITY						

SMP Attachment 8: Hazard Assessment Site Inventory

The following table lists each of the completed contractor work authorization forms and risk assessments for the scope of work of this contract.

HID#	Description of Hazard, Location, Safety Permits Required	Original Date	Check which is applicable below		Review Date
			Contractor Authorization Form	Risk Assessment Form	
1	Use of Vehicles	5/29/14	yes	yes	5/29/14
2	Site Surveys, Walk Throughs, Visits	5/29/14	yes	yes	5/29/14
3	General PPE requirements	5/29/14	yes	yes	5/29/14
4					
5					
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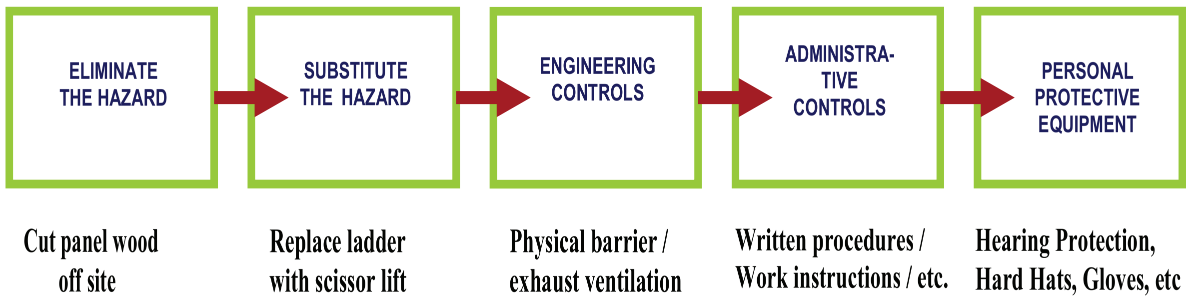
SMP Attachment 9: Field Risk Assessment Form

FIELD RISK ASSESSMENT FORM CRITERIA / CALCULATOR

Hierarchy of Controls



HONEYWELL RISK ASSESSMENT CALCULATOR

SEVERITY / CONSEQUENCE

PROBABILITY / LIKELIHOOD	1. Negligible	2. Minor	3. Serious	4. Major	5. Catastrophic
5. Almost Certain	Medium	High	High	High	High
4. Highly Likely	Medium	Medium	Medium	High	High
3. Likely	Low	Low	Medium	Medium	High
2. Unlikely	Low	Low	Low	Medium	High
1. Remote	Low	Low	Low	Medium	Medium

Severity / Consequence Criteria	Probability / Likelihood Criteria
Catastrophic ❑ Injury: Fatality of employees, contractors or the public. (Tier 1) ❑ Environment/Assets: Irreversible contamination of environment; Significant damage to building/equipment integrity. ❑ Public Relations: Significant public interest, national and/or international media involvement or significant impact on business reputation. ❑ Law and Permits: Federal regulatory intervention and/or regulatory fines greater then $5M to the company/unit; Government withdrawal of permits to operate the entire Honeywell unit or project.	**Almost Certain** 5. Occurred or likely to occur many times.
Major ❑ Injury: Extensive injury or Hospitalization of employees, contractors or the public. (Tier 2) ❑ Environment/Assets: Reversible contamination of environment; Moderate damage to building/equipment integrity. ❑ Public Relations: Moderate public interest, regional media involvement or moderate impact on business reputation. ❑ Law and Permits: Regional/District/State regulatory intervention and or regulatory fines greater then $1M to the company/unit; Government suspension of permits to operate a project.	**Highly Likely** 4. Occurred or likely to occur several times.
Serious ❑ Injury: Medical treatment of employees, contractors or the public. (Tier 2) ❑ Environment/Assets: Reversible small contamination of environment; Minor damage to building/equipment integrity. ❑ Public Relations: Some public interest, local media involvement or some impact on business reputation. ❑ Law and Permits: Local regulatory intervention and/or fines less then $1M to the company/unit; Customer suspension of some permits to a daily operation or written warning to Honeywell or project management.	**Likely** 3. Occurred or likely to occur once.
Minor ❑ Injury: First-aid treatment or Safety Observation of an employee, contractor or a member of the public. (Tier 3) ❑ Environment/Assets: No contamination of environment, no breach of law and no damage to building/equipment integrity. ❑ Public Relations: Little public interest, local media involvement or little impact on business reputation. ❑ Law and Permits: No suspension of permits to operate, continue daily operations, verbal warning to Honeywell or project management.	**Unlikely** 2. Might occur or likely to occur.
Negligible ❑ Injury: No injury. ❑ Environment/Assets: No impact. ❑ Public Relations: No public interest, local media involvement or no impact on business reputation. ❑ Law and Permits: No impact.	**Remote** 1. Rarely occurs.

RISK ASSESSMENT GUIDELINES

In most instances, moderate and major risks to health and safety can be adequately managed using site specific safe systems of work. For example, if a safety harness is specified as the control measure for working at height the risk assessment form should specify the pre-use inspections, selection of proper anchorage points, training of wearers, rescue of a suspended worker, etc.

For work with plant and substances consideration must be given to any safety recommendations of the manufacturer (e.g. the MSDS).

The actual workers performing the task should participate in all steps of the risk assessment process. It is crucial that the workers involved in the activity have input in the development and review of the safety measures.

Remember.

1. The risk assessment provides a written record of the process to be used to carry out a task safely. To demonstrate mutual understanding, it should be signed off by the parties who have responsibility for the tasks.
2. Management processes must be in place to ensure workers are competent and have the skills to complete the job and that there is a required level of supervision to ensure the tasks are completed as documented.
3. The risk assessment should be completed by all employees involved in the activity, not just the principal contractor or supervisor.

Describe the Site and the Scope of Work (Job Task)

The risk assessment should contain a brief description of the scope of work, location, supervisor, contractors, date & revision date where relevant.
Details of the specific area where the work is to be performed should also be included with the site details (e.g., building 1, phase 1 etc)

Document the Hazards that Make up the Scope of Work (Job Task)

In consultation with the persons performing the work, write down the hazards required to perform the scope of work/job task in the order to be carried out.
Details of the equipment and tools to be used should also be included. (e.g., fixing cabling to metal frame in roof space using an explosive powered ramset gun).

Identify Harm from Exposure to the Hazard

For each hazard, identify the harm/injury that may be caused from exposure to the hazard (s) to those engaged in the task or to others in the vicinity. For example, the main hazards from drilling concrete include exposure to hazardous silica dust, flying debris, high torque of tools and noise. The respective consequences would typically include respiratory damage, hearing damage, eye damage, sprains or cuts.
Pay particular attention to the use of plant and power tools to ensure that all safety hazards are identified.
For mobile plant check the general plant risk assessment record/Work instructions, as this will provide specific information on potential hazards associated with the plant.

Document all the Existing Risk Control Measures Associated with the Hazard to Eliminate / Reduce Risk

List all the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures). Control measures include training, instructions, information and supervision. For each hazard assess the foreseeable level of risk using the Honeywell risk assessment calculator.

Also include cross reference in the control measure column to any other risk assessments undertaken as part of the task, by referring to relevant hazard assessed (i.e. manual handling of ladders).

Risk Control Measures

Risk control measures should be selected in consultation with the relevant workers, making reference to the Honeywell HSE procedures where applicable. It may be necessary to seek advice from persons with safety training, working experience & the relevant Safety Advisor to identify the most appropriate control measure.
When selecting control measures consider:

- All persons that may be affected by the hazard, not just those involved in performing the task.
- The actual work practices on site.
- How often and for how long people are exposed to the hazard.
- The experience of workers doing the task.
- Safe work methods available and their effectiveness.
- The degree of safety training & instruction required (e.g. Safety inductions, safe work procedures, PPE use, use of MSDS's or the amount of supervision required).

