Teaneck Board of Education

Energy Savings Plan Rev.1

Project Number: ESG-Project # DPBWI00575

Teaneck, New Jersey | March 27th, 2020

energy systems group

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SECTION 1. EXECUTIVE SUMMARY

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

Priority items include:

- Comprehensive LED Lighting Upgrades
- Replace Rooftop Cooling Unit at Whittier Elementary School
- Unit Ventilator Replacement at Teaneck High School
- Boiler Room Upgrade/ Replacement at Teaneck High School

Energy Savings

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

Benefits

The measures investigated in this Energy Savings Plan could result in an annual utility savings of 1,697,814 kWh's of electricity and save 100,381 therms of natural gas. The total utility cost savings is $7,544,068 over the life of the project (19 years). Additionally, these energy savings will result in a net reduction of greenhouse gases and will reduce the school district's carbon footprint by 3,507,204 lbs. of CO_2 annually. All these savings are achieved while improving the classroom environment and renewing many items that have been in service beyond useful life expectancy

SECTION 2. PROJECT DESCRIPTION

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

Teaneck Board of Education	
Benjamin Franklin Middle School	1315 Taft Road, Teaneck, NJ 07666
Bryant Elementary School	1 Tryon Avenue, Teaneck, NJ 07666
Hawthorne Elementary School	201 Fycke Lane, Teaneck, NJ 07666
Lowell Elementary School	1025 Lincoln Place, Teaneck, NJ 07666
Teaneck High School	100 Elizabeth Avenue, Teaneck, NJ 07666
Thomas Jefferson Middle School	655 Teaneck Road, Teaneck, NJ 07666
Whittier Elementary School	491 W Englewood Avenue, Teaneck NJ 07666

Facility Descriptions

Benjamin Franklin Middle School

Benjamin Franklin Middle School

Background Information

Benjamin Franklin Middle School is located at 1315 Taft Road in Teaneck, New Jersey. This 100,202 ft^2 facility was originally built in 1957.

Building Occupancy

Approximate enrollment is 575 students with 105 staff members, including frequent visitors. Full occupancy of the building is through the months of September to June. Partial occupancy of the building remains throughout the summer months for school classes and camps.

Hours of Operation

- Monday through Friday 6:00 am to 4:00 pm (students/staff)
- Monday through Friday 6:00 AM to 12:00 AM (custodial staff)
- Saturday and Sunday hours vary

Envelope

Benjamin Franklin Middle School is a single structure building. The exterior wall of the building is composed of a brick façade. The roof of the building is flat with an EPDM overlay, while some older sections of the roof consist of spray foam insulation with gravel finish. Evidence of leakage and deterioration is seen in the older roof system.

The building has double paned windows and energy efficient FRP doors. The existing weather stripping on the building's doors appears to be in poor condition and should be replaced.

Lighting

Many light fixtures throughout the building consist of linear fluorescent fixtures which contain T8 fixtures with electronic ballast. Light fixtures also include metal halide, incandescent or CFL fixtures. Replacing the fixtures with LED technology would be a great opportunity for energy savings.

Mechanical Systems

HVAC Systems and Equipment: The entire building is heated by three (3) gas-fired condensing hot-water boilers. All boilers are located in the buildings' boiler room. Hot water generated by the boilers is circulated to the classrooms' fan coil unit ventilators by constant-speed pumps.

Air handling units with DX cooling coils provide heating or cooling to the zones they serve. Cooling throughout the building is provided by a ductless split system and AC units.

Hot Water Systems

Domestic Hot Water: The building is supplied hot water by one (1) natural gas-fired hot water heater.

Building Controls (HVAC Controls)

The building's HVAC equipment for rooms and zones are controlled by the building management system. The building's rooftop units are controlled by the building management system. The normal temperature set points for Benjamin Franklin Middle School are as follows:

Time Period	Heating Season	Cooling Season
Occupied Hours	**68-72°F**	**72-76°F**
Unoccupied Hours	**55°F**	**80°F**

Plug Load

The classrooms throughout Teaneck Board of Education contain computers, printers, TV's and overhead projectors. Many schools have computer centers and library's which contain 20 or more computers in each. Most schools also have office areas that contain copiers, microwaves, refrigerators, vending machines and coffee makers.

Bryant Elementary School

Background Information

Bryant Elementary School is located at 1 Tryon Ave in Teaneck, New Jersey. This 47,438 ft^2 facility was originally built in 1926.

Hours of Operation

- Monday through Friday 6:00 am to 4:00 pm (students/staff)
- Weekends – Closed

Building Occupancy

Approximate enrollment at Bryant Elementary School is 386 students. The school has approximately 76 staff members.

Full occupancy of the building is through the months of September to June. Partial occupancy of the building remains throughout the summer months for school classes and camps.

Envelope

The building is a single structure with a brick façade and an insulated exterior finish system. The building has flat roofs with an EPMD overlay. Pitched sections of the roof have slate shingles that appear to be original to the building. The building windows are mostly double paned and appear to be in good condition. Exterior doors on the building FRP energy efficient FRP doors. The weather stripping for these doors is in poor condition. There is gapping between the main entry door and the door frame.

Bryant Elementary School Building Envelope

Lighting

The majority of light fixtures throughout the building consist of linear fluorescent fixtures which contain T8 fixtures with electronic ballast. Light fixtures also include metal halide, incandescent or CFL fixtures. Replacing the fixtures with LED technology would be a great opportunity for energy savings.

Mechanical Systems

HVAC Systems and Equipment: The building is provided heat by two (2) gas-fired steam boilers that are located in the boiler room. The steam generated by the boilers is ran through a heat exchanger and supplied to the classroom unit ventilators. The building utilizes two (2) DX air handling units, one is located on the roof while the other is outside on ground-level. The original built structure utilizes both unit ventilators and two-pipe steam radiator units to provide steam generated heat.

Cooling for the building is supplied by a ductless split system and individual AC units for space cooling throughout the school.

Bryant Elementary School Boilers

Domestic Hot Water Systems

Domestic Hot Water: The building is supplied hot water by two electric water heaters. One water heater is 50 gallons while the other holds 40 gallons.

Building Controls (HVAC Controls)

Bryant has all systems on the BMS control. Additionally, all UVs are tied to a thermostat and a CO2 monitor for each designated area.

Plug Load

The classrooms throughout Teaneck Board of Education contain computers, printers, TV's and overhead projectors. Many schools have computer centers and library's which contain 20 or more computers in each. Most schools also have office areas that contain copiers, microwaves, refrigerators, vending machines and coffee makers.

Bryant Elementary School Hot Water Heater

Hawthorne Elementary School

Background Information

The Hawthorne Elementary School is located at 201 Fycke Ln in Teaneck, New Jersey. This 49,373 ft^2 facility was originally built in 1925 and is in fair condition.

Building Occupancy

Approximately 342 students are enrolled at Hawthorne Elementary School. There is approximately 60 full-time or part-time employees year-round. Full occupancy of the building is through the months of September to June. Partial occupancy of the building remains throughout the summer months for school classes and camps.

Hours of Operation

- Monday through Friday 6:00 am to 4:00 pm (students/staff)
- Sunday 11:00 am to 3:00 pm

Envelope

The building's exterior wall is brick façade. This building has a flat EPDM roof with pitched roof decks. The roof decks appear to be original to the building. The roof decks contain asbestos composite shingling. The windows throughout the building are double panned. The building has many window AC units that are shielded by AC covers during the winter months.

Lighting

The majority of light fixtures throughout the building consist of linear fluorescent fixtures which contain T8 fixtures with electronic ballast. Light fixtures also include metal halide, incandescent or CFL fixtures. Replacing the fixtures with LED technology would be a great opportunity for energy savings.

Mechanical Systems

HVAC Systems and Equipment: Hawthorne Elementary School is heated by two (2) gas-fired steam boilers that are located in the boiler room. Steam generated by the boilers is ran through a heat exchanger that supplies hot water to the building unit ventilators. There are two (2) air handling units equip with DX cooling coils. One unit is located on the roof, while the other is located in the cafeteria. Both air handling units provide heating, cooling and outdoor air for ventilation. An older section of the building utilizes steam heating from either unit ventilators or two-pipe steam radiator units.

Additional cooling is provided to the office spaces by a ductless split system and individual AC units.

Hawthorne Elementary School
Boiler Room

Domestic Hot Water Systems

The building is supplied domestic hot water by one (1) 80-gallon electric hot water heater.

Hawthorne Elementary School
Hot Water Heater

Building Controls (HVAC Controls)

Hawthorne has all systems on the BMS control. Additionally, all UVs are tied to a thermostat and a CO2 monitor for each designated area.

The typical set points for Hawthorne Elementary School are as follows:

Time Period	Heating Season	Cooling Season
Occupied Hours	**68-72°F**	**72-76°F**
Unoccupied Hours	**55°F**	**80°F**

Plug Load

The classrooms throughout Teaneck Board of Education contain computers, printers, TV's and overhead projectors. Many schools have computer centers and library's which contain 20 or more computers in each. Most schools also have office areas that contain copiers, microwaves, refrigerators, vending machines and coffee makers.

Lowell Elementary School

Background Information

Lowell Elementary School is located at 1025 Lincoln Place in Teaneck, New Jersey. This 47,106 ft^2 facility was originally built in 1934 and is in fair condition.

Building Occupancy

Approximately 300 full-time or part-time staff members occupy the building. The building is occupied year-round.

Hours of Operation

- Monday through Friday 6:30 am to 6:00 pm.
- The building is at full occupancy year-round.

Envelope

The building is constructed of composite walls with a brick and concrete façade. The building is three stories tall. This includes a basement, ground level and two (2) floors. This building has a flat roof built with tar and granular finish. The pitched roof decks with asphalt shingles. The windows throughout the building are double paned and appear to be in good condition. Exterior doors are high efficiency FRP doors.

Lowell Elementary School
Exterior Door

Lighting

The building is primarily lit by linear fluorescent fixtures which contain T8 lamps with electronic ballast. Other fixtures throughout the building include individual fixtures with incandescent lamps, while some areas have fixtures with compact fluorescent plug in lamps. Replacing the fixtures with LED technology would be a great opportunity for energy savings.

Lighting Controls: The interior lighting is manually controlled by wall switches. The exterior lighting is controlled by mechanical time clocks to switch lights on and off.

Mechanical Systems

HVAC Systems and Equipment: The building is heated by two (2) natural gas-fired steam boilers which are located in the boiler room. Steam generated by the boilers are fed to a heat exchanger to provide hot water for space heating. Hot water is then circulated through unit ventilators in some of the classrooms. The building utilizes three (3) air handling units that provide outside air to the building. One air handling unit is located on the roof, while the other two are inside the building.

Cooling for offices, shared spaces and the library are provided by a ductless split system and through the wall air conditioning units.

Location	Floor/Serves	Manufacturer	Model/Make	Date	Efficiency	Capacity
Basement Boiler Room	1st Floor Lobby	Weil-McLain	88 series 2	2011	Unknown	1701 MBH 5psi

Domestic Hot Water Systems

The building is supplied domestic hot water by one (1) 40-gallon natural gas-fired water heater.

Building Controls (HVAC Controls)

The boilers are currently connected through a Bradley Scochetti interface. The building's roof-top units communicate with programmable thermostats. The remaining equipment within the building is controlled manually. The set points for Lowell Elementary School are as follows;

Time Period	Heating Season	Cooling Season
Occupied Hours	**68-72°F**	**72-76°F**
Unoccupied Hours	**55°F**	**80°F**

Kitchen Equipment

The kitchen utilizes both electric and gas cooking equipment. Various types of refrigeration equipment are and ice machines are also present.

Plug Load

The classrooms throughout Teaneck Board of Education contain computers, printers, TV's and overhead projectors. Many schools have computer centers and library's which contain 20 or more computers in each. Most schools also have office areas that contain copiers, microwaves, refrigerators, vending machines and coffee makers.

Teaneck High School

Background Information

Teaneck High School is located at 100 Elizabeth Avenue in Teaneck, New Jersey. This 215,808 ft^2 facility was originally built in 1927 and is in fair condition.

Building Occupancy

Approximate enrollment is 75 students with a staff of 15 full-time or part-time employees. The building is fully occupied September through June. Partial occupy occurs during the summer months.

Hours of Operation

- Monday through Friday 6:30 am to 6:00 pm (students/staff)
- Saturday – No use and Sunday 11:00 am to 3:00 pm

Envelope

The building is constructed of composite walls with a brick façade that appears to be in good condition. The roof is flat and contains sprayed foam roofing with gravel finish. The windows throughout the building are single or double-panned. The windows appear to be in good condition. The exterior doors throughout the building are FRP doors which are in good condition.

Teaneck High School
Foam Roof Deterioration

Lighting

The building is primarily lit by linear fluorescent fixtures which contain T8 linear fixtures with electronic ballast. Fixtures throughout the building include individual fixtures with incandescent lamps, while some areas have fixtures with compact fluorescent plug in lamps. The fixtures are in good condition which provides a great opportunity for energy savings by retrofitting to LED technology.

Lighting Controls: The building's interior and exterior lighting are manually controlled.

Mechanical Systems

HVAC Systems and Equipment: The building is heated by two (2) oil-fired cast iron steam boilers which are located in the boiler room. Both boilers are duel-fueled and can be fired with either gas or oil. Steam from the boilers serves a heat exchanger which provides hot water for the building unit ventilators. Steam from the boilers also serve a separate double wall heat exchanger to generate domestic hot water.

Steam from the boilers may also serve a single-stage absorption liquid chiller. This chiller is located in the boiler room and generates chilled water for building cooling. This chiller is used on an as-needed basis throughout the summer months.

Cooling for the building is primarily provided by separate screw chillers which are adjacent to the building's boiler room. Administrative offices and technical rooms are conditioned by a ductless split system and through the wall air conditioning units.

Air handling units equip with DX cooling and hot water coils provide heat air conditioning throughout the building.

Teaneck High School

Pneumatic valves for the building are integrated into Automated Logic Control System, but many valves must be manually controlled. Many of the valves are not functioning properly and require manual operation. Building maintenance personal for the facility have difficulty in switching from heating to cooling, or cooling to heating, because of the need for manual operation, or nonfunctional valves.

Teaneck High School
Hot Water Heater

Domestic Hot Water Systems

Steam from the boilers serve a double wall heat exchanger which generates domestic hot water for the building. There is a gas fired domestic hot water heater with back-up storage tank containing a hot water coil, heated from rejected engine cooling water from the primary Tecogen chiller system.

Teaneck High School
Controls System

Building Controls (HVAC Controls)

Building controls consist of standalone, local thermostats, controllers or switches. The valves are pneumatically controlled by an Automated Logic System. The boiler is controlled by the Building Management System.

Teaneck High School typical set points are:

Time Period	Heating Season	Cooling Season
Occupied Hours	**68-72°F**	**72-76°F**
Unoccupied Hours	**55°F**	**80°F**

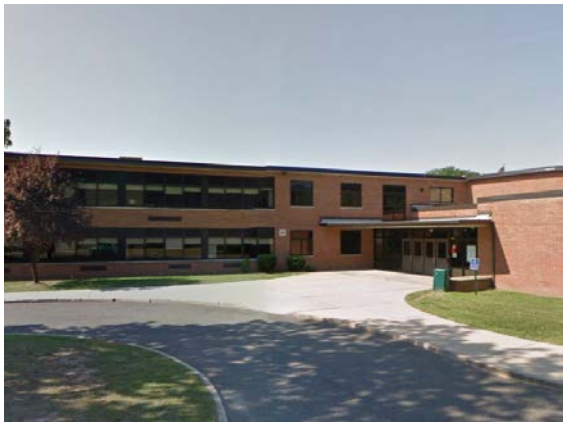
Kitchen Equipment

The kitchen utilizes both electric and gas cooking equipment. Various types of refrigeration equipment are present including walk-in coolers and a walk-in freezer. Standard refrigerators and ice machines are also present.

Plug Load

The classrooms throughout Teaneck Board of Education contain computers, printers, TV's and overhead projectors. Many schools have computer centers and library's which contain 20 or more computers in each. Most schools also have office areas that contain copiers, microwaves, refrigerators, vending machines and coffee makers.

Thomas Jefferson Middle School



Background Information

Thomas Jefferson Middle School is located at 655 Teaneck Road in Teaneck, New Jersey. This 105,216 ft^2 facility was originally built in 1927 and is in fair condition.

Building Occupancy

Approximate enrollment is 2000 students with 180 full-time staff. Full occupancy of the building is through the months of September to June. Partial occupancy occurs during the summer months.

Hours of Operation

- Monday through Friday 6:00 am to 5:00 pm (students/staff)
- A second janitorial staff is present until 12 AM Monday through Friday
- Weekend hours are varied

Envelope

The building is a single structure constructed of composite walls with a brick façade. The building has flat roofs built up from tar with granular finish. The building windows are mostly double-paned, while the building exterior doors are FRP.

Lighting

The building is primarily lit by linear fluorescent fixtures which include T8 lamps with electronic ballast. Fixtures throughout the building include individual fixtures with incandescent lamps, high bay fixtures, metal-halide fixtures and compact fluorescent plug in lamps. Replacing the fixtures with LED technology would be a great opportunity for energy savings.

Lighting Controls: The interior light fixtures are manually controlled via wall switches or sensor mounted switches. The exterior light fixtures are controlled by mechanical time clocks and wall switches.

Mechanical Systems

HVAC Systems and Equipment: The entire building is heated by three (3) gas-fired condensing hot-water boilers. All boilers are located in the buildings' boiler room. Hot water generated by the boilers is circulated to the classrooms' fan coil unit ventilators by constant-speed pumps. Air Handling units located throughout the building provide heating and cooling throughout the building zones. These air handling units have DX cooling coils and hot-water heating coils. Heating for the corridor beside the boiler room and kitchen is provided by unit heaters,

Air conditioning throughout the building is provided by a ductless spit system and through the wall air conditioning units.

Ventilation throughout the original building is provided by unit ventilators in the classrooms, lounges and office areas.

Domestic Hot Water Systems

The building is supplied domestic hot water by one (1) gas-fired water heater rated for 199 MBH. This domestic hot water heater is located in the building's boiler room.

Building Controls (HVAC Controls)

The building's equipment is controlled by self-contained local thermostats, controllers or switches. The building's rooftop units are controlled by a building management system. The normal temperature set points for Thomas Jefferson Middle School are as follows:

The typical temperature set points are as follows:

Time Period	Heating Season	Cooling Season
Occupied Hours	**68-72°F**	**72-76°F**
Unoccupied Hours	**55°F**	**80°F**

Kitchen Equipment

The kitchen utilizes both electric and gas cooking equipment. Various types of refrigeration equipment are present including walk-in coolers. Standard refrigerators and ice machines are also present.

Thomas Jefferson Middle School Kitchen

Plug Load

The classrooms throughout Teaneck Board of Education contain computers, printers, TV's and overhead projectors. Many schools have computer centers and library's which contain 20 or more computers in each. Most schools also have office areas that contain copiers, microwaves, refrigerators, vending machines and coffee makers.

Whitter Elementary School

Background Information

Whitter Elementary School is located on 491 West Englewood Avenue in Teaneck, New Jersey. This 55,158 ft^2 facility was originally built in 1921 and is in fair condition.

Building Occupancy

Approximate enrollment is 402 students with 55 faculty and staff members. The school is occupied in the summer by administrative personnel only.

Hours of Operation

- Monday through Friday 6:00 am to 4:00 pm (students/staff)
- Saturday and Sunday – Closed

Envelope

The building is constructed of composite walls with a brick façade. The building façade is in good condition. The roof consists of hot tar built up with white granular finish. Pitched sections of the roof contain asphalt shingles. Windows throughout the building are double-paned. The exterior doors are high efficiency FRP doors.

Lighting

The building is primarily lit by linear fluorescent fixtures which contain T8 lamps with electronic ballast. Replacing the fixtures with LED technology would be a great opportunity for energy savings.

Lighting Controls: The interior lighting is controlled manually by wall switches.

Mechanical Systems

HVAC Systems and Equipment: The building is heated by two (2) gas-fired boilers. Steam that is provided by the boilers is fed through a heat exchanger to produce hot water for space heating. This heating hot water is provided to the building unit ventilators or two-pipe steam radiator units in each classroom.

Ductless split system and through the wall air conditioning units provide cooling for the cafeteria, elevator, administrative offices, and computer rooms.

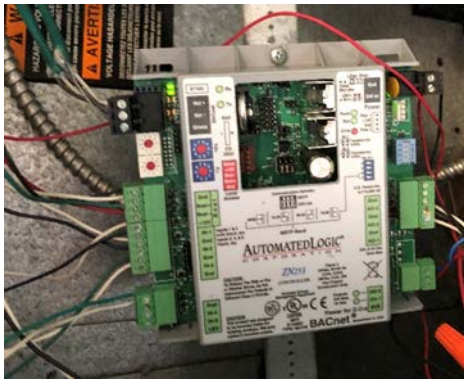
Domestic Hot Water Systems

The building is supplied domestic hot water by two (2) hot water heaters. One 50-gallon water heater is gas-fired, the other is an 80-gallon electric water heater.

Whitter Elementary School
Hot Water Heater

Building Controls (HVAC Controls)

Whittier Elementary has all systems on the BMS control. Additionally, all UVs are tied to a thermostat and a CO2 monitor for each designated area.



Whitter Elementary School Building Controls

The typical temperature set points are as follows:

Time Period	Heating Season	Cooling Season
Occupied Hours	**68-72°F**	**72-76°F**
Unoccupied Hours	**55°F**	**80°F**

Kitchen Equipment

The kitchen utilizes both electric and gas cooking equipment. Various refrigeration and ice machines are also present.

Plug Load

The classrooms throughout Teaneck Board of Education contain computers, printers, TV's and overhead projectors. Many schools have computer centers and library's which contain 20 or more computers in each. Most schools also have office areas that contain copiers, microwaves, refrigerators, vending machines and coffee makers.

Utility Baseline Analysis

Electric

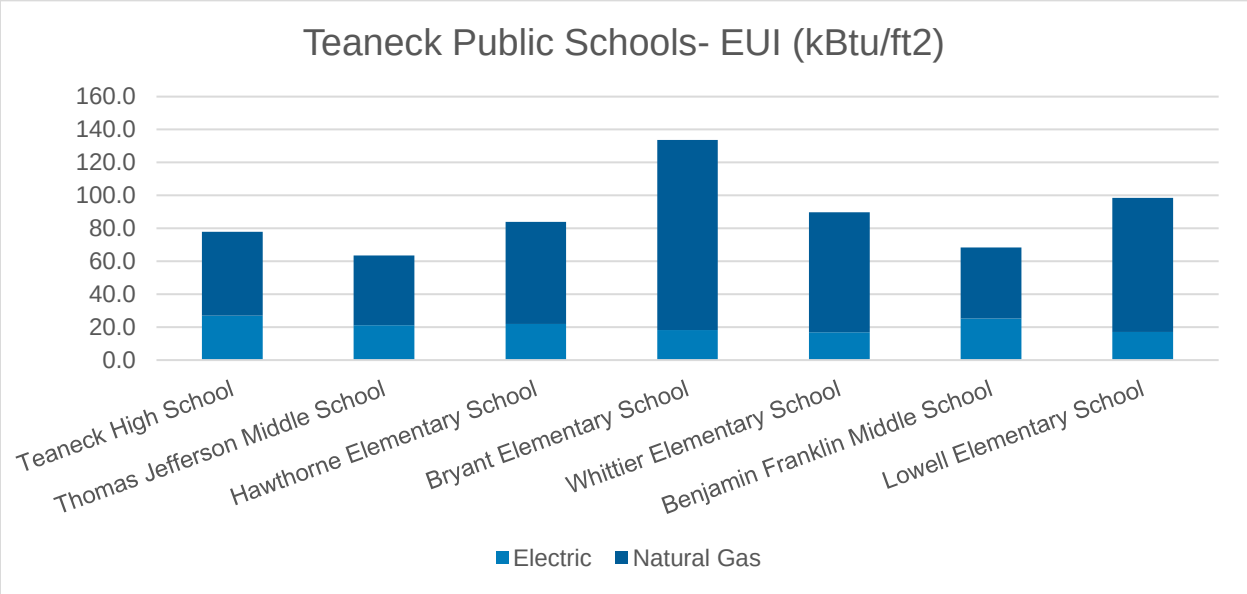
The electric commodity suppler of electricity for the beginning of the baseline period is Direct Energy, LLC (DE). The transport company is PSE&G. One kWh usage is equivalent to 1000 watts running for one hour.

Natural Gas

The gas commodity suppler of electricity for the beginning of the baseline period is Direct Energy, LLC. The transport company is PSE&G. The gas utility PSE&G measures consumption in cubic feet x 100 (CCF) and converts the quantity into therms of energy. The district buildings fall under the General Service (GSG) or Large Volume Service (LVG) Rate structure for natural gas.

Energy Usage Summary

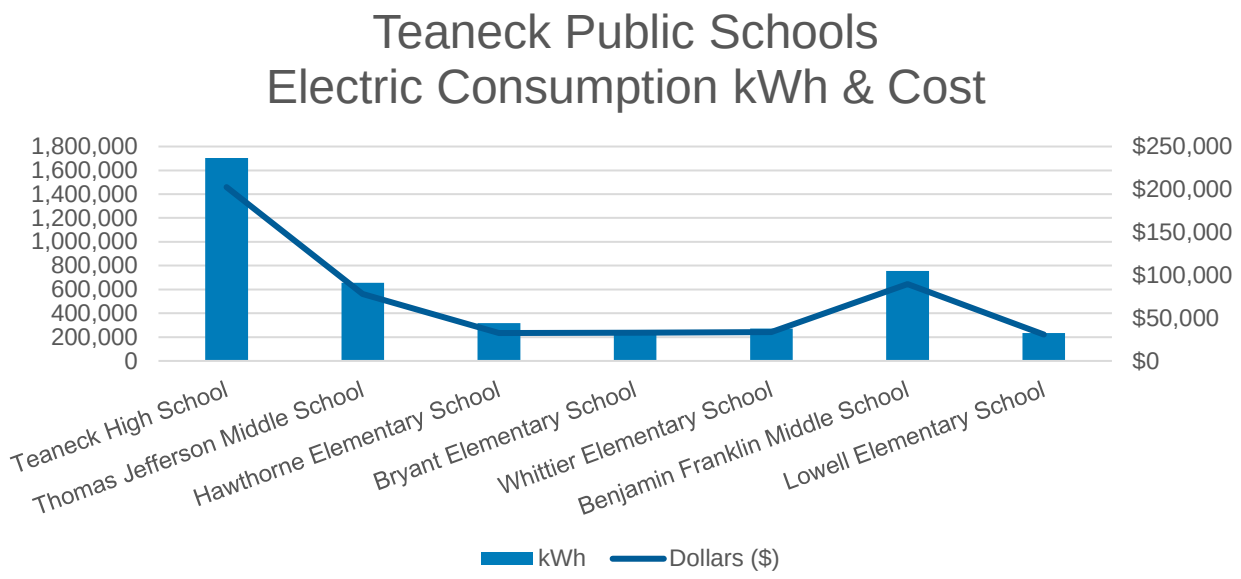
Teaneck Public Schools Energy Summary Analysis Table



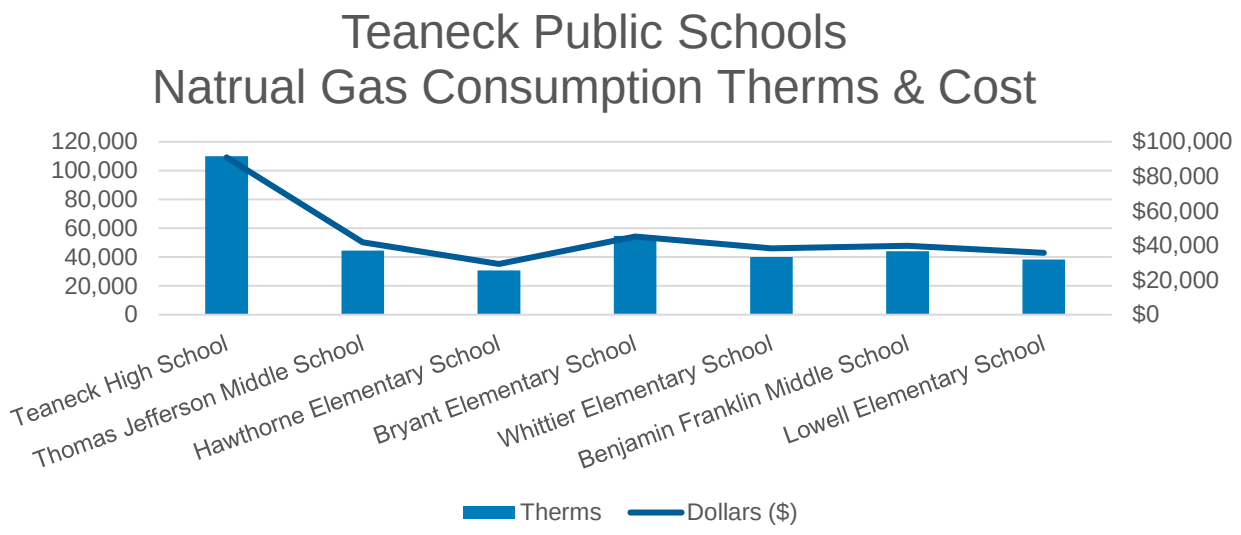
Teaneck Public Schools Energy Use Index (EUI) Analysis

The chart below shows the distribution of these two energy source costs relative to the entire District energy consumption. At 70% of the total consumption, electricity comprises a larger share of the energy costs.

Teaneck Public Schools Utility Cost Breakdown Electric



Teaneck Public Schools Utility Cost Breakdown Gas



Marginal Rates

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

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

Electric

The effective supply kWh rate is the most recent in the baseline period. The effective transport $/kWh and $/kW demand rates are based on the most recent utility tariff rates as of 0612/17. The total effective $/kWh rate is the summation of the supply and transport effective rates. For simplification an Average Effective $/kWh rate was determined by averaging the summer and annual effective $/kWh rates and is used for calculations. Summer rate is considered months June through September. The total summer billed demand rate is the annual demand rate plus the summer demand rate. Rates shown include New Jersey Sales and Use Tax (SUT). A simplified weighted average $/kW demand is used as the effective rate for savings calculations. It was calculated by taking the summation of the annual $/kW demand times 8/12 plus the total summer $/kW demand times 4/12.

Natural Gas

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

Building	$/therm
Benjamin Franklin Middle School	$0.867
Bryant Elementary School	$0.798
Hawthorne Elementary School	$0.908
Lowell Elementary School	$0.893
Teaneck High School	$0.813
Thomas Jefferson Middle School	$0.909
Whittier Elementary School	$0.917
Benjamin Franklin Middle School	$0.867

Building Name	Rate	Meter #	Electric Transport Account #	Effective Rate (Note 2) Supply Effective $/kWh	Delivery Effective $/kWh	Combine Eff $/kWh	Solar Effective $/kWh	EFFECTIVE RATE (Note 2) TOTAL Eff $/kW	Eff $/kWH	Solar $ Cost Electric $	Solar Production Electric (Note 3) kWh	Total IN Electric kWh	Total OUT Electric kWh	NET Usage Electric kWh	Total kWh Baseline (Note 4) kWh	Annual Demand Billed (Note 5) kW	Peak Demand Billed (Note 5) kW	Demand Cost Cost $	Supply Cost Cost $	Delivery Cost Cost $	TOTAL Electric Cost Cost $	Blended Avg Unit Cost ($ / Unit) (Note 6)	Base Year
Teaneck High	LPLS	9205642	42 003 120 18	$0.0784	$0.01270	$0.0911	$0.09857	**$6.72**	**$0.11899**	$10,618	109,049	-	-	1,595,094	**1,704,143**	4,826.8	430.9	$ 30,797	$ 142,102	$ 49,925	$ 192,026	$ 0.120	Jul-18 - Jun-19
Teaneck High Athletic Field	GLP	9207652	65 806 170 04	Note 10	$0.01702	Note 10	$0.09857	**$7.21**	**$0.09857**	Note 10	Note 10	18,264	79,112	-60,848	**Note 10**	Note 10	141.0	$ 5,000	$ 10	$ 5,100	Note 10	Note 10	Jul-18 - Jun-19
Eugene Field Administration	GLP BPL	9209244	66 421 219 02	$0.0784	$0.01702	$0.0954	$0.09857	**$7.21**	**$0.11171**	$5,214	53,551	201,403	4,421	196,982	**250,533**	629.7	73.9	$ 4,596	$ 14,803	$ 7,905	$ 22,709	$ 0.115	Jul-18 - Jun-19
Thomas Jefferson Middle	LPLS	9209230	42 003 988 18	$0.0784	$0.01270	$0.0911	$0.09857	**$6.72**	**$0.11914**	$9,750	100,134	559,642	4,968	554,674	**654,808**	2,017.1	205.9	$ 12,912	$ 45,735	$ 22,409	$ 68,144	$ 0.123	Jul-18 - Jun-19
Hawthorne Elementary	GLP BPL	9210816	67 562 643 03	$0.0784	$0.01702	$0.0954	$0.09857	**$7.21**	**$0.10356**	$16,014	164,464	202,950	51,053	151,897	**316,361**	932.0	96.2	$ 6,302	$ 14,075	$ 2,476	$ 16,551	$ 0.109	Jul-18 - Jun-19
Bryant Elementary	GLP	9210817	65 828 671 05	$0.0784	$0.01702	$0.0954	$0.09857	**$7.21**	**$0.13102**	$21,670	222,549	149,769	118,569	31,757	**254,306**	819.5	94.5	$ 5,612	$ 5,218	$ 6,166	$ 11,384	$ 0.358	Jul-18 - Jun-19
Whittier Elementary	GLP	9210154	66 128 016 03	$0.0784	$0.01702	$0.0954	$0.09857	**$7.21**	**$0.12279**	$0	-	-	-	272,800	**272,800**	666.0	106.0	$ 5,020	$ 24,645	$ 8,851	$ 33,496	$ 0.123	Jul-18 - Jun-19
Benjamin Franklin Middle	LPLS	9209245	42 008 678 18	$0.0784	$0.01270	$0.0911	$0.09857	**$6.72**	**$0.11910**	$29,290	300,807	532,766	76,917	455,849	**756,656**	2,349.9	233.3	$ 13,130	$ 37,371	$ 23,096	$ 60,467	$ 0.133	Jul-18 - Jun-19
Lowell Elementary	GLP	9210145	65 900 523 01	$0.0784	$0.01702	$0.0954	$0.09857	**$7.21**	**$0.13074**	$0	-	-	-	235,390	**235,390**	1,170.6	190.5	$ 7,635	$ 19,266	$ 11,508	$ 30,774	$ 0.131	Jul-18 - Jun-19

Note 1: The electric commodity suppler of electricity for the beginning of the baseline period is Direct Energy, LLC (DE) and was then switched to East Coast Power & Gas (ECP&G) New Jersey, LLC . For the purpose of calculations ECP&G is the most recent supply company in the baseline period and is considered the supply company for the baseline rates. The transport company is PSE&G. Teaneck High School Athletic Field uses PSE&G as the supplier under the Basic Generation Service (BGS) rate.
Note 2: The effective transport $/kWh and $/kW demand rates are based on the PSE&G tariff rates effective 6/1/2019. The total effective $/kWh rate is the summation of the supply and transport effective rates. Summer rate is considered months June through September. A simplified weighed average delivery/transport $/kW demand rate is used in determining the Total Effective rate for savings calculations. The $/kW demand rate was calculated by taking the summation of the non-summer $/kW rate times 12/12 plus the Summer $/kW rate times 4/12. A simplified weighted average delivery/transport $/kWh rate to account for summer and winter rate differences was calculated in a similar manor by taking the summation of the non-summer $/kWh rate times 8/12 plus the Summer $/kW rate times 4/12. The Solar supply rate is based on the most recent solar rates in the baseline. The total effective $/kWh rate is a ratio of the solar $/kWh and utility $/kWh Blended Avg Unit Cost rates ratioed by the kWh contribution.
Note 3: Solar kWh production data was only provided for 11 months and over a different time frame from the baseline. The solar data provided coved 12/1/2018 to 9/30/2019. To establish 12 months of solar production the 11 months of solar kWh production was multiplied by a factor of (12/11). Solar costs for the baseline were estimated assuming the following: Solar Costs = 0.5*kWh*$0.9617 + 0.5*kWh*$0.9857 = $0.0974/kWh (this assumes 6 months at each of the two rates)
Note 4: Total kWh baseline is the summation of the Net Utility Meter kWh usage plus the Solar Production. The solar panels were assumed to be on the building side of the utility electric meter.
Note 5: Annual Billed Demand is the sum of the billed demand of all billing periods during the baseline. Average billed demand is the average of the billed demand of all billing periods during the baseline. Peak Demand Billed is the highest billed demand that occurred during the baseline period.
Note 6: The average blended unit cost is the total 12 month utility costs divided by the total 12 month billed kWhs.
Note 7: In some instances Supply cost data was missing especially in the months of August through Oct 2018, the supply costs for these months were estimated as needed using the kWh usage multiplied by the closest available / adjoining month supply cost rates.
Note 8: Two months of demand costs were estimated for Whittier ES.
Note 9: Multiple billing errors and rebilling occurred for Lowell Elementary. Missing data was estimated using adjoining months.
Note 10: Teaneck High School Athletic Field full 12 months of billing data for the baseline period was not provided however 6 months from June 2018 to Dec 2018 showed it was a net producer of electricity and the only major utility non-fixed cost in that time are associated with demand charges. The demand charges for 7 months = $4,623, and estimated 12 month charge was set to $5000 with total delivery charges set to $5100. The kWh in, out, and net were estimated by multiplying the 6 months of available data by 12/6 to estimated the annual numbers. No solar billing data was provided for Teaneck High School Athletic Field which prevents determine / estimating building kWh usage from the utility data. The peak and average demand shown are based on the 6 months of available data.
Note 11: Hawthorne Elementary unmetered BPL lighting usage and costs are not included in data. BPL unmetered rate is show for information purposes.