Document Risk Level

Using the Risk Calculator, perform a risk assessment: evaluate the potential severity and probability (1, 2, 3, 4 or 5) of an incident for each hazard associated with the task.

Use the Risk Matrix to establish the risk ranking for each Task and Hazard; based on the Severity and Probability of an event, determine Low, Medium or High risk
Low Risk (green): Adhere to current hazard controls
Medium Risk (yellow): Control plan requires cell supervisor approval. Task should only proceed once the controls are in place
High Risk (red): Control plan must be reviewed and approved by the supervisor and site HSE. Work should not proceed until all the controls are in place and verified.
High risk tasks must also be added to site Risk Assessment tool. Activities should take place to lower risk classification.

List in priority order any additional control measures required to eliminate or reduce the hazard to the lowest exposure level possible relevant to the Hierarchy of Control.

Hierarchy of Risk Control Measures

Select control measures from the highest level practicable in levels 1 to 5 below, e.g., first try to eliminate the hazard, as this gives the best result. The measures at the lower levels are less effective and require training of workers plus frequent review of the hazards and systems of work. In some situations a combination of control measures may need to be used.
1 - Eliminate the hazard
Discontinue the activity or stop using the plant, tool or substance where practicable.
2 - Substitute the hazard
Use something safer or change the system of work
3 - Engineering controls
Use guards, fencing, safety screens, etc to separate workers from the hazard, use dust extractors on tools or exhaust ventilation to reduce dust
4 - Administrative controls.
e.g. specific worker instructions or procedures.
5 - Personal protective equipment (PPE).
Only when level 1 - 4 control measures have been considered and applied to the highest extent practicable, any remaining risk may be reduced by using PPE such as safety harness, eye protection, hearing protection, etc.

Any specific training, permits and information needed to carry out the task safely should also be noted (e.g. work at height training).

Identify Who Is Responsible

Document the names of the person's responsible for implementing the control plan (additional controls/information) to lower the risk level.

Monitor and Review the Risk Assessment

Make sure the work is supervised to ensure that the work is carried out as documented in the risk assessment.
Review the risk assessment if conditions, location, etc of the work change or after an appropriate length of time. Consider also:

- Whether the control measures are suitable for the task.
- The degree of support it has amongst the employees concerned.
- The effectiveness of control measures.

Designated Major Risk Tasks

Major risk work includes, but is not limited to:

- Unprotected work at heights >1.8 meters / 6 feet, particularly on roofs.
- Working on ladders above 1.8 meters / 6 feet.
- Entering confined spaces.
- Live electrical works.
- Working with mobile plant and machinery.
- Working near power lines.
- Working with elevating work platforms and cranes.
- Trenching and excavation.
- Work on or near gas mains or electricity supplies.
- Working with/near asbestos or lead or their removal.
- Demolition.
- Using certain hazardous substances including carcinogens.

Assessing and Reviewing Subcontractor Risk Assessments

The team leader/project manager or their delegated representative should ensure that the adequacy of subcontractor risk assessments and any associated safety documents and instructions are assessed prior to commencing work. In assessing subcontractor risk assessments consider the following:

- Compliance with Honeywell's policies and procedures.
- Has the recommended process been followed to develop the risk assessment?
- Are foreseeable significant hazards and risks to health and safety identified in relation to the nature of the works, including plant, tools and equipment used?
- Are risk control measures adequate and in line with the hierarchy of controls?
- Are all legislative requirements satisfied?
- Has the subcontractors inducted their workers into their own risk assessment?
- Is there adequate provision for supervision to ensure control?

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:

SITE LOCATION:	SCOPE OF WORK (JOB TASK):	PERMIT TO WORK REQUIRED?
Verona School District	**Use of Vehicles**	Yes ☐ No ☒

PERSON POTENTIALLY EXPOSED: / **DURATION OF EXPOSURE:** / **FREQUENCY OF JOB:**

	Person		Person		Duration		Duration		Frequency
X	ALL STAFF	X	CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES	X	CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY	X	VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR	X	1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Severity / Consequence

Probability/ Likelihood	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
4. Highly Likely	Medium	Medium	Medium	High
3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	**RISK** Low / Medium /High *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	**RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS** *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	**RISK** Low / Medium /High *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	**ASSIGN RESPONSIBILITY** *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
Collision between other vehicles or users	M	Ensure vehicle is inspected before each use and use safe driver techniques (safe following distance, maintaining speed limit, defensive driving etc) Ensure vehicle has valid registration, insurance, and inspection. Driver must hold a valid drivers license.	L	Driver
Mechanical Failure	M	Ensure vehicle is well maintained (oil changes, tire inflation, bulb maintenance etc)	L	Driver
Road Traffic	M	Plan routes ahead of time. Leave early in case traffic is encountered	L	Driver

I have read and understood the content of this RISK ASSESSMENT and agree to follow the requirements as outlined or alternatively contact the responsible Honeywell supervisor to revise the agreement

This risk assessment is written and approved at an administrative level. This approval does not imply that the risk assessment is a comprehensive and accurate document. Any subsequent use of the risk assessment makes it implicit upon the user to verify the accurate sequence of events, potential hazards, risks and controls.	**RISK ASSESSMENT AUTHOR** (PRINT NAME) Travis Krichman	**AUTHOR'S SIGNATURE** Travis Krichman	**ASSESSMENT DATE** 2/5/14
	MANAGERS NAME (PRINT NAME) Travis Krichman	**MANAGER'S SIGNATURE** Travis Krichman	**ASSESSMENT REVIEW DATE** 2/5/14

EMPLOYEE SIGNATURES

EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE	EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:	

SITE LOCATION:	SCOPE OF WORK (JOB TASK):	PERMIT TO WORK REQUIRED?
Verona School District	**Site Surveys, Walk Throughs, Visits**	Yes ☐ No ☒

PERSON POTENTIALLY EXPOSED: / **DURATION OF EXPOSURE:** / **FREQUENCY OF JOB:**

	PERSON POTENTIALLY EXPOSED				DURATION OF EXPOSURE				FREQUENCY OF JOB
	ALL STAFF	X	CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES	X	CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY	X	VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR	X	1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Severity / Consequence

Probability/ Likelihood	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
4. Highly Likely	Medium	Medium	Medium	High
3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
Slips, Trips	M	Wear proper footwear, steel toe boots are to be worn on site at all times. Stay alert at all times.	L	PM, Foreman, Visitors
Falls	M	Use 3-points of contact when climbing stairs and ladders. Stay alert at all times. Keep 15' away from unguarded roof edges.	L	PM, Foreman, Visitors
Head Bump	M	Wear hard hat in construction areas. Stay alert at all times.	L	PM, Foreman, Visitors
Eye Injuries	M	Wear safety glasses with side shields in mechanical rooms and construction areas.	L	PM, Foreman, Visitors

I have read and understood the content of this RISK ASSESSMENT and agree to follow the requirements as outlined or alternatively contact the responsible Honeywell supervisor to revise the agreement

This risk assessment is written and approved at an administrative level. This approval does not imply that the risk assessment is a comprehensive and accurate document. Any subsequent use of the risk assessment makes it implicit upon the user to verify the accurate sequence of events, potential hazards, risks and controls.	**RISK ASSESSMENT AUTHOR** (PRINT NAME) **Travis Krichman**	**AUTHOR'S SIGNATURE** **Travis Krichman**	**ASSESSMENT DATE** **2/5/14**
	MANAGERS NAME (PRINT NAME) **Travis Krichman**	**MANAGER'S SIGNATURE** **Travis Krichman**	**ASSESSMENT REVIEW DATE** **2/5/14**