Building Name	Rate	Account #	Meter #	Total Effective Rate (Note 2)	Baseline Consumption	Transport Cost	Supply Cost	TOTAL COST	Blended Avg Unit Cost ($ / Unit)	Base Year
				$/therm	therms	$	$	$		
Teaneck High School	LVG	66 793 594 06	3128206	**$0.813**	**110,033**	$ 28,941	$ 62,061	$ 91,001	$ 0.83	Jul-18 - Jun-19
Teaneck High School (SMALL GAS)	GSG (HTG)	42 003 120 18	3166301	**$0.892**	**1,912**	$ 825	$ 1,049	$ 1,873	$ 0.98	Jul-18 - Jun-19
Eugene Field Administration Building	GSG (HTG)	66 421 219 02	3740309	**$0.949**	**13,400**	$ 5,091	$ 7,796	$ 12,886	$ 0.96	Jul-18 - Jun-19
Thomas Jefferson Middle School	LVG	42 003 988 18	3637636	**$0.909**	**44,534**	$ 15,069	$ 26,892	$ 41,961	$ 0.94	Jul-18 - Jun-19
Hawthorne Elementary School	LVG	67 562 643 03	2415218	**$0.908**	**30,685**	$ 10,801	$ 18,543	$ 29,344	$ 0.96	Jul-18 - Jun-19
Bryant Elementary School	LVG	65 828 671 05	3227881	**$0.798**	**54,724**	$ 17,043	$ 28,102	$ 45,145	$ 0.82	Jul-18 - Jun-19
Whittier Elementary School	LVG	65 182 085 03	3765336	**$0.917**	**40,145**	$ 14,366	$ 23,942	$ 38,309	$ 0.95	Jul-18 - Jun-19
Benjamin Franklin Middle School	LVG	42 008 678 18	2806915	**$0.867**	**44,141**	$ 14,138	$ 25,645	$ 39,784	$ 0.90	Jul-18 - Jun-19
Lowell Elementary School (Note 4)	LVG	65 900 523 01	3010316	**$0.893**	**38,369**	$ 13,656	$ 22,085	$ 35,741	$ 0.93	Jul-18 - Jun-19

Note 1: The gas commodity suppler of electricity for the beginning of the baseline period is Direct Energy, LLC and was then switched to East Coast Power & Gas (ECP&G) New Jersey, LLC . If no 3rd party supplier is used the suppler defaults to the transport company is PSE&G.
Note 2: For simplification of the rates, the effective rate is the total cost minus $168.44 or $1495.23 or the fixed service charge for the GSL and LVG rates during the baseline period. This is considered the overall effective rate for savings calculations which integrates the demand and balancing charge into a single blended rate while subtracting out the fixed service charges. The fixed charges are based on the fixed charges for the baseline period for THS (GSG) and Bryant (LVG) from the billing data.
Note 3: The Blended Average Unit Cost is the total costs divided by the total usage.
Note 4: Lowell ES Natural Gas showed zero usage since 2016 until the utility changed the meter. It appears the meter was not functioning. A baseline was calculated to approximate what that utility baseline usage and costs would have been if the meter was working. The therms of usage was estimated based on heating degree days and having a 81 KBtu/SF energy index for the thermal usage. The average thermal index of 71 KBtu/SF is the average of all the other thermal indexes. Costs were estimated based on the average Transport Costs of $0.356/therm and Supply Costs of $0.576 multiplied by the estimated usage. The CDM Energy Audit report from May 28th 2010 showed 435 therms of natural gas and 27,018 gallons of fuel oil usage in 2008/2009 time frame which equates to a total of 37,981 therms combined fuel oil and natural gas indicating the estimated baseline 38,369 therms as accurate.
Note 7: In some instances data was missing, values were calculated based on utility billing meter readings or estimated by the closest available / adjoining months data.

Utility Breakdown by Building

Electric Usage and Demand

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

Natural Gas Usage

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

Utility Escalation Rates

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

School	Energy					
	Electric Consumption		**Annual Electric Demand**		**Natural Gas**	
	Escalation Rate	Start Year of Escalation	Escalation Rate	Start Year of Escalation	Escalation Rate	Start Year of Escalation
Benjamin Franklin Middle School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Bryant Elementary School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Hawthorne Elementary School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Lowell Elementary School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Teaneck High School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Thomas Jefferson Middle School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1
Whitter Elementary School	2.2%	Year 1	2.2%	Year 1	2.4%	Year 1

SECTION 3. FINANCIAL IMPACT

Energy Savings and Cost Summary

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

ECM #	ECM	Year 1 Savings ($/Yr)	ECM Cost	Simple Payback	Installation Plan	Recommend Installation
1	Comprehensive LED Lighting Upgrades - Teaneck HS	$53,668	$357,574	6.7	Public Bidding	Yes
2	Install VFD's and Premium Motor Upgrades for HVAC	$ 4,609	$ 33,685	7.3	Public Bidding	Yes
3	Direct Install Program (Lighting)	$ 74,283	$ 696,698	9.4	DI Installer	Yes
4	Plug Load Controls	$ 4,994	$ 44,952	9.0	Public Bidding	Yes
5	Combined Heat and Power (35kW)	$ 14,122*	$ 335,500	23.8	Public Bidding	Yes
6	Computer Power Management Software	$ 15,401	$ 30,875	2.0	Public Bidding	Yes
7	Refrigeration Controls	$ 4,096	$ 42,684	10.4	Public Bidding	Yes
8	Fuel Use Economizers (Hot Water Boilers)	$ 5,513	$ 39,270	7.1	Public Bidding	Yes
9	Direct Install Program Fuel Use Economizers (Steam Boilers)	$ 9,979	$ 4,916	0.5	DI Installer	Yes
10	Direct Install Program Low-flow Domestic Hot Water Devices	$ 790	$ 597	0.8	DI Installer	Yes
11	Replace Rooftop Cooling Unit at Whittier Elementary School	$ 1,126	$ 134,922	119.8	Public Bidding	Yes
12	Replace Cooling in Media Center – Benjamin Franklin Middle School	$ 1,016	$ 70,018	68.9	Public Bidding	Yes
13	Replace Cooling in Media Center – Lowell Elementary School	$ 96	$ 34,312	355.7	DI Installer	Yes
14	Condensing Hot Water Boiler Plant (Teaneck High School - Fan Room Upgrades)	$ 10,493	$ 1,037,479	98.9	Co-op Mechanical Installer	Yes
15	Condensing Hot Water Boiler Plant (Teaneck High School – Hot Water Header Pipe)	$ 0	$ 284,900	100+	Co-op Mechanical Installer	Yes
16	Replace Steam Traps	$ 13,070	$ 198,580	15.2	Public Bidding	Yes
17	Replace Domestic Hot Water Storage Tank at Benjamin Franklin Middle School	$ 370	$ 50,070	135.2	Public Bidding	Yes
18	Refurbish Cooling Tower	$ 1,599	$ 22,638	14.2	Public Bidding	Yes

ECM #	ECM	Year 1 Savings ($/Yr)	ECM Cost	Simple Payback	Installation Plan	Recommend Installation
19	Upgrade Building Management System	$ 22,529	$ 413,584	18.4	Co-op Controls Installer	Yes
20	Operational Verification and HVAC Improvements	$ 38,938	$ 163,130	4.2	Co-op Controls Installer	Yes
21	Building Envelope Weatherization	$ 21,429	$ 257,632	12.0	Public Bidding	Yes
22	Repair Missing Piping Insulation	$ 7,484	$ 113,334	15.1	Public Bidding	Yes
23	Construction Contingency	$ 0.0	$ 542,500	100+	Public Bidding	Yes
24	Unit Ventilator Refurbishment at Teaneck High School – First Floor	$ 1,744	$ 132,000	75.7	Public Bidding	Yes
25	Unit Ventilator Replacement at Teaneck High School – Second Floor	$ 1,581	$ 438,625	277.5	Public Bidding	Yes
26	Unit Ventilator Replacement at Teaneck High School – Third Floor	$ 2,453	$ 680,625	277.5	Public Bidding	Yes

*Savings from Combined Heat and Power is Energy Savings & Distributed Generation (Capacity & Generation: $20,093; Energy: ($5,971)

Operational Savings Estimates

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

A brief description of the operational savings estimated for this project is included below. Energy Systems Group has worked with the District to quantify the exact sources of savings by going through past invoices and expenses. The operational savings will not be escalated.

Operational Savings for Financial Model	
ECM Description	**Annual Savings**
LED Lighting Upgrades	$26,130
Reduction in replacement parts and maintenance expenses – District Wide	$59,474
Totals	**$85,604**

Potential Revenue Generation Estimates

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

- NJ Smart Start Equipment Incentives
- Combined Heat and Power Incentive
- Demand Response Energy Efficiency Credit

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

NJ Smart Start Equipment Incentives

The NJ Smart Start Equipment Incentives provide prescriptive rebates for defined retrofits. Incentives are applied on a unit-by-unit basis for making energy efficiency upgrades. The table below summarizes the equipment incentives, which will be applied for at Teaneck Public Schools:

Energy Conservation Measure	Estimated Incentive
LED Lighting Upgrades & Occupancy Sensors – Benjamin Franklin Middle School	$61,605.60
LED Lighting Upgrades & Occupancy Sensors – Hawthorne Elementary School	$96,013.98
LED Lighting Upgrades & Occupancy Sensors – Lowell Elementary School	$78,633.43
LED Lighting Upgrades & Occupancy Sensors – Teaneck High School	$62,675.30
LED Lighting Upgrades & Occupancy Sensors – Thomas Jefferson Elementary School	$49,968.10
LED Lighting Upgrades & Occupancy Sensors – Whitter Elementary School	$110,828.02
Totals	$459,724.43

Cogeneration Incentives

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

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

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

Building	Estimated Incentive #1	Estimated Incentive #2	Estimated Incentive #3	Estimated Total
Cogeneration – Teaneck High School	$19,530	$32,550	$13,020	$65,100
Totals	**$19,530**	**$32,550**	**$13,020**	**$65,100**

Demand Response Energy Efficiency Credit

The LED Lighting Upgrades recommended for the District will be eligible for the Energy Efficiency Credit available through PJM. The Energy Efficiency Credit pays consumers based on the permanent load reduction through the installation of energy efficiency measures. The following table summarizes the available Demand Response Incentives available due to the lighting upgrades at all buildings at the Teaneck Public Schools.

Demand Response Energy – Emergency Capacity Credit		
PJM Payment Year	**Approved Load (kW)**	**Annual Customer Capacity Benefit**
2020/2021	312.5 kW	$5,684
2021/2022	312.5 kW	$3,573
2022/2023	312.5 kW	$3,573
2023/2024	312.5 kW	$3,573
Totals	**312.5 kW**	**$16,403**

Business Case for Recommended Project

FORM VI - ENERGY SAVINGS PLAN

ESCO's PRELIMINARY ENERGY SAVINGS PLAN (ESP):
ESCO's PRELIMINARY ANNUAL CASH FLOW ANALYSIS FORM
Teaneck Public Schools Energy Savings Improvement Plan
ENERGY SAVINGS IMPROVEMENT PROGRAM

ESCO Name: ENERGY SYSTEMS GROUP **Project Scenario 1**

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

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

1. Term of Agreement: 19 years
2. Construction period[2] (months): 12
3. Cash Flow Analysis Format:

Total Financed Amount[(4)] $ 7,976,791
Design/Consultant Fee $ 416,666
Bond Council/FA $ 35,000
Total ESG Project Cost [(1)] $ 7,525,125

Interest Rate to be used for Proposal Purposes: **2.30%**

	Annual Energy Savings	Annual Operational Savings	Energy Rebates/ Incentives	Solar PPA	Total Annual Savings	Annual Project Costs	Board Costs	Annual Service Costs	Net Cash-Flow to client	Cumulative Cash Flow
Installation[(3)]	$ 92,070	$ -	$ -	$ -	$ 92,070	$ -	$ -	$ -	$ 92,070	$ 92,070
1	$ 417,071	$ 85,604	$ 87,122	$ 111,347	$ 701,145	$ 671,220	$ 698,945	$ 27,725	$ 2,200	$ 94,270
2	$ 332,334	$ 85,604	$ 36,123	$ 113,797	$ 567,857	$ 565,657	$ 565,657	$ -	$ 2,200	$ 96,470
3	$ 339,832	$ 26,130	$ 16,593	$ 116,300	$ 498,855	$ 496,655	$ 496,655	$ -	$ 2,200	$ 98,670
4	$ 347,499	$ 26,130	$ 3,573	$ 118,859	$ 496,061	$ 493,861	$ 493,861	$ -	$ 2,200	$ 100,870
5	$ 355,340	$ 26,130	$ -	$ 121,474	$ 502,943	$ 500,743	$ 500,743	$ -	$ 2,200	$ 103,070
6	$ 363,357	$ -	$ -	$ 124,146	$ 487,504	$ 485,304	$ 485,304	$ -	$ 2,200	$ 105,270
7	$ 371,556	$ -	$ -	$ 126,878	$ 498,434	$ 496,234	$ 496,234	$ -	$ 2,200	$ 107,470
8	$ 379,941	$ -	$ -	$ 129,669	$ 509,610	$ 507,410	$ 507,410	$ -	$ 2,200	$ 109,670
9	$ 388,515	$ -	$ -	$ 132,522	$ 521,036	$ 518,836	$ 518,836	$ -	$ 2,200	$ 111,870
10	$ 397,282	$ -	$ -	$ 135,437	$ 532,719	$ 530,519	$ 530,519	$ -	$ 2,200	$ 114,070
11	$ 406,248	$ -	$ -	$ 138,417	$ 544,665	$ 542,465	$ 542,465	$ -	$ 2,200	$ 116,270
12	$ 415,416	$ -	$ -	$ 141,462	$ 556,878	$ 554,678	$ 554,678	$ -	$ 2,200	$ 118,470
13	$ 424,792	$ -	$ -	$ 144,574	$ 569,366	$ 567,166	$ 567,166	$ -	$ 2,200	$ 120,670
14	$ 434,380	$ -	$ -	$ 147,755	$ 582,134	$ 579,934	$ 579,934	$ -	$ 2,200	$ 122,870
15	$ 444,184	$ -	$ -	$ 151,005	$ 595,189	$ 592,989	$ 592,989	$ -	$ 2,200	$ 125,070
16	$ 454,210	$ -	$ -	$ -	$ 454,210	$ 452,010	$ 452,010	$ -	$ 2,200	$ 127,270
17	$ 464,463	$ -	$ -	$ -	$ 464,463	$ 462,263	$ 462,263	$ -	$ 2,200	$ 129,470
18	$ 474,947	$ -	$ -	$ -	$ 474,947	$ 472,747	$ 472,747	$ -	$ 2,200	$ 131,670
19	$ 485,669	$ -	$ -	$ -	$ 485,669	$ 388,363	$ 388,363	$ -	$ 97,306	$ 228,976
20	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -	$ -
Totals	**$ 7,697,035**	**$ 249,598**	**$ 143,412**	**$ 1,953,641**	**$ 10,043,685**	**$ 9,879,054**	**$ 9,906,779**	**$ 27,725**	**$ 136,906**	**$ -**

NOTES:

1 Includes: Hard costs and project service fees defined in ESCO's PROPOSED 'FORM V"
2 No payments are made by the Board during the construction period.
3 Installation period savings for Energy Savings and Operational Savings are guaranteed. These savings will be used in addition to the first loan payment.
4 Total Financed Cost includes all Fees and project costs.
5 Interest rate is indicative rate only. Final rate will vary with market conditions at time of closing.
6 ESG is an energy services and engineering company, not a financial advisor.
7 ESG is not a financial advisor and the presented cash flow proforma is for information only
8 The cash flow shown is for illustration purposes, and is not intended as financial advice.
9 Loan repayment includes interest accumulation in the construction period
10 Loan repayment assumes that the 1st repayment starts immediately after construction
11 The annual energy 2.26% and labor .% escalation are in accordance with the RFP
12 The utility incentive amount shown is typical expected and is not indicative of the actual amount as project timing, changes to utility program and availability of funds affect the outcome
13 The 3rd party M&V fee (0 .45% of the annual energy savings) is per the RFP

Incentive Breakout for Recommended Project

Year	DR EE Credit	NJ Clean Energy Rebates	CHP	Total
1	$ 5,684	$61,908	$ 19,530	$ 87,122
2	$ 3,573	$0	$ 32,550	$ 36,123
3	$ 3,573	$0	$ 13,020	$ 16,593
4	$ 3,573	$0	$0	$ 3,573
TOTAL	**$ 16,403**	**$ 61,908**	**$ 65,100**	**$ 143,412**

Greenhouse Gas Reductions

Avoided Emissions	Total Electric Savings	Total Natural Gas Savings	Total Annual Avoided Emissions
Annual Unit Savings	kWh	Therms	
NO_X	1,698 lbs	924 lbs	2,808 lbs
SO_2	1,664 lbs	0 lbs	1,664 lbs
CO_2	2,332,796 Lbs	1,174,456 lbs	3,507,254 lbs

Factors Used in Calculations:

CO_2 Electric Emissions:	1,374 lbs. per MWh saved
CO_2 Gas Emissions:	11.7 lbs. per therm saved
NO_X Electric Emissions:	1.11 lbs. per MWh saved
NO_X Gas Emissions:	0.0092 lbs. per therm saved
SO_2 Electric Emissions:	0.98 lbs. per MWh saved

SECTION 4. ENERGY CONSERVATION MEASURES

1-1 Comprehensive LED Lighting Upgrades

ECM Summary

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

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

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

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

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

Lighting Controls: Lighting controls are effective in areas where lighting is left on unnecessarily, mainly because it is a common area or due to the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed.

Occupancy sensors detect motion and will switch the lights on when the room is occupied. No Occupancy/Vacancy sensors were included in this project, due to poor economics.

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work

Because the Teaneck High School does not qualify for Direct Install Program incentives, Energy Systems Group recommends retrofitting the lighting system with new LED technology lamps. The retrofit process includes the removal of existing components of fluorescent technology including lamps, ballast(s), and tombstones. If the lens of the existing fixture is cracked or discolored, ESG will recommend replacement of this component as well. ESG recommends replacing the fluorescent technology components with new LED technology components - Direct wired Type – B LED T8 Tube and tombstone replacement.

There was no recommendation for upgrade to the metal halide and quartz downlights in the Auditorium space. Unfortunately, no cost effective options are available that will work with the existing dimming system. In order to replace these lights with an energy saving lower wattage technology, the existing dimming system will need to be replaced with a compatible dimming system. This option is not a cost effective solution for the project.

Any classrooms with bi-level switching will be converted to a checkerboard pattern, rather than two levels within each fixture.

Any existing LED fixtures will remain and not be replaced.

Energy Systems Group included (54) Fifty Four "1200 Lumen Constant Wattage Emergency Back-up LED Strip" in existing egress fixtures to provide illumination during a power loss.

Refer to Line by Line inventory included in the appendix for comprehensive fixture list.

Savings Methodology

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

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

Maintenance

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

Benefits

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

1-2 Direct Install Program (Lighting)

ECM Summary

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

Facilities Available for Direct Install

- Benjamin Franklin Middle School
- Bryant Elementary School
- Thomas Jefferson Middle School
- Lowell Elementary School
- Hawthorne Elementary School

Scope of Work

- ESG will work closely with one of the program partners to evaluate the Direct Install Program
- The systems and equipment addressed by the program are
    - Lighting
    - Fuel use economizers
    - Low flow DHW devices, etc.

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

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

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

Lighting Controls: Lighting controls are effective in areas where lighting is left on unnecessarily, mainly because it is a common area or due to the inconvenience to manually switch lights off when a room is left or on when a room is first occupied. This is common in rooms that are occupied for only short periods and only a few times per day. Lighting controls come in many forms. Sometimes an additional switch is adequate to provide reduced lighting levels when full light output is not needed.

Occupancy sensors detect motion and will switch the lights on when the room is occupied. No Occupancy/Vacancy sensors were included in this project, due to poor economics.

Energy Systems Group recommends replacing the aging lighting system with new High Efficiency LED technology. The majority of fixtures will be replaced with new Flat panel LED technology. In each building there is a minority of specific areas that will require an LED retrofit because of technology or economic constraints.

The following locations have area specific assumptions and exclusions:

Ben Franklin Middle School

- ESG does not recommend an upgrade for the 300w R40 lamps in Auditorium downlights. There are no cost-effective high lumen options that are compatible with the dimming system.
- Bi-Level switching in (3) classrooms will be converted to a checkerboard pattern, rather than two levels within each fixture.
- Existing light levels are very low. A number of classrooms were in the 20-25 fc range.

Thomas Jefferson Middle School

- ESG does not recommend an upgrade for the 250w R40 lamps in Auditorium downlights. There are no cost-effective high lumen options that are compatible with the dimming system.
- Only (10) emergency battery backup ballasted fixtures were recorded in this school. All on second floor restrooms.
- Existing light levels are very low. A number of classrooms were in the 20-25 fc range.

Bryant Elementary School

- ESG recommends new LED Tube retrofits in areas that have Direct/Indirect fixtures such as in restrooms and in display cases.
- Light Levels were recorded on average of 35 – 40 footcandles.

Hawthorne Elementary School

- ESG recommends new LED Tube retrofits in areas such as display cases.
- Bi-Level switching in classrooms will be converted to a checkerboard pattern, rather than two levels within each fixture.
- Light Levels were recorded on average of 35 – 40 footcandles.

Lowell Elementary School

- ESG recommends new LED Tube retrofits in areas that have Direct/Indirect fixtures such as in restrooms and in display cases.
- Bi-Level switching in cafeteria, classrooms and library will be converted to a checkerboard pattern, rather than two levels within each fixture.
- Light Levels were recorded on average of 35 – 40 footcandles.

Whittier Elementary School

- ESG recommends new LED Tube retrofits in areas such as display cases.
- Light Levels were recorded on average of 35 – 40 footcandles.

Through conversation with Teaneck staff the following locations were discussed to have material only left on site. Installation will be the responsibility of Teaneck PS. Taking into consideration a six to eight week lead time, Teaneck will request the material from ESG when ready. ESG will have the materials delivered to Teaneck at the specified location. Materials will consist of the LED Flat panel fixtures only. No wiring, or ancillary electrical components are included.

BENJAMIN FRANKLIN MIDDLE SCHOOL - Material Only Locations					
Floor	Space Type	Room Number	Quantity	Existing Fixture Type	Replacement Fixture Type
First Floor	Classroom	105	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	107	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	108	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	106	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	104	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	202	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	201	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Media Center		21	1x8-4FO28-Fin	New 41w 1x8 LED Low Bay
Second Floor	Storage (Locked)		1	1x8-4FO28-Fin	New 41w 1x8 LED Low Bay
Second Floor	Prep Room		1	1x8-4FO28-Fin	New 41w 1x8 LED Low Bay
Second Floor			1	1x4-2FO28-FIN	New 23w 1x4 LED Low Bay
Second Floor	Instrumental Music	204	15	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Office		2	1x8-4FO28-Fin	New 41w 1x8 LED Low Bay
Third Floor	Classroom	307	8	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Third Floor	Classroom	305	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Third Floor	Classroom	303	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Third Floor	Classroom	301	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel

THOMAS JEFFERSON MIDDLE SCHOOL - Material only locations					
Floor	Space Type	Room Number	Quantity	Existing Fixture Type	Replacement Fixture Type
Second Floor	Classroom	201	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	204	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	206	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	208	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	210	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	212	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	214	8	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Prep Room		3	1x8-4FO28-Fin	New 30w 2x4 LED Flat Panel
Second Floor	Classroom	216	8	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	218	6	1x8-4FO28-Fin	New 30w 2x4 LED Flat Panel
Second Floor			2	1x4-2FO28-FIN	New 30w 2x4 LED Flat Panel
Second Floor	Classroom	215	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	213	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	222	2	1x8-4FO28-Fin	New 30w 2x4 LED Flat Panel
Second Floor			2	1x4-2FO28-FIN	New 30w 2x4 LED Flat Panel
Second Floor	Classroom	211	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor			3	1x8-4FO28-W	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	209	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	207	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	205	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Floor	Space Type	Room Number	Quantity	Existing Fixture Type	Replacement Fixture Type
Second Floor	Classroom	203	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	202	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel

First Floor	Classroom	116A	6	1x8-4FO28-W	New 40w 2x4 LED Flat Panel
First Floor	Classroom	120B	2	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Studio	121	4	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor			2	1x4-2FO28-FIN	New 30w 2x4 LED Flat Panel
First Floor	Classroom	109	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	107	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	105	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	103	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	102	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	101	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	104	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	106	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	108	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	110	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
First Floor	Classroom	111	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	G4	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	G3	6	1x8-4FO28-Fin	New 40w 2x4 LED Flat Panel

Refer to Line by Line inventory included in the appendix for comprehensive fixture list.

Savings Methodology

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

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

Maintenance

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

Benefits

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

1-3 Install VFD's and Premium Motor Upgrades for HVAC

ECM Summary

This measure will replace constant volume pumping systems with a variable flow system through the installation of Variable Frequency Drive(s) (VFD) on electric motor(s) for hot water pumps, where prudent. Constant volume systems are equipped with a differential pressure sensor and bypass valve that diverts water not being used at the terminal units back to the pump inlet. While this enables the system to properly control flow at the units, the central pumps continually operate at full speed/flow. Varying the speed of a motor to match the actual load at the terminal units reduces the pumps electrical motor power (kW), which results in significant electrical energy savings.

Any single speed or two speed inverter-duty pump motor (typically greater than 5 to 10 HP) that has fluctuating loads is a good candidate for a variable speed drive. Heating hot water pumps are ideal candidates for VFD control due to the varying loads on building heating demand and motors which are typically larger than 10 HP.

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work by School

Teaneck High School

Removal & New Installation Work

- Disconnect Qty. (2) 25HP heating hot water system base mounted pumps and motors.
- F&I Qty. (2) new 25HP premium efficiency motors with pumps and new variable frequency drives (VFD's).
- Include new suction diffusers, valves, strainers, and flex connectors for each new base mounted pump.
- Include vibration isolation for (2) new base mounted pumps.
- Install new VFD's on wall and connect line voltage from new VFD's to new motors.
- Tap will need to be installed by MC in heating hot water main pipe with location determined by engineer for pressure differential switch with controls and wiring to be by controls contractor.

Savings Methodology

Motor (kW) =	(Motor Horsepower x 0.746 (kW/HP) x Load Factor) = or = (Motor Amperage x Volts x 1.732 x Power Factor) / 1000
Speed Ratio Correction Factor =	((New RPM)/(Existing RPM)) ^ 3
Existing Energy Use (kWh)=	(Existing kW /Existing Efficiency) x Hours of Use
Existing Demand Use (kW) =	(Existing kW /Existing Efficiency) x Peak Load Months x Utilization factor
New Energy Use (kWh) =	(New kW /New Efficiency) x Hours of Use x Speed Ratio Correction Factor
New Demand Use (kW) =	(New kW /New Efficiency) x Peak Load Months x Utilization factor x Speed Ratio Correction Factor
Total Savings (kWh, kW) =	(kWh existing - kWh new) x $/kWh + (kW existing - kW new) x $/kW

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Minimizes pump unit energy efficiency
- Lower operating cost

2-1 Plug Load Controls

ECM Summary

BERT Plug Load Management Software

BERT Plug Load Management Devices

Office equipment is always regularly left in the 'on' state allowing the individual machine to revert to the 'Sleep' mode based on an internal timer. This measure will plug the office equipment into a networkable device that will allow for scheduling of the plugged-in equipment. A full survey of plug load devices for each facility was performed by ESG.

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

A full plug load survey was completed for each facility, detailed charts can be found in the appendix.

Facilities Recommended for this Measure

- Benjamin Franklin Middle School
- Hawthorne Elementary School
- Whittier Elementary School
- Lowell Elementary School
- Teaneck High School
- Thomas Jefferson Middle School

Scope of Work

Refer to Appendix 4 for detailed counts per building and scope descriptions.

Savings Methodology

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

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

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

Electrical energy savings

2-2 Combined Heat and Power (35 kW)

ECM Summary

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

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work

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

New Installation Work:

Furnish & Install (1) Yanmar Model CP35D1-TNUG (35 kW) or equivalent, the high-efficiency generator provides 35kW of electrical power. The engine heat is captured and heats water at a rated temperature of 158°F for immediate use or storage in your facility.

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

Savings Methodology

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

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

Maintenance

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

Benefits

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

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

2-3 Computer Power Management Software

ECM Summary

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

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

Facilities Recommended for this Measure

- Benjamin Franklin Middle School
- Whittier Elementary School
- Hawthorne Elementary School
- Lowell Elementary School
- Teaneck High School
- Thomas Jefferson Middle School

Scope of Work

Power Management software/hardware and installation will include approximately (800) existing computer machines. Details concerning computer quantities are listed in the appendix concerning the energy savings calculations.

Savings Methodology

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

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

Maintenance

Update software as needed.

Benefits

- Energy Savings

2-4 Refrigeration Controls

ECM Summary

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

Existing Refrigeration Systems	
Teaneck High School	Cooler
	Freezer
Thomas Jefferson Middle School	Freezer A
	Freezer B
	Cooler C
Benjamin Franklin Middle School	Freezer A
	Freezer B
	Cooler C

Facilities Recommended for this Measure

- Benjamin Franklin Middle School
- Thomas Jefferson Middle School
- Teaneck High School

Scope of Work

Furnish and install NRM Cooltrol® at the following locations:

Teaneck High School

- Two zone(s) of energy-saving CoolTrol refrigeration controls to cycle temperature and evaporator fans
- Replace four (4) existing shaded-pole motors with four (4) EC motors in evaporators
- Dewpoint-based pulse control for anti-sweat door heaters

Thomas Jefferson Middle School

- Three zone(s) of energy-saving CoolTrol refrigeration controls to cycle temperature and evaporator fans
- Replace five (5) existing shaded-pole motors with five (5) EC motors in evaporators
- Dewpoint-based pulse control for anti-sweat door heaters

Benjamin Franklin Middle School

- Three zone(s) of energy-saving CoolTrol refrigeration controls to cycle temperature and evaporator fans
- Replace six (6) existing shaded-pole motors with six (6) EC motors in evaporators
- Dewpoint-based pulse control for anti-sweat door heaters

Savings Methodology

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

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

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electrical energy savings
- Reduces evaporator fan run-time

2-5/2-7 Direct Install Program Fuel Use Economizers

ECM Summary

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

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

Facilities Recommended for this Measure

- Benjamin Franklin Middle School
- Bryant Elementary School
- Whittier Elementary School
- Lowell Elementary School
- Hawthorne Elementary School
- Thomas Jefferson Middle School

Scope of Work

Benjamin Franklin Middle School

New Installation Work:
Proposed are the following:

- Furnish & install (F&I) (3) each Intellidyne IntelliCon Controls at the boiler burners.
- Provide connection to existing, or newly installed, building Energy Management System (EMS)
- Provide factory commissioning of system (start up and testing).

Bryant Elementary School (Direct Install Program)

New Installation Work:
Proposed are the following:

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

Hawthorne Elementary School (Direct Install Program)

New Installation Work:
Proposed are the following:

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

Scope of Work Continued…

Lowell Elementary School (Direct Install Program)

New Installation Work:
Proposed are the following:

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

Thomas Jefferson Middle School

New Installation Work:
Proposed are the following:

- Furnish & install (F&I) (3) each Intellidyne IntelliCon Controls at the boiler burners.
- Provide connection to existing, or newly installed, building Energy Management System (EMS)
- Provide factory commissioning of system (start up and testing).

Whittier Elementary School (Direct Install Program)

New Installation Work:
Proposed are the following:

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

Savings Methodology

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

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

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

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Natural Gas savings

2-6 Direct Install Program - Low-flow Domestic Hot Water Devices

ECM Summary

Bathroom and kitchen fixtures offer good water saving opportunities because many of these fixtures can be retrofit to reduce the amount of water consumed per minute of use (sinks and showers). Reducing sink water usage also saves the thermal energy used to make hot water.

Facilities Recommended for this Measure

- Hawthorne Elementary School
- Bryant Elementary School
- Whittier Elementary School
- Lowell Elementary School

Scope of Work

Installation of Low-flow Domestic Hot Water Devices on Sink Faucets –

- Existing high flow faucets on 98 sinks will be retrofit to 1.0 gpm:
- For those faucets from which existing aerators cannot be removed without damaging the faucet, a replacement aerator will not be installed. The replacement aerator will be turned over to Owner with the project's shelf stock.
- Where possible, tamper resistant aerator will be installed. For faucets that cannot accept a tamper resistant aerator, a regular aerator will be installed.

Proposed Aerator Replacements by School			
Building	Lavatory Fixtures	Kitchen Fixtures	Toilet & Shower Fixtures
Bryant Elementary School	17	8	0
Hawthorne Elementary School	12	3	0
Lowell Elementary School	14	5	0
Whitter Elementary School	24	14	0

Savings Methodology

Thermal energy savings for sink usage is based on the following assumptions: the ratio of hot-to-cold water use, average hot and cold-water temperatures, and the domestic hot water heater efficiency.

Savings Calculation Method		
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/Shower Energy Savings (MMBtu/yr)	=	Water Savings (gal/yr) x (Tmixed -Tcold) (°F) x (1 Btu/lb °F X 8.34 (lb/gal) x 1 MMBtu/1,000,000 Btu
Sink/Shower Energy Savings (kWh/yr)	=	= Energy Savings (MMBtu/yr) x 293.1 kWh/1 MMBtu
Cost Savings ($/yr)	=	[Water Savings] (kgal/yr) x [water rate + sewer rate] ($/kgal) + [(Sink/Shower Energy Savings (MMbtu/yr)] x 1/boiler efficiency (%) x Thermal Rate ($/MMbtu)] + [(Sink/Shower Energy Savings (kWh/yr)] x 1/boiler efficiency (%) x Electric Rate ($/kWh)]

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Incentives available under NJ Direct Install Program
- Reducing water will result in natural gas (heated hot water) savings
- Decreased water usage

3-4 Replace Cooling in Media Center (Ben Franklin Middle School)

ECM Summary

Split units at Teaneck Public Schools vary based on age and condition. Replacing aged mini-split HVAC units will reduce the operating and maintenance costs of these systems. Both heating and cooling efficiencies of mini-split heat pump equipment have significantly increased in the past 10 years. ESG has identified several older units that still utilize R22 refrigerant as the prime candidates for replacement.

Facilities Recommended for this Measure

- Benjamin Franklin Middle School

Scope of Work

Currently there are (3) wall unit ventilators with HW heating coils and (3) wall mount mini split indoor units 'one unit was removed' and (4) mini -split outdoor units on roof above. Concept is to replace existing (4) mini-split systems with (4) new high efficiency mini-spit heat pump systems.

Demolition and Removal Work

- Reclaim and dispose of refrigerant by licensed company from (4) existing mini-split outdoor systems on roof.
- Disconnect electrical, refrigerant piping and condensate pipe to remove (3) indoor wall mount units and (4) outdoor units on roof.
- Remove existing refrigerant piping for all (4) systems.
- Provide crane for removing of old units and setting of new units.
- Remove all demolished materials and equipment from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- F&I Qty. (4) Mitsubishi (or approved equal) Model PVA-A36AA7 3-ton (208/230/1) indoor wall mounted cassette units.
- F&I Qty. (4) Mitsubishi (or approved equal) Model PUZ-HA36NHA5 (33,400 BTUH Cooling / 38,000 BTUH Heating, 16.2 SEER / 12.0 EER) outdoor heat pump units placed on roof with new preformed plastic unit pads elevated with pump-up legs.
- F&I new outdoor electric disconnects for each heat pump unit.
- Reconnect power wiring to new equipment.
- F&I new manufacturers insulated refrigerant tubing packages which include interconnecting wiring.
- F&I new condensate pumps and piping as required for new indoor units.
- Mechanical Contractor to coordinate with Controls Contractor to provide integration of cooling system control and monitoring points into the DDC control system.
- Perform startup and test of new systems.

Savings Methodology

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

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electric savings

3-5 Replace Cooling in Media Center (Lowell Elementary School)

ECM Summary

Split units at Teaneck Public Schools vary based on age and condition. Replacing aged mini-split HVAC units will reduce the operating and maintenance costs of these systems. Both heating and cooling efficiencies of mini-split heat pump equipment have significantly increased in the past 10 years. ESG has identified several older units that still utilize R22 refrigerant as the prime candidates for replacement.

Facilities Recommended for this Measure

- Lowell Elementary School

Scope of Work

Currently there are (5) split systems that are servicing the library and special education areas at Lowell Elementary School. Concept is to replace existing (5) split systems with (5) new high efficiency split systems. This work will be completed through the Direct Install as part of the lighting upgrade to the school.

Demolition and Removal Work

- Reclaim and dispose of refrigerant by licensed company from (5) existing split outdoor systems on roof.
- Disconnect electrical, refrigerant piping and condensate pipe to remove (5) outdoor units on roof.
- Remove existing refrigerant piping for all (5) systems.
- Provide crane for removing of old units and setting of new units.
- Remove all demolished materials and equipment from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- F&I Qty. (5) high-efficiency electric split systems (2) 3-ton units, (2) 4-ton units, and (1) 2.5-ton units) with new preformed plastic unit pads elevated with pump-up legs.
- F&I new outdoor electric disconnects for each heat pump unit.
- Reconnect power wiring to new equipment.
- F&I new manufacturers insulated refrigerant tubing packages which include interconnecting wiring.
- F&I new condensate pumps and piping as required for new indoor units.
- Mechanical Contractor to coordinate with Controls Contractor to provide integration of cooling system control and monitoring points into the DDC control system.
- Perform startup and test of new systems.

Savings Methodology

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

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electric savings

3-6 Replace Rooftop Cooling Unit at Whittier Elementary School

ECM Summary

Condensing units at Teaneck Public Schools vary based on age and condition. Replacing aged condensing HVAC units will reduce the operating and maintenance costs of these systems. Whittier Elementary School's current setup includes using the condensing unit located on the roof to cool a chiller barrel located in the boiler room to provide chilled water to the new section of the school. ESG has identified this setup as a prime candidate to be replaced by packaged air-cooled chiller located on the roof of the building.

Facilities Recommended for this Measure

- Whittier Elementary School

Scope of Work

Scope is to replace existing 40 Ton, R-22 DX split condenser on roof and indoor chiller barrel with new R-410A high efficiency packaged air cooled chiller with built-in pumps, eliminating chiller barrel.

Demolition and Removal Work

- Shut down system, reclaim and dispose of refrigerant by licensed company.
- Disconnect electrical, CHW piping, refrigerant piping, condensate pipe and controls.
- Crane unit off condenser onto flatbed trailer and remove indoor chiller barrel for disposal.
- Remove all existing refrigerant piping.
- Remove all demolished equipment and materials from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- F&I Qty. (1) York Model YCA0043 (or approved equal) (40 Ton) Air Cooled Chiller with built-in CHW pumps to set on existing roof supports. New unit to match existing electrical voltage and phase.
- Modify existing condenser unit roof rail supports to accept new chiller unit without involving the removing of existing roof rails. Engineer will need to perform calculations for added weight and if any additional steel will be required.
- Provide crane for setting of new chiller unit.
- Mechanical Contractor to coordinate with Controls Contractor to provide integration of cooling system control and monitoring points into the DDC control system.
- Perform startup and test of new systems.

Savings Methodology

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

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electric savings
- Eliminate recurring maintenance costs

4-1 Condensing Hot Water Boiler Plant (Teaneck High School – Fan Room Upgrades)

ECM Summary

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

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

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work

Demolition and Removal Work

- Replace (2) each Cleaver Brooks fire-tube boilers with (3) new high efficiency AERCO Benchmark Platinum 3000 (or approved equal) condensing boilers
- Demolition of (2) existing Cleaver Brooks steam boilers.
- Demolition of existing feed water tank and pumps – cut up for removal, if necessary
- Demolition of (2) 25-HP HHW pumps, heat exchanger, condensate receiver and all related steam piping and equipment in boiler mechanical room
- Disconnect, remove and properly dispose of hot water supply and return piping for boilers to nearest isolation valves or as required for new installation.
- Disconnect, remove and properly dispose of gas flue for boilers as required.
- Disconnect all electric, controls, gas piping, water lines, pressure reliefs and drains.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- Furnish & install (F&I) (3) each high-efficiency AERCO Benchmark Platinum 3000 (or approved equal) condensing boilers set on existing concrete pad.

Details of installation to include the following:

- F&I Qty. (3) new AERCO Benchmark Platinum 3000 (or approved equal) condensing hot water boilers
- Set boilers on new concrete pad
- F&I (3) new boiler circulating pumps
- F&I (2) TACO #F15009 6" X 5" End Scustion Flex-Coupled Base Mounted 25-HP Pumps.
- New pumps to include Suction Diffusers, Flanged Multi-purpose Valves, Gauges and Shut-Off Valves.
- New base-mounted pumps and motors are to be specified to match process, electrical and controls requirements.
- F&I all motor mounting adapters required for new motors.
- F&I all power transmission components required to adapt motors to pumps.
- F&I (4) new TACO Dura-Flex Stainless Steel Pipe Couplings.
- F&I new flanged air separator, floor-mounted expansion tanks, condensate neutralization kits with new chemical treatment system.
- F&I all new insulated VIC hot water supply and return piping, valves, fittings to connect from boilers to new Hot Water Header system.
- F&I new boiler drains, pressure reliefs piped to floor drains, water supply, blow down drains piped over to existing floor drains.
- F&I new 2" fiberglass insulation on all new and existing hot water supply and return piping "that has no insulation".
- F&I new gas line piping from existing gas line to new boilers with new shut off valves. Include vent relief piping as designed by engineer.
- F&I new CPVC combustion air intake and AL29-4C Stainless Steel flue exhaust piping for each boiler to vent to the outside.
- F&I proper pipe suspensions for all piping.
- F&I pipe identification and tags for all pipe, valves, etc.
- Install new line voltage electrical circuits to (3) new boilers.
- Provide factory startup; assist during startup and testing of both new boilers.

Exclusions

This ECM is designed to upgrade only the hot water generation system and does not include any of the following:

- Structural upgrades, repairs, and/or modifications in the boiler room are excluded.
- Electrical infrastructure upgrades, repairs, and/or modifications are restricted to only what is described in the New Installation Work section.
- Piping and insulation will be replaced to the first shut-off valve for the equipment. This project does not include any other piping systems.
- Any ancillary system outside of the heating hot water system is not in scope, and thus excluded from this project.

Savings Methodology

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

Boiler Replacement

$E_E = \sum_{i=1}^{8760}(Q_i \div \square_E)$
$E_P = \sum_{i=1}^{8760}(Q_i \div \square_P)$
$E_S = E_E - E_P$
$C_S = E_S \times FUR$

Where,

E_E = Annual energy (fuel) use of existing system
E_P = Annual energy use of proposed system
E_S = Annual energy savings
C_S = Annual cost savings
Q_i = Hourly heating demand, modeled as a linear fit of OA DBT (dry-bulb temperature), with a cut-off temperature above which there is no heating
$\square$ = Combustion efficiency of heating system based on field data, manufacturer's rating or snap-shot measurements
FUR = Fuel unit utility rate, determined from baseline utility rate analysis

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

Maintenance

Follow manufacturers' recommendations for preventative maintenance.

Benefits

- Natural Gas savings
- Operational savings through new equipment and preventative maintenance plan

4-1 Condensing Hot Water Boiler Plant (Teaneck High School – Hot Water Header Pipe)

ECM Summary

The purpose of this ECM is to reconfigure the piping from a steam/HHW system to a dedicated HHW system. Due to the conversion of the boilers from steam to condensing hot water, the header piping in the boiler room will require replacement. The new Hot Water Header Pipe design will be configured to optimize the transfer of hot water throughout the building and integrate with current systems as required.

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work

Demolition and Removal Work

- Disconnect, remove and properly dispose of hot water supply and return piping for HHW system to nearest isolation valves or as required for new installation.
- Disconnect all electric, controls, piping, water lines, pressure reliefs and drains.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:

Proposed are the following:

- Furnish & install newly design Hot Water Header system as approved design
- Details of installation to include the following:
- F&I all correctly sized piping, valves, actuators, for the system
- F&I new drains, pressure reliefs piped to floor drains, water supply, etc.
- F&I new 2" fiberglass insulation on all new and existing hot water supply and return piping "that has no insulation".
- F&I proper pipe suspensions for all piping.
- F&I pipe identification and tags for all pipe and valves.
- Re-connect existing line voltage electrical circuits to new actuators.
- Provide startup; assist during startup and testing of both new header system.

Exclusions

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

Savings Methodology

N/A

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

Natural Gas Savings

4-2 Replace Domestic Hot Water Tank at Benjamin Franklin Middle School

ECM Summary

The existing domestic water heaters at some facilities are nearing the end of their useful life. As existing domestic hot water tanks age, they typically experience a loss in efficiency due to fouling and scaling on the internal heat exchange components, as well as an increase in maintenance costs. This measure will include replacing the existing unit with a new high-efficiency domestic water tank.

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

Facilities Recommended for this Measure

- Benjamin Franklin Middle School

Scope of Work

ESG proposes to replace existing AO Smith vented gas DHW heater and replace with new Lochinvar condensing gas water heater and new insulated storage tank. Existing indirect water heater tank will be removed.

Demolition and Removal Work

- Shut down, isolate existing indirect domestic hot water storage tank and disconnect to be removed.
- Disconnect and remove existing AO Smith 100 Gallon vented gas hot water heater, flue pipe and piping.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:

- Furnish & install (F&I) (1) Lochinvar ARMOR Model AWN200PM (96% Thermal Efficiency, 5:1 Turndown, 232 GPM Recovery @ 100-degree rise) high-efficiency condensing water heater set on new concrete housekeeping pad.
- F&I Qty. (1) Lochinvar Model RGA-200 (200 Gallon) insulated DHW storage tank.
- F&I Qty. (1) TACO Model PAX30-150 expansion tank.
- F&I new copper pipe, fittings, valves and insulation to reconnect existing hot water piping system to new water heater, storage tank and expansion tank.
- F&I new mixing valve.
- F&I new 3" PVC combustion air intake and flue exhaust piping to exterior of building as per manufacturer recommendations.
- F&I condensate neutralization kit and drain piping to nearby floor drain.
- F&I pipe supports, hangers and brackets as required.
- Reconnect gas piping to new water heater.
- All connections to be leak tested.
- Provide start-up with written combustion report.
- (5) Year Manufacturer Warranty on Furnace Heat Exchanger
- All existing H&C water piping, supply pumps and check valves to remain.

Savings Methodology

Savings Calculation Methodology		
Existing DHWH Efficiency	=	Existing Heat Production/ Existing Fuel Input
Proposed DHWH Efficiency	=	Proposed Heat Production/ Proposed Fuel Input
Energy Savings	=	Heating Production (Proposed Efficiency – Existing Efficiency)

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Natural gas savings

4-3 Replace Steam Traps

ECM Summary

Mechanical traps are prone to failure as they age, resulting in large steam losses and requiring substantial maintenance. Steam traps separate the steam system from the condensate system. Traditional steam traps can fail in the open or closed position. When a steam trap fails in the open or leaking-by position, some or all of the energy that was added at the boiler is lost into the condensate return system. The energy contained in steam is only utilized when it condenses in a heat exchanger (radiator, convector, hot water heater, AHU coil, etc.) and releases its latent heat to the process. It is at this point the steam trap should allow this condensate into the condensate return system to return to the boiler. As mentioned above, a leaking trap still allows steam to flow through the heat exchange device it serves and will typically not affect its heating capacity. For this reason, leaking traps are rarely discovered without performing specific tests on the trap. Conversely, a steam trap that fails in the closed position does not allow the condensate to enter the condensate return system. As a result, condensate backs up into the heat exchange device it serves, thereby first reducing, then eliminating, its heating capacity. Plugged traps are often identified through “cold calls” and repaired. Replacing or repairing failed traps will improve the efficiency of the steam distribution system and save energy.

Facilities Recommended for this Measure

- Bryant Elementary School
- Hawthorne Elementary School
- Lowell Elementary School
- Whittier Elementary School

Scope of Work

- All mechanical traps identified in the steam trap audit will be replaced with new traps
- In many instances it was difficult to confirm size, make and model of the various thermostatic traps inside radiator and convector enclosures due to the cover itself and accumulated dust and debris. This information should be confirmed before ordering any model specific parts.

Proposed Trap Replacements by School

Building	Traps
Bryant Elementary School	128
Hawthorne Elementary School	87
Lowell Elementary School	80
Whitter Elementary School	119
Total Steam trap Replacements	**414**

Detailed drawings of the trap locations for each building is provided in Appendix 4.

Savings Methodology

Savings are calculated using the following methodology:

Steam trap losses depend on the steam pressure and temperature, the type of trap, orifice size, and the level of leakage through the failed trap. Steam losses are calculated based on the amount of steam lost through the trap. Failed closed or “plugged” traps are unique in that there is no steam lost through the trap itself. Steam traps are important in the steam system to remove the condensate from the system. If the condensate is not removed from the steam system, the system loses efficiency. In some cases, a steam trap that is failed closed will cause an excessive buildup of condensate and could cause a blockage of steam flow.

Steam trap losses for leaking traps are calculated using the following modified Napier formula:

Savings Calculation Methodology		
Q, Heat Loss (lb/hr)	=	24.24 * D^2 * (P+14.7) * orifice factor * app factor *loss factor
Where, D	=	orifice diameter (inches)
P	=	Gauge Pressure (psig)
Orifice Factor	=	0.66 (orifice reduction due to presence of condensate)
App Factor	=	application factor (1 if drip leg, 0.92 if coil or other valved application)
Loss Factor	=	1.0 for blowing by, 0.3 for leaking

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Natural gas savings

5-3 Refurbish Cooling Tower

ECM Summary

As cooling towers age, their efficiency decreases due to dirt, corrosion and scale impairing heat transfer. Leaks and evaporative losses cause the cooling tower to use more water and the cooling energy associated with it. ESG proposes to coat the cooling tower to provide a flexible barrier to seal all of the seams for the cooling tower.

Additionally, variable frequency drives (VFDs) are used to control the fan speed of cooling towers in correlation with the outside air temperature. This allows for the optimal efficiency of cooling tower water and saves electric energy. ESG proposes to repair/recommission the current non-functioning VFDs installed on the cooling tower fan.

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work

Cooling Tower Coating

- Remove and save fill.
- Clean the exterior and interior of the cooling tower.
- Sandblast/grind pan to remove any scale.
- Coat entire pan with polyurea to stop leak and protect from future leaks.
- Re-install original fill. Any material that is damaged during process will be replaced with new.

VFD Repair/Recommission

- Replace damaged VFD cabinet.
- Recommission current drives and integrate onto Building Management System.

Savings Methodology

Motor (kW) =	(Motor Horsepower x 0.746 (kW/HP) x Load Factor) = or = (Motor Amperage x Volts x 1.732 x Power Factor) / 1000
Speed Ratio Correction Factor =	((New RPM)/(Existing RPM)) ^ 3
Existing Energy Use (kWh)=	(Existing kW /Existing Efficiency) x Hours of Use
Existing Demand Use (kW) =	(Existing kW /Existing Efficiency) x Peak Load Months x Utilization factor
New Energy Use (kWh) =	(New kW /New Efficiency) x Hours of Use x Speed Ratio Correction Factor
New Demand Use (kW) =	(New kW /New Efficiency) x Peak Load Months x Utilization factor x Speed Ratio Correction Factor
Total Savings (kWh, kW) =	(kWh existing - kWh new) x $/kWh + (kW existing - kW new) x $/kW

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Maximizes fan energy efficiency
- Lower operating cost
- Electric cost savings

5-4 Unit Ventilator Replacement at Teaneck High School (Second and Third Floor)

ECM Summary

Unit Ventilators (UVs) throughout Teaneck Public School District vary based on age and condition. Replacing aged unit ventilator units at Teaneck High School will reduce the operating and maintenance costs of these systems. Motor efficiency, heating and outdoor air damper efficiency of unit ventilators will improve with the installed units. ESG has identified a majority of the units as the prime candidates for replacement.

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work

Replace (74) seventy-four existing unit ventilators at the Teaneck High School. ESG recommends replacing (29) twenty nine units on the second floor and (45) forty five units on the third floor of the high school

Note the total count of unit ventilators at the high school is 115, however, at least ten of these units were chosen to be removed from the scope of work by ESG and Teaneck, for the following reasons:

- Room 218 -1 (new and no need to replace)
- Room 222 -1 (new and no need to replace)
- Room 226 -1 (new and no need to replace)
- Room 230 -1 (new and no need to replace)
- Room 234 -1 (new and no need to replace)
- Room 236 -1 (new and no need to replace)
- Room 227 -1 (contains 3 UVs but only 2 are needed)
- Room 214 -1 (contains 3 UVs but only 2 are needed)
- Room 216 -1 (contains 2 UVs but only 1 is needed)

Demolition and Removal Work

- Remove (74) seventy-four Unit Vent Systems inclusive of cabinet, filler pieces and false back. Existing wall sleeve and outside grille is to remain.
- Disconnect and make safe electrical, plumbing (Hot water, steam, etc.) and controls and prepare for new work
- Remove piping from unit ventilator to point of isolation ball valve located at the branch take-off for each unit's supply and return. If applicable, disconnect existing condensate piping and prepare for connection to new equipment.
- Provide rigging/equipment to safely remove/install overhead located Unit Ventilators.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:
Proposed are the following:

- F&I (74) seventy-four Carrier Model (or approved equal) Unit Ventilators each with high-efficiency EC motor, DDC-ready, Dual temp Coils, Cold Weather Damper Assembly, 208V/1PH, 1" Filter, End Panels, 1,250 CFM Supply Air.
- Repair exterior wall as required and paint to match existing
- Install new floor tile where required – owner to select tile
- Rig new unit ventilator into the building and anchor to exterior wall
- Provide new DDC control valve
- Reconnect existing piping to new unit ventilator and reinsulate piping
- Reconnect condensate drain piping
- Relocate DDC controller and mount inside new unit ventilator
- Reconnect power and DDC wiring
- Controls Contractor is responsible for all controls; open protocol DDC Controller to integrate with building DDC Controls Upgrade project.
- Provide testing and balancing (air & water) for each new unit ventilator.

Exclusions

- Any ancillary system outside of the unit ventilator system is not in scope, and thus excluded from this project.
- Cosmetic repairs will be completed to best match the current tile/paint, complete wall/room replacement or re-painting is excluded from this project.

Savings Methodology

Motor (kW) =	(Motor Horsepower x 0.746 (kW/HP) x Load Factor) = or = (Motor Amperage x Volts x 1.732 x Power Factor) / 1000
Speed Ratio Correction Factor =	((New RPM)/(Existing RPM)) ^ 3
Existing Energy Use (kWh)=	(Existing kW /Existing Efficiency) x Hours of Use
Existing Demand Use (kW) =	(Existing kW /Existing Efficiency) x Peak Load Months x Utilization factor
New Energy Use (kWh) =	(New kW /New Efficiency) x Hours of Use x Speed Ratio Correction Factor
New Demand Use (kW) =	(New kW /New Efficiency) x Peak Load Months x Utilization factor x Speed Ratio Correction Factor
Total Savings (kWh, kW) =	(kWh existing - kWh new) x $/kWh + (kW existing - kW new) x $/kW

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Electric savings

5-5 Unit Ventilator Refurbishment – Teaneck High School (First Floor)

ECM Summary

Energy Systems Group proposes to refurbish the existing standard efficiency motors with high efficiency EC motors in the unit ventilators throughout the District. The advantages of replacing existing permanent split capacity (PSC) motors with electronically commutated motors (ECM) is the increase in control ability of the motor. EC Motors may be programmed to vary speed and can reach efficiencies up to 80% above standard PSC motors.

Facilities Recommended for this Measure

- Teaneck High School

Scope of Work

Concept is to refurbish unit ventilators on the first floor. Components to be replaced will include fan deck assembly (motor, fan wheels and shaft), replacement of existing pneumatic control valve with new 2-way DDC control valve as provided by controls contractor for mechanical contractor to install.

Demolition and Removal Work:

- Remove existing unit ventilator fan deck assemblies.
- The metal cabinet (shroud) of the existing Unit Ventilators will remain in place. Replacement components should fit within the allowed space of the existing metal cabinet.
- Components to remain consistent across all Unit Vent installations and interface with building control systems.
- Disconnect electrical, plumbing (hot water, etc.) and controls.
- Remove all demolished materials from premises and dispose of in accordance with local regulations.

New Installation Work:

- F&I high-efficiency EC motor-based fan deck assemblies (including motor / shaft and fan wheels inside unit ventilators.
- Install Only Qty. (32) new two-way DDC hot water heating valves ‘provided by controls contractor’ to connect existing hot water heating coil inside each unit ventilators.
- Install Only DDC actuators ‘provided by controls contractor’ for outside air damper on each unit ventilator.
- Clean and inspect outside air damper at each unit ventilator for proper mechanical movement and operation before installing new DDC actuator.
- Clean hot water coils, clean and service inside unit ventilators.
- Provide air test of each of the Unit Vent refurbishments.

Savings Methodology

Motor (kW) =	(Motor Horsepower x 0.746 (kW/HP) x Load Factor) = or = (Motor Amperage x Volts x 1.732 x Power Factor) / 1000
Speed Ratio Correction Factor =	((New RPM)/(Existing RPM)) ^ 3
Existing Energy Use (kWh)=	(Existing kW /Existing Efficiency) x Hours of Use
Existing Demand Use (kW) =	(Existing kW /Existing Efficiency) x Peak Load Months x Utilization factor
New Energy Use (kWh) =	(New kW /New Efficiency) x Hours of Use x Speed Ratio Correction Factor
New Demand Use (kW) =	(New kW /New Efficiency) x Peak Load Months x Utilization factor x Speed Ratio Correction Factor
Total Savings (kWh, kW) =	(kWh existing - kWh new) x $/kWh + (kW existing - kW new) x $/kW

Maintenance

Periodically the equipment should be checked to ensure proper operation.

Benefits

- Reduced energy consumption
- Improve system performance

6-1 Upgrade Building Management System

ECM Summary

This ECM includes modernization of the District's DDC control system for the HVAC equipment. With the communication between the control devices and the new updated digital interface/software, the facility manager will be able to take advantage of scheduling for occupied and unoccupied periods based on the actual occupancy of each space in the facility. The DDC system will also aid in the response time to service / maintenance issues when the facility is not under normal maintenance supervision, i.e. after-hours. To achieve this level of control, ESG, with the help of Teaneck Staff and outside controls experts worked together to evaluate the existing system and identify deficiencies.

Facilities Recommended for this Measure

- Benjamin Franklin Middle School
- Bryant Elementary School
- Whittier Elementary School
- Hawthorne Elementary School
- Lowell Elementary School
- Teaneck High School
- Thomas Jefferson Middle School

Scope of Work

Level 1 –

OBJECTIVE: Update the software and develop a good base and starting point for the following recommended measures.

A. NEW SOFTWARE PACKAGE – install latest and greatest ALC software for multiple users.

B. Provide and install Premium multiuser Version 7.0 of WebCTRL w/advanced reporting onto the Teaneck BOE server

C. Create new Graphics with updated display information

Exclusion: additional storage for trend data will be quantified and carried on the existing co-op contract not the ESIP project.

Benjamin Franklin M.S.

1. Add OA sensor readings to all graphics
2. Basement floor plan – add thermographic areas and picks for basement equipment
3. Basement dressing rooms – update reheat coil graphic
4. Basement – remove heat exchanger graphic and program from database
5. Basement – update graphic for corridors A, B, C, D & F MAU and corridors C & E MAU
6. First floor – add thermographic area and pick for the garage on the first floor plan
7. First floor – update 19 UV graphics
8. First floor – update graphics for common locker room MAU and girl's locker room AHU
9. First floor – update graphics for boy's gym AHU and girl's gym AHU
10. Second floor – update 21 UV graphics
11. Second floor - update graphics for main office AHU
12. Second floor - update graphics for kitchen AHU
13. Second floor - update graphics for cafeteria AHU
14. Second floor - update graphics for rehearsal AHU

15. Second floor - update graphics for foyer AHU
16. Second floor - update 11 UV graphics
17. Third floor – update graphics for auditorium RTU and add in CO2 sensor

Bryant E.S.

1. Basement – add second boiler and data for both boilers to graphics
2. Basement – add graphics for gas sub meter
3. Basement – create graphics for boiler interface
4. 1st floor – update graphic for EF-34
5. Roof – add picks for rooftop equipment to roof graphics
6. Add graphic for outside air conditions
7. Add picks for building levels to floorplan

Hawthorne E.S.

1. Basement – add equipment picks to basement graphics
2. Basement – add graphic for gas sub meter
3. Basement – create graphic for boiler interface panel
4. Basement - update graphic for EF-38
5. Roof – Add picks for rooftop equipment to roof graphics
6. Add graphic for outside air conditions
7. Roof - update graphic for EF-6A and EF-6B

Lowell Elementary School

1. Basement – add equipment picks to basement graphic
2. Basement – add graphic for gas sub meter
3. Basement – create graphic for boiler interface panel
4. Basement – add second boiler and data for both boilers to the pumps and heat exchanger graphic
5. First floor – update graphic for AHU-131
6. First floor – update graphic for AHU-114A auditorium
7. First floor – update graphic for AHU-114B
8. First floor – create graphic for EF-110 and EF-115
9. Roof – Correct picks for rooftop equipment on roof graphic
10. Add graphic for outside air conditions
11. Roof – update graphic for rooftop EFs

Thomas Jefferson M.S.

1. Add OA humidity sensor readings to all graphics
2. Map correct OA temperature reading to equipment graphics
3. Ground floorplan – add thermographic areas and picks for ground floor equipment
4. Ground floor – create graphic to show Jefferson HW system boilers and pumps
5. Ground floor – correct link to Jefferson HW system overview
6. Ground floor – create graphic for gas sub meter
7. Ground floor – remove heat exchanger graphic and program from database
8. Ground floor – update 6 UV graphics
9. Ground floor – create graphic for EF-17A, EF-4 and EF-6
10. First floor North – update 12 UV graphics
11. First floor North – update graphic for kitchen AHU
12. First floor North – update graphic for cafeteria AHU
13. First floor North – update graphic for girls lock room AHU
14. First floor North – add freezestat reset button to graphic for Gym AHU-2 and AHU-3
15. First floor North – update graphic for girls locker room AHU
16. First floor South – update 21 UV graphics
17. Second floor South – update 22 UV graphics
18. Auditorium – update graphic for RTU

Whittier E.S.

1. Basement – add graphics for teacher's lounge RAD-4A and 4B
2. Basement – add graphics for room 9 RAD-9B
3. Basement – add graphic for gas sub meter
4. Basement – create graphics for boiler interface
5. Basement – add second boiler and data for both boilers to the pumps and heat exchanger graphic
6. First floor - create graphic for air-cooled chiller
7. First floor - create graphic for dual temp isolation valves
8. First floor - create graphic for room 129 RAD
9. First floor - create graphic for room 102 RAD
10. First floor - create graphic for EF-10 south
11. First floor - create graphic for EF-13 and EF-14
12. Second floor – create graphic for FT-13 and EF-5
13. Second floor – create graphic for EF-1, 2 and EF-3
14. Second floor – create graphic for RADE-E
15. Second floor – create graphic for RADE-226, PR EF-1 and PR EF-2
16. Second floor – create graphic for EF-10 north
17. Roof – correct picks for rooftop equipment on roof graphic
18. Add graphic for outside air conditions

Teaneck High School

1. Add OA sensor readings to all graphics
2. Basement – add graphic for mechanical room exhaust systems
3. Basement – remove graphic and programming hot water plant gym heat exchanger
4. Basement – add graphic for chilled water plant Bacharach refrigerant Monitor

Level 2 –
OBJECTIVE: Once the new software is installed and the graphics have been created, make sure the end points are communicating and controlling the end use devices correctly by the following recommended measures:

C. Map the system to the end use devices through an Operational Verification and HVAC Improvement

- Benjamin Franklin Middle School
- Bryant Elementary School
- Whittier Elementary School
- Hawthorne Elementary School
- Lowell Elementary School
- Teaneck High School
- Thomas Jefferson Middle School

process in the following schools:

D. Install 4 new boiler room interface control boards to replace existing Bradley Scochetti. (2 Middle

- Bryant Elementary School
- Whittier Elementary School
- Lowell Elementary School
- Hawthorne Elementary School

schools are Aerco and not required. 1 HS will be replaced with new Aerco boilers and not required)

E. Hook up all exhaust fans in all schools. Identify how many are not physically connected and provide a price to get them on the system and working.

- Benjamin Franklin M.S. – All Exhaust Fans on ALC System
- Bryant E.S – 4 Exhaust Fans
- Hawthorn E.S. – 4 Exhaust Fans
- Lowell Elementary School – 5 Exhaust Fans
- Thomas Jefferson M.S. – All Exhaust Fans on ALC System
- Whittier E.S. – 5 Exhaust Fans
- Teaneck High School – 14 Exhaust Fans

F. Carry an allowance for parts on a per school basis to fix potential hardware problems (valves, actuators, bad EP boards, thermostats, etc.)

- Benjamin Franklin M.S. – 6 rooms
- Bryant E.S – 4 rooms
- Hawthorn E.S. – 4 rooms
- Lowell Elementary School – 4 rooms
- Thomas Jefferson M.S. – 6 rooms
- Whittier E.S. – 4 rooms
- Teaneck High School – 0 rooms

Elementary schools = 4 rooms/bldg.
Middle Schools = 6 rooms/bldg.
High School = 0 – will be rectified by the replacement of unit ventilators and refurbishment ECMs.

Level 3 -

OBJECTIVE: Now that the system has been created and everything is talking correctly. Let's implement a schedule to achieve energy savings by the following recommended measures:

- Benjamin Franklin Middle School
- Bryant Elementary School
- Whittier Elementary School
- Hawthorne Elementary School
- Lowell Elementary School
- Teaneck High School
- Thomas Jefferson Middle School

G. Create a schedule for each piece of equipment in the following schools:

H. after 1 month revisit schedule and tune system and again after 3 months revisit schedule and tune system.

Level 4 -

OBJECTIVE: Get the cooling tower Fans / VFDs communicating and working correctly by the following recommended measures:

I. Programming, Hardware – box and displays, Installation.

I. Replace NEMA 4 rated VFDs enclosure, replace both VFD displays, confirm communications and reprogram control of both VFDs and condenser water bypass valve.