EMPLOYEE SIGNATURES

EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE	EMPLOYEE NAME (PRINT NAME)	EMPLOYEE SIGNATURE	DATE

FIELD RISK ASSESSMENT FORM

ASSESSMENT NO:	

SITE LOCATION:	SCOPE OF WORK (JOB TASK):	PERMIT TO WORK REQUIRED?
Verona School District	**General PPE Requirements for Contractors and Honeywell Employees at Site/Customer Locations**	Yes ☐ No ☒

PERSON POTENTIALLY EXPOSED: / **DURATION OF EXPOSURE:** / **FREQUENCY OF JOB:**

	Person potentially exposed				Duration of exposure				Frequency of job
	ALL STAFF	X	CONTRACTORS		UNDER 5 MINUTES		6-15 MINUTES	X	CONTINUOUS/ ONGOING
	STAFF MEMBER PERFORMING JOB ONLY	X	VISITORS		16-30 MINUTES		31-45 MINUTES		NO OF TIMES PER WEEK
	MEMBERS OF THE PUBLIC		OTHER (SPECIFY)		46 MINS -1 HOUR	X	1 HOUR OR MORE		NO OF TIMES PER MONTH

HONEYWELL RISK ASSESSMENT CALCULATOR

Severity / Consequence

Probability/ Likelihood	1. Negligible	2. Minor	3. Serious	4. Major
5. Almost Certain	Medium	High	High	High
4. Highly Likely	Medium	Medium	Medium	High
3. Likely	Low	Low	Medium	Medium
2. Unlikely	Low	Low	Low	Medium
1. Remote	Low	Low	Low	Medium

JOB HAZARD EXPOSURE OR DETAILED HAZARD AND HARM *List each of the hazards associated with the scope of work in the sequence they are encountered including possible harm and effects.*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	RISK CONTROL MEASURES / SPECIAL PERMIT REQUIREMENTS *List the control measures required to eliminate or minimise the risk of injury from the identified hazard (Refer to relevant Honeywell HSE Procedures)*	RISK LOW / MEDIUM /HIGH *Using the Honeywell Hazard & Risk Matrix list the risk level against each hazard*	ASSIGN RESPONSIBILITY *Write the name of the person responsible (supervisor or above): implement the control measures identified.*
Crush hazards (Mandatory at all site/customer locations)	**M**	**Wear steel/composite toe safety shoes at all times when at the site/customer/work location.**	**L**	**Site Contractors / HON employees**
Eye hazards (Mandatory at all site/customer locations)	**M**	**Wear safety glasses with side shields in all work areas**	**L**	**Site Contractors / HON employees**
	M	**Wear goggles when dust is airborne or when working below the task**	**L**	
	M	**Wear face shields when exposure to liquids may splash**	**L**	
Bump hazards (Mandatory at all site/customer locations)	**M**	**Wear hard hat or safety bump cap, as required by site conditions when at the site/customer site**	**L**	**Site Contractors / HON employees**
	M	**Avoid low hanging equipment, piping, shelving, etc.**	**L**	
	M	**Egress slowly in areas to assess safe path of travel**	**L**	
	M	**Post signage where potential of a bump is likely**	**L**	
Noise hazards	**M**	**Wear hearing protection for nuisance noise or any noise level over 85 dBa over an eight hour continuous period.**	**L**	**Site Contractors / HON employees**
Arc Flash hazards	**M**	**Wear arc flash PPE and clothing based on the hazard category (1-4)**	**L**	**Site Contractors / HON employees**
Respiratory	**M**	**Wear disposable (dust) masks for nuisance dust/particulates only.**	**L**	**Site Contractors / HON employees**

SMP Attachment 10: Orientation Form (Completed at Project Construction Kick-off)

Employee/Contractor:………………………………… Contract: ……………………………………… Date……………………………...

Honeywell Representative:……………………………………………………………………………

Please tick ✓	Yes	No	Comments
• Honeywell/Customer HSE Policy	☐	☐	
• Discuss (or provide copies) of relevant Honeywell and/or Customer HSE procedures	☐	☐	
• Discuss/provide copy of Contractor HSE guidelines	☐	☐	
• First Aid arrangements	☐	☐	
• Location of hazardous materials listed in Hazardous Materials Register	☐	☐	
• Emergency Procedures	☐	☐	
• Evacuation Procedures	☐	☐	
• HSE Risk Assessment Worksheet	☐	☐	
• Reviewed Health and Safety Plan	☐	☐	
• Site Entry/Access requirements	☐	☐	
• Specific Training for special Area/Tasks (list below)	☐	☐	
• Works Authorization Form requirements	☐	☐	
	☐	☐	
	☐	☐	

I have completed the Orientation & Training as required for this Contract and agree to follow the guidelines and procedures as outlined in these courses.

Name	Signature	Name	Signature

SMP Attachment 10: (Completed by ALL Contractor/HW Employees prior to construction start)

I have read and understand the Risk Assessments, completed Site Orientation & Safety training as required for this Contract at (enter project name) and agree to follow all guidelines to work safely

Print Name	Signature	Company	Date

SMP Attachment 10: (Completed by ALL Contractor/HW Employees prior to construction start)

I have read and understand the Risk Assessments, completed Site Orientation & Safety training as required for this Contract at (enter project name) and agree to follow all guidelines to work safely

Print Name	Signature	Company	Date

SMP Attachment 11: Training Register

The following table lists the Site Specific training requirements that must be completed prior to working on the project site. These training procedures were identified as a result of the completed hazard and risk assessments observed at the contract site. All employees and contractors must be familiar with the required training for this project and agree to follow these procedures for the entire duration of the project.

Training Register				
#	Training Requirement	Contract Required (yes or no)	Who is to Complete	Comments
1	Customer orientation	Yes	Honeywell Employees	
2	Honeywell Safety Awareness / Orientation	Yes	Honeywell Employees	
3	Asbestos Awareness	Yes	Honeywell Employees	
4	Bloodborne Pathogen Awareness			
5	Canine Awareness			
6	Cold Weather Safety			
7	Compressed Gas Awareness			
8	Confined Space Awareness	Yes	Honeywell Employees	
9	Confined Space Entry – advanced training required	Yes	Honeywell Employees	
10	Cranes & Slings	Yes	Honeywell Employees	
11	Driver Safety	Yes	Honeywell Employees	
12	Electrical Arc Flash Awareness	Yes	Honeywell Employees	
13	Electrical Safety General Awareness	Yes	Honeywell Employees	
14	Emergency Preparedness Plan (Customer)			
15	Environmental Hazard	Yes	Honeywell Employees	
16	Eye & Face Protection	Yes	Honeywell Employees	
17	Fall Protection	Yes	Honeywell Employees	
18	Fire Extinguisher Usage	Yes	Honeywell Employees	
19	Hand & Power Tool	Yes	Honeywell Employees	
20	Hazard Communication	Yes	Honeywell Employees	
21	Hearing Protection	Yes	Honeywell Employees	
22	Hot Work Permit	Yes	Honeywell Employees	
23	Ladder Safety	Yes	Honeywell Employees	
24	Laser Safety			
25	Lead Safety	Yes	Honeywell Employees	
26	Line Breaking	Yes	Honeywell Employees	
27	Lock Out/Tag Out	Yes	Honeywell Employees	
28	Machine Safeguarding			
29	Management of Change	Yes	Honeywell Employees	
30	Manual Material Handling / Back Safety	Yes	Honeywell Employees	
31	Office Ergonomics	Yes	Honeywell Employees	
32	Personal Protective Equipment	Yes	Honeywell Employees	
33	Powered Industrial Trucks	Yes	Honeywell Employees	
34	Process Safety Management			
35	Refrigerant Management	Yes	Honeywell Employees	
36	Respiratory Protection	Yes	Honeywell Employees	
37	Safety Observation System (SOS)	Yes	Honeywell Employees	
38	Safe Operations Management (SOM)Training	Yes	Honeywell Employees	
Below list other customer specific training requirements, if applicable.				
1				
2				

SMP Attachment 13: Behavioral Observation Checklist (HW Employee Monitoring)

Utilize the Behavior Observation Checklist to identify both safe and at risk conditions in the work environment. After observation provide feedback to the employee for both safe and at risk observations. All at risk observations must have comments to identify corrective action or explanation. Only respond to questions that apply to the task

1. Observer

Report Observer Name

Observer EID

2. Observed

Observed Name

Observed EID

3.Task performed by Employee:____________________

(4)	**Select SBU: HBS or HPS**	**(5)**	**Select Pole (Americas or EMEA or AP):**	**(6)**	**Region within Pole:**	**(7)**	**State/District /Branch within Region:**

(8) Location of Behavior Observation (select only one):

- ☐ Manufacturing plant / Mill
- ☐ Honeywell Office
- ☐ Customer Office
- ☐ Hospital
- ☐ School
- ☐ Mechanical Room
- ☐ Laboratory
- ☐ Residence
- ☐ Warehouse
- ☐ Roof
- ☐ Computer Room / Control Room
- ☐ Vehicle
- ☐ Other

(9) Date BOC Observed: DD/MM/YYYY

SAFE PATH OF TRAVEL			
Uses designated walkways to access work area	SAFE	AT RISK	N/A
Has clear view of path to travel	SAFE	AT RISK	N/A
PERSONAL PROTECTIVE EQUIPMENT (PPE)			
Head Protection	SAFE	AT RISK	N/A
Eye/Face Protection	SAFE	AT RISK	N/A
Hand Protection	SAFE	AT RISK	N/A
Foot Protection	SAFE	AT RISK	N/A
Respiratory Protection	SAFE	AT RISK	N/A
Electrical Protection	SAFE	AT RISK	N/A
Personal gas detector	SAFE	AT RISK	N/A
SAFE MOTOR VEHICLE OPERATION			
Does not use any mobile device while driving	SAFE	AT RISK	N/A
Secures equipment for safe transport	SAFE	AT RISK	N/A
Vehicle properly maintained	SAFE	AT RISK	N/A
Parking brake engaged when parked	SAFE	AT RISK	N/A
BODY POSITIONING DURING TASK			
Uses knees to lift not back	SAFE	AT RISK	N/A
Use knee pads when kneeling	SAFE	AT RISK	N/A
Watches hand placement / Keeps eyes on task	SAFE	AT RISK	N/A
Avoids pinch points or “line of fire” hazards	SAFE	AT RISK	N/A
Note: Line of fire: Struck by/against, caught in /between/under			
LADDERS			
Properly stores ladder on vehicle	SAFE	AT RISK	N/A
Ladders inspected prior to use	SAFE	AT RISK	N/A
Right ladder (step/extension) for the job	SAFE	AT RISK	N/A
Three points of contact at all times	SAFE	AT RISK	N/A
Does not use ladders in wet conditions	SAFE	AT RISK	N/A
Uses tool belt/back pack to carry tools	SAFE	AT RISK	N/A
PRE-JOB PLANNING			

Identifies all hazards in the work environment	SAFE	AT RISK	N/A
Conducts risk assessment using the risk calculator for	SAFE	AT RISK	N/A
Low / Medium or High Risks	SAFE	AT RISK	N/A
Obtains Work Permit where required	SAFE	AT RISK	N/A
Implements controls prior to starting work	SAFE	AT RISK	N/A
Communicates job activities with customer or team	SAFE	AT RISK	N/A
TOOLS			
Tools properly maintained	SAFE	AT RISK	N/A
Lock out, tag out properly applied	SAFE	AT RISK	N/A
Verifies zero energy after lock out	SAFE	AT RISK	N/A
Proper use of tools/ Uses right tool for the job	SAFE	AT RISK	N/A
Inspects tools before use	SAFE	AT RISK	N/A
INCLEMENT WEATHER			
Drinking plenty of fluids	SAFE	AT RISK	N/A
Taking rest breaks	SAFE	AT RISK	N/A
Uses ice cleats for icy conditions	SAFE	AT RISK	N/A
WORK ENVIRONMENT			
Keeps work area clean / free of trip hazards	SAFE	AT RISK	N/A
Checks work area for bees, wasps, snakes, etc	SAFE	AT RISK	N/A
HAZARD/INCIDENT REPORTING			
Reports Safety Observations	SAFE	AT RISK	N/A
Knows how to report injuries	SAFE	AT RISK	N/A
OTHER CRITICAL BEHAVIORS OBSERVED			
______________________	SAFE	AT RISK	N/A
______________________	SAFE	AT RISK	N/A

Describe At Risk Behavior:

Describe Safe Behavior:

Corrective action entered into SOS: Yes: **No:** **SOS Number:**

Manager / Lead Signature **Date** DD/MM/YYYY

SMP Attachment 14: Contractor Performance Safety Checklist (Contractor Audits)

Contractor Performance Safety Checklist

Site location:		**Location of work**		
Auditor:		**Date and time**	**Date**	**Time**
Details of work being undertaken				
Contract Number or Name				
Name of contractor				

Observed health and safety standards				**Comments**
(i)	Have all contractor and sub contractor staff attended a site safety orientation course and received required HSE training?	Yes	No	
(ii)	Have all contractor and sub contractor staff aware of the sites emergency procedures?	Yes	No	
(iii)	Have all contractor and sub contractor staff been aware of what to do in the event of an accident and/or safety observation? (speak to contractor staff)	Yes	No	
(iv)	Has the contractor made adequate first aid provision?	Yes	No	
(v)	Have safety observations been submitted to Honeywell on a periodic basis?	Yes	No	
(vi)	Are the contractor and sub contractor risk assessments, safe work procedures, method statements, HSE procedures, and permits to work being followed?	Yes	No	
(vii)	Has required PPE, e.g. hard hats, safety boots, etc. been provided according to the risk assessment and is it being worn?	Yes	No	
(viii)	Has the contractor implemented life critical control measures for fall protection, electrical safety, arc flash, and permit confined spaces?	Yes	No	
(ix)	Where applicable are the contractor works securely fenced off or otherwise protected from the public, staff, etc?	Yes	No	
(x)	Is the contractor maintaining a safe work area and implementing good housekeeping standards, including safe egress to roads, aisles, stairs, etc.?	Yes	No	
(xi)	Is the contractor holding regular tool box talks with employees?	Yes	No	
(xii)	Other observations			

Auditor: *I hereby declare that I have completed health and safety monitoring on the contractor named above*

Name (capitals)		Signature			
Job Title		Time		Date	
Contractors representatives name		Signature		Date	
Site managers name		Signature		Date	

SMP Attachment 15: Vehicle, Tool, & PPE Inspection Checklist (Honeywell Employees)

EMPLOYEE NAME: Travis Krichman	VEHICLE #: 62277
SUPERVISOR NAME: Robert Letso	VEHICLE MILEAGE: 51258
LOCATION ID# VEHICLE ASSIGNED:	INSPECTION DATE (MM/DD/YY): 2/5/2014