Level 5 -

OBJECTIVE: Boiler room upgrade by the following recommended measures:

K. Install Seven Control valves, (3) new boilers, (1) air cooled chiller, Controls to monitor/talk to VFDs on HW and condenser water pumps.

K. Boiler room upgrade. Isolate and disconnect existing controls and wiring for all equipment being removed. Provide two (2) 8" electronic control valves, three (3) 6" electronic control valves and two (2) 4" electronic control valves. Provide, install, program, startup and commission a complete DDC system to monitor and control three (3) new Aerco boilers, two (2) new dual temperature water pump VFDs, two (2) new hot water pump VFDs, two (2) new condenser water VFDs, seven (7) electronic control valves along with all required temperature and pressure sensors. Provide one (1) Modbus interface router, front end equipment graphics, trends and alarms. Provide one (1) day of training to owner.

Savings Methodology

See savings calculations provided in Appendix.

Maintenance

Update software as needed.

Benefits

- Electrical energy savings
- Natural gas savings
- Continuous monitoring and HVAC scheduling
- Maintaining occupancy comfort levels
- Reduce operational cost

6-2 Operational Verification and HVAC Improvements

ECM Summary

Through extensive field investigations and discussions with Teaneck staff it was discovered that the existing BMS system has a corrupted database and is not thoroughly connected or controlled. ESG believes that as a result of the implementation of the "Operational Verification and HVAC Improvements" ECM, there will be a significant amount of savings that will not be easily quantifiable or verifiable. Teaneck and ESG, agree that a 5% savings from electrical and thermal systems is a conservative estimate of energy savings as a result of the implementation of Operational Verification and the HVAC improvements listed below.

Facilities Recommended for this Measure

- Benjamin Franklin Middle School
- Bryant Elementary School
- Whittier Elementary School
- Hawthorne Elementary School
- Lowell Elementary School
- Teaneck High School
- Thomas Jefferson Middle School

Scope of Work

The following approach was developed in tiers to accomplish a complete and fully functioning control system.

Level 1 –

A. NEW SOFTWARE PACKAGE – install latest and greatest ALC software for multiple users.
B. Create new Graphics with updated display information.

Level 2 –

C. Map the system to the end use devices through an Operational Verification and HVAC Improvement process.

Level 3 -

G. Create a schedule for each piece of equipment
H. after 1 month revisit schedule and tune system and again after 3 months revisit schedule and tune system.

Savings Methodology

From the implementation of the Level 1, 2 and 3 work, Teaneck PS and ESG agree to a stipulated savings for this work equaling 5% of total cooling and total heating energy.

Savings Calculation Method		
Cooling Savings (kWh)	=	Stipulated Savings % * Total Annual Electrical Usage
Heating Savings (Therm)	=	Stipulated Savings % * Total Annual Natural Gas Usage

Maintenance

Update BMS software as needed.

Benefits

- Electrical energy savings
- Natural gas savings
- Continuous monitoring and HVAC scheduling
- Maintaining occupancy comfort levels
- Reduce operational cost

7-1 Building Envelope Weatherization

ECM Summary

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

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

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

Detailed findings from the audit are located in the appendix.

Facilities Recommended for this Measure

- Benjamin Franklin Middle School
- Bryant Elementary School
- Whittier Elementary School
- Hawthorne Elementary School
- Lowell Elementary School
- Teaneck High School
- Thomas Jefferson Middle School

Scope of Work

A building envelope audit was performed for the entire district. The results of the audit were the identification of several areas of envelope deficiency. The deficient areas were tabulated and their savings potential calculated.

Building Envelope Scope drawings and recommendations are listed in the Appendices.

Savings Methodology

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

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

Thermal Upgrade

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

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

- Weak Existing Insulation Values: U-Value
  Insulating surfaces with the weakest existing insulation values generates savings.
- Big Surface Areas: Area
  Insulating large surface areas generates savings.
- Big Temperature Differentials: ΔT or Degree Days

INFILTRATION/ EXFILTRATION SAVINGS CALCULATION METHODOLOGY

Cooling Savings

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

Insulating interior-to-exterior surfaces (attic surfaces are included in this category) generates savings. Isolating interior surfaces (or compartmentalizing) is effective only across interior spaces with very different interior environment needs.

Maintenance

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

Benefits

- Electrical energy savings
- Fuel energy savings

7-3 Repair Missing Pipe Insulation

ECM Summary

Non-insulated pipelines and associated valves and fittings carrying thermal fluids because heat loss where not intended and result in excess fuel consumption, as well as discomfort in occupied areas. Valves and fittings without insulation were observed throughout the buildings and installation of new insulation is recommended. Installation of the proper amount of insulation will not only conserve energy but will also improve safety by reducing the chance for burns on hot piping or slipping due to condensate on a pipe. This ECM would insulate bare and poorly insulated heating hot water piping and failed heating hot water piping insulation in the boiler room.

Findings

- Pipe Insulation – un-insulated pipes in the steam, condensate, and heating and hot water systems are leading to unnecessary distribution losses and wasted energy.
- Valve & Fitting Insulation – valves and fittings are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. These un-insulated or poorly insulated components have the same temperature fluids passing through them as the pipes that are more likely to be insulated; un-insulated components of the distribution system lead to unnecessary distribution losses and wasted energy.
- Tank Insulation – tanks are difficult components of a mechanical system to insulate and as a result are frequently left un-insulated. Un-insulated or poorly insulated tanks or equipment have the same temperature fluids passing through them as the pipes that are more likely to be insulated; un-insulated components of the distribution system lead to unnecessary distribution losses and wasted energy.

Facilities Recommended for this Measure

- Teaneck High School
- Hawthorne Elementary School
- Whittier Elementary School
- Lowell Elementary School
- Thomas Jefferson Middle School
- Bryant Elementary School
- Benjamin Franklin Middle School

Scope of Work

Detailed information, quantities and types, can be found in the appendix.

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

Savings Methodology

Mechanical Insulation Savings Calculations

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

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

Methodology

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

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

Energy Usage

Existing and proposed energy use are computed as follows:

Pipes & Fittings

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

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

Tanks, Plates, & Ductwork

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

*Heat Loss (Btu/h) = (Heat Loss / sq.ft.) * (sq.ft. of component) * (qty) * [1 – (%insulated)] + (Heat Loss / sq.ft. insulated) * (qty) * (sq.ft. of component) * (%insulated)*

*Fuel Loss (MMBTU/yr) = (Heat Loss Btu/h) * (heating hrs/year) ÷ (efficiency)*

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

Energy Savings

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

Fuel Savings (MMBTU/yr) = (Existing Fuel Loss) – (Proposed Fuel Loss)

Electric Savings (MMBTU/yr) = (Existing Electric Loss) – (Proposed Electric Loss)

*Cost Savings ($/yr) = (Fuel Savings MMBTU/yr) * (Fuel Rate $/MMBTU) + (Electric Savings kWh/yr) * (Electric Rate $/kWh)*

Heat Transfer: Bare Systems

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

Pipes & Fittings

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

For fittings (valves, elbows, strainers, etc.), we estimate heat loss based on equivalent length of straight pipe, which is the ratio of the area of the fitting to the area of 1 linear foot of pipe of the same size (fitting equivalent length = Area of fitting, ft² / Area of pipe of equivalent diameter, ft²).

$$q_{pipe} = \frac{2 * \pi * \Delta T}{\frac{1}{h * \left(D_{outer}/_2\right)}}$$

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

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

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

$\Delta T = T_{surface} - T_{air}$
$\Delta T = T_{surface} - T_{air}$
D = Outer diameter

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

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

Heat Transfer: Insulated Systems

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

$$q_{pipe} = \frac{2 * \pi * \Delta T}{\frac{ln\left(D_{outer}/D_{inner}\right)}{k} + \frac{1}{h * \left(D_{outer}/_2\right)}}$$

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

$$h_{convection} = 0.213 * \left(\frac{\Delta T}{D}\right)^{\left(\frac{1}{4}\right)}$$ [ASHR

$\Delta T = T_{surface} - T_{air}$
$\Delta T = T_{surface} - T_{air}$
D = Outer diameter

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

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

Heat Transfer for Outdoor Systems

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

Pipes & Fittings: Outdoor Systems

The convection heat transfer coefficient is:

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

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

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

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

$v = kinematic\ viscosity\ of\ air$

$V = wind\ speed$

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

Plates, Tanks, Ductwork: Outdoor Systems

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

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

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

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

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

$v = kinematic\ viscosity\ of\ air$

$V = wind\ speed$

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

Maintenance

The maintenance staff should maintain the newly installed equipment per manufacturers' recommendations. The manufacturer specification sheets will be provided for exact maintenance requirements.

Benefits

- Fuel energy savings

SECTION 5. MEASUREMENT AND VERIFICATION

Measurement & Verification (M&V) Methodologies

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

They have been developed and defined by two independent authorities:

- International Performance Measurement and Verification Protocol (IPMVP)
- Federal Energy Management Program (FEMP)

There are four guarantee options that may be used to measure and verify the performance of an energy conservation measure. Each one is described below.

Option A – Retrofit Isolation: Key Parameter Measurement

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

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

Option B – Retrofit Isolation: All Parameter Measurement

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

Option C – Whole Building Metering/Utility Bill Comparisons

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

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

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

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

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

Option D – Calibrated Simulation

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

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

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

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

Selecting M&V Options for a Specific Project

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

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

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

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

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

Recommended Performance Verification Steps

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

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

ECM Description	Measurement and Verification Method - Summary	Detail of M&V Methodology
Comprehensive LED Lighting Upgrades (including lighting occupancy sensors)	Option A: One-time pre and post-retrofit kW measurement. Burn hours agreed upon with school district.	Pre M&V: Lighting power readings will be taken on a sample of lighting fixtures. Lighting burn hours were measured through the use of light loggers. Post M&V: Lighting power readings will be taken on a sample of lighting fixtures. Measurements will occur once at the outset of the agreement. "Occupied" hours logged during the baseline data collection will be used as the post-installation burn hours. Energy Savings: Energy savings will be calculated using the actual measured wattage reduction and measured burn-hours.
Building Envelope / Weatherization Improvements	Option A: Existing envelope deficiencies are documented based on collected field data to provide a baseline for evaluation the effectiveness of the air barrier systems and insulation. Post-retrofit verification of improvements will be documented.	Pre M&V: The magnitude of the air infiltration caused by cracks and joint deficiencies determined by field surveys. Thickness of existing attic insulation will be sample measured in at least 5 locations where applicable to scope of work Post M&V: The areas identified for weatherization improvements will be verified to be complete through visual inspection and as-built documentation. Thickness of existing attic insulation will be sample measured in at least 5 locations where applicable to scope of work which will be used to estimate the U-value based on manufactures data or estimates. Energy Savings: Energy savings will be based on the ASHRAE crack method calculations. If the commissioning process reveals any variation in the as-build conditions, then savings will be adjusted.
Repair Missing Piping Insulation	Option A: Savings are from installing pipe insulation and insulation blankets.	Pre M&V: The size of the space requiring insulation installation were measured during the field audit of a sample of spaces per IPMVP protocol.

		Post M&V: Following installation, the size and the surface temperature of the space where the insulation is installed will be verified. Energy Savings: Savings are from a reduction in heat loss through uninsulated pipes, valves, and surfaces.
Plug Load Management	Option A: Savings are from the reduced operating hours of the plugged in equipment.	Pre M&V: Quantity of plug load devices was determined in the field survey. Nameplate data was used to determine the total kW of plugged in equipment. Post M&V: Once the installation is complete, the plug load control devices will be inspected to ensure proper operation. During the guarantee term, actual operating conditions will be downloaded from a sample of plug load devices to verify equipment schedules are still in place and equipment is being turned off. Energy Savings: Savings are from the reduced operating hours of the plugged in equipment.
Condensing Hot Water Boiler Plant (Teaneck High School - Fan Room Upgrades)	Option A: Baseline energy consumption based on collected field data and combustion efficiency of existing boilers. Post installation energy consumption based on combustion efficiency of new boilers.	Pre M&V: Energy Systems Group will take a combustion efficiency test to verify the efficiency of existing boilers and estimate the fuel consumption of existing boilers based on collected field data and utility bills. Post M&V: Energy Systems Group will take a combustion efficiency test to verify the efficiency of new boilers. Energy Savings: Savings for the new boilers will be determined using the base heating load and the difference in efficiencies between the existing boilers and new boilers. Total energy savings is the difference between the existing overall building heating system efficiency and the post heating system efficiency.
Refrigeration Controls	Non-Measured: Savings are from the reduced electric consumption of freezer and refrigerator.	Pre M&V: Manufacturer's data and operating parameters will be collected on the freezer and refrigerator. Post M&V: Once the installation is completed, the walk-in box control system will be inspected to ensure proper operation. Energy Savings: Savings are from the reduced electric consumption of freezer and refrigerator.
Combined Heat and Power	Option B: Savings are from the electric and heat provided by the cogeneration system.	Pre M&V: The baseline utility bills were analyzed to determine baseline heating and electric loads and the time that the cogeneration system is able to operate per year and the capacity of the cogeneration system. Post M&V: The electric generation output from

		the cogeneration system will be measured with an electric meter. The heat output from the cogeneration system will be determined by measuring the water inlet/outlet temperature and flow rate. The gas input to the cogeneration system will be measured with a gas meter. Combined, these data points will be used to verify the conversion efficiency of the cogeneration system. Energy Savings: Savings are from the electric and heat provided by the cogeneration system.
Computer Power Management	Option A: Pre and post data will be collected over a two to four week period before and after the power management strategies have been implemented.	Pre M&V: Power state on a sample of devices over sample period of time prior to implementation of power strategies. Post M&V: Power state on a sample of devices over sample period of time following implementation of power strategies. Energy Savings: The energy savings for each state (on/active, standby, hibernate, and off) are calculated and totalized to determine the total energy cost savings for the measure.
Replace Steam Traps	Option A: Savings are from replacing failed working steam traps and/or fixing steam trap leakage.	Pre M&V: Pre (baseline) field survey showing number and types of trap failures Post M&V: Post – completion of repairs to identified failed traps and verification of quantities and trap sizes. Energy Savings: Energy savings will be calculated using the field survey, drawings, and manufactures data, with savings coming from a reduction in steam and thermal losses from repaired or replaced leaking traps
Upgrade Building Management System	Option A: Savings are from implementing control strategies.	Pre M&V: Due to lack of functionality in existing HVAC Controls and the nature of work proposed in the ECMs, the following Pre M&V tasks will be performed. Accepted engineering practices / building simulations will be used to calculate energy consumption baselines. Operating parameters of the system was verified through BAS system (where applicable). Post M&V: The new HVAC Controls will be utilized to record the following items as an assurance of performance. Various control points within the building management system will be trended and/or totalized. This data will be used to verify that all control strategies are in place and functioning as intended. Energy Savings: Savings are from implementing control strategies.

Install VFDs and Premium Efficiency Motor Upgrades	Option A: Savings are from the reduced operating hours of the plugged in equipment.	Pre M&V Quantity of the motors and horsepower were determined in the field survey. Nameplate data was used to determine the total KW of related equipment. Post M&V: Once the installation is complete, the VFD's will be inspected to ensure proper operation. During the guarantee term, actual operating conditions will be downloaded from the BMS to verify motors (and associated fans/pumps) are being operated at part load. Energy Savings: Savings are from the reduced kW load of the equipment at reduced speed.
Unit Ventilator Replacement (Teaneck High School)	Option A: Savings are from replacing the existing unit ventilators with new unit ventilators	Pre M&V: Manufacturer's data and operating parameters will be collected on the unit ventilators requiring replacement. Post M&V The new unit ventilators will be inspected following installation to verify proper operation. Energy Savings: Savings are from improving the efficiency by refurbishing the existing unit ventilators.
Unit Ventilator Refurbishment (Teaneck High School)	Option A: Savings are from refurbishing the existing unit ventilators with new components	Pre M&V: Manufacturer's data and operating parameters will be collected on the unit ventilators requiring refurbishment. Post M&V: The refurbished unit ventilators will be inspected following installation to verify proper operation. Energy Savings: Savings are from improving the efficiency by refurbishing the existing unit ventilators.
Low Flow Hot Water Devices	Non-Measured – Savings are from reduced hot water consumption.	Pre M&V: Manufactures rating, label information, or observed estimated field conditions Post M&V: Once the installation is completed, the new equipment will be inspected to verify if they are working properly. Energy Savings: Savings are from the reduce domestic hot water load being placed on the domestic water heater.
Fuel Use Economizers	Non-Measured: Savings are from the optimized on and off cycles of the burner ignition.	Pre M&V: Manufacturer's data and existing operating parameters will be collected on the boilers. Post M&V: The boiler controllers will be inspected following installation to verify proper operation Energy Savings: Savings are from the optimized on and off cycles of the burner ignition.
Replace Cooling in	Non-Measured: Savings	Pre M&V: Manufacturer's data and operating

Media Centers	are from the reduced electric consumption of split system condensing units.	parameters will be collected on the condensing units. Post M&V: Once the installation is completed, the condensing units will be inspected to ensure proper operation. Energy Savings: Savings are from the reduced electric consumption of the condensing units.
Replace DHW Tank (Benjamin Franklin Middle School)	Non-Measured: Baseline energy consumption based on collected field data and combustion efficiency of existing water heaters. Post installation energy consumption based on combustion efficiency of new water heaters.	Pre M&V: Manufacturer's data and operating parameters will be collected on the unit. Post M&V: Once the installation is completed, the unit will be inspected to ensure proper operation. Energy Savings: Savings for the new domestic hot water heater will be determined using the base heating load and the difference in efficiencies between the existing and new water heaters.
Refurbish Cooling Tower	Non-Measured: Savings are from the reduced full load operating hours of the connected equipment.	Pre M&V: The cooling tower controls are failed based on field survey and interviews and is being operated in hand at 100% speed. Post M&V: Once the installation is complete, the VFD's will be inspected to ensure proper operation. Energy Savings: Savings are from the reduced kW load of the equipment at reduced speed.
Operation Verification and HVAC Improvements	Non-Measured: Savings are from the reduced electric and heating fuel consumption of the HVAC systems.	Pre M&V: Existing operating parameters will be collected on the systems. Post M&V: Updated operating parameters will be collected on the systems. Energy Savings: By updating BMS programs, installing advanced software, verifying and correcting scheduling based on when the spaces are occupied, energy savings are achieved.
Condensing Hot Water Plant (THS - Hot Water Header Pipe)	Non-Measured	This work is required as part of the conversion of the existing boiler plant from Steam to Hot Water.
Construction Contingency	Non-Measured	N/A, Non-Measured

Measurement and Verification Services

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

Year	Annual Amount ($/Yr)
1	$27,725
Total	$27,725

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

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

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

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

SECTION 6. CUSTOMER SUPPORT

Maintenance Impacts/ On-Going Service

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

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

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

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

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

Energy Systems Group recommends the District go out to bid for the following 3rd party service contracts in order to achieve the continuous savings throughout the term of the Energy Savings Improvement Program:

- Cogeneration Service Agreement to allow for emergency service and preventative maintenance on the new cogeneration systems. In order to receive the incentives for the cogeneration system, a 10-year maintenance contract must be in place. Energy Systems Group has shown the savings paying for this maintenance agreement but has not included the agreement within the ESIP.

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

Design and Compliance Issues

Teaneck Public School District will work closely with Energy Systems Group and CHA Consulting Inc. (CHA) to oversee and complete all design engineering for the purposes of public bidding of the work as well as completing construction drawings.

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

Customer Risks

Asbestos reports were obtained and reviewed for all schools as part of Energy Systems Group's safety policy. Based on the reports, asbestos materials will have to be abated prior to any work being performed. If any additional asbestos is found during the installation of the measures, Energy Systems Group will stop work and notify the School District. Any work associated with testing or remediation of asbestos containing material will be the responsibility of Teaneck Public School District. Based on the asbestos reports provided, we feel this is a low risk item.

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

Public Engagement and Community Outreach

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

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

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

ESG will seek to develop and build partnerships between The National Education Foundation (NEF) and the Teaneck Public School District. These partnerships were developed by ESG and the NEF, to bring

engineering and engineering technology career opportunities to students through the educational programs offered by the University of Salt Lake City Utah. These programs help students who might not otherwise consider careers in these sciences or further expand the knowledge of the children who are participating in such class. In addition, this affords local colleges and Universities the opportunity to recruit future applicants from the local school boards. Some of these programs are listed below:

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

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

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

SECTION 7: IMPLEMENTATION SCHEDULE

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

- Pre-ESIP Contract Work: January 1, 2020 – March 10, 2020
- Approval resolution to contract with Energy Systems Group: April 21, 2020
- Financing of project: 21 days (April 22 -)
- Complete 95% design drawings and bid specifications – April 27, 2020
- Installation – January 2020 - April 2021
- Maintenance: On-going

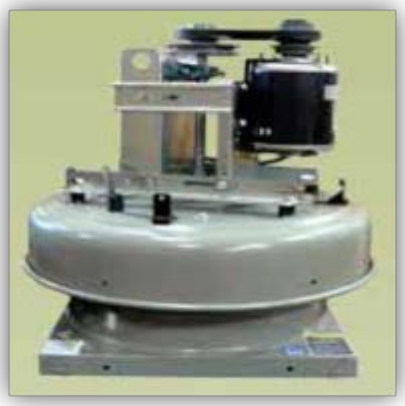
SECTION 8. SAMPLE ENERGY PERFORMANCE CONTRACT

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

APPENDIX 1. ENERGY CONSERVATION MEASURES INVESTIGATED BUT NOT RECOMMENDED AT THIS TIME

ECM: Replace Exhaust Fan Motors with EC Motors

ECM Summary



GREENHECK Vari-Green Motor

The District has several exhaust fans that have older low-efficiency motors and have exceeded their useful life. Although this measure results in a poor payback period, it is recommended based on the potential for energy savings, improved occupant comfort and safety concerns.

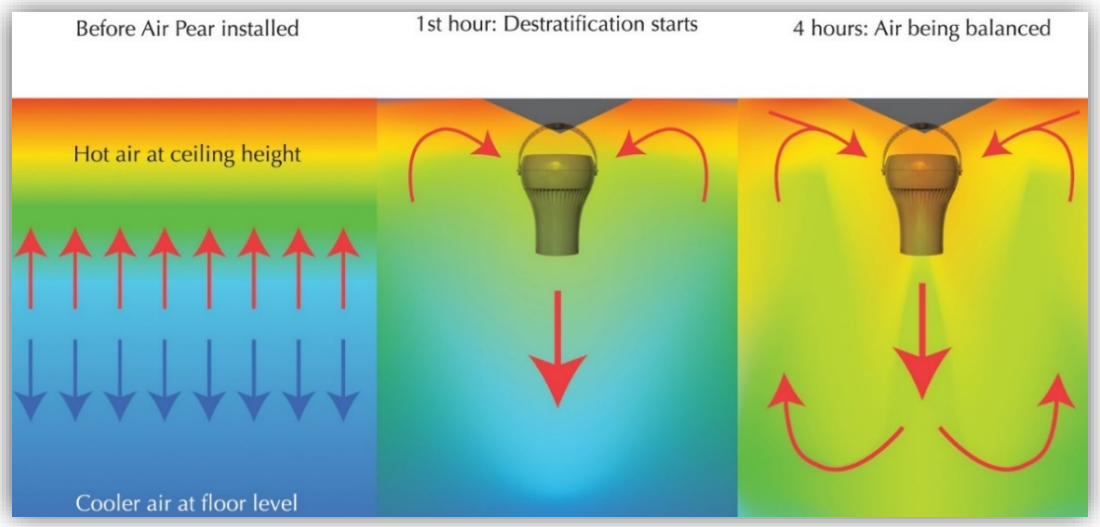
On small motor applications, Electronically Commutated (EC) Motors have the proven potential to generate significant savings. These motors are typically in sizes up to 1 horsepower, and their efficiencies are high compared to the older fractional horsepower motors. Since these motors are without mechanical brushes and the commuter reduces friction losses, they work much like Direct Current (DC) motors. They are programmable and can be used for a wide range of applications.

Facilities Considered for this Measure

- All buildings

ECM: Destratification Fans

ECM Summary



In rooms with high ceilings typically stratification of heated air occurs, resulting in air at ceiling level being warmer than the floor level. Since temperature at the floor level dictates the comfort of occupants and is typically the location of the thermostat controlling the system, this results in additional operating hours to satisfy space conditions. A de-stratification fan continuously mixes the air, balancing temperatures from ceiling to floor and wall to wall which helps the HVAC system maintain the desired temperature.

Facilities Considered for this Measure

- All buildings

ECM: Addition of Air-Cooled Chillers

ECM Summary

Some of the schools in the district have areas that are either not fully air conditioned or have systems that are in need of an upgrade/replacement. We have proposed the addition of cooling at Benjamin Franklin & Thomas Jefferson Middle Schools, in an efficient manner so that the space can be comfortably occupied throughout the year. This ECM entails the addition a high efficiency air cooled chilling system. The proposed system will reduce cooling costs compared to a standard DX equipment and will include DDC controls that can be easily integrated into the proposed Building Management System. The new systems will also ensure that all equipment operates with a common, environmentally low-impact refrigerant minimizing the ozone depletion potential.

Benjamin Franklin Middle School
Concept would be to install a new 280-ton air cooled chiller setting on steel structure next to Auditorium Trane 40-ton DX Rooftop unit with HW Coil. Trane 40-ton unit would be converted; removing DX system, compressors, piping and DX cooling coil and new CHW coil installed in unit. Chiller would provide CHW from new roof mounted chiller down to boiler mechanical room connecting to new pumps with premium efficiency motors. These pumps will be piped for Dual Temperature to provide chilled water and heating hot water for each season

Thomas Jefferson Middle School
Concept would be to install a new 315-ton air cooled chiller setting on steel structure on the roof. Chiller would provide CHW from new roof mounted chiller down to boiler mechanical room connecting to new pumps with premium efficiency motors. These pumps will be piped for Dual Temperature to provide chilled water and heating hot water for each season

Facilities Considered for this Measure

- Thomas Jefferson Middle School
- Benjamin Franklin Middle School

ECM: Replace Cafeteria Roof Top Unit at Bryant Elementary School

ECM Summary

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

The scope of this project would be to replace the current split HVAC system (with HW coil) that uses R22 refrigerant with a new, high-efficiency R410A split system. The new system would be adapted to the current installation for fit and functionality.

Facilities Considered for this Measure

- Bryant Elementary School

ECM: Install High Efficiency Domestic Water Heaters

ECM Summary

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

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

Facilities Considered for this Measure

- All buildings

ECM: Addition of Cooling to Cafeteria at Middle Schools

ECM Summary

The existing cafeteria air handling units at the Middle Schools are heating only. As existing units, they are unable to be modified to allow cooling to be added to the cafeterias. This measure will include replacing these units with new high-efficiency rooftop units with DX cooling and HHW coil for heating. These units will include economizers, relief dampers and new roof curbs.

Facilities Considered for this Measure

- Ben Franklin Middle School
- Thomas Jefferson Middle School

ECM: Replace Water-Cooled Chiller with Air-Cooled Chiller

ECM Summary

The existing (2) 100-ton water-cooled chillers at Teaneck High School are nearing the end of their useful life. As existing chillers age, they typically experience a loss in efficiency due to fouling and scaling on the internal heat exchange components, as well as an increase in maintenance costs. This measure will include replacing these units with new high-efficiency 200-ton air-cooled chiller.

The addition of the air-cooled chiller to the cooling system will allow for flexibility to add cooling more easily as the air-cooled chiller could provide cooling in the shoulder months without requiring the cooling tower to be brought online.

Facilities Considered for this Measure

- Teaneck High School

APPENDIX 2. ENERGY SAVINGS CALCULATIONS

Energy Savings

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

Operational Savings

New LED Fixtures

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

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

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

Mechanical Upgrades (Boiler Replacement & Controls Upgrades)

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

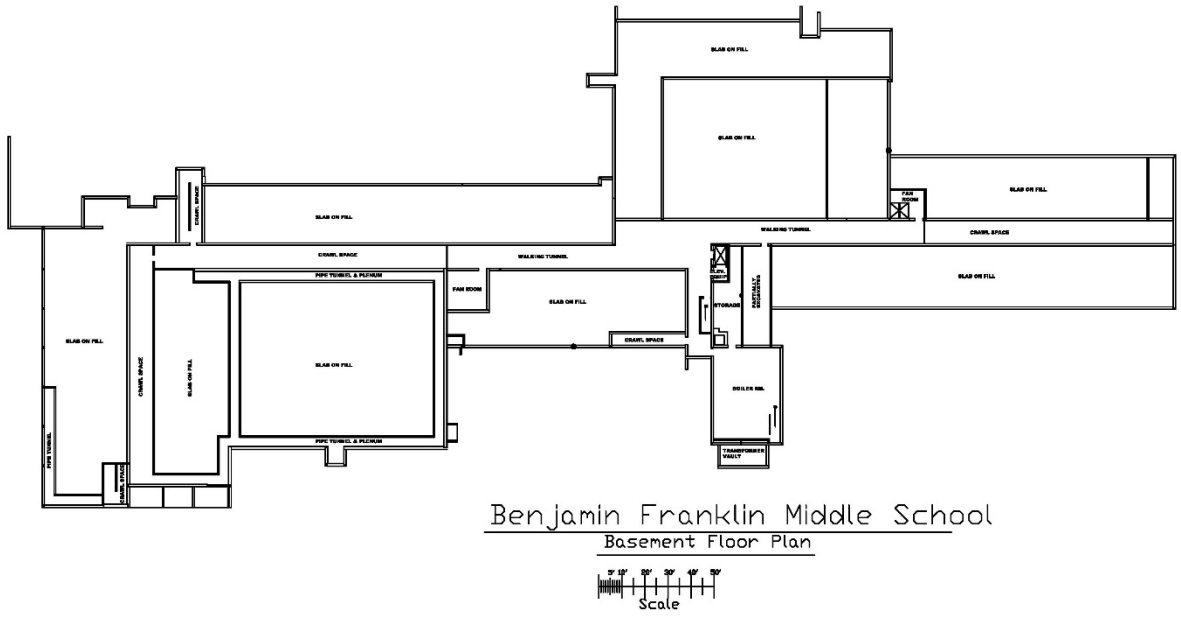
Operational Savings Summary

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

Operational Savings for Financial Model	
ECM Description	**Annual Savings**
LED Lighting Upgrades	$26,130
Reduction in replacement parts and maintenance expenses – District Wide	$59,474
Totals	**$85,604**

APPENDIX 3. BUILDING ENVELOPE SCOPE DRAWINGS

No Work Recommended on this Floor

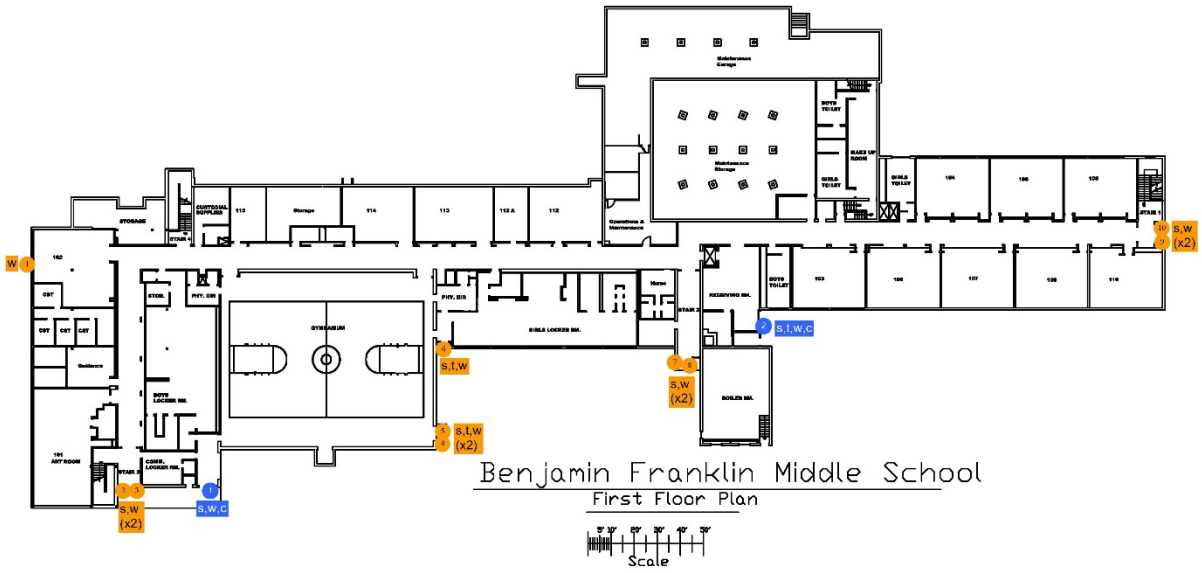


Benjamin Franklin Middle School
Basement Floor Plan

Scale

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

Single Door Weather Stripping
Double Door Weather Stripping
Caulking
Retrofit Wall AC Unit



Door Weather Stripping

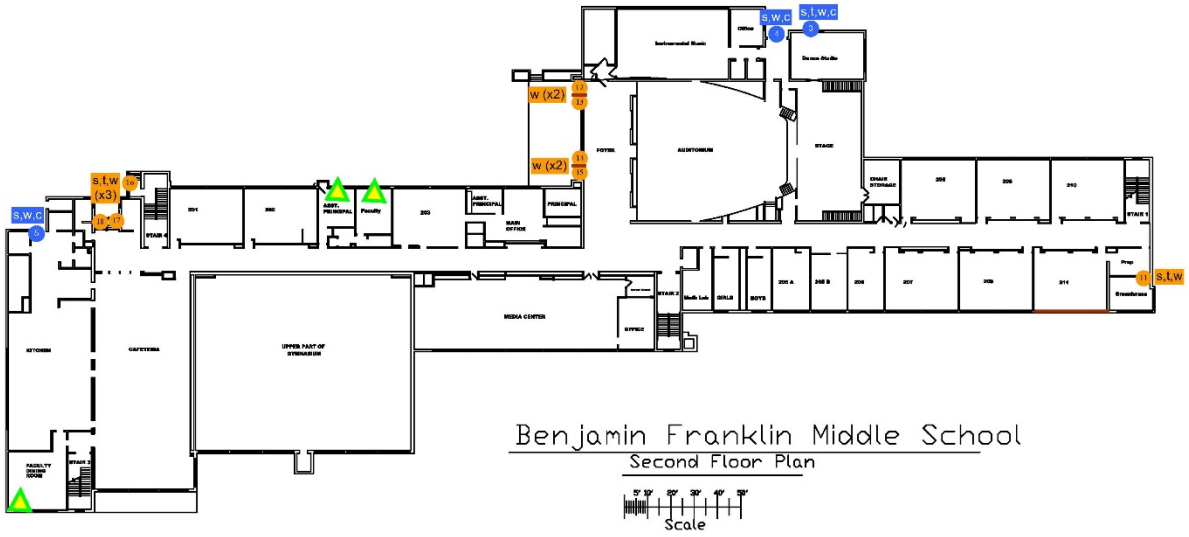
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