	Insp	Test	Items	OK	DEV	N/A	Deviations: Enter a brief description of deviation, action taken, and date corrected
VEHICLE SAFETY ITEMS	x		**Housekeeping -** vehicle, tools, and equipment are neat and orderly, items in driver compartment are adequately secured	X			
	x		**Ladder racks** - in good condition, hardware intact, operates easily, ladders secure			X	
	x		**Exterior/Body damage** - exterior clean and in good condition (note all damage including scratches, dents, etc.)			X	
	x	x	**Lights** visible and operational - headlights (low & high beam), tail lights, brake lights, emergency flashers, other lights			X	
	x	x	**Windshield washer system/wipers/fluid** - operating properly, good condition, appropriate fluid level	X			
	x	x	**Seatbelt** - available and in good condition	X			
	x		**Glass & mirrors** - clean, no cracks or pits in areas that obstruct driver's view, mirrors securely mounted, properly positioned	X			
	x	x	**Tire Condition and Pressure** - appropriate tire wear and pressure (including spare)	X			
	x	x	**Fluid levels -** verify that oil is full, no fluid leaks	X			
	x	x	**Tire Condition and Pressure** - adequate tread depth and appropriate tire wear, proper pressure (including spare)	X			
	x	x	**Brakes** - operating properly (per driver's verbal report), verify that emergency brake operates properly	X			
	x	x	**Doors & locks** - door catches and handles work properly, locks work properly and can be secured	X			
	x		**Fire extinguisher** - mounted within vehicle, gauge needle in "green" zone or otherwise indicates "full"	X			
	x		**First aid kit** - vehicle kit available and adequately stocked	X			
	x		**Chocks and cones -** available, as needed			X	
	x		**Vehicle registration, insurance card, driver's license, Honeywell driver's guide, fuel card** -present, current, available for appropriate vehicle	X			
LADDERS & FALL	x		**Ladders** - Rungs, rails, hardware, rope in good condition. Appropriate ladder size and type available (non-conductive ladder available when electricity could be encountered)			X	
	x		**Fall protection equipment** - harness, lanyard, anchoring equipment inspected and in good condition. Complete system from same manufacturer. Harness and lanyard stored properly (without twisting, bending, away from chemicals and direct sunlight). Replaced according to manufacturer guidance.			X	
PPE	x		**Eye protection** - readily available, clean, in good condition	X			
	x	x	**Hard hat** – in good condition, no cracks or dents. Cradle system intact and in good condition. Clean surface.	X			
	x		**Hand and foot protection** - available and in good condition	X			
	x		**Hearing protection** – appropriately selected, clean, in good condition, stored properly	X			

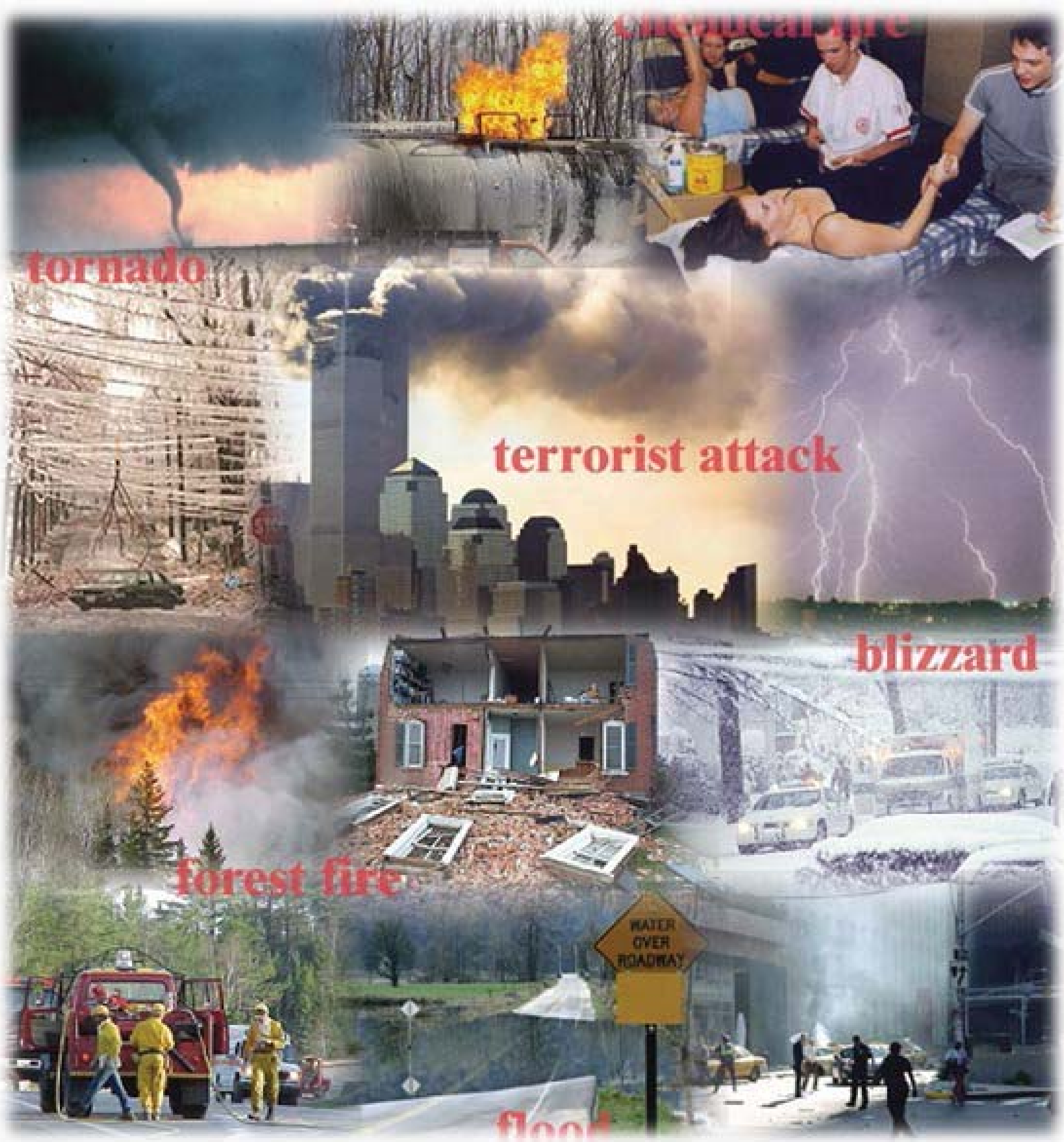
	x	x	**Respiratory protection** - appropriately selected, in good condition, stored properly			X	
TOOLS & EQUIPMENT	x		**Power tools** - in good condition; cords, plugs, prongs present and good condition; grounded or double insulated; no broken pads; guards in place; removed from service/replaced promptly if poor condition detected			X	
	x		**Pneumatic tools** - hose/whip secured to tool by positive means (to prevent tool from being accidentally disconnected); safety clips or retainers used on impact/percussion tools			X	
	x		**Hand tools** - Good condition, no mushroomed heads, no broken or cracked parts; removed from service/replaced promptly if poor condition			X	
	x		**Fuel-powered tools/equipment** - good condition; stored so as to prevent spilling of fuel during transport; when in use in enclosed spaces, measures are taken to prevent build-up of gases and fumes; stopped for refueling, service, and maintenance			X	
ELECTRICAL	x		**Extension cords** - cord and plugs in good condition (no cracks, cuts, or tape), prongs intact, cord is grounded or double-insulated (and/or GFI available)			X	
	x		**Lockout/Tagout** - appropriate devices available (locks, tags, hasps, etc.), appropriate variety available for job conditions			X	
	x	x	**Amp Meter** - clean, no damage, proper storage, good working order, test battery			X	
COMPRESSED	x		**Torches, hoses, regulators** - fittings in good condition, no leaks, auto shut-off tested, hoses & connections designed for pressure and service to which subjected; equipped with backflow prevention or flash arrestor			X	
	x		**Gas cylinders** - turned off, stored upright with caps in place, secured (to prevent tipping), properly labeled, used with appropriate PPE, regulators and torches removed and/or disconnected from cylinders when not used			X	
	x		**Personal Protective Equipment for Hot Work** (i.e. face shield, body protection, etc.) - protective equipment available and in good condition			X	
MISCELLANEOUS	x		**Outdoor/inclement weather supplies & equipment** - appropriate supplies available for hazards encountered (i.e. drinking water/fluids, snow/ice management equipment {sand, shovels, etc.], insect spray [di-electric spray required if working near electricity], sunscreen, etc.)			X	
	x		**Chemicals** - only “approved” chemicals used, all containers properly labeled, containers stored properly (secured). Material Safety Data Sheets (MSDS) on file at HON office. If refrigerant is distributed, logs are available and up-to-date.			X	
	x		**Hand lines and ropes** - no cuts, abrasions, decay, burns, signs of wear			X	
	x		**Portable blowers** - in good condition, proper ratings on blower, proper set-up and use (test)			X	
	x	x	**Air monitoring equipment (for confined space entry)** - appropriate for job conditions and hazards potentially encountered, in good condition and functioning properly, test/calibrate equipment according to requirements, appropriate calibration gases and test kit available			X	
	x	x	**Electrical insulating gloves (for electrical hot work) -** if used and available, ensure appropriate class/type for use, verify current inspection/test date stamp rubber protective layer (w/in past 9 mos.), stored in bag with fingers upright, stored away from direct sunlight in dedicated bag			X	
	x		**Electrical mats/barriers** - Mats and barriers in good condition, no tears, rips or holes. Appropriate for hazards encountered.			X	
	x		**Gasoline** - stored in approved flammable liquid container with self-closing lid, flame/flash arrestor. Stored to prevent tipping. Maximum capacity stored less than 5 gallons.			X	
	x		**Heaters** – equipped with proper shut-off (tip over protection), use only approved heaters in good condition.			X	
	x		**Permits** - verify adequate supply of required permits (Hot Work, Live Electrical, Permit-Required Confined Space Entry, etc.)			X	