Single Door Weather Stripping

Double Door Weather Stripping

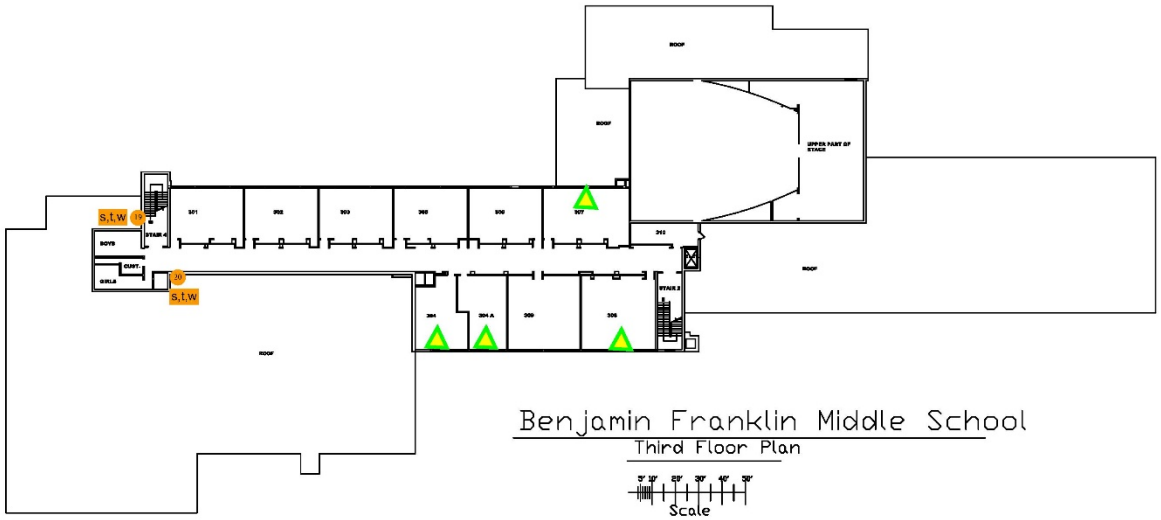
Caulking

Retrofit Wall AC Unit



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

Single Door Weather Stripping
Double Door Weather Stripping
Caulking
Retrofit Wall AC Unit



Door Weather Stripping

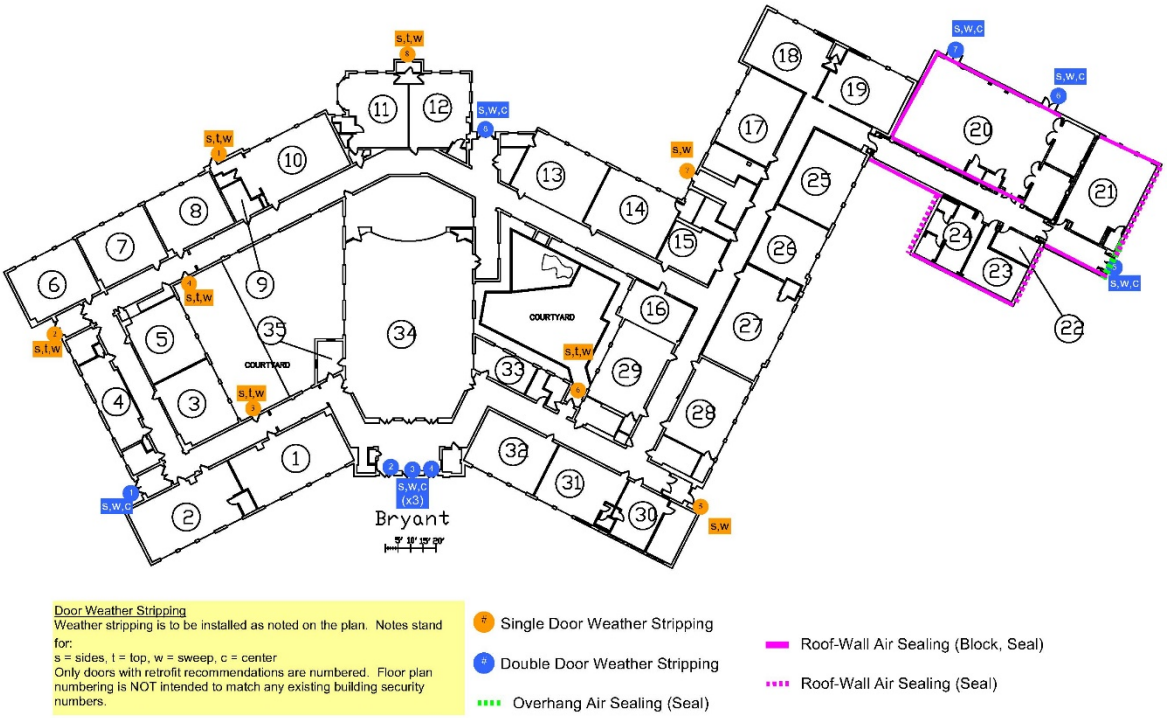
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

Single Door Weather Stripping

Double Door Weather Stripping

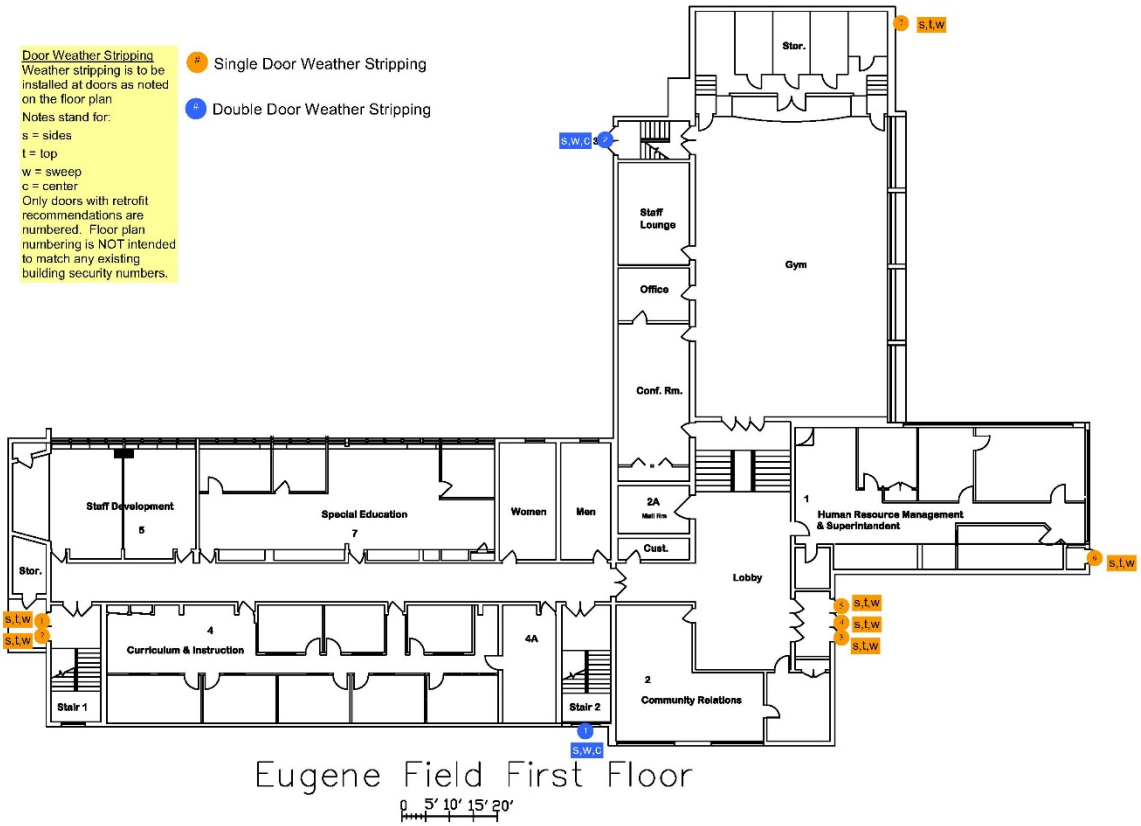
Caulking

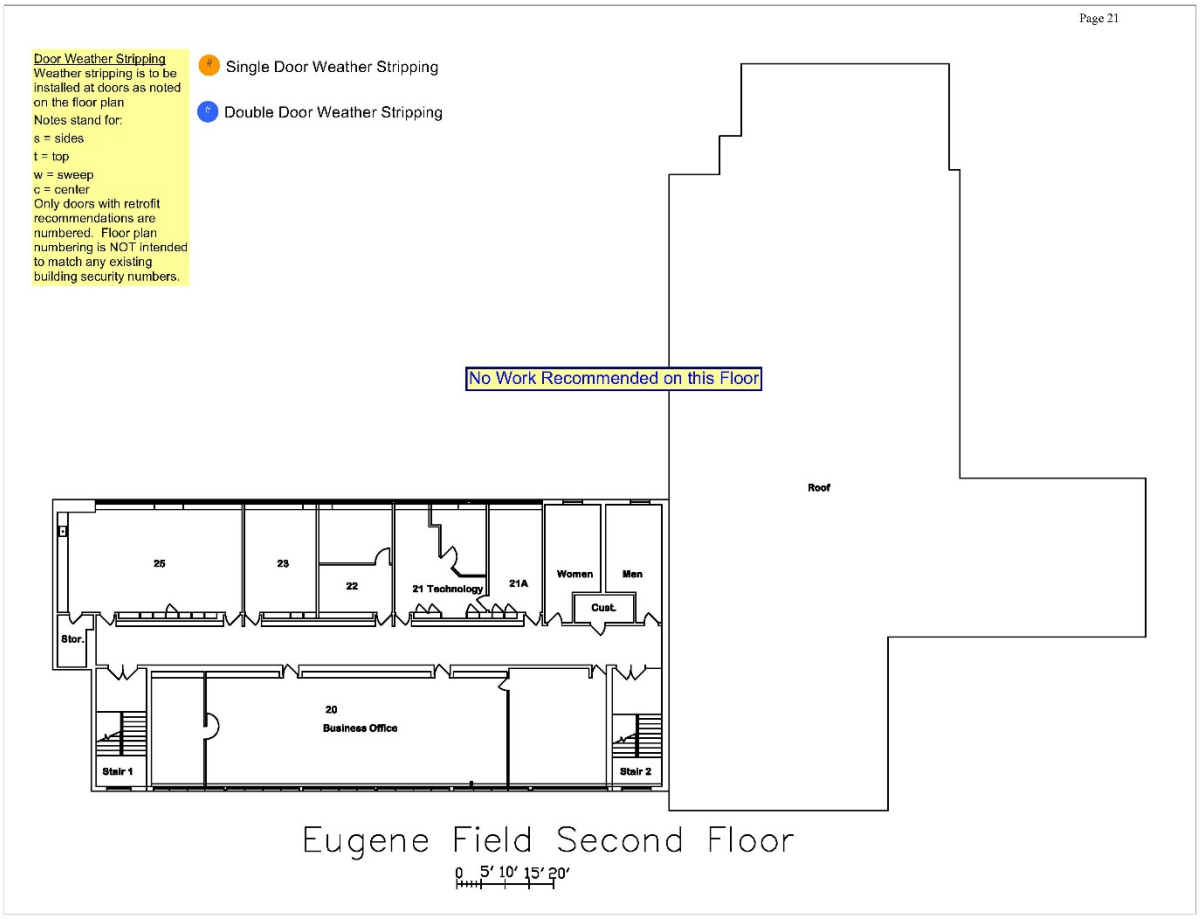
Retrofit Wall AC Unit

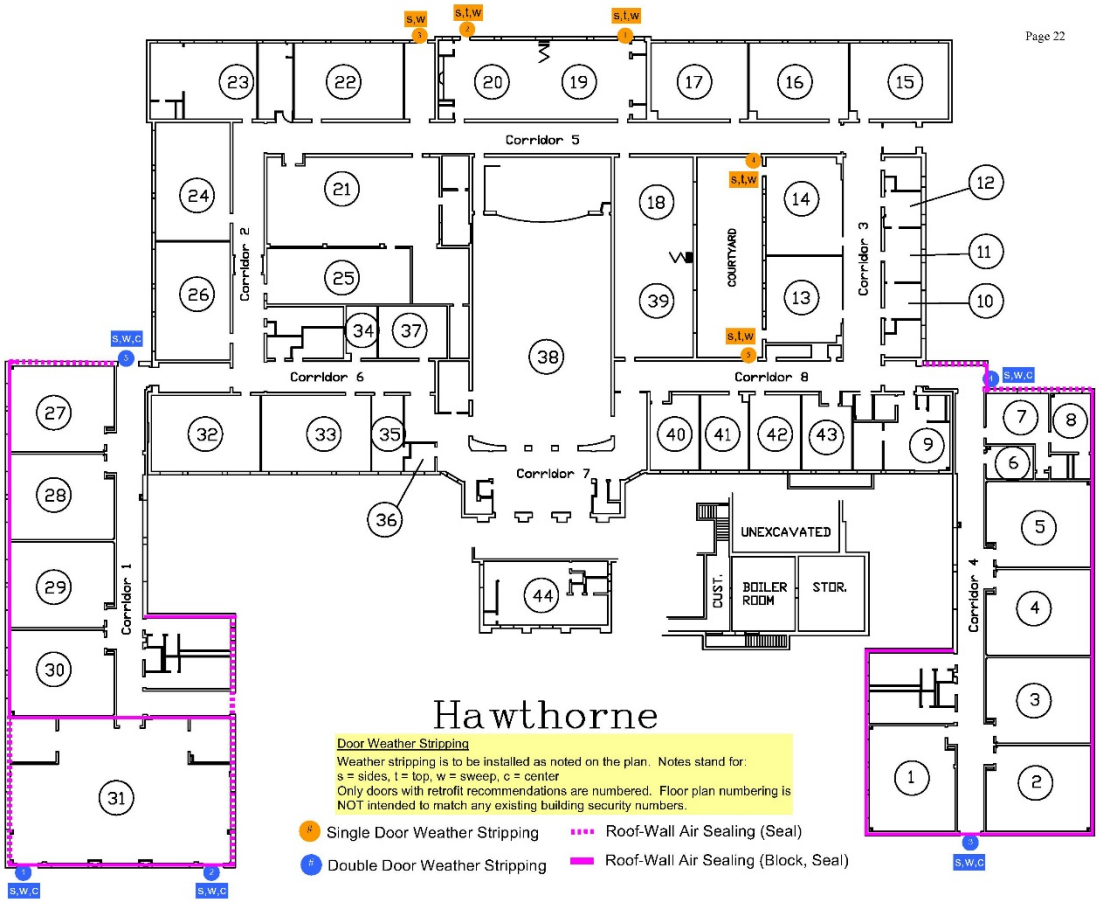


Door Weather Stripping
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

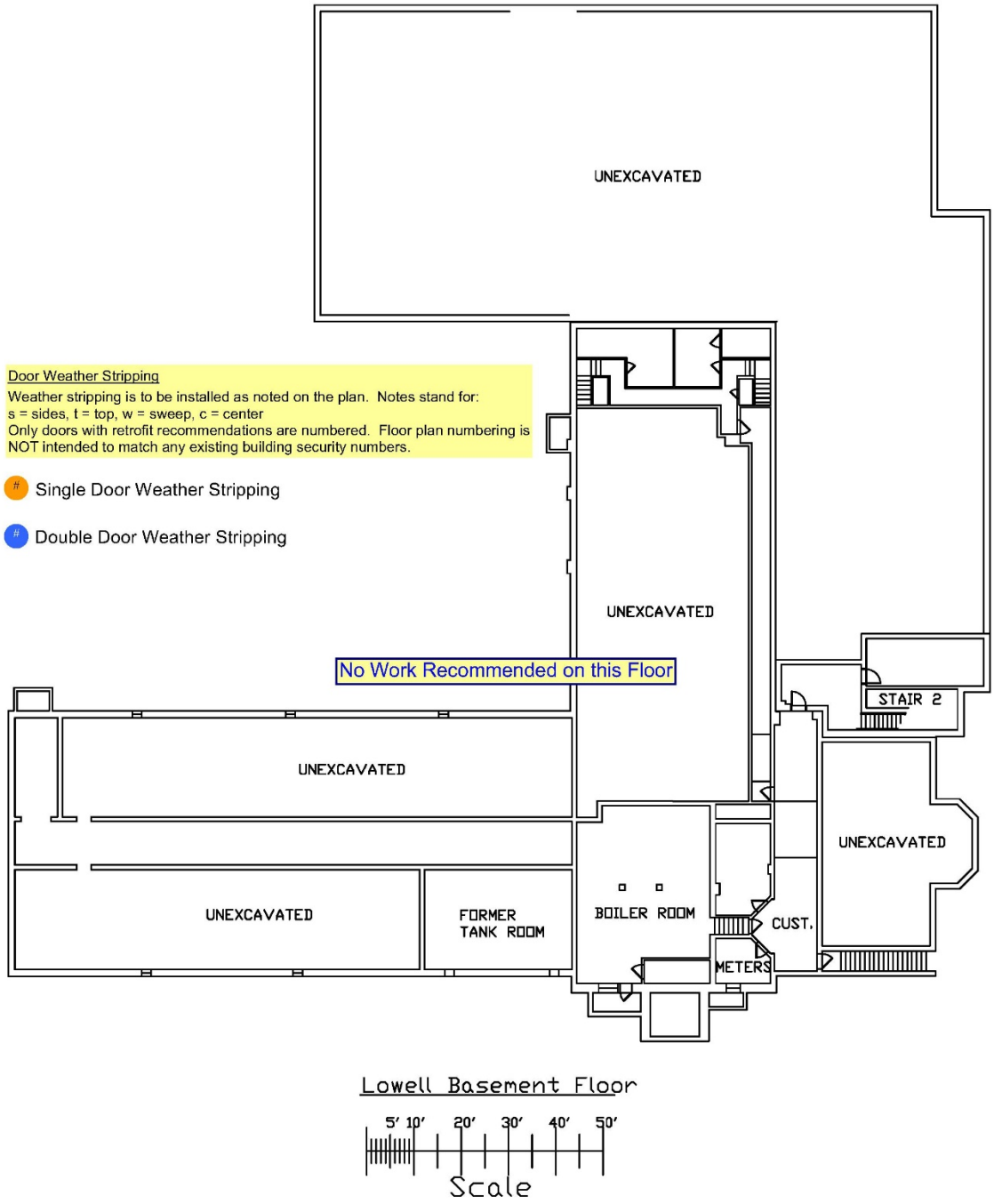
- Single Door Weather Stripping
- Double Door Weather Stripping
- Overhang Air Sealing (Seal)
- Roof-Wall Air Sealing (Block, Seal)
- Roof-Wall Air Sealing (Seal)

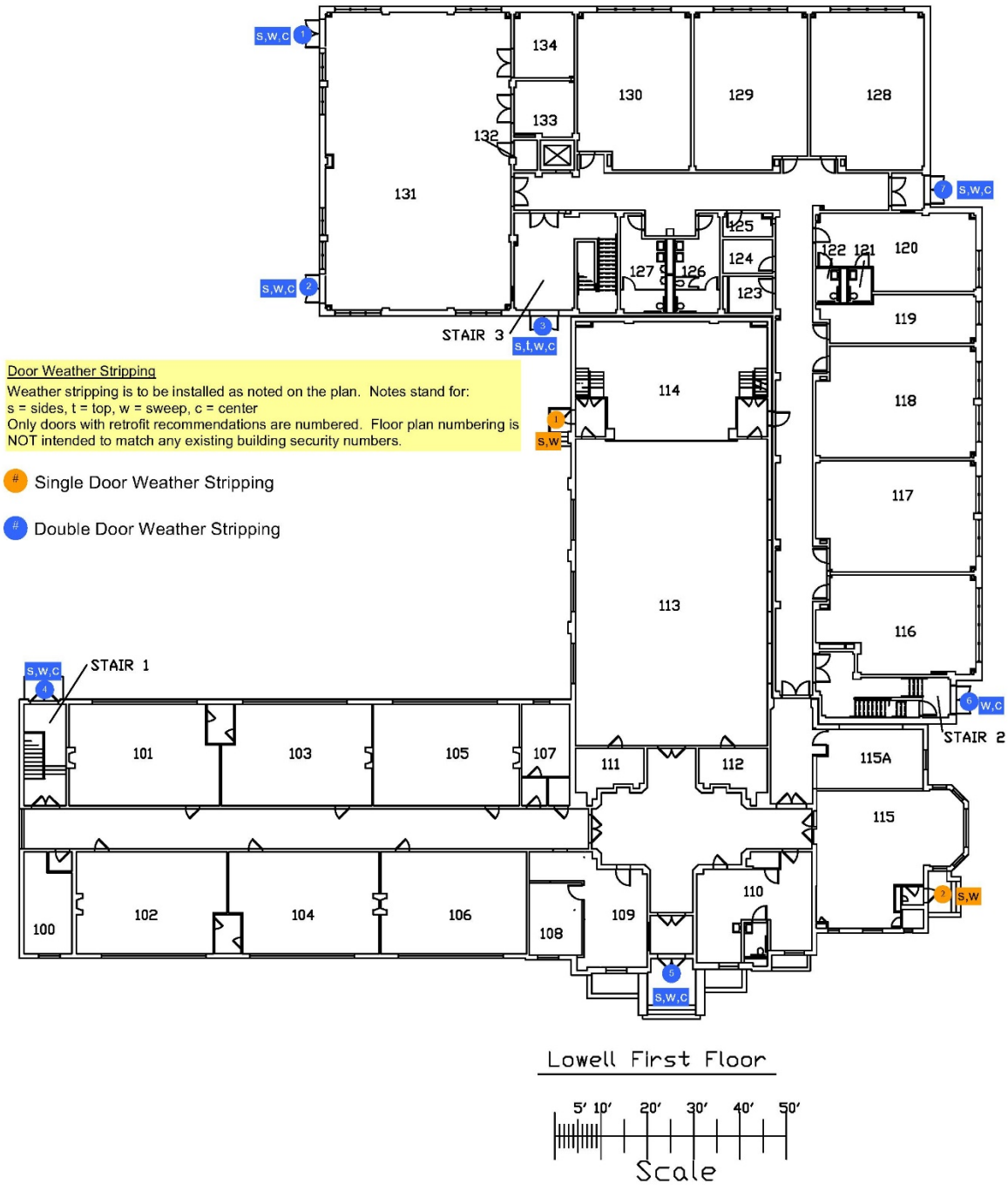


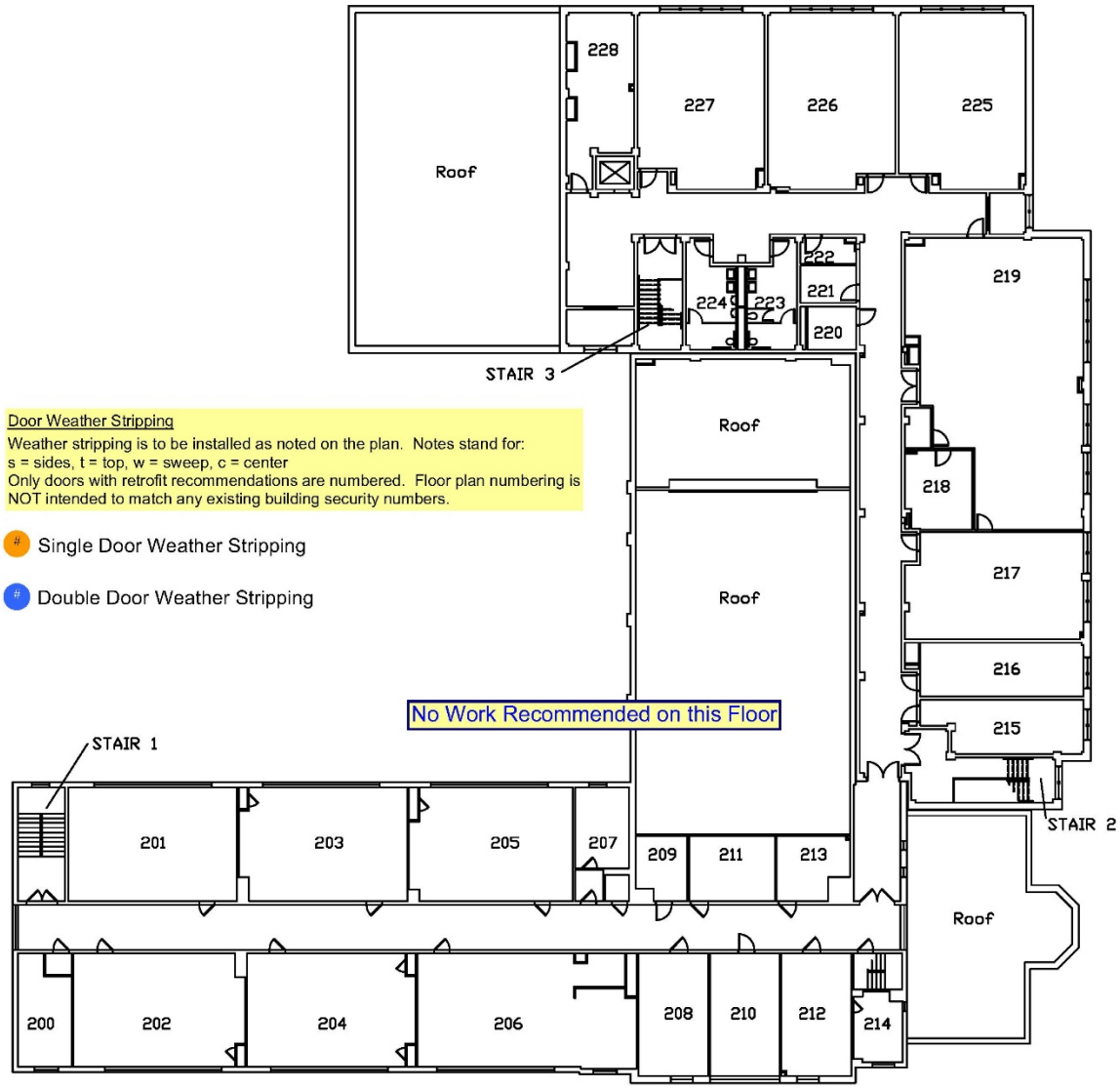

Page 21
Door Weather Stripping
Weather stripping is to be installed at doors as noted on the floor plan
Notes stand for:
s = sides
t = top
w = sweep
c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.
Single Door Weather Stripping
Double Door Weather Stripping
No Work Recommended on this Floor
Roof
25
23
22
21 Technology
21A
Women
Men
Cust.
Stor.
20
Business Office
Stair 1
Stair 2
Eugene Field Second Floor
0 5' 10' 15' 20'



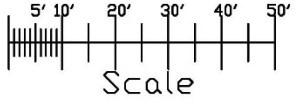
Page 23




S,W,C
1
134
130
129
128
133
132
131
S,W,C
7
S,W,C
2
125
124
127
126
123
122
121
120
119
STAIR 3
S,t,W,C
3
Door Weather Stripping
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.
Single Door Weather Stripping
Double Door Weather Stripping
114
1
S,W
118
117
113
116
S,W,C
4
STAIR 1
101
103
105
107
111
112
6
W,C
STAIR 2
115A
115
110
2
S,W
100
102
104
106
108
109
8
S,W,C
Lowell First Floor
5' 10' 20' 30' 40' 50'
Scale



Lowell Second Floor



High School First Floor

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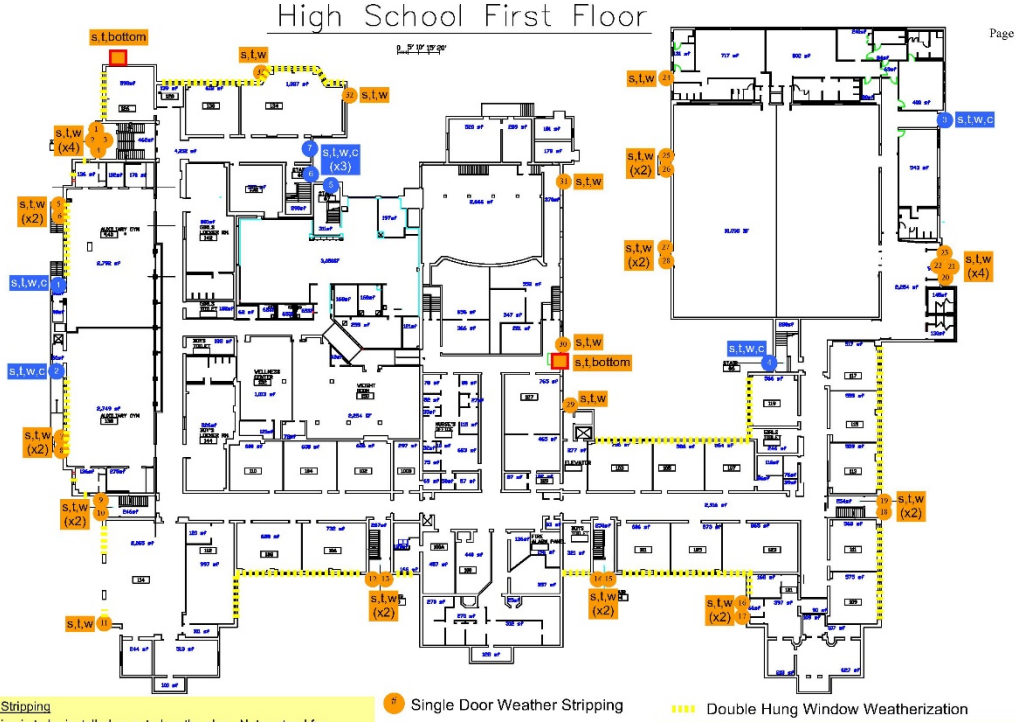

Door Weather Stripping
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

Single Door Weather Stripping
Double Door Weather Stripping
Overhead Door Weather Stripping

Double Hung Window Weatherization

Window Weatherization:
Repair Interior Glazing Gasket Corners (all windows) - apply caulk to corners of window lite assemblies where existing gaskets were installed improperly, damaged, or removed.

High School Second Floor

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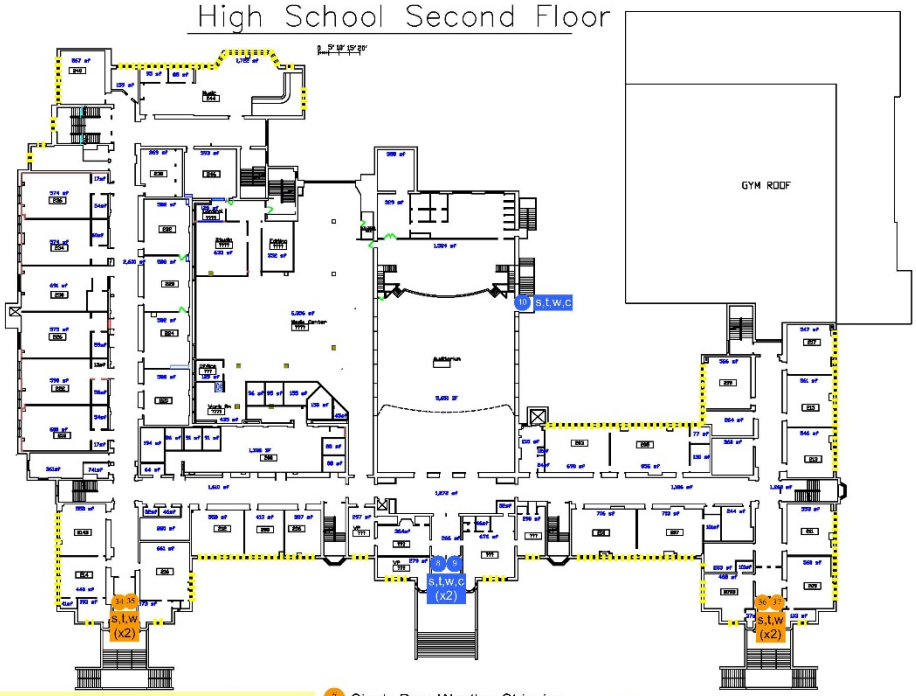


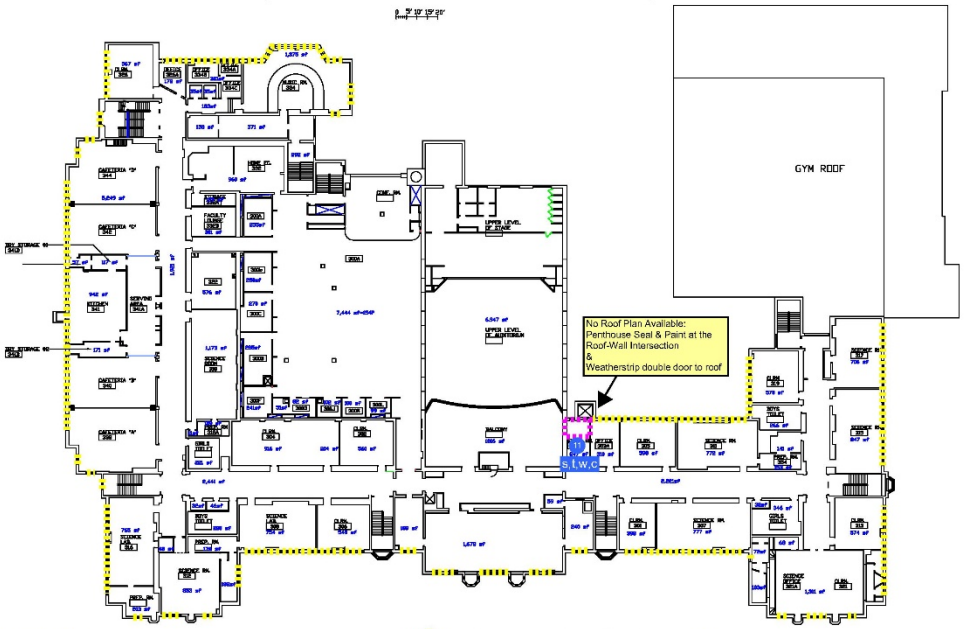
Door Weather Stripping
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

Single Door Weather Stripping
Double Door Weather Stripping
Overhead Door Weather Stripping

Double Hung Window Weatherization

Window Weatherization:
Repair Interior Glazing Gasket Corners (all windows) - apply caulk to corners of window lite assemblies where existing gaskets were installed improperly, damaged, or removed.

High School Third Floor



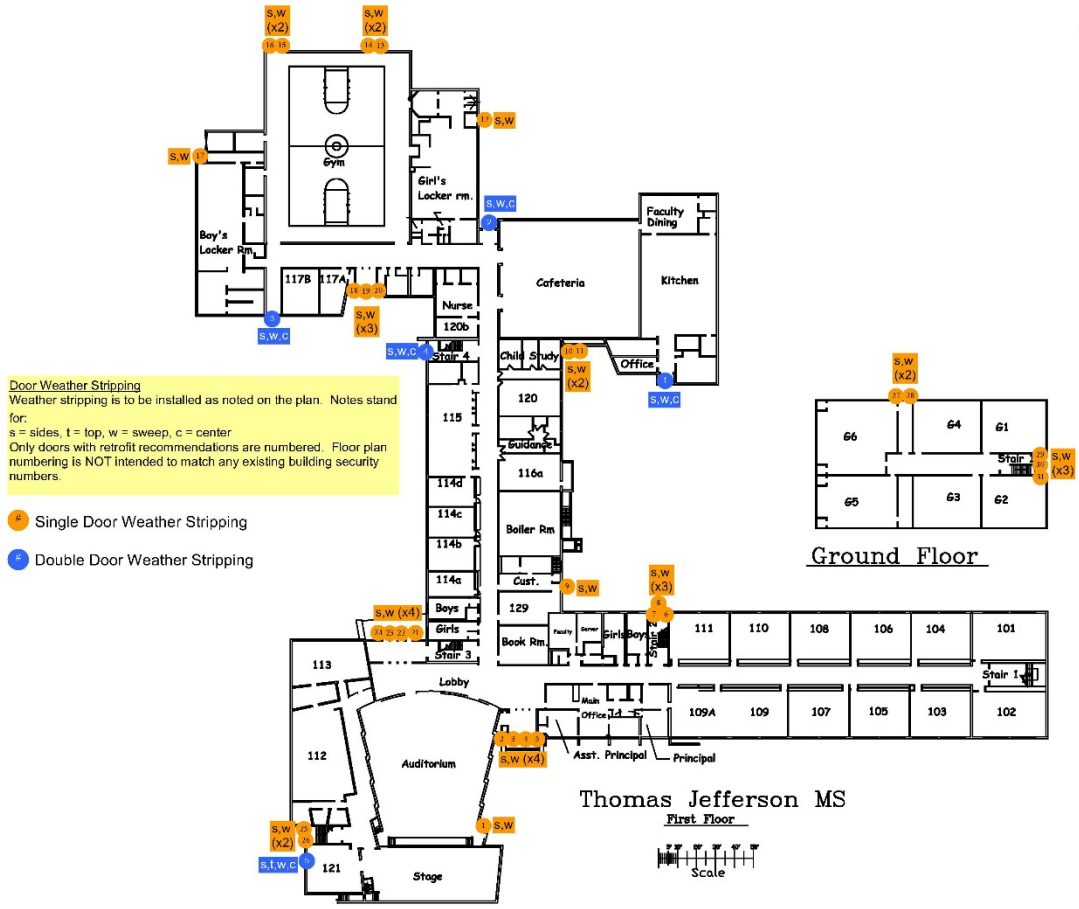
Door Weather Stripping

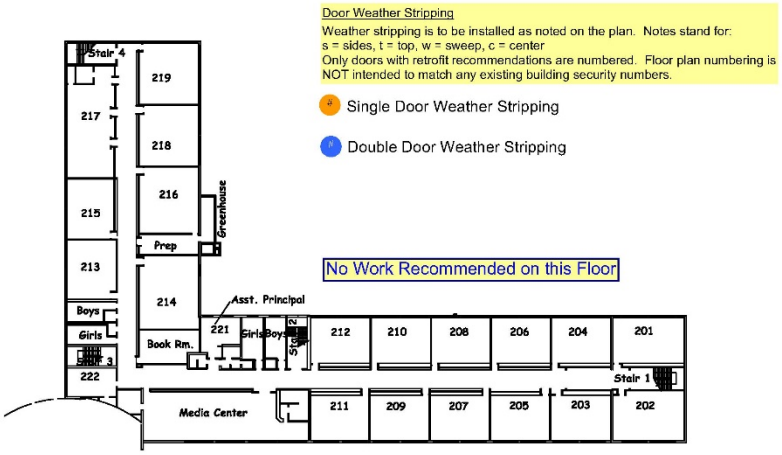
Weather stripping is to be installed as noted on the plan. Notes stand for:
s = sides, t = top, w = sweep, c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

- Single Door Weather Stripping
- Double Door Weather Stripping
- Overhead Door Weather Stripping

Double Hung Window Weatherization

Window Weatherization:
Repair Interior Glazing Gasket Corners (all windows) - apply caulk to corners of window lite assemblies where existing gaskets were installed improperly, damaged, or removed.



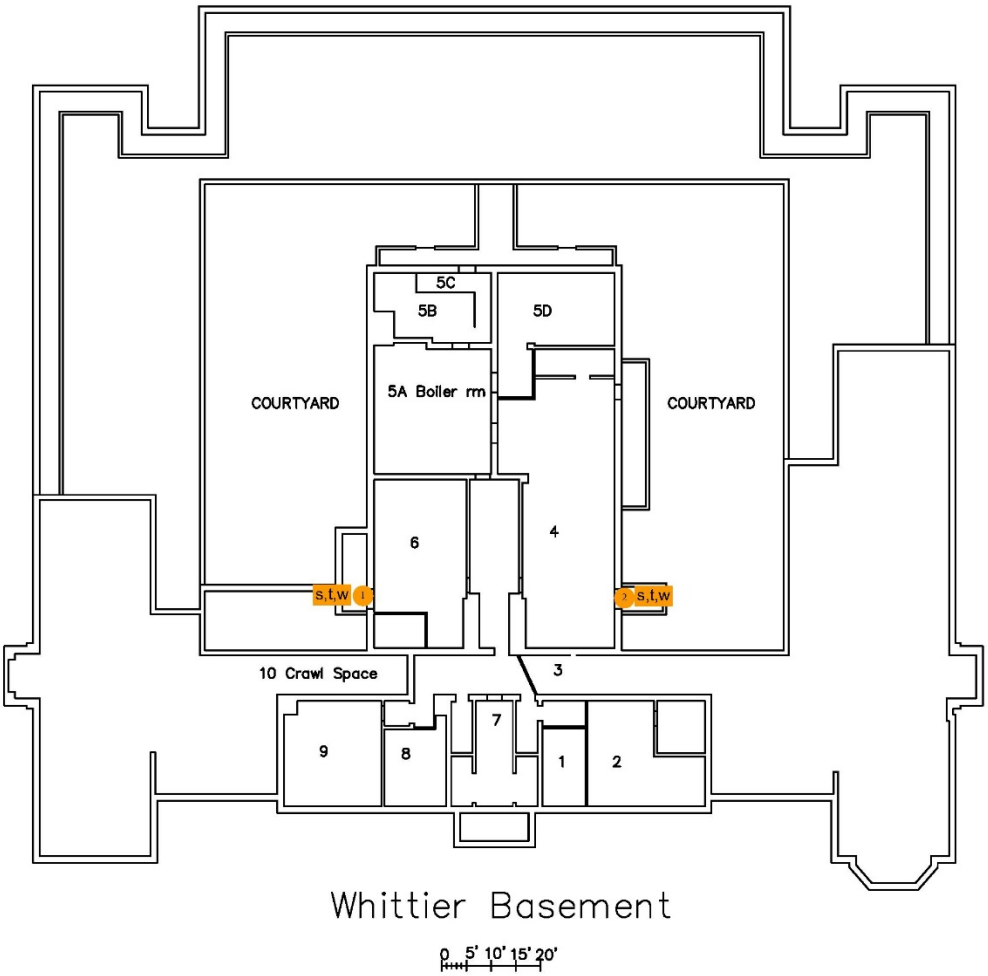


Thomas Jefferson MS
Second Floor

Scale

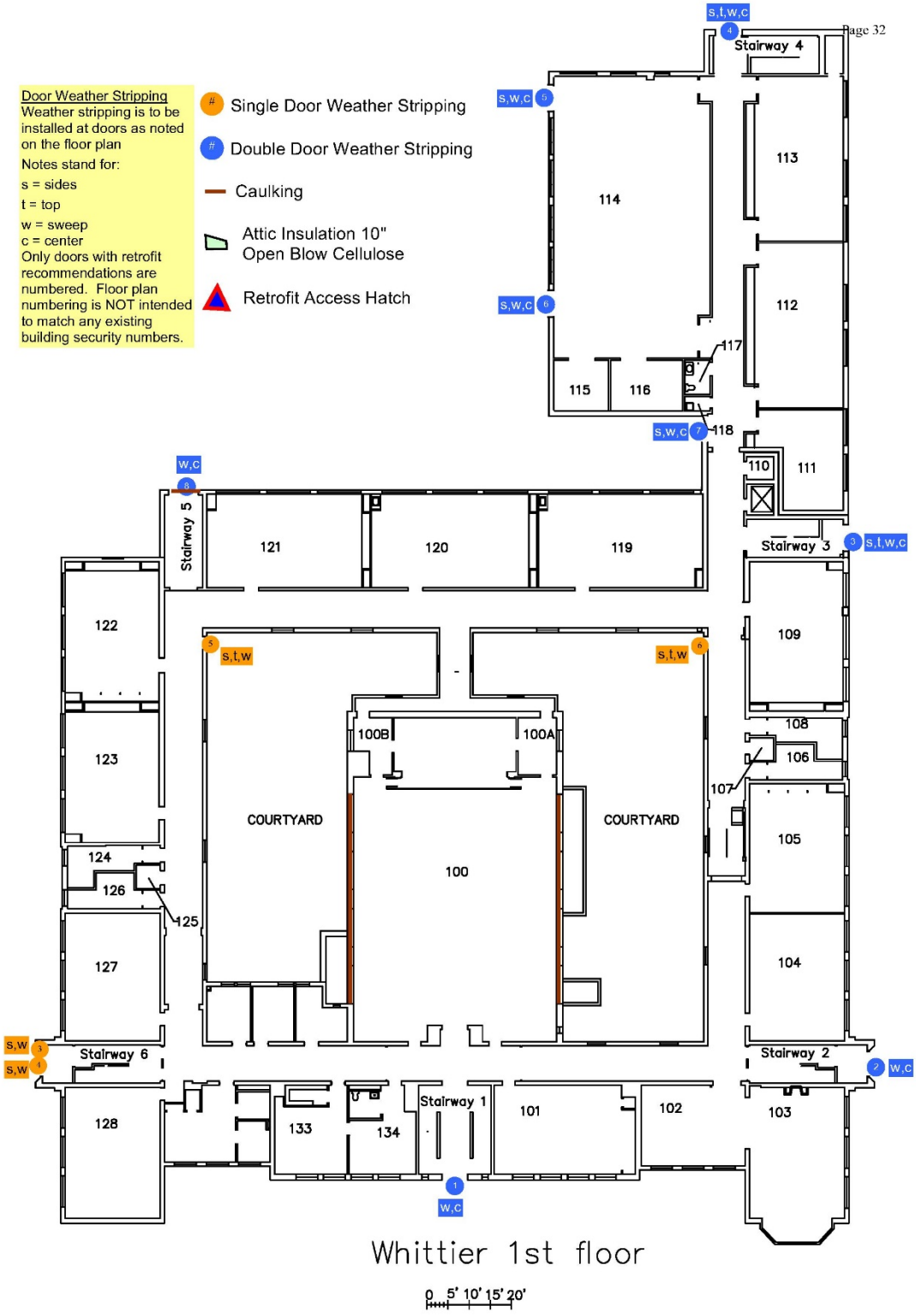
Door Weather Stripping
Weather stripping is to be installed at doors as noted on the floor plan
Notes stand for:
s = sides
t = top
w = sweep
c = center
Only doors with retrofit recommendations are numbered. Floor plan numbering is NOT intended to match any existing building security numbers.

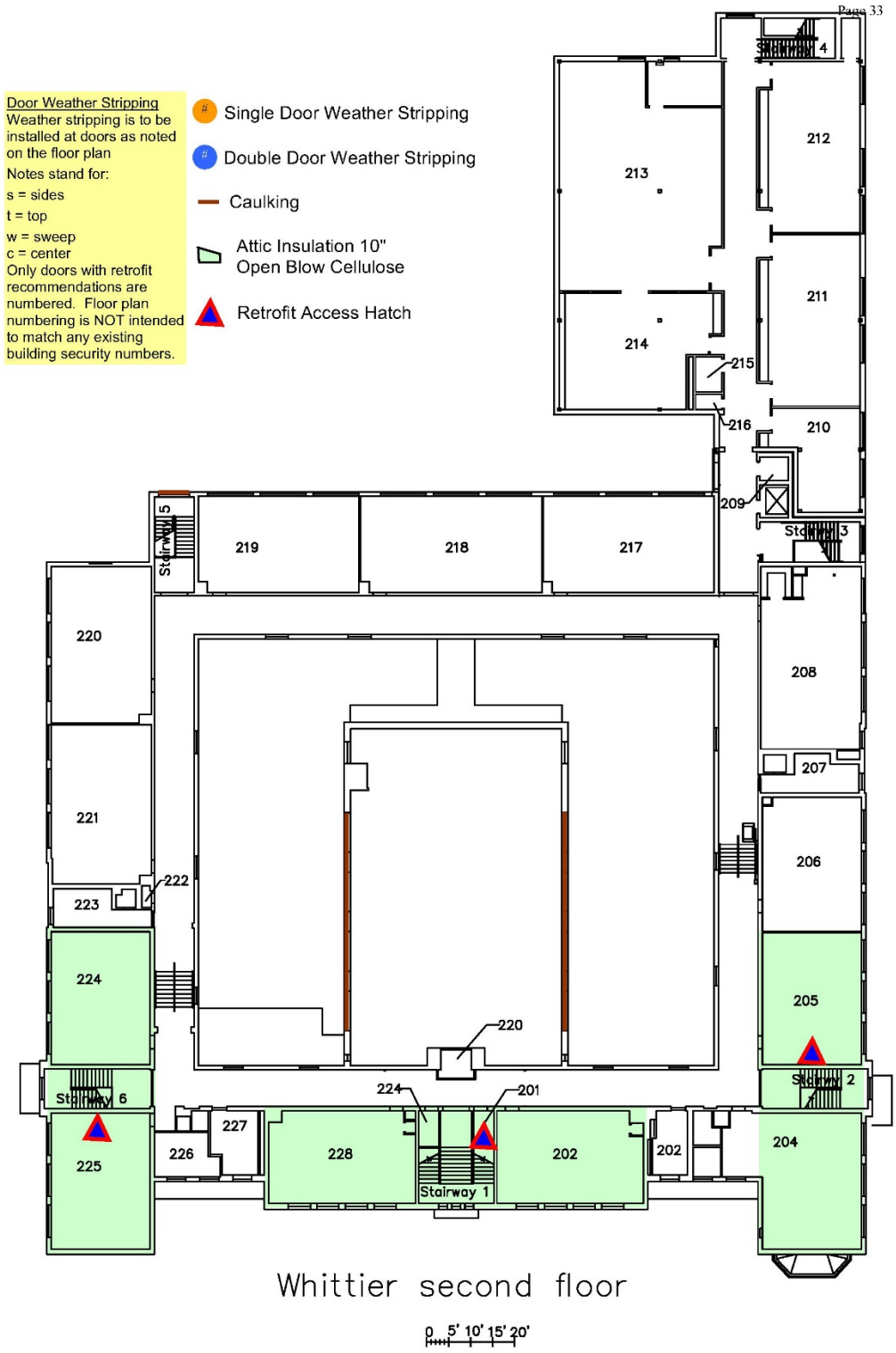
- # Single Door Weather Stripping
- # Double Door Weather Stripping
- Caulking
- Attic Insulation 10" Open Blow Cellulose
- Retrofit Access Hatch



Whittier Basement

0 5' 10' 15' 20'





APPENDIX 4. DETAILED SCOPE DESCRIPTIONS

Design Drawings will be available electronically.

Building Envelope Weatherization

Findings

AC Unit Weatherization – air conditioning units at Benjamin Franklin Elementary School are installed through-the-wall and remain in the building all year. A/C Unit Covers will eliminate unwanted air infiltration/exfiltration while the covers are in place.

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

Caulking – there are unsealed perimeter joints and holes found at the gym window systems of Whittier Elementary School. Weaknesses at snap trim components of doors and windows at Benjamin Franklin Middle School are also allowing air to infiltrate and exfiltrate the building at small cracks in the construction of building envelope components.

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

Double Hung Window Weatherization – deteriorated weather stripping at double hung windows of Teaneck High School are allowing excessive air leakage at the meeting rail and bottom of lower sashes throughout the building. Double Hung window sash locks have fallen off completely at select windows and have been replaced by sliding latch locks in order to keep windows secured. The sliding latch locks do not compress the little existing weather stripping that still exists; regardless of locking hardware double hung windows are the largest building envelope weakness throughout the High School building.

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

Overhead Door Weather Stripping/ Roll-up Door Weather Stripping – remove existing weather stripping and replace with new commercial grade weather stripping to create a full air seal around the door. With low grade, none, or deteriorating materials in place overhead and roll-up doors are a major air leakage sources.

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

Window Weatherization – glazing gaskets throughout the High School building were installed poorly or have deteriorated badly resulting in small air gaps at the intersection between muntions, mullions and glass components.

Building Envelope Improvement Recommendations

- AC Unit Weatherization
  - A/C Unit Covers (Benjamin Franklin MS) – install rigid coverings over all relevant A/C units as noted on floor plan.
- Attic Flat Insulation
  - 10" Open Blow Cellulose (Whittier ES) – install 10 inches of cellulose across the attic flat.
- Caulking
- Door Weather Stripping
- Double Hung Window Weatherization
  - Double Hung Window Weatherization (Teaneck High School) – where the meeting rail lock has been removed; install continuous mechanically fastened Q-lon weather stripping to bottom sash so as to compress against the gap between the upper and lower sash at the meeting rail. Where the meeting rail sash lock is in place; separate the upper and lower sash for the purpose of cleaning the upper sash "U-channel" receiving weather barrier. Vacuum out debris and metal brush channel to receive sealant. Apply siliconized acrylic sealant to channel. Close and lock window inserting PVDC monofilaments to keep the sealant in the "U-channel" from adhering to the upper sash. Remove the monofilaments once the sealant is cured. Install PVC foam Weatherseal Tape to sill so as to receive lower sash at the interior frame. Make upper sash stationary and caulk in place to eliminate air leakage at upper sash.

- Overhang Air Sealing
- Overhead Door Weather Stripping/ Roll-up Door Weather Stripping
- Weather Strip (Teaneck High School) – install heavy-duty aluminum carrier with oversized vinyl insert gasket at the sides: install heavy-duty aluminum carrier with an oversized bottom U-style gasket at bottom.
- Roof-Wall Intersection Air Sealing
- Window Weatherization
- Custom Window Weatherization (Teaneck High School) – install Sascho Big Stretch caulk at failed and missing glazing bead corners of all windows. Caulk is to be applied at corners and full lengths of windows where existing glazing gaskets are missing or damaged.

Plug Load Controls

Benjamin Franklin Middle School

Device Type:	Quantity:
Projector	7
Smartboard	0
Projector/Smartboard Combo	0
Amplifier	0
Charging Cart	19
Small Printer	0
Medium Printer	12
Large Printer/Copier (110 only)	2
TV/LCD/Smart TV	0
Snack Vending	1
Soda Vending	1
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC - 220 (not to be more then 20 amps)	0
AC - 110 20 amps	0
AC - 110 15 amps	1
Electric Hot Water Heater	0
Other Device not listed above	

Hawthorne Elementary School

Device Type:	Quantity:
Projector	1
Smartboard	3
Projector/Smartboard Combo	0
Amplifier	0
Charging Cart	9
Small Printer	0
Medium Printer	10
Large Printer/Copier (110 only)	0
TV/LCD/Smart TV	0
Snack Vending	0
Soda Vending	0
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC - 220 (not to be more then 20 amps)	0
AC - 110 20 amps	3
AC - 110 15 amps	0
Electric Hot Water Heater	0
Other Device not listed above	0

Lowell Elementary School

Device Type:	Quantity:
Projector	0
Smartboard	0
Projector/Smartboard Combo	0
Amplifier	0
Charging Cart	16
Small Printer	0
Medium Printer	8
Large Printer/Copier (110 only)	0
TV/LCD/Smart TV	0
Snack Vending	0
Soda Vending	0
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC - 220 (not to be more then 20 amps)	0
AC - 110 20 amps	0
AC - 110 15 amps	2
Electric Hot Water Heater	0
Other Device not listed above	0

Teaneck High School

Device Type:	Quantity:
Projector	18
Smartboard	0
Projector/Smartboard Combo	0
Amplifier	0
Charging Cart	34
Small Printer	0
Medium Printer	9
Large Printer/Copier (110 only)	6
TV/LCD/Smart TV	0
Snack Vending	0
Soda Vending	0
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	6
AC - 220 (not to be more then 20 amps)	0
AC - 110 20 amps	0
AC - 110 15 amps	0
Electric Hot Water Heater	0
Other Device not listed above	0

Thomas Jefferson Middle School

Device Type:	Quantity:
Projector	0
Smartboard	4
Projector/Smartboard Combo	0
Amplifier	0
Charging Cart	25
Small Printer	2
Medium Printer	23
Large Printer/Copier (110 only)	0
TV/LCD/Smart TV	0
Snack Vending	1
Soda Vending	2
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	3
AC - 220 (not to be more then 20 amps)	0
AC - 110 20 amps	0
AC - 110 15 amps	0
Electric Hot Water Heater	0
Other Device not listed above	0

Whitter Elementary School

Device Type:	Quantity:
Projector	1
Smartboard	4
Projector/Smartboard Combo	0
Amplifier	0
Charging Cart	11
Small Printer	0
Medium Printer	7
Large Printer/Copier (110 only)	0
TV/LCD/Smart TV	0
Snack Vending	0
Soda Vending	1
Lg Coffeemaker (Bunn)	0
H/C Water Dispenser	0
Water Fountain (plug on outside)	0
AC - 220 (not to be more then 20 amps)	0
AC - 110 20 amps	1
AC - 110 15 amps	1
Electric Hot Water Heater	1
Other Device not listed above	0

Mechanical Insulation

TEANECK PUBLIC SCHOOLS, NJ
MECHANICAL INSULATION SAVINGS SUMMARY

Building	Fluid Type	Pipe Dia (") or Tank Surface Area(SF)*	Component	Insulation Thickness (")	Proposed Insulation Type	Quantity or Length	Total Eq Length(LF) or Total Area(SF)*	Heating or Cooling Hrs/Yr	Price per Unit	Total Investment	Fuel Savings MMBTU	Electric Savings kWh	Total Savings	Payback
Benjamin Franklin Middle School	MTHW	10	Butterfly Valve	1.5	Removable Blanket	2	8.2	5110	305.20	$610	11.3 MMBtu	0 kWh	$91	6.7 yrs
	MTHW	10	Centrifugal Pump	1.5	Removable Blanket	2	10	5110	352.30	$705	13.8 MMBtu	0 kWh	$111	6.4 yrs
	MTHW	10	Check Valve	1.5	Removable Blanket	2	8.2	5110	337.70	$675	11.3 MMBtu	0 kWh	$91	7.4 yrs
	MTHW	10	Flange	1.5	Removable Blanket	12	21.6	5110	279.30	$3,352	29.9 MMBtu	0 kWh	$239	14.0 yrs
	MTHW	10	Flex Fitting	2	Cellular Glass	4	6	5110	62.80	$251	8.7 MMBtu	0 kWh	$70	3.6 yrs
	MTHW	10	Suction Diffuser	1.5	Removable Blanket	2	8.8	5110	352.30	$705	12.2 MMBtu	0 kWh	$97	7.2 yrs
	MTHW Total									**$6,298**	**87.3 MMBtu**	**0 kWh**	**$698**	**9.0 yrs**
Benjamin Franklin Middle School Total										**$6,298**	**87.3 MMBtu**	**0 kWh**	**$698**	**9.0 yrs**
Bryant Elementary School	MTHW	2	Butterfly Valve	1.5	Removable Blanket	5	20.5	5110	90.80	$454	7.1 MMBtu	0 kWh	$57	8.0 yrs
	MTHW	2	Flo-Check	1.5	Removable Blanket	2	8.2	5110	108.70	$217	2.9 MMBtu	0 kWh	$23	9.5 yrs
	MTHW	2	In-Line Pump	1.5	Removable Blanket	2	10	5110	142.70	$285	3.5 MMBtu	0 kWh	$28	10.2 yrs
	MTHW	2	Straight Pipe	2	Cellular Glass	12	12	5110	36.10	$433	4.4 MMBtu	0 kWh	$35	12.4 yrs
	MTHW	3.4	Air Seperator Tank	2	Cellular Glass	1	3.4	5110	161.40	$548	2.0 MMBtu	0 kWh	$16	35.1 yrs
	MTHW	12	Flange	2	Cellular Glass	1	1.8	5110	47.00	$47	3.0 MMBtu	0 kWh	$24	1.9 yrs
	MTHW Total									**$1,985**	**22.9 MMBtu**	**0 kWh**	**$183**	**10.9 yrs**
	LPS	1.25	Control Valve	1.5	Removable Blanket	2	8.2	5110	100.50	$201	2.7 MMBtu	0 kWh	$22	9.3 yrs
	LPS	2	Butterfly Valve	1.5	Removable Blanket	2	8.2	5110	90.80	$182	3.8 MMBtu	0 kWh	$30	6.0 yrs
	LPS	2.5	90 Degree Elbow	2.5	Cellular Glass	2	3.6	5110	72.70	$145	0.9 MMBtu	0 kWh	$7	20.8 yrs
	LPS	2.5	Flange	1.5	Removable Blanket	2	3.6	5110	87.60	$175	2.0 MMBtu	0 kWh	$16	11.1 yrs
	LPS	2.5	Gate Valve	1.5	Removable Blanket	1	5	5110	123.30	$123	2.7 MMBtu	0 kWh	$22	5.6 yrs
	LPS	2.5	Straight Pipe	2.5	Cellular Glass	8	8	5110	67.60	$541	1.9 MMBtu	0 kWh	$16	34.8 yrs
	LPS	2.5	Strainer	1.5	Removable Blanket	2	10	5110	123.30	$247	5.5 MMBtu	0 kWh	$44	5.6 yrs
	LPS	5	90 Degree Elbow	3	Cellular Glass	1	1.8	5110	88.00	$88	1.9 MMBtu	0 kWh	$15	5.7 yrs
	LPS	5	Flange	3	Cellular Glass	1	1.8	5110	74.20	$74	1.9 MMBtu	0 kWh	$15	4.8 yrs
	LPS	5	Straight Pipe	3	Cellular Glass	6	6	5110	74.20	$445	6.5 MMBtu	0 kWh	$52	8.6 yrs
	LPS	6	Bonnet	1.5	Removable Blanket	2	3.6	5110	204.50	$409	4.2 MMBtu	0 kWh	$34	12.1 yrs
	LPS	6	Flange	1.5	Removable Blanket	3	5.4	5110	201.40	$604	6.3 MMBtu	0 kWh	$51	11.9 yrs
	LPS	6	Gate Valve	1.5	Removable Blanket	1	5	5110	253.30	$253	5.9 MMBtu	0 kWh	$47	5.4 yrs
	LPS	8	90 Degree Elbow	3	Cellular Glass	1	1.8	5110	104.80	$105	2.9 MMBtu	0 kWh	$23	4.5 yrs
	LPS	8	Bonnet	1.5	Removable Blanket	2	3.6	5110	204.50	$409	5.4 MMBtu	0 kWh	$43	9.5 yrs
	LPS	8	Flange	3	Cellular Glass	3	5.4	5110	79.50	$238	8.7 MMBtu	0 kWh	$69	3.4 yrs
	LPS	8	T Intersection	3	Cellular Glass	1	1.2	5110	104.80	$105	1.9 MMBtu	0 kWh	$15	6.8 yrs
	LPS	14	Flange	3	Cellular Glass	6	10.8	5110	94.10	$565	25.2 MMBtu	0 kWh	$202	2.8 yrs
	LPS	14	Straight Pipe	3	Cellular Glass	6	6	5110	94.10	$565	14.0 MMBtu	0 kWh	$112	5.0 yrs
	LPS	14	T Intersection	3	Cellular Glass	1	1.2	5110	118.30	$118	2.8 MMBtu	0 kWh	$22	5.3 yrs
	LPS Total									**$5,592**	**107.2 MMBtu**	**0 kWh**	**$857**	**6.5 yrs**
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	24	43.2	5110	32.30	$775	6.9 MMBtu	0 kWh	$55	14.1 yrs
	Cond	1	Steam Trap	1.5	Removable Blanket	5	22	5110	116.80	$584	3.4 MMBtu	0 kWh	$27	21.3 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	75	75	5110	32.90	$2,471	12.0 MMBtu	0 kWh	$96	25.8 yrs
	Cond	1	Strainer	1.5	Cellular Glass	4	20	5110	36.70	$147	3.2 MMBtu	0 kWh	$26	5.8 yrs
	Cond	1	T Intersection	1.5	Cellular Glass	2	2.4	5110	32.30	$65	0.4 MMBtu	0 kWh	$3	21.1 yrs
	Cond	1.5	45 Degree Elbow	2	Cellular Glass	4	4	5110	37.70	$151	0.9 MMBtu	0 kWh	$7	20.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	6	10.8	5110	37.70	$226	2.5 MMBtu	0 kWh	$20	11.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	3	5.4	5110	37.70	$113	1.3 MMBtu	0 kWh	$10	11.3 yrs
	Cond	1.5	In-Line Pump	1.5	Removable Blanket	2	10	5110	142.70	$285	2.2 MMBtu	0 kWh	$18	16.2 yrs
	Cond	1.5	Steam Trap	1.5	Removable Blanket	1	4.4	5110	123.30	$123	1.0 MMBtu	0 kWh	$8	15.9 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	9	9	5110	35.80	$322	2.1 MMBtu	0 kWh	$17	19.3 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	22	22	5110	35.80	$787	5.1 MMBtu	0 kWh	$41	19.3 yrs
	Cond	1.5	T Intersection	2	Cellular Glass	2	2.4	5110	37.70	$75	0.6 MMBtu	0 kWh	$4	16.9 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	3	5.4	5110	37.70	$113	1.5 MMBtu	0 kWh	$12	9.2 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	47	47	5110	36.10	$1,697	13.4 MMBtu	0 kWh	$107	15.8 yrs
	Cond	3	Bonnet	1.5	Removable Blanket	1	1.8	5110	123.30	$123	0.7 MMBtu	0 kWh	$6	22.1 yrs
	Cond	3	Straight Pipe	2	Cellular Glass	2	2	5110	37.10	$74	0.8 MMBtu	0 kWh	$7	11.4 yrs
	Cond	3	T Intersection	2	Cellular Glass	1	1.2	5110	40.40	$40	0.5 MMBtu	0 kWh	$4	10.3 yrs
	Cond	4	Flange	2	Cellular Glass	2	3.6	5110	38.40	$77	1.8 MMBtu	0 kWh	$15	5.2 yrs
	Cond	56.9	Condensate Tank	2	Cellular Glass	1	56.9	5110	44.90	$2,553	25.4 MMBtu	0 kWh	$203	12.6 yrs
	Cond Total									**$10,802**	**85.7 MMBtu**	**0 kWh**	**$685**	**15.8 yrs**