SMP Attachment 17: Emergency Response Plan

HBS & HPS Facilities Emergency Response Plan

Honeywell Business Unit:	EES - Customer Site - Verona School District
Street Address:	121 Fairview Avenue
City, State, Zip:	Verona, NJ
Date of ERP Review:	

Emergency Response Preparedness (ERP) Checklist: ***(Click on PDF)***



SMP Attachment 17: Emergency Response Plan

TABLE OF CONTENTS

1. EMERGENCY PREPAREDNESS PLAN SCOPE:

Honeywell International Inc. (Honeywell) will provide a safe and healthy work environment. Consistent with policy, the following emergency action plan is developed for this site and will guide the actions taken by employees, management, and emergency coordinators. Emergency events addressed by this plan include building evacuation, fires, severe weather, medical emergencies, Bomb Threats or other facility-related emergencies that could endanger employees and/or visitors to this Honeywell location.

2. HSE HOTLINE REPORTING GUIDANCE:

Report all Injuries and Illnesses and Emergency Events addressed within this reporting procedure to the **Honeywell Hotline at (866-466-1765).** Early Post Injury Reporting with Immediate First Aid measures can reduce Injury Severity & Eliminate the need for Future Medical Care (Recordable Injuries).

3. DRILLS/TEST OF EMERGENCY PREPAREDNESS PLAN:

Familiarity with responsibilities and procedures must be thorough so that response to the plan is automatic. Each location is responsible for accomplishing at least one emergency situation drill every twelve (12) months. After accomplishing the emergency situations drill it must be documented on the Emergency Preparedness Drill Critique.

4. FACILITY IDENTIFICATION, DESCRIPTION, GENERAL INFORMATION:

Office Name/LID	customer site, various schools located in Verona, NJ
Address	121 Fairview Avenue, Verona NJ
Description of Bldg, Usage	School Building
Location Description, Cross Streets, Directions	
Facility Utilities, Nearby Buildings	

5. EMERGENCY COORDINATOR INFORMATION

THE EMERGENCY COORDINATOR HAS PRIMARY RESPONSIBILITY FOR ASSURING THE IMPLEMENTATION OF THIS EMERGENCY PREPAREDNESS PLAN AND REQUIREMENTS STATED HEREIN. WHEN EMERGENCIES OCCUR, THE EMERGENCY COORDINATOR MAINTAINS PRIMARY RESPONSIBILITY FOR APPROPRIATE NOTIFICATIONS TO EMPLOYEES, HONEYWELL MANAGEMENT, MUNICIPAL EMERGENCY SERVICES (I.E. FIRE AND/OR POLICE DEPARTMENTS), AND OTHER AGENCIES OR SERVICES THAT MAY ASSIST IN MANAGEMENT OF THE EMERGENCY.

The alternate Emergency Coordinator serves in place of the Emergency Coordinator when the primary coordinator is unavailable. (It is recommended that these positions be filled with employees who are typically in the building for the majority of the workday.)

A. THE PRIMARY EMERGENCY COORDINATOR FOR THIS FACILITY IS:

Name	Travis Krichman
Title	Project Supervisor
Office Phone	
Pager or Cell	732-600-1654
Alternate Phone	

B. THE ALTERNATE EMERGENCY COORDINATOR FOR THIS FACILITY IS:

Name	Paul McDevitt
Title	Manager of Buildings and Grounds
Office Phone	
Pager or Cell	973-239-1845
Alternate Phone	

6. HONEYWELL CRISIS COMMUNICATION:

Major crisis situations often generate interest from the news media and require effective internal communications to address employee concerns. As soon as possible following a major crisis event, contact the Communications Leader to discuss the situation so appropriate internal and external communications plans and tools can be developed. Examples of such times where crisis reporting should be accomplished include the following:

a. Catastrophic facility damage caused by fires, storms, explosions, or earthquakes, tsunamis, accidents that may result in severe injury and threats or acts of violence or terrorism

b. Other unexpected events that have the potential to cause harm to Honeywell's employees, reputation, competitive positioning, or financial viability.

I. INTERNAL RESOURCE NUMBERS: It is always appropriate to contact the local site leader if they are not on-site at the time of the incident. Additionally, based on the nature of the event/injury it may also be necessary to contact other Honeywell personnel listed below:

	Name	Office Phone	Cell Phone
Local Site Leader(s)	Travis Krichman		732-600-1654
HSE Leader	Steve Serian	603-930-0222	603-930-0222
Facilities Manager	Paul McDevitt		973-239-1845
HR Leader			
ACS Security Director	Jeff Soholt	763-954-6123	952-303-1648

- **Additional Links**
  - Corporate Communication Policy
  - Corporate Communication Contacts

II. EXTERNAL RESOURCES / EMERGENCY PHONE NUMBERS:

	Name	Phone
Police Department	Verona Police	911 973-239-5000
Fire & Ambulence		911
Building Landlord/Manager	Paul McDevitt	973-239-1845
Other		

7. EMERGENCY EVACUATION SYSTEM:

A fire alarm will be used to alert employees within the building of fire or severe weather emergency or other need to evacuate the building or to seek shelter in place. In buildings that are not equipped with audible emergency alarms, employees will be alerted to other emergencies through direct verbal communication from the Emergency Coordinator(s) and/or designated alternate.

The Emergency Coordinator or designated alternate will make physical contact with employees who have sight or hearing disabilities to ensure that they are aware of the emergency.

a. BUILDING EVACUATION:

Evacuation of employees to a rally point outside of the building or to a refuge area within the building will be enacted whenever there is a threat to their safety or health because of an emergency condition. The refuge area shall be a safe area within the building away from windows where employees can gather, for example, in severe weather. The Emergency Coordinator is authorized to enact the evacuation of a particular room, floor, or the building.