TEANECK PUBLIC SCHOOLS, NJ
MECHANICAL INSULATION SAVINGS SUMMARY

Building	Fluid Type	Pipe Dia (") or Tank Surface Area(SF)*	Component	Insulation Thickness (")	Proposed Insulation Type	Quantity or Length	Total Eq Length(LF) or Total Area(SF)*	Heating or Cooling Hrs/Yr	Price per Unit	Total Investment	Fuel Savings MMBTU	Electric Savings kWh	Total Savings	Payback
Bryant Elementary School Total										**$18,379**	**215.7 MMBtu**	**0 kWh**	**$1,726**	**10.7 yrs**
Eugene Administration Building	MTHW	1.5	90 Degree Elbow	2	Cellular Glass	5	9	5110	37.70	$188	2.7 MMBtu	0 kWh	$21	8.8 yrs
	MTHW	1.5	Control Valve	1.5	Removable Blanket	1	4.1	5110	123.30	$123	1.2 MMBtu	0 kWh	$9	13.3 yrs
	MTHW	1.5	End Cap	2	Cellular Glass	2	3.6	5110	123.20	$246	1.1 MMBtu	0 kWh	$9	28.7 yrs
	MTHW	1.5	Flo-Check	1.5	Removable Blanket	1	4.1	5110	107.00	$107	1.2 MMBtu	0 kWh	$9	11.5 yrs
	MTHW	1.5	Straight Pipe	2	Cellular Glass	4	4	5110	35.80	$143	1.2 MMBtu	0 kWh	$10	15.0 yrs
	MTHW	1.5	Straight Pipe	2	Cellular Glass	7	7	5110	35.80	$250	2.1 MMBtu	0 kWh	$17	15.0 yrs
	MTHW	1.5	Strainer	1.5	Removable Blanket	1	5	5110	105.40	$105	1.4 MMBtu	0 kWh	$11	9.3 yrs
	MTHW	1.5	Triple Duty Valve	1.5	Removable Blanket	1	5	5110	105.40	$105	1.4 MMBtu	0 kWh	$11	9.3 yrs
	MTHW	2	90 Degree Elbow	2	Cellular Glass	2	3.6	5110	37.70	$151	2.6 MMBtu	0 kWh	$21	7.2 yrs
	MTHW	2	Bonnet	1.5	Removable Blanket	1	1.8	5110	98.90	$99	0.6 MMBtu	0 kWh	$5	19.7 yrs
	MTHW	2	Control Valve	1.5	Removable Blanket	1	4.1	5110	155.80	$156	1.4 MMBtu	0 kWh	$11	13.6 yrs
	MTHW	2	Flange	1.5	Removable Blanket	4	7.2	5110	87.60	$350	2.5 MMBtu	0 kWh	$20	17.5 yrs
	MTHW	2	In-Line Pump	1.5	Removable Blanket	2	10	5110	142.70	$285	3.5 MMBtu	0 kWh	$28	10.2 yrs
	MTHW	2	In-Line Pump	1.5	Removable Blanket	1	5	5110	142.70	$143	1.7 MMBtu	0 kWh	$14	10.2 yrs
	MTHW	2	Straight Pipe	2	Cellular Glass	2	2	5110	36.10	$72	0.7 MMBtu	0 kWh	$6	12.4 yrs
	MTHW	2	Straight Pipe	2	Cellular Glass	31	31	5110	36.10	$1,120	11.3 MMBtu	0 kWh	$91	12.4 yrs
	MTHW	2	T Intersection	2	Cellular Glass	1	1.2	5110	37.70	$38	0.4 MMBtu	0 kWh	$4	10.7 yrs
	MTHW	2	Triple Duty Valve	1.5	Removable Blanket	1	5	5110	123.30	$123	1.7 MMBtu	0 kWh	$14	8.9 yrs
	MTHW	3	90 Degree Elbow	2	Cellular Glass	2	3.6	5110	40.40	$161	3.8 MMBtu	0 kWh	$30	5.4 yrs
	MTHW	3	Control Valve	1.5	Removable Blanket	1	4.1	5110	188.30	$188	2.0 MMBtu	0 kWh	$16	11.5 yrs
	MTHW	3	Flange	1.5	Removable Blanket	7	12.6	5110	87.60	$613	6.3 MMBtu	0 kWh	$50	12.2 yrs
	MTHW	3	Flange	2	Cellular Glass	4	7.2	5110	37.10	$148	3.8 MMBtu	0 kWh	$30	4.9 yrs
	MTHW	3	Gate Valve	1.5	Removable Blanket	1	5	5110	155.80	$156	2.5 MMBtu	0 kWh	$20	7.8 yrs
	MTHW	3	Straight Pipe	2	Cellular Glass	6	6	5110	37.10	$223	3.1 MMBtu	0 kWh	$25	8.9 yrs
	MTHW	3	Strainer	1.5	Removable Blanket	1	5	5110	123.30	$123	2.5 MMBtu	0 kWh	$20	6.2 yrs
	MTHW	3	T Intersection	2	Cellular Glass	6	7.2	5110	40.40	$242	3.8 MMBtu	0 kWh	$30	8.1 yrs
	MTHW	3	Triple Duty Valve	1.5	Removable Blanket	2	10	5110	123.30	$247	5.0 MMBtu	0 kWh	$40	6.2 yrs
	MTHW	4	Butterfly Valve	1.5	Removable Blanket	2	8.2	5110	123.30	$247	5.1 MMBtu	0 kWh	$41	6.0 yrs
	MTHW	4	Gate Valve	1.5	Removable Blanket	1	5	5110	188.30	$188	3.1 MMBtu	0 kWh	$25	7.5 yrs
	MTHW	4	Straight Pipe	2	Cellular Glass	6	6	5110	38.40	$231	3.9 MMBtu	0 kWh	$31	7.3 yrs
	MTHW	4	Straight Pipe	2	Cellular Glass	3	3	5110	38.40	$115	2.0 MMBtu	0 kWh	$16	7.3 yrs
	MTHW	4	T Intersection	2	Cellular Glass	1	1.2	5110	43.60	$44	0.8 MMBtu	0 kWh	$6	6.9 yrs
	MTHW Total									**$6,732**	**86.4 MMBtu**	**0 kWh**	**$691**	**9.7 yrs**
Eugene Administration Building Total										**$6,732**	**86.4 MMBtu**	**0 kWh**	**$691**	**9.7 yrs**
Hawthorne Elementary School	MTHW	2	Check Valve	1.5	Removable Blanket	2	8.2	5110	123.30	$247	2.9 MMBtu	0 kWh	$23	10.8 yrs
	MTHW	2	Flange	1.5	Removable Blanket	9	16.2	5110	87.60	$789	5.6 MMBtu	0 kWh	$45	17.5 yrs
	MTHW	2	In-Line Pump	1.5	Removable Blanket	2	10	5110	142.70	$285	3.5 MMBtu	0 kWh	$28	10.2 yrs
	MTHW	3	Check Valve	1.5	Removable Blanket	2	8.2	5110	155.80	$312	4.1 MMBtu	0 kWh	$33	9.6 yrs
	MTHW	3	End Cap	2	Cellular Glass	1	1.8	5110	124.50	$125	0.9 MMBtu	0 kWh	$8	16.6 yrs
	MTHW	3	Flange	1.5	Removable Blanket	4	7.2	5110	87.60	$350	3.6 MMBtu	0 kWh	$29	12.2 yrs
	MTHW	3	In-Line Pump	1.5	Removable Blanket	2	10	5110	175.20	$350	5.0 MMBtu	0 kWh	$40	8.8 yrs
	MTHW	16	Flange	2	Cellular Glass	1	1.8	5110	56.20	$56	3.8 MMBtu	0 kWh	$30	1.9 yrs
	MTHW Total									**$2,514**	**29.3 MMBtu**	**0 kWh**	**$234**	**10.7 yrs**
	LPS	2	Bonnet	1.5	Removable Blanket	4	7.2	5110	98.90	$396	3.3 MMBtu	0 kWh	$26	14.9 yrs
	LPS	2	Control Valve	1.5	Removable Blanket	2	8.2	5110	155.80	$312	3.8 MMBtu	0 kWh	$30	10.3 yrs
	LPS	2	Flange	1.5	Removable Blanket	4	7.2	5110	87.60	$350	3.3 MMBtu	0 kWh	$26	13.2 yrs
	LPS	2	Strainer	1.5	Removable Blanket	2	10	5110	123.30	$247	4.6 MMBtu	0 kWh	$37	6.7 yrs
	LPS	4	Bonnet	1.5	Removable Blanket	1	1.8	5110	155.80	$156	1.5 MMBtu	0 kWh	$12	13.1 yrs
	LPS	4	Flange	1.5	Removable Blanket	1	1.8	5110	168.90	$169	1.5 MMBtu	0 kWh	$12	14.2 yrs
	LPS	6	Bonnet	1.5	Removable Blanket	5	9	5110	204.50	$1,023	10.6 MMBtu	0 kWh	$85	12.1 yrs
	LPS	8	Bonnet	1.5	Removable Blanket	2	3.6	5110	204.50	$409	5.4 MMBtu	0 kWh	$43	9.5 yrs
	LPS Total									**$3,061**	**33.9 MMBtu**	**0 kWh**	**$271**	**11.3 yrs**
	Cond	0.75	90 Degree Elbow	1.5	Cellular Glass	10	18	5110	31.80	$318	2.3 MMBtu	0 kWh	$19	17.1 yrs
	Cond	0.75	Ball Valve	1.5	Removable Blanket	2	8.2	5110	74.50	$149	1.0 MMBtu	0 kWh	$8	18.1 yrs
	Cond	0.75	Check Valve	1.5	Removable Blanket	2	8.2	5110	90.80	$182	1.0 MMBtu	0 kWh	$8	22.0 yrs
	Cond	0.75	Steam Trap	1.5	Removable Blanket	2	8.8	5110	107.00	$214	1.1 MMBtu	0 kWh	$9	24.2 yrs

TEANECK PUBLIC SCHOOLS, NJ
MECHANICAL INSULATION SAVINGS SUMMARY

Building	Fluid Type	Pipe Dia (") or Tank Surface Area(SF)*	Component	Insulation Thickness (")	Proposed Insulation Type	Quantity or Length	Total Eq Length(LF) or Total Area(SF)*	Heating or Cooling Hrs/Yr	Price per Unit	Total Investment	Fuel Savings MMBTU	Electric Savings kWh	Total Savings	Payback
Hawthorne Elementary School	Cond	0.75	Straight Pipe	1.5	Cellular Glass	12	12	5110	32.70	$392	1.5 MMBtu	0 kWh	$12	31.6 yrs
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	10	18	5110	32.30	$323	2.9 MMBtu	0 kWh	$23	14.1 yrs
	Cond	1	In-Line Pump	1.5	Removable Blanket	2	10	5110	118.30	$237	1.6 MMBtu	0 kWh	$12	19.0 yrs
	Cond	1	Steam Trap	1.5	Removable Blanket	1	4.4	5110	116.80	$117	0.7 MMBtu	0 kWh	$5	21.3 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	3	3	5110	32.90	$99	0.5 MMBtu	0 kWh	$4	25.8 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	45	45	5110	32.90	$1,482	7.2 MMBtu	0 kWh	$57	25.8 yrs
	Cond	1	Strainer	1.5	Removable Blanket	1	5	5110	100.50	$101	0.8 MMBtu	0 kWh	$6	16.1 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	3	5.4	5110	37.70	$113	1.3 MMBtu	0 kWh	$10	11.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	5	9	5110	37.70	$188	2.1 MMBtu	0 kWh	$17	11.3 yrs
	Cond	1.5	Steam Trap	1.5	Removable Blanket	2	8.8	5110	123.30	$247	1.9 MMBtu	0 kWh	$15	15.9 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	15	15	5110	35.80	$536	3.5 MMBtu	0 kWh	$28	19.3 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	28	28	5110	35.80	$1,001	6.5 MMBtu	0 kWh	$52	19.3 yrs
	Cond	1.5	Strainer	1.5	Removable Blanket	1	5	5110	105.40	$105	1.1 MMBtu	0 kWh	$9	12.0 yrs
	Cond	1.5	T Intersection	2	Cellular Glass	4	4.8	5110	37.70	$151	1.1 MMBtu	0 kWh	$9	16.9 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	1	1.8	5110	37.70	$38	0.5 MMBtu	0 kWh	$4	9.2 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	19	34.2	5110	37.70	$716	9.7 MMBtu	0 kWh	$78	9.2 yrs
	Cond	2	Ball Valve	1.5	Removable Blanket	2	8.2	5110	123.30	$247	2.2 MMBtu	0 kWh	$18	13.9 yrs
	Cond	2	Check Valve	1.5	Removable Blanket	2	8.2	5110	123.30	$247	2.2 MMBtu	0 kWh	$18	13.9 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	16	16	5110	36.10	$578	4.6 MMBtu	0 kWh	$36	15.8 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	60	60	5110	36.10	$2,167	17.1 MMBtu	0 kWh	$137	15.8 yrs
	Cond	2	T Intersection	2	Cellular Glass	6	7.2	5110	37.70	$226	2.1 MMBtu	0 kWh	$16	13.8 yrs
	Cond	3	90 Degree Elbow	2	Cellular Glass	2	3.6	5110	40.40	$81	1.5 MMBtu	0 kWh	$12	6.9 yrs
	Cond	3	T Intersection	2	Cellular Glass	2	2.4	5110	40.40	$81	1.0 MMBtu	0 kWh	$8	10.3 yrs
	Cond	56.9	Condensate Tank	2	Cellular Glass	1	56.9	5110	44.90	$2,553	25.4 MMBtu	0 kWh	$203	12.6 yrs
	Cond Total									**$12,886**	**104.3 MMBtu**	**0 kWh**	**$835**	**15.4 yrs**
Hawthorne Elementary School Total										**$18,461**	**167.5 MMBtu**	**0 kWh**	**$1,340**	**13.8 yrs**
Lowell Elementary School	MTHW	3	90 Degree Elbow	2	Cellular Glass	1	1.8	5110	40.40	$40	0.9 MMBtu	0 kWh	$8	5.4 yrs
	MTHW	3	Balance Valve	1.5	Removable Blanket	2	8.2	5110	155.80	$312	4.1 MMBtu	0 kWh	$33	9.6 yrs
	MTHW	3	Butterfly Valve	1.5	Removable Blanket	2	8.2	5110	107.00	$214	4.1 MMBtu	0 kWh	$33	6.6 yrs
	MTHW	3	Centrifugal Pump	1.5	Removable Blanket	2	10	5110	167.20	$334	5.0 MMBtu	0 kWh	$40	8.4 yrs
	MTHW	3	End Cap	2	Cellular Glass	1	1.8	5110	124.50	$125	0.9 MMBtu	0 kWh	$8	16.6 yrs
	MTHW	3	Flange	2	Cellular Glass	5	9	5110	37.10	$186	4.7 MMBtu	0 kWh	$38	4.9 yrs
	MTHW	3	Flex Fitting	2	Cellular Glass	4	6	5110	41.10	$164	3.1 MMBtu	0 kWh	$25	6.6 yrs
	MTHW	3	Straight Pipe	2	Cellular Glass	6	6	5110	37.10	$223	3.1 MMBtu	0 kWh	$25	8.9 yrs
	MTHW	3	Straight Pipe	2	Cellular Glass	9	9	5110	37.10	$334	4.7 MMBtu	0 kWh	$38	8.9 yrs
	MTHW	3	Suction Diffuser	1.5	Removable Blanket	2	8.8	5110	188.30	$377	4.4 MMBtu	0 kWh	$35	10.8 yrs
	MTHW	15.3	Air Seperator Tank	2	Cellular Glass	1	15.3	5110	44.90	$687	8.8 MMBtu	0 kWh	$70	9.8 yrs
	MTHW	16	Flange	2	Cellular Glass	1	1.8	5110	56.20	$56	3.8 MMBtu	0 kWh	$30	1.9 yrs
	MTHW Total									**$3,051**	**47.6 MMBtu**	**0 kWh**	**$381**	**8.0 yrs**
	LPS	1	Control Valve	2.5	Cellular Glass	1	4.1	5110	72.40	$72	1.2 MMBtu	0 kWh	$9	7.8 yrs
	LPS	1	Gate Valve	1.5	Removable Blanket	2	10	5110	82.70	$165	2.7 MMBtu	0 kWh	$21	7.8 yrs
	LPS	1	Straight Pipe	2.5	Cellular Glass	6	6	5110	65.30	$392	1.7 MMBtu	0 kWh	$14	28.8 yrs
	LPS	1	Strainer	1.5	Removable Blanket	1	5	5110	100.50	$101	1.3 MMBtu	0 kWh	$11	9.5 yrs
	LPS	2	Control Valve	1.5	Removable Blanket	1	4.1	5110	155.80	$156	1.9 MMBtu	0 kWh	$15	10.3 yrs
	LPS	2	Flange	2.5	Cellular Glass	2	3.6	5110	66.40	$133	1.8 MMBtu	0 kWh	$14	9.4 yrs
	LPS	2	Straight Pipe	2.5	Cellular Glass	3	3	5110	66.40	$199	1.5 MMBtu	0 kWh	$12	17.0 yrs
	LPS	2	Strainer	1.5	Removable Blanket	1	5	5110	123.30	$123	2.3 MMBtu	0 kWh	$18	6.7 yrs
	LPS	4	Flange	3	Cellular Glass	1	1.8	5110	72.30	$72	1.6 MMBtu	0 kWh	$13	5.7 yrs
	LPS	6	Bonnet	1.5	Removable Blanket	8	14.4	5110	204.50	$1,636	16.9 MMBtu	0 kWh	$135	12.1 yrs
	LPS	6	Flange	3	Cellular Glass	2	3.6	5110	75.30	$151	4.5 MMBtu	0 kWh	$36	4.1 yrs
	LPS	6	Flange	3	Cellular Glass	1	1.8	5110	75.30	$75	2.3 MMBtu	0 kWh	$18	4.1 yrs
	LPS	6	Straight Pipe	3	Cellular Glass	3	3	5110	75.30	$226	3.8 MMBtu	0 kWh	$30	7.5 yrs
	LPS	10	End Cap	1.5	Removable Blanket	3	5.4	5110	350.80	$1,052	9.9 MMBtu	0 kWh	$79	13.4 yrs
	LPS	10	Straight Pipe	3	Cellular Glass	1	1	5110	82.80	$83	2.0 MMBtu	0 kWh	$16	5.3 yrs
	LPS Total									**$4,637**	**55.2 MMBtu**	**0 kWh**	**$441**	**10.5 yrs**
	Cond	0.75	45 Degree Elbow	1.5	Cellular Glass	2	2	5110	31.80	$64	0.3 MMBtu	0 kWh	$2	30.7 yrs
	Cond	0.75	90 Degree Elbow	1.5	Cellular Glass	4	7.2	5110	31.80	$127	0.9 MMBtu	0 kWh	$7	17.1 yrs
	Cond	0.75	Straight Pipe	1.5	Cellular Glass	18	18	5110	32.70	$588	2.3 MMBtu	0 kWh	$19	31.6 yrs

TEANECK PUBLIC SCHOOLS, NJ
MECHANICAL INSULATION SAVINGS SUMMARY

Building	Fluid Type	Pipe Dia (") or Tank Surface Area(SF)*	Component	Insulation Thickness (")	Proposed Insulation Type	Quantity or Length	Total Eq Length(LF) or Total Area(SF)*	Heating or Cooling Hrs/Yr	Price per Unit	Total Investment	Fuel Savings MMBTU	Electric Savings kWh	Total Savings	Payback
Lowell Elementary School	Cond	1	90 Degree Elbow	1.5	Cellular Glass	2	3.6	5110	32.30	$65	0.6 MMBtu	0 kWh	$5	14.1 yrs
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	4	7.2	5110	32.30	$129	1.1 MMBtu	0 kWh	$9	14.1 yrs
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	3	5.4	5110	32.30	$97	0.9 MMBtu	0 kWh	$7	14.1 yrs
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	7	12.6	5110	32.30	$226	2.0 MMBtu	0 kWh	$16	14.1 yrs
	Cond	1	Bonnet	1.5	Removable Blanket	3	5.4	5110	74.50	$224	0.8 MMBtu	0 kWh	$7	33.2 yrs
	Cond	1	Gate Valve	1.5	Removable Blanket	1	5	5110	82.70	$83	0.8 MMBtu	0 kWh	$6	13.3 yrs
	Cond	1	Steam Trap	1.5	Removable Blanket	2	8.8	5110	116.80	$234	1.4 MMBtu	0 kWh	$11	21.3 yrs
	Cond	1	Steam Trap	1.5	Removable Blanket	1	4.4	5110	116.80	$234	1.4 MMBtu	0 kWh	$11	21.3 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	2	2	5110	32.90	$132	0.6 MMBtu	0 kWh	$5	25.8 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	12	12	5110	32.90	$395	1.9 MMBtu	0 kWh	$15	25.8 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	24	24	5110	32.90	$791	3.8 MMBtu	0 kWh	$31	25.8 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	69	69	5110	32.90	$2,273	11.0 MMBtu	0 kWh	$88	25.8 yrs
	Cond	1	Strainer	1.5	Cellular Glass	2	10	5110	36.70	$73	1.6 MMBtu	0 kWh	$13	5.8 yrs
	Cond	1	Strainer	1.5	Removable Blanket	1	5	5110	100.50	$101	0.8 MMBtu	0 kWh	$6	16.1 yrs
	Cond	1.25	90 Degree Elbow	1.5	Cellular Glass	2	3.6	5110	32.30	$65	0.7 MMBtu	0 kWh	$6	11.3 yrs
	Cond	1.25	90 Degree Elbow	1.5	Cellular Glass	5	9	5110	32.30	$162	1.8 MMBtu	0 kWh	$14	11.3 yrs
	Cond	1.25	Gate Valve	1.5	Removable Blanket	2	10	5110	82.70	$165	1.9 MMBtu	0 kWh	$16	10.7 yrs
	Cond	1.25	Steam Trap	1.5	Removable Blanket	1	4.4	5110	116.80	$234	1.7 MMBtu	0 kWh	$14	17.1 yrs
	Cond	1.25	Straight Pipe	1.5	Cellular Glass	2	2	5110	32.90	$66	0.4 MMBtu	0 kWh	$3	20.7 yrs
	Cond	1.25	Straight Pipe	1.5	Cellular Glass	30	30	5110	32.90	$988	6.0 MMBtu	0 kWh	$48	20.7 yrs
	Cond	1.25	Strainer	1.5	Removable Blanket	1	5	5110	100.50	$201	1.9 MMBtu	0 kWh	$16	13.0 yrs
	Cond	1.5	45 Degree Elbow	2	Cellular Glass	4	4	5110	37.70	$151	0.9 MMBtu	0 kWh	$7	20.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	22	39.6	5110	37.70	$829	9.2 MMBtu	0 kWh	$73	11.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	7	12.6	5110	37.70	$264	2.9 MMBtu	0 kWh	$23	11.3 yrs
	Cond	1.5	Gate Valve	1.5	Removable Blanket	4	20	5110	107.00	$428	4.4 MMBtu	0 kWh	$35	12.2 yrs
	Cond	1.5	In-Line Pump	2	Cellular Glass	3	15	5110	42.40	$127	3.5 MMBtu	0 kWh	$28	4.6 yrs
	Cond	1.5	Steam Trap	1.5	Removable Blanket	1	4.4	5110	123.30	$123	1.0 MMBtu	0 kWh	$8	15.9 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	53	53	5110	35.80	$1,895	12.3 MMBtu	0 kWh	$98	19.3 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	103	103	5110	35.80	$3,682	23.9 MMBtu	0 kWh	$191	19.3 yrs
	Cond	1.5	T Intersection	2	Cellular Glass	3	3.6	5110	37.70	$226	1.7 MMBtu	0 kWh	$13	16.9 yrs
	Cond	2	45 Degree Elbow	2	Cellular Glass	2	2	5110	37.70	$75	0.6 MMBtu	0 kWh	$5	16.5 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	6	10.8	5110	37.70	$226	3.1 MMBtu	0 kWh	$25	9.2 yrs
	Cond	2	Gate Valve	1.5	Removable Blanket	1	5	5110	123.30	$123	1.4 MMBtu	0 kWh	$11	11.4 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	24	24	5110	36.10	$867	6.8 MMBtu	0 kWh	$55	15.8 yrs
	Cond	2	T Intersection	2	Cellular Glass	1	1.2	5110	37.70	$38	0.3 MMBtu	0 kWh	$3	13.8 yrs
	Cond	2.5	45 Degree Elbow	2	Cellular Glass	4	4	5110	40.40	$161	1.4 MMBtu	0 kWh	$11	14.9 yrs
	Cond	2.5	90 Degree Elbow	2	Cellular Glass	4	7.2	5110	40.40	$161	2.4 MMBtu	0 kWh	$20	8.3 yrs
	Cond	2.5	90 Degree Elbow	2	Cellular Glass	6	10.8	5110	40.40	$242	3.7 MMBtu	0 kWh	$29	8.3 yrs
	Cond	2.5	Flange	2	Cellular Glass	2	3.6	5110	36.70	$73	1.2 MMBtu	0 kWh	$10	7.5 yrs
	Cond	2.5	Flange	2	Cellular Glass	3	5.4	5110	36.70	$110	1.8 MMBtu	0 kWh	$15	7.5 yrs
	Cond	2.5	Gate Valve	1.5	Removable Blanket	2	10	5110	123.30	$247	3.2 MMBtu	0 kWh	$26	9.5 yrs
	Cond	2.5	Straight Pipe	2	Cellular Glass	24	24	5110	36.70	$880	8.2 MMBtu	0 kWh	$65	13.5 yrs
	Cond	2.5	Straight Pipe	2	Cellular Glass	84	84	5110	36.70	$3,079	28.5 MMBtu	0 kWh	$228	13.5 yrs
	Cond	4	Straight Pipe	2	Cellular Glass	4	4	5110	38.40	$154	2.0 MMBtu	0 kWh	$16	9.4 yrs
	Cond	4	Straight Pipe	2	Cellular Glass	6	6	5110	38.40	$231	3.1 MMBtu	0 kWh	$25	9.4 yrs
	Cond	4	T Intersection	2	Cellular Glass	6	7.2	5110	43.60	$261	3.7 MMBtu	0 kWh	$29	8.9 yrs
	Cond	4	T Intersection	2	Cellular Glass	3	3.6	5110	43.60	$131	1.8 MMBtu	0 kWh	$15	8.9 yrs
	Cond Total									**$22,499**	**179.7 MMBtu**	**0 kWh**	**$1,438**	**15.6 yrs**
Lowell Elementary School Total										**$30,186**	**282.5 MMBtu**	**0 kWh**	**$2,260**	**13.4 yrs**
Teaneck High School	MTHW	3	Butterfly Valve	1.5	Removable Blanket	1	4.1	5110	107.00	$107	2.0 MMBtu	0 kWh	$16	6.6 yrs
	MTHW	3	Flange	1.5	Removable Blanket	1	1.8	5110	87.60	$88	0.9 MMBtu	0 kWh	$7	12.2 yrs
	MTHW Total									**$195**	**2.9 MMBtu**	**0 kWh**	**$23**	**8.3 yrs**
	LPS	1.5	90 Degree Elbow	2.5	Cellular Glass	2	3.6	5110	69.50	$139	1.4 MMBtu	0 kWh	$11	12.1 yrs
	LPS	1.5	Control Valve	1.5	Removable Blanket	1	4.1	5110	123.30	$247	3.1 MMBtu	0 kWh	$25	10.1 yrs
	LPS	1.5	Flange	1.5	Removable Blanket	2	3.6	5110	71.40	$143	1.3 MMBtu	0 kWh	$11	13.3 yrs
	LPS	1.5	Straight Pipe	2.5	Cellular Glass	3	3	5110	66.00	$198	1.2 MMBtu	0 kWh	$10	20.7 yrs
	LPS	1.5	Straight Pipe	2.5	Cellular Glass	19	19	5110	66.00	$1,254	7.6 MMBtu	0 kWh	$61	20.7 yrs
	LPS	1.5	Strainer	1.5	Removable Blanket	1	5	5110	105.40	$211	3.7 MMBtu	0 kWh	$30	7.0 yrs
	LPS	2.5	90 Degree Elbow	2.5	Cellular Glass	2	3.6	5110	72.70	$145	2.1 MMBtu	0 kWh	$17	8.7 yrs

TEANECK PUBLIC SCHOOLS, NJ
MECHANICAL INSULATION SAVINGS SUMMARY

Building	Fluid Type	Pipe Dia (") or Tank Surface Area(SF)*	Component	Insulation Thickness (")	Proposed Insulation Type	Quantity or Length	Total Eq Length(LF) or Total Area(SF)*	Heating or Cooling Hrs/Yr	Price per Unit	Total Investment	Fuel Savings MMBTU	Electric Savings kWh	Total Savings	Payback
Teaneck High School	LPS	2.5	Control Valve	1.5	Removable Blanket	2	8.2	5110	155.80	$312	4.5 MMBtu	0 kWh	$36	8.7 yrs
	LPS	2.5	Flange	2.5	Cellular Glass	7	12.6	5110	67.60	$473	7.3 MMBtu	0 kWh	$59	8.1 yrs
	LPS	2.5	Gate Valve	1.5	Removable Blanket	2	10	5110	123.30	$247	5.5 MMBtu	0 kWh	$44	5.6 yrs
	LPS	2.5	Straight Pipe	2.5	Cellular Glass	5	5	5110	67.60	$338	2.9 MMBtu	0 kWh	$23	14.5 yrs
	LPS	2.5	Strainer	1.5	Removable Blanket	2	10	5110	123.30	$247	5.5 MMBtu	0 kWh	$44	5.6 yrs
	LPS	3	Bonnet	1.5	Removable Blanket	1	1.8	5110	123.30	$123	1.2 MMBtu	0 kWh	$9	13.0 yrs
	LPS	3	Bonnet	1.5	Removable Blanket	3	5.4	5110	123.30	$370	3.5 MMBtu	0 kWh	$28	13.0 yrs
	LPS	3	Control Valve	1.5	Removable Blanket	1	4.1	5110	188.30	$377	5.4 MMBtu	0 kWh	$43	8.7 yrs
	LPS	3	Flange	1.5	Removable Blanket	2	3.6	5110	87.60	$175	2.4 MMBtu	0 kWh	$19	9.3 yrs
	LPS	3	Flange	2.5	Cellular Glass	2	3.6	5110	68.10	$136	2.5 MMBtu	0 kWh	$20	6.8 yrs
	LPS	3	Gate Valve	1.5	Removable Blanket	1	5	5110	155.80	$156	3.3 MMBtu	0 kWh	$26	5.9 yrs
	LPS	3	Straight Pipe	2.5	Cellular Glass	3	3	5110	68.10	$204	2.1 MMBtu	0 kWh	$17	12.2 yrs
	LPS	3	Strainer	1.5	Removable Blanket	1	5	5110	123.30	$123	3.3 MMBtu	0 kWh	$26	4.7 yrs
	LPS	5	90 Degree Elbow	3	Cellular Glass	1	1.8	5110	88.00	$88	1.9 MMBtu	0 kWh	$15	5.7 yrs
	LPS	5	Bonnet	1.5	Removable Blanket	1	1.8	5110	155.80	$156	1.8 MMBtu	0 kWh	$14	10.8 yrs
	LPS	5	Flange	1.5	Removable Blanket	1	1.8	5110	201.40	$201	1.8 MMBtu	0 kWh	$14	14.0 yrs
	LPS	5	Straight Pipe	3	Cellular Glass	6	6	5110	74.20	$445	6.5 MMBtu	0 kWh	$52	8.6 yrs
	LPS	8	Bonnet	1.5	Removable Blanket	1	1.8	5110	204.50	$205	2.7 MMBtu	0 kWh	$21	9.5 yrs
	LPS	10	Bonnet	1.5	Removable Blanket	2	3.6	5110	220.80	$442	6.6 MMBtu	0 kWh	$53	8.4 yrs
	LPS Total									**$7,153**	**91.0 MMBtu**	**0 kWh**	**$728**	**9.8 yrs**
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	2	3.6	5110	32.30	$65	0.6 MMBtu	0 kWh	$5	14.1 yrs
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	16	28.8	5110	32.30	$517	4.6 MMBtu	0 kWh	$37	14.1 yrs
	Cond	1	Gate Valve	1.5	Removable Blanket	1	5	5110	82.70	$83	0.8 MMBtu	0 kWh	$6	13.3 yrs
	Cond	1	In-Line Pump	1.5	Removable Blanket	2	10	5110	118.30	$237	1.6 MMBtu	0 kWh	$12	19.0 yrs
	Cond	1	Steam Trap	1.5	Removable Blanket	1	4.4	5110	116.80	$117	0.7 MMBtu	0 kWh	$5	21.3 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	2	2	5110	32.90	$66	0.3 MMBtu	0 kWh	$3	25.8 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	48	48	5110	32.90	$1,581	7.7 MMBtu	0 kWh	$61	25.8 yrs
	Cond	1	Strainer	1.5	Removable Blanket	1	5	5110	100.50	$101	0.8 MMBtu	0 kWh	$6	16.1 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	4	7.2	5110	37.70	$301	3.3 MMBtu	0 kWh	$27	11.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	3	5.4	5110	37.70	$113	1.3 MMBtu	0 kWh	$10	11.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass				34.00	$102	0.5 MMBtu	0 kWh	$4	24.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	11	19.8	5110	37.70	$414	4.6 MMBtu	0 kWh	$37	11.3 yrs
	Cond	1.5	Check Valve	1.5	Removable Blanket	2	8.2	5110	123.30	$247	1.8 MMBtu	0 kWh	$14	17.1 yrs
	Cond	1.5	In-Line Pump	1.5	Removable Blanket	2	10	5110	142.70	$285	2.2 MMBtu	0 kWh	$18	16.2 yrs
	Cond	1.5	Steam Trap	1.5	Removable Blanket	4	17.6	5110	123.30	$493	3.9 MMBtu	0 kWh	$31	15.9 yrs
	Cond	1.5	Steam Trap	1.5	Removable Blanket	1	4.4	5110	123.30	$247	1.9 MMBtu	0 kWh	$15	15.9 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	6	6	5110	35.80	$215	1.4 MMBtu	0 kWh	$11	19.3 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	3	3	5110	35.80	$215	1.4 MMBtu	0 kWh	$11	19.3 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	24	24	5110	35.80	$858	5.6 MMBtu	0 kWh	$45	19.3 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	19	19	5110	35.20	$668	1.8 MMBtu	0 kWh	$15	45.2 yrs
	Cond	1.5	Strainer	1.5	Removable Blanket	2	10	5110	105.40	$211	2.2 MMBtu	0 kWh	$18	12.0 yrs
	Cond	1.5	Strainer	1.5	Removable Blanket	4	20	5110	105.40	$422	4.4 MMBtu	0 kWh	$35	12.0 yrs
	Cond	1.5	Strainer	1.5	Removable Blanket	1	5	5110	105.40	$105	1.1 MMBtu	0 kWh	$9	12.0 yrs
	Cond	1.5	T Intersection	2	Cellular Glass	1	1.2	5110	34.00	$34	0.1 MMBtu	0 kWh	$1	36.4 yrs
	Cond	2	45 Degree Elbow	2	Cellular Glass	2	2	5110	37.70	$75	0.6 MMBtu	0 kWh	$5	16.5 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	2	3.6	5110	37.70	$75	1.0 MMBtu	0 kWh	$8	9.2 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	1	1.8	5110	37.70	$113	1.2 MMBtu	0 kWh	$10	11.4 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	3	5.4	5110	37.70	$113	1.5 MMBtu	0 kWh	$12	9.2 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	5	9	5110	37.70	$188	2.6 MMBtu	0 kWh	$21	9.2 yrs
	Cond	2	Check Valve	1.5	Removable Blanket	3	12.3	5110	123.30	$370	3.3 MMBtu	0 kWh	$27	13.9 yrs
	Cond	2	Gate Valve	1.5	Removable Blanket	3	15	5110	123.30	$370	4.1 MMBtu	0 kWh	$32	11.4 yrs
	Cond	2	Steam Trap	1.5	Removable Blanket	1	4.4	5110	123.30	$123	1.2 MMBtu	0 kWh	$10	12.9 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	2	2	5110	36.10	$72	0.2 MMBtu	0 kWh	$2	38.7 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	1	1	5110	36.10	$36	0.3 MMBtu	0 kWh	$2	15.8 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	9	9	5110	36.10	$650	5.1 MMBtu	0 kWh	$41	15.8 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	21	21	5110	36.10	$758	6.0 MMBtu	0 kWh	$48	15.8 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	20	20	5110	36.10	$722	5.7 MMBtu	0 kWh	$46	15.8 yrs
	Cond	2	Strainer	1.5	Removable Blanket	1	5	5110	123.30	$123	1.4 MMBtu	0 kWh	$11	11.4 yrs
	Cond	2	Strainer	1.5	Removable Blanket	3	15	5110	123.30	$370	4.1 MMBtu	0 kWh	$32	11.4 yrs
	Cond	4	90 Degree Elbow	2	Cellular Glass	1	1.8	5110	43.60	$44	0.9 MMBtu	0 kWh	$7	5.9 yrs
	Cond	4	Flange	1.5	Removable Blanket	1	1.8	5110	168.90	$169	0.9 MMBtu	0 kWh	$7	24.1 yrs