- ✓ The designated rally point is:
  Specify: front of school, parking lot near main enterance
  If the designated rally point is involved in the emergency, the alternate rally point will be:
  Specify: parking lot, adjacent to gymnasium
- ✓ The designated (indoor) refuge area is:
  Specify: gymnasium
- ✓ The Emergency Coordinator and Team will be responsible for accounting for all employees, visitors and contractors. If personnel are unaccounted for after conducting the headcount at the rally point, the Emergency Coordinator will be the designated person responsible for communicating with emergency services.
- ✓ Re-entry to the building will be coordinated through emergency services and the Emergency Coordinator. In the event of an incident preventing re-entry, the Emergency Coordinator will work with senior management, Facilities, and Health, Safety, Environmental (HSE) departments to assure the safety of the building and personnel.
- ✓ Injured personnel will receive medical care through the municipality's emergency response system.
- ✓ In the event an unplanned evacuation results from an actual site emergency, the Emergency Coordinator shall ensure appropriate notifications are made to site leadership.
- ✓ A diagram or description of the evacuation routes, exit doors, rally points and refuge areas are posted:
  Specify: see evacuation routes located in classroom and front office
  The designated exit doors for this facility are (list exit doors).
- ✓ Know the locations of your building evacuation route, outdoor rally point, and indoor refuge area before an emergency occurs by reviewing the posted/attached instructions and/or evacuation map.

8. MEDICAL EMERGENCY:

Remember to report all injuries no matter how minor to your manager and HSE leader immediately and the **Honeywell Hotline at (866-466-1765).** *Never enter into a medical emergency area unless you are sure there are no hazards present. Scan the area visually, overhead as well, to ensure that there are no physical dangers present. We do not want to delay the initial medical emergency response nor do we want to provide additional responses to would-be rescuers. Never move or attempt to render any assistance that could impact greater injury to the already injured victim.*

The following steps to be taken in the event of an on-site medical emergency:

a. *Immediately contact First Aid personnel and dial 9-911 for assistance, such as loss of consciousness, uncontrolled bleeding, potential heart attack or stroke and give exact location and nature of the emergency.*

b. *Remember, when First Aid arrives, they are in charge. Persons in the immediate area should be limited to only those identified by the First Aid Attendant. The First Aid Person will provide direction and course of action.*

c. *If further medical assistance is required, the First Aid Attendant or designate will contact dial 911 and request an ambulance be dispatched*

9. FIRE EMERGENCY (Evacuate and call 9-911):

To protect yourself, it is important to understand the basic characteristics of fire. Fire spreads quickly so there is no time to gather valuables or make a phone call. In just two minutes, a fire can become life-threatening. In five minutes, a residence can be engulfed in flames. Heat and smoke from fire can be more dangerous than the flames. Inhaling the super-hot air can sear your lungs. Fire produces poisonous gases that make you disoriented and drowsy. Asphyxiation is the leading cause of fire deaths, exceeding burns by a three-to-one ratio.

a. **Protective Measures for Fires:**
- ✓ Insure smoke alarms are installed, tested and cleaned in accordance with applicable instructions.
- ✓ Ensure Fire Suppression Systems are maintained and tested in accordance with applicable instructions.
- ✓ Ensure Fire extinguishers are in place and serviceable.
- ✓ Accomplish Annual Emergency Fire Drills to prepare employees.

b. **Escaping the Fire:**
- ✓ Review escape routes with personnel and practice escaping from each room.
- ✓ Ensure security doors and other antitheft mechanisms that could block outside window entry are easily opened from the inside.
- ✓ Remain low to the floor (where the air is safer in a fire) when escaping from a fire.
- ✓ Clean out storage areas. Never allow trash, old newspapers, boxes or magazines to accumulate.

c. **Flammable Items:**
- ✓ Never use gasoline, benzene, naphtha, or similar flammable liquids indoors.
- ✓ Store flammable liquids in approved containers in well-ventilated storage areas.

d. **Fire sources and smoking:**
- ✓ Never smoke near flammable liquids
- ✓ Smoke only in designated smoking areas as described below:

Specify: NONE, NO SMOKING ONSITE

Provide deep sturdy ashtrays or outdoor approved cigarette/cigar disposal cans.

e. **Heating Sources**
- ✓ Be careful when using portable heating sources.
- ✓ Ensure space heaters are at least three feet (1 meter) away from combustible materials.
- ✓ Ensure Portable heating devices have a tilt shutoff as well as a timer shutoff.
- ✓ Always unplug Portable Heating Devices when not in use.

f. **Electrical Wiring:**
- ✓ Ensure electrical wiring is not exposed.
- ✓ Never Daisy Chain extension cords.
- ✓ Inspect extension cords for frayed or exposed wires or loose plugs.
- ✓ Make sure outlets have cover plates and no exposed wiring.
- ✓ Make sure wiring does not run under rugs, over nails, or across high-traffic areas.
- ✓ Do not overload extension cords or outlets. If you need to plug in two or three appliances, get a UL-approved unit with built-in circuit breakers to prevent sparks and short circuits.

g. **During a Fire If your clothes catch on fire:**
- ✓ Stop, drop, and roll until the fire is extinguished.

10. TERROIST / BOMB / BIOLOGICAL / CHEMICAL / RADIOLOGICALTHREAT EMERGENCY:

a. ***Remain calm, listen carefully and record the following details:***
- ✓ *Time the call was received,*
- ✓ *Details of the threat (Where is the bomb or When it is expected to explode),*
- ✓ *Details of the caller (voice tone – angry, joking, sarcastic, quiet, business-like),*
- ✓ *Background noise (car noise, street noise, television, radio),*
- ✓ *Time the call ended*

c. ***Notify Local Police Department, Honeywell Management and Security immediately.***

Bomb, Chemical and/or Biological Threat Guideline

Detailed DESCRIPTION OF CALLER'S VOICE	**_Ask the below EXACT WORDS upon BOMB THREAT_**
Male ______ Female______ Young _____ Middle Aged _____ Older______ _________ Calm _________ Nasal _________ Angry _________ Stutter _________ Excited _________ Lisp _________ Slow _________ Raspy _________ Rapid _________ Deep _________ Soft _________ Cleared Throat _________ Loud _________ Deep Breathing _________ Laughter _________ Cracked Voice _________ Crying __________Accent _________ Normal __________Familiar _________ Slurred __________Disguised BACKGROUND SOUNDS _________ Street _________ Factory _________ Animal _________ Clear _________ Voices __________PA System _________ House __________Traffic _________ Other *THREAT LANGUAGE* _________*Well spoken* __________ *Incoherent* _________Foul/ Irrational ________ Read Message?	1. *Where is the device right now?* 2. *What does it look like?* 3. *What kind of a device is it?* 4. *Why are you doing this?* 5. *What is your name?* 6. Are you part of an organization? 7. *Why are you warning us?* 8. What will cause it to activate?
*Person receiving call*____________________________________ *Time Caller hung up*____________ *Phone number at which call was received*____________________ *Date*___________________	

11. HAZARDOUS CHEMICALS:

If applicable, identify and list below all hazardous chemical quantities stored on site. Otherwise state "Not Applicable" to this location.

- ✓ **Inside and/or outside locations:**
- ✓ **Quantities of hazardous materials:**
- ✓ **Physical and/or chemical hazards, i.e., asphyxiation hazards**
- ✓ **Hazardous material properties, i.e. flammability, toxicity. Reference location of Safety Data Sheets**

12. INTERNAL HAZARD / CONTROL MEASURES:

Include in this section any process operations that may fail during an emergency event.

Possible Failures	Emergency Control Measure Description

The following are examples of process operations that are addressed in the procedure, but do not need to be part of this section if not applicable to your location: *(Truck/railcar deliveries, transfer of materials, utilities, pollution control devices, control rooms, pipelines, control valves, ventilation systems, boilers, pressure vessels, security access controls, fire protection systems, identify existing engineering control measures to avoid release of hazardous materials).* However, if applicable, prepare emergency control measures for each potential failed process that may apply to your location.

13. EMERGENCY DRILL REQUIREMENTS

a. *Annual Emergency Evacuation Drills*

- ✓ *Drills must be accomplished annually and include different types of Emergency Scenarios as outlined in this Emergency Preparedness Plan*
- ✓ *Upon completion of the Emergency Evacuation Drill use the Critique Form to Document Drill.*
- ✓ *In accordance with Corporate Policy,* once the Emergency Evacuation Drill is complete, forward the Critique Form to regional HSE Manager for entry into the Corporate Event Tracking System.

b. *Annual AED Emergency Drill*

- ✓ *If a location has more than 200 employees an AED is required.* Before making the determination to purchase an AED, contact your Regional Safety Manager.
- ✓ Locations with AEDs must conduct AED drills at least annually on all shifts where AED trained personnel are present. These drills must be documented and must measure the actual response time.
- ✓ When AED drill response times are greater than or equal to 5 minutes, the organization must create a corrective action plan to reduce the response time to less than 5 minutes. *This action plan must be documented in the Corporate Event Tracking System by the HSE Manager*. Corrective actions must include a mechanism for ensuring the response time of 5 minutes or less is met.

14. NATURAL DISASTERS:

a. TORNADO EMERGENCY:

I. Tornado Terms:

- ✓ **Tornado Watch:** Means Tornadoes are possible. Remain alert for approaching storms. Watch the sky and stay tuned to NOAA Weather Radio, commercial radio, or television for information.
- ✓ **Tornado Warning:** A tornado has been sighted or indicated by weather radar. Take shelter immediately.

II. Protective Measures before and during a Tornado:

- ✓ Listen to NOAA Weather Radio or to commercial radio or television newscasts for the latest information & remain alert.
- ✓ Look for approaching danger signs such as a dark greenish sky or dark low-lying cloud with rotation or evidence of large hail.
- ✓ Listen for a loud roar, similar to a freight train.
- ✓ If you see approaching storms or any of the danger signs, be prepared to take shelter immediately or if you're under a tornado WARNING, seek shelter immediately!
- ✓ If inside an enclosed structure such as a small building, school, nursing home, hospital, factory, shopping center or high-rise building, go to a pre-designated shelter area such as a safe room, basement, storm cellar, or the lowest building level. If there is no basement, go to the center of an interior room on the lowest level (closet, interior hallway) away from corners, windows, doors, and outside walls. Put as many walls as possible between you and the outside. Get under a sturdy table and use your arms to protect your head and neck. Do not open windows.
- ✓ If outside with no shelter lie flat in a nearby ditch or depression and cover your head with your hands.
- ✓ Watch out for flying debris. Flying debris from tornadoes causes most fatalities and injuries.

b. HURRICANE/CYCLONE EMERGENCY:

I. Hurricanes Terms:

- ✓ **Hurricane/Cyclone and Tropical Storm Watch**: Hurricane/tropical storm conditions are possible in the specified area, usually within 36 hours. Tune in to NOAA Weather Radio, commercial radio, or television for information.
- ✓ **Hurricane/Cyclone and Tropical Storm Warning**: Hurricane/tropical storm conditions are expected in the specified area, usually within 24 hours.

II. Hurricane/Cyclone Protective Measures before and during a Hurricane:

- ✓ Make plans to secure property by closing all windows, doors and roof vents if possible.
- ✓ Determine a safe room / location for shelter.
- ✓ Listen to the radio or TV for information.
- ✓ Turn off utilities if instructed to do so.
- ✓ Evacuate building if directed by local authorities and be sure to follow their instructions.

c. EARTHQUAKE EMERGENCY:

I. Protective Measures before and during an Earthquake:

- ✓ *Keep your cool, avoid panic and confusion and ride out the motion.*
- ✓ *Take cover under a sturdy desk, table, or bench or against an inside wall, and hold on. If there isn't a table or desk near you, cover your face and head with your arms and crouch in an inside corner of the building.*
- ✓ *Stay away from glass, windows, outside doors and walls, and anything that could fall, such as lighting fixtures or furniture.*
- ✓ *Use a doorway for shelter only if it is in close proximity to you and if you know it is a strongly supported, load bearing doorway.*
- ✓ *Remain inside until shaking stops and it is safe to go outside. Most injuries during earthquakes occur when people are hit by falling objects when entering into or exiting from buildings.*
- ✓ *Be aware that the electricity may go out or the sprinkler systems or fire alarms may turn on.*
- ✓ *Do not use elevators during an Earthquake.*

II. Post Earthquake Protective Measures: *Being prepared for aftershocks are extremely important. Even though secondary shockwaves are usually less violent, they can be strong enough to cause additional damage to already weekend structures.*

- ✓ *Check for injuries amongst those around you. Notify First Aid of injured persons as soon as safe to do so. Do not move the seriously injured unless they are in immediate danger. Try and keep the injured warm.*
- ✓ *Contact local emergency resource centers such as the hospital or fire department as required for injuries or fire concerns or call 9-911.*
- ✓ *Stay away from damaged areas unless your assistance has been specifically requested by police, fire, or relief organizations*
- ✓ *Listen for sounds or smell of leaking gas and exit building if the smell of gas apparent.*
- ✓ *Be aware of possible tsunamis if you live in coastal areas. These are also known as seismic sea waves (mistakenly called "tidal waves"). When local authorities issue a tsunami warning, assume that a series of dangerous waves is on the way. Stay away from the beach.*
- ✓ *Always open cabinets cautiously as objects may have shifted causing falling hazards.*
- ✓ *Never leave the worksite area unless you have advised your Site Manager. You may be jeopardizing your safety (bridge or road damage, et cetera) as well as create traffic congestion for emergency vehicles.*
- ✓ *If evacuation is ordered, leave by the nearest emergency exit and report directly to your designated assembly/rally point.*

d. VOLCANO EMERGENCY:

I. Protective Measures before and during a Volcanic Eruption:

- ✓ Monitor local radio stations and News Broadcasts

- ✓ Ensure the building / office ventilation system is turned off. This will keep ash particulates from entering building.
- ✓ Cover sensitive equipment with plastic sheets to keep ash particulates from entering parts.
- ✓ Evacuate immediately from the volcano area to avoid flying debris, hot gases, lateral blast and lava flow.
- ✓ Wear long-sleeved shirts and long pants.
- ✓ Use goggles and war eyeglasses instead of contact lenses.
- ✓ Use a dust mask or hold a damp cloth over your face to help with breathing.
- ✓ Stay away from areas downwind from the volcano to avoid volcanic ash.
- ✓ Stay indoors until the ash has settled unless there is a danger of the roof collapsing.
- ✓ Close doors, windows and turn off all ventilation systems.

e. TSUNAMI EMERGENCY:

I. Understanding Tsunamis Terms:

- ✓ Advisory: An earthquake has occurred in the Pacific basin, which might generate a tsunami.
- ✓ Watch: A tsunami was or may have been generated, but is at least two hours travel time to the area in Watch status.
- ✓ Warning: A tsunami was, or may have been generated, which could cause damage; therefore, people in the warned area are strongly advised to evacuate.

II. Tsunami Protective measures before and during a tsunami event:

- ✓ Turn on your radio to learn if there is a tsunami warning if an earthquake occurs and you are in a coastal area.
- ✓ Move inland to higher ground immediately and stay there.
- ✓ **Visual Indication of Imminent Tsunami** - Strong Earthquake lasting 20 seconds or more where it is difficult to stand or walk or the water level at the beach begins receding / being pulled back into the ocean.

15. Insert PDF of Building Evacuation Map and Location of Fire Extinguishers on Following Page

Insert PDF map on here or on next page

see school's emergency plan and evacuation maps located in classrooms