MECHANICAL INSULATION SAVINGS SUMMARY

Building	Fluid Type	Pipe Dia (") or Tank Surface Area(SF)*	Component	Insulation Thickness (")	Proposed Insulation Type	Quantity or Length	Total Eq Length(LF) or Total Area(SF)*	Heating or Cooling Hrs/Yr	Price per Unit	Total Investment	Fuel Savings MMBTU	Electric Savings kWh	Total Savings	Payback
Teaneck High School	Cond	4	Straight Pipe	2	Cellular Glass	5	5	5110	38.40	$192	2.6 MMBtu	0 kWh	$20	9.4 yrs
	Cond	4	T Intersection	2	Cellular Glass	2	2.4	5110	43.60	$87	1.2 MMBtu	0 kWh	$10	8.9 yrs
	Cond	6	Flange	2	Cellular Glass	1	1.8	5110	40.10	$40	1.3 MMBtu	0 kWh	$10	3.8 yrs
	Cond	16	Condensate Tank	2	Cellular Glass	1	16	5110	44.90	$718	7.1 MMBtu	0 kWh	$57	12.6 yrs
	Cond	51.4	Condensate Tank	2	Cellular Glass	1	51.4	5110	44.90	$2,307	23.0 MMBtu	0 kWh	$184	12.6 yrs
	Cond	129.1	Condensate Tank	2	Cellular Glass	1	129.1	5110	31.90	$4,120	57.7 MMBtu	0 kWh	$461	8.9 yrs
	Cond Total									**$19,533**	**187.4 MMBtu**	**0 kWh**	**$1,499**	**13.0 yrs**
Teaneck High School Total										**$26,881**	**281.4 MMBtu**	**0 kWh**	**$2,251**	**11.9 yrs**
Thomas Jefferson Middle School	MTHW	10	Butterfly Valve	1.5	Removable Blanket	2	8.2	5110	305.20	$610	11.3 MMBtu	0 kWh	$91	6.7 yrs
	MTHW	10	Centrifugal Pump	1.5	Removable Blanket	2	10	5110	352.30	$705	13.8 MMBtu	0 kWh	$111	6.4 yrs
	MTHW	10	Check Valve	1.5	Removable Blanket	2	8.2	5110	337.70	$675	11.3 MMBtu	0 kWh	$91	7.4 yrs
	MTHW	10	Flange	1.5	Removable Blanket	12	21.6	5110	279.30	$3,352	29.9 MMBtu	0 kWh	$239	14.0 yrs
	MTHW	10	Flex Fitting	2	Cellular Glass	4	6	5110	62.80	$251	8.7 MMBtu	0 kWh	$70	3.6 yrs
	MTHW	10	Suction Diffuser	1.5	Removable Blanket	2	8.8	5110	352.30	$705	12.2 MMBtu	0 kWh	$97	7.2 yrs
	MTHW Total									**$6,298**	**87.3 MMBtu**	**0 kWh**	**$698**	**9.0 yrs**
Thomas Jefferson Middle School Total										**$6,298**	**87.3 MMBtu**	**0 kWh**	**$698**	**9.0 yrs**
Whittier Elementary School	MTHW	4	90 Degree Elbow	2	Cellular Glass	2	3.6	5110	43.60	$87	2.4 MMBtu	0 kWh	$19	4.6 yrs
	MTHW	4	In-Line Pump	1.5	Removable Blanket	1	5	5110	207.70	$208	3.1 MMBtu	0 kWh	$25	8.3 yrs
	MTHW Total									**$295**	**5.5 MMBtu**	**0 kWh**	**$44**	**6.7 yrs**
	LPS	1.25	90 Degree Elbow	2.5	Cellular Glass	4	7.2	5110	66.80	$267	2.5 MMBtu	0 kWh	$20	13.2 yrs
	LPS	1.25	Control Valve	1.5	Removable Blanket	2	8.2	5110	100.50	$201	2.7 MMBtu	0 kWh	$22	9.3 yrs
	LPS	1.25	Gate Valve	1.5	Removable Blanket	1	5	5110	82.70	$83	1.6 MMBtu	0 kWh	$13	6.3 yrs
	LPS	1.25	Straight Pipe	2.5	Cellular Glass	9	9	5110	65.30	$588	3.2 MMBtu	0 kWh	$25	23.2 yrs
	LPS	1.25	T Intersection	2.5	Cellular Glass	4	4.8	5110	66.80	$267	1.7 MMBtu	0 kWh	$14	19.8 yrs
	LPS	3	Bonnet	1.5	Removable Blanket	1	1.8	5110	123.30	$123	1.2 MMBtu	0 kWh	$9	13.0 yrs
	LPS	3	Flange	1.5	Removable Blanket	2	3.6	5110	87.60	$175	2.4 MMBtu	0 kWh	$19	9.3 yrs
	LPS	3	Gate Valve	1.5	Removable Blanket	1	5	5110	155.80	$156	3.3 MMBtu	0 kWh	$26	5.9 yrs
	LPS	3	Strainer	1.5	Removable Blanket	1	5	5110	123.30	$123	3.3 MMBtu	0 kWh	$26	4.7 yrs
	LPS	4	Bonnet	1.5	Removable Blanket	2	3.6	5110	155.80	$312	3.0 MMBtu	0 kWh	$24	13.1 yrs
	LPS	4	Strainer	1.5	Removable Blanket	1	5	5110	155.80	$156	2.1 MMBtu	0 kWh	$17	9.4 yrs
	LPS	5	45 Degree Elbow	3	Cellular Glass	1	1	5110	88.00	$88	1.1 MMBtu	0 kWh	$9	10.2 yrs
	LPS	5	90 Degree Elbow	3	Cellular Glass	2	3.6	5110	88.00	$176	3.9 MMBtu	0 kWh	$31	5.7 yrs
	LPS	5	Flange	1.5	Removable Blanket	5	9	5110	201.40	$1,007	9.0 MMBtu	0 kWh	$72	14.0 yrs
	LPS	5	Straight Pipe	3	Cellular Glass	4	4	5110	74.20	$297	4.3 MMBtu	0 kWh	$34	8.6 yrs
	LPS	6	Bonnet	1.5	Removable Blanket	4	7.2	5110	204.50	$818	8.5 MMBtu	0 kWh	$68	12.1 yrs
	LPS	8	Bonnet	1.5	Removable Blanket	2	3.6	5110	204.50	$409	5.4 MMBtu	0 kWh	$43	9.5 yrs
	LPS	10	End Cap	3	Cellular Glass	1	1.8	5110	141.10	$141	3.5 MMBtu	0 kWh	$28	5.0 yrs
	LPS	10	Flange	3	Cellular Glass	1	1.8	5110	82.80	$83	3.5 MMBtu	0 kWh	$28	2.9 yrs
	LPS Total									**$5,470**	**66.1 MMBtu**	**0 kWh**	**$528**	**10.4 yrs**
	Cond	1	45 Degree Elbow	1.5	Cellular Glass	1	1	5110	32.30	$32	0.2 MMBtu	0 kWh	$1	25.3 yrs
	Cond	1	90 Degree Elbow	1.5	Cellular Glass	10	18	5110	32.30	$323	2.9 MMBtu	0 kWh	$23	14.1 yrs
	Cond	1	Steam Trap	1.5	Removable Blanket	3	13.2	5110	116.80	$350	2.1 MMBtu	0 kWh	$16	21.3 yrs
	Cond	1	Straight Pipe	1.5	Cellular Glass	43	43	5110	32.90	$1,417	6.9 MMBtu	0 kWh	$55	25.8 yrs
	Cond	1	Strainer	1.5	Removable Blanket	5	25	5110	100.50	$503	3.9 MMBtu	0 kWh	$31	16.1 yrs
	Cond	1	T Intersection	1.5	Cellular Glass	3	3.6	5110	32.30	$97	0.6 MMBtu	0 kWh	$5	21.1 yrs
	Cond	1.25	90 Degree Elbow	1.5	Cellular Glass	2	3.6	5110	32.30	$65	0.7 MMBtu	0 kWh	$6	11.3 yrs
	Cond	1.25	90 Degree Elbow	1.5	Cellular Glass	1	1.8	5110	32.30	$32	0.4 MMBtu	0 kWh	$3	11.3 yrs
	Cond	1.25	Straight Pipe	1.5	Cellular Glass	3	3	5110	32.90	$99	0.6 MMBtu	0 kWh	$5	20.7 yrs
	Cond	1.25	Straight Pipe	1.5	Cellular Glass	18	18	5110	32.90	$593	3.6 MMBtu	0 kWh	$29	20.7 yrs
	Cond	1.25	Strainer	1.5	Removable Blanket	1	5	5110	100.50	$101	1.0 MMBtu	0 kWh	$8	13.0 yrs
	Cond	1.25	T Intersection	1.5	Cellular Glass	1	1.2	5110	32.30	$32	0.2 MMBtu	0 kWh	$2	17.0 yrs
	Cond	1.5	45 Degree Elbow	2	Cellular Glass	2	2	5110	37.70	$75	0.5 MMBtu	0 kWh	$4	20.3 yrs
	Cond	1.5	90 Degree Elbow	2	Cellular Glass	22	39.6	5110	37.70	$829	9.2 MMBtu	0 kWh	$73	11.3 yrs
	Cond	1.5	In-Line Pump	1.5	Removable Blanket	2	10	5110	142.70	$285	2.2 MMBtu	0 kWh	$18	16.2 yrs
	Cond	1.5	Steam Trap	1.5	Removable Blanket	1	4.4	5110	123.30	$247	1.9 MMBtu	0 kWh	$15	15.9 yrs
	Cond	1.5	Straight Pipe	2	Cellular Glass	107	107	5110	35.80	$3,825	24.8 MMBtu	0 kWh	$199	19.3 yrs

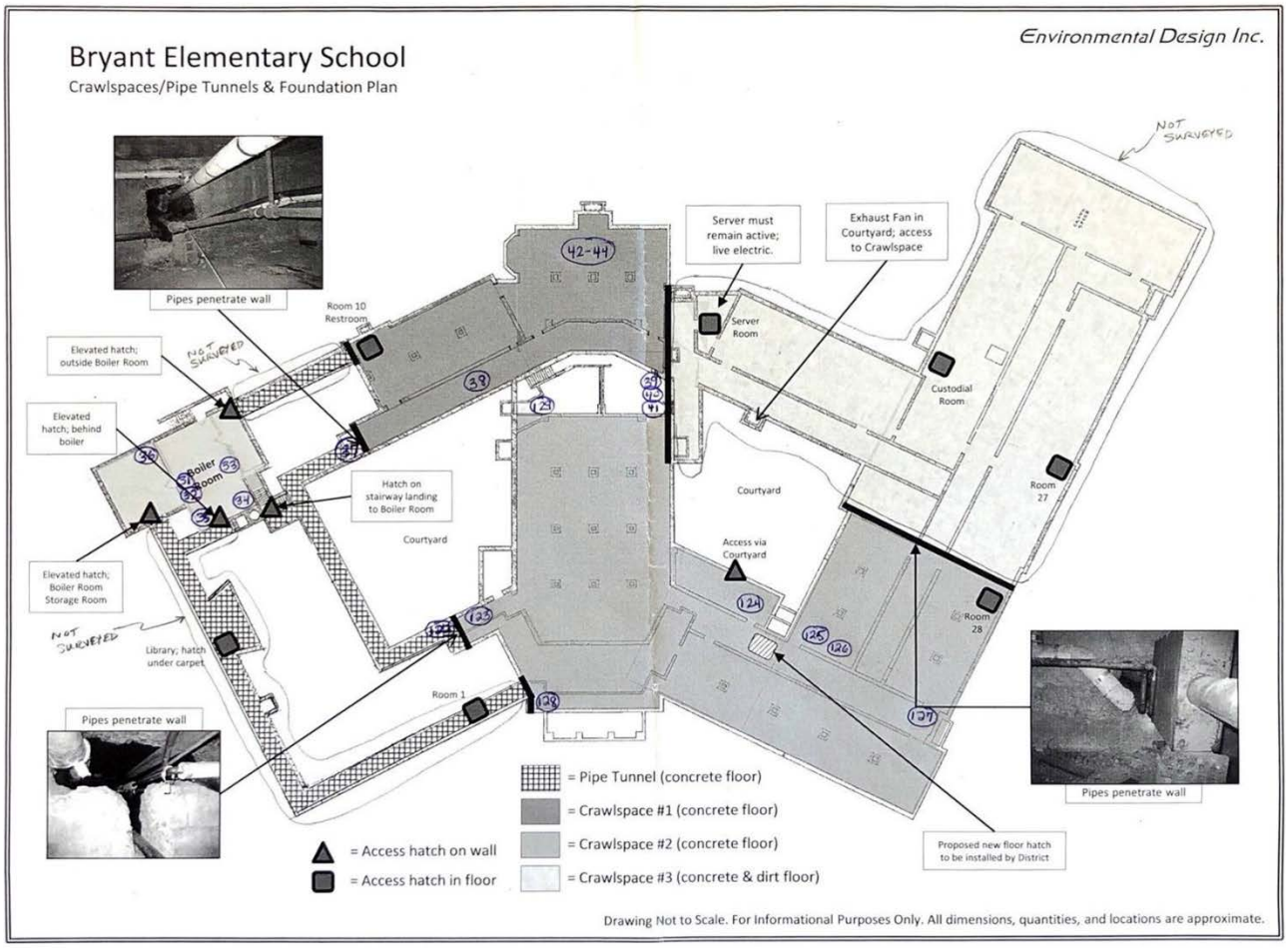
TEANECK PUBLIC SCHOOLS, NJ
MECHANICAL INSULATION SAVINGS SUMMARY

Building	Fluid Type	Pipe Dia (") or Tank Surface Area(SF)*	Component	Insulation Thickness (")	Proposed Insulation Type	Quantity or Length	Total Eq Length(LF) or Total Area(SF)*	Heating or Cooling Hrs/Yr	Price per Unit	Total Investment	Fuel Savings MMBTU	Electric Savings kWh	Total Savings	Payback
Whittier Elementary School	Cond	1.5	Strainer	1.5	Removable Blanket	3	15	5110	105.40	$316	3.3 MMBtu	0 kWh	$26	12.0 yrs
	Cond	1.5	T Intersection	2	Cellular Glass	1	1.2	5110	37.70	$38	0.3 MMBtu	0 kWh	$2	16.9 yrs
	Cond	2	45 Degree Elbow	2	Cellular Glass	6	6	5110	37.70	$226	1.7 MMBtu	0 kWh	$14	16.5 yrs
	Cond	2	90 Degree Elbow	2	Cellular Glass	7	12.6	5110	37.70	$264	3.6 MMBtu	0 kWh	$29	9.2 yrs
	Cond	2	Gate Valve	1.5	Removable Blanket	1	5	5110	123.30	$123	1.4 MMBtu	0 kWh	$11	11.4 yrs
	Cond	2	Straight Pipe	2	Cellular Glass	78	78	5110	36.10	$2,817	22.2 MMBtu	0 kWh	$178	15.8 yrs
	Cond	2	Strainer	1.5	Removable Blanket	1	5	5110	123.30	$123	1.4 MMBtu	0 kWh	$11	11.4 yrs
	Cond	2	T Intersection	2	Cellular Glass	1	1.2	5110	37.70	$38	0.3 MMBtu	0 kWh	$3	13.8 yrs
	Cond	3	90 Degree Elbow	2	Cellular Glass	2	3.6	5110	40.40	$81	1.5 MMBtu	0 kWh	$12	6.9 yrs
	Cond	3	Flange	2	Cellular Glass	2	3.6	5110	37.10	$74	1.5 MMBtu	0 kWh	$12	6.3 yrs
	Cond	3	Straight Pipe	2	Cellular Glass	13	13	5110	37.10	$482	5.3 MMBtu	0 kWh	$42	11.4 yrs
	Cond	3	T Intersection	2	Cellular Glass	2	2.4	5110	40.40	$81	1.0 MMBtu	0 kWh	$8	10.3 yrs
	Cond	4	90 Degree Elbow	2	Cellular Glass	6	10.8	5110	43.60	$261	5.5 MMBtu	0 kWh	$44	5.9 yrs
	Cond	4	Straight Pipe	2	Cellular Glass	26	26	5110	38.40	$1,000	13.3 MMBtu	0 kWh	$106	9.4 yrs
	Cond	4	T Intersection	2	Cellular Glass	6	7.2	5110	43.60	$261	3.7 MMBtu	0 kWh	$29	8.9 yrs
	Cond	56.9	Condensate Tank	2	Cellular Glass	1	56.9	5110	44.90	$2,553	25.4 MMBtu	0 kWh	$203	12.6 yrs
	Cond Total									**$17,644**	**152.8 MMBtu**	**0 kWh**	**$1,222**	**14.4 yrs**
Whittier Elementary School Total										**$23,409**	**224.3 MMBtu**	**0 kWh**	**$1,795**	**13.0 yrs**
Grand Totals										**$136,646**	**1,432.3 MMBtu**	**0 kWh**	**$11,459**	**11.9 yrs**

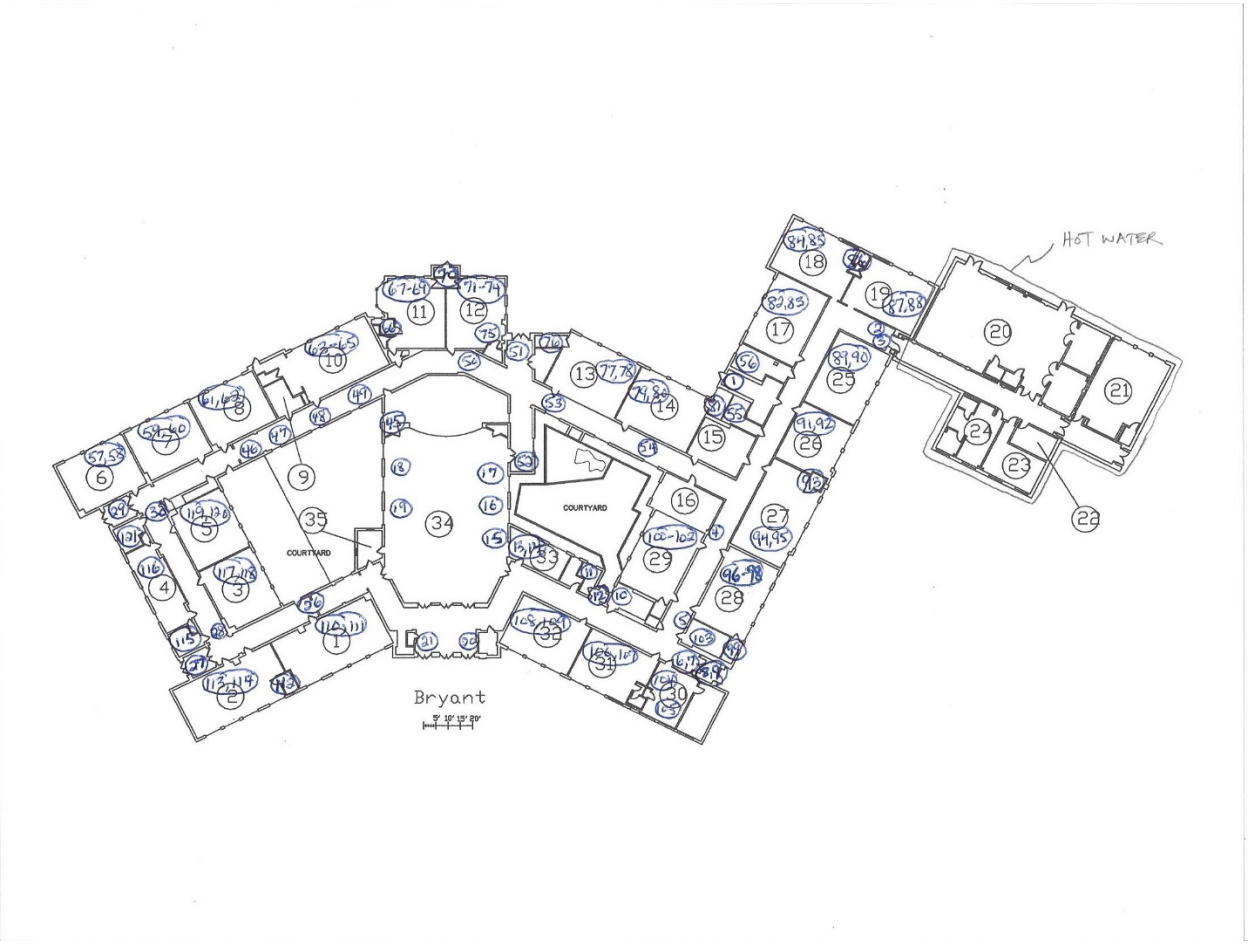
Steam Trap Replacements

Bryant Elementary School

- Steam returning to condensate receiver in boiler room. Temperature is 217F (measured by gauge and IR camera)
- Overheating in some areas that have thermostatic controls on terminal heating unit (some TS controls may be faulty)
- Steam in condensate return system may also be contributing to the overheating in some areas
- Some trap tags were hung on the UC, UV or radiator enclosures rather than the trap piping.
- In many instances it was difficult to confirm size, make and model of the various thermostatic traps inside radiator and convector enclosures due to the cover itself and accumulated dust and debris. This information should be confirmed before ordering any model specific parts.

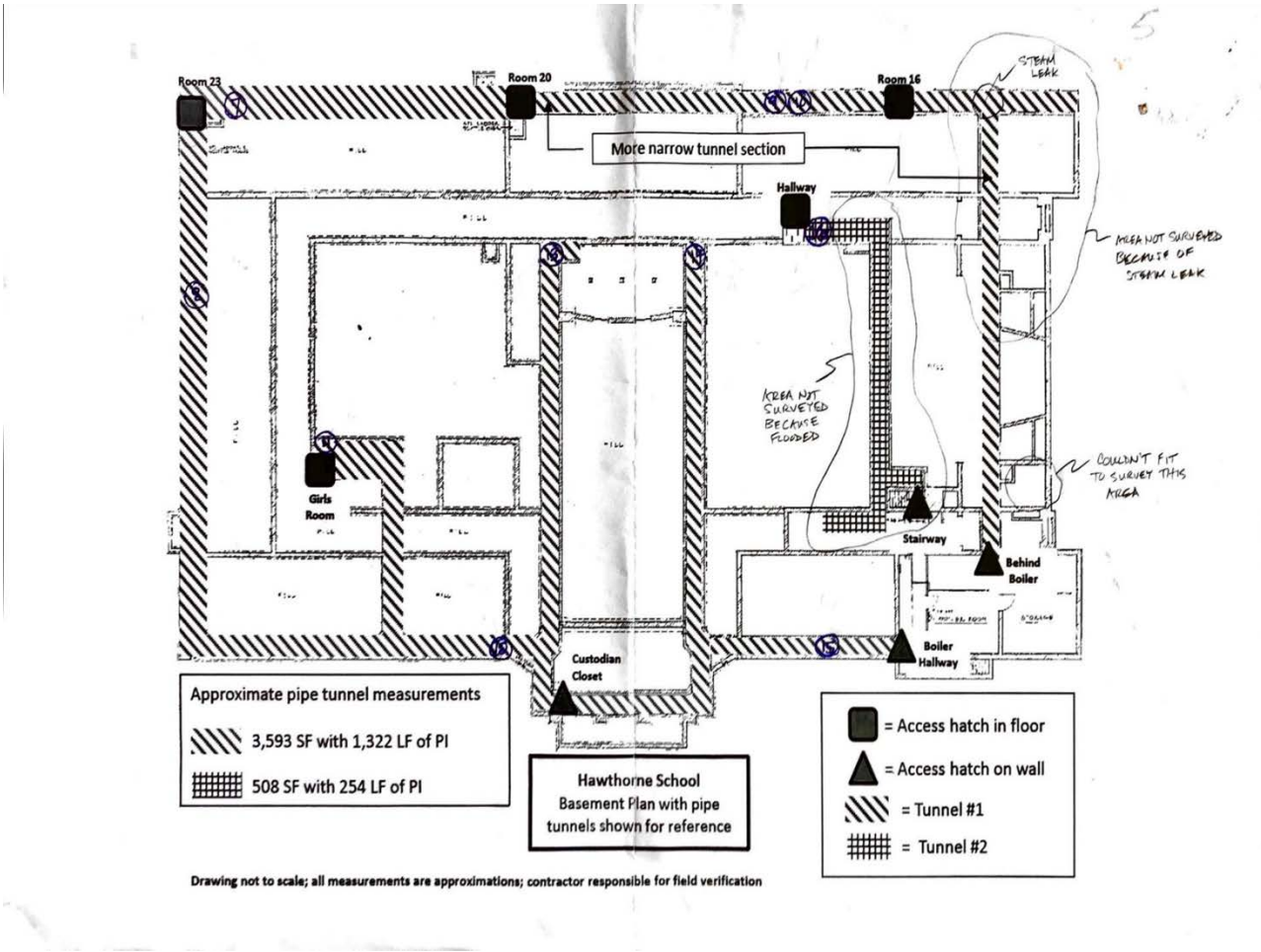


Bryant Elementary School Continued

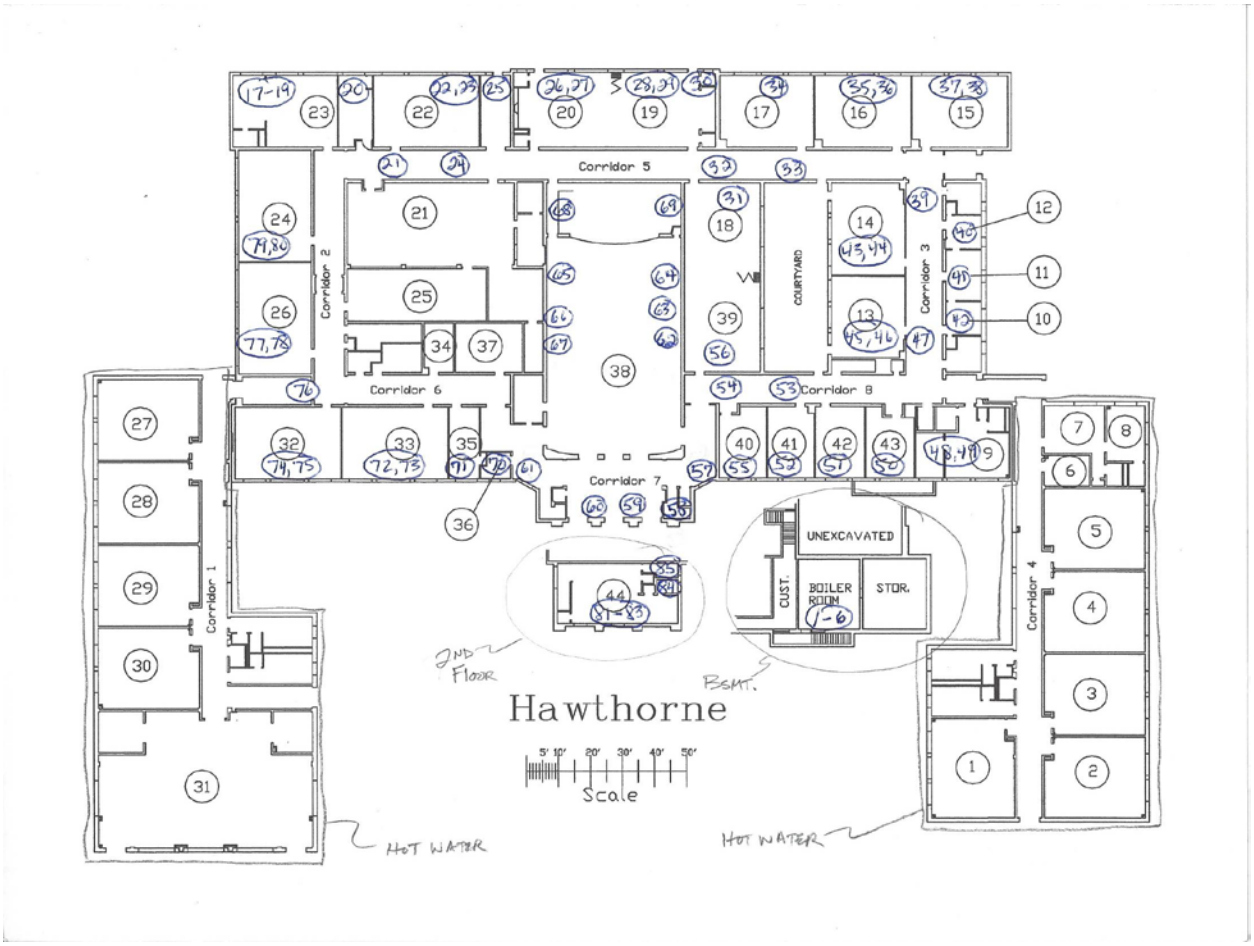


Hawthorne Elementary School

- Boiler pressure: 6-7psig
- No school on day of survey (building unoccupied)
- Survey performed during daytime hours
- Condensate receiver in boiler room is 136F
- Condensate received in tunnel (under Rm. 23) is 213F (venting slightly)
- Couldn't survey tunnel under Rm.'s 15 & 16 and the hallway for Rm.'s 10 - 12 due to steam leak in tunnel
- Couldn't survey tunnel under Rm.'s 13 & 14 and the hallway in front of Rm. 17 due to flooding (4"+ deep)

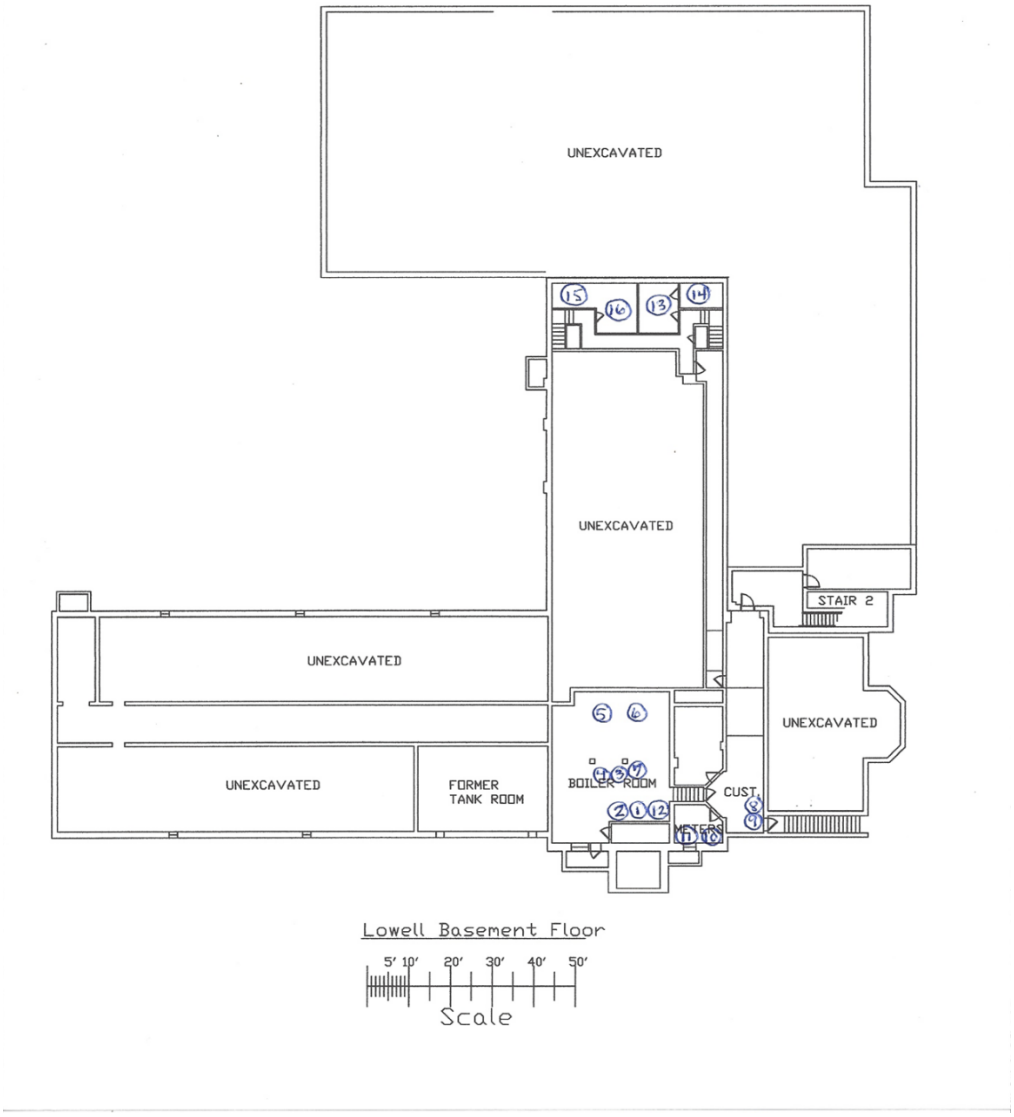


Hawthorne Elementary School Continued



Lowell Elementary School

- Boiler pressure: 6-7psig
- No school on day of survey (building unoccupied)
- Survey performed during daytime hours
- Condensate receiver in boiler room is 182F (temperatures of various condensate return lines vary significantly)
- Many terminal heating units located outside of classrooms were cold indicating they hadn't called for heat recently.



Lowell Elementary School Continued

Lowell Elementary School Continued

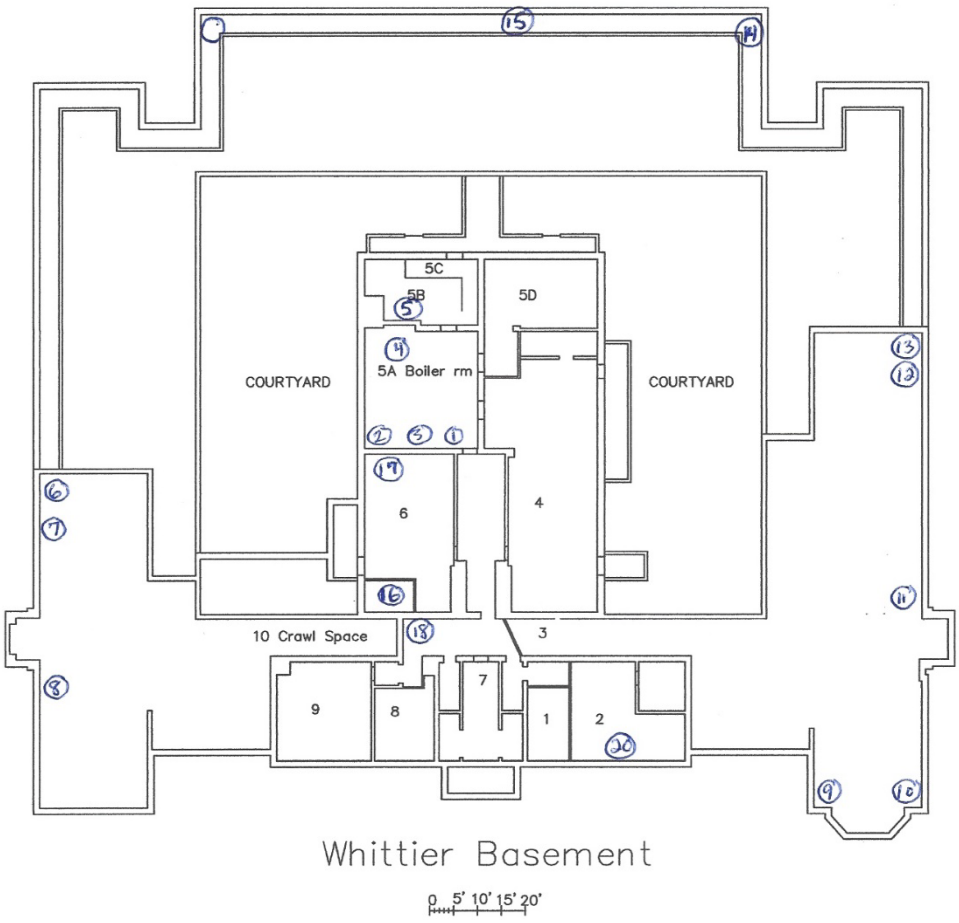
Lowell Second Floor

5' 10' 20' 30' 40' 50'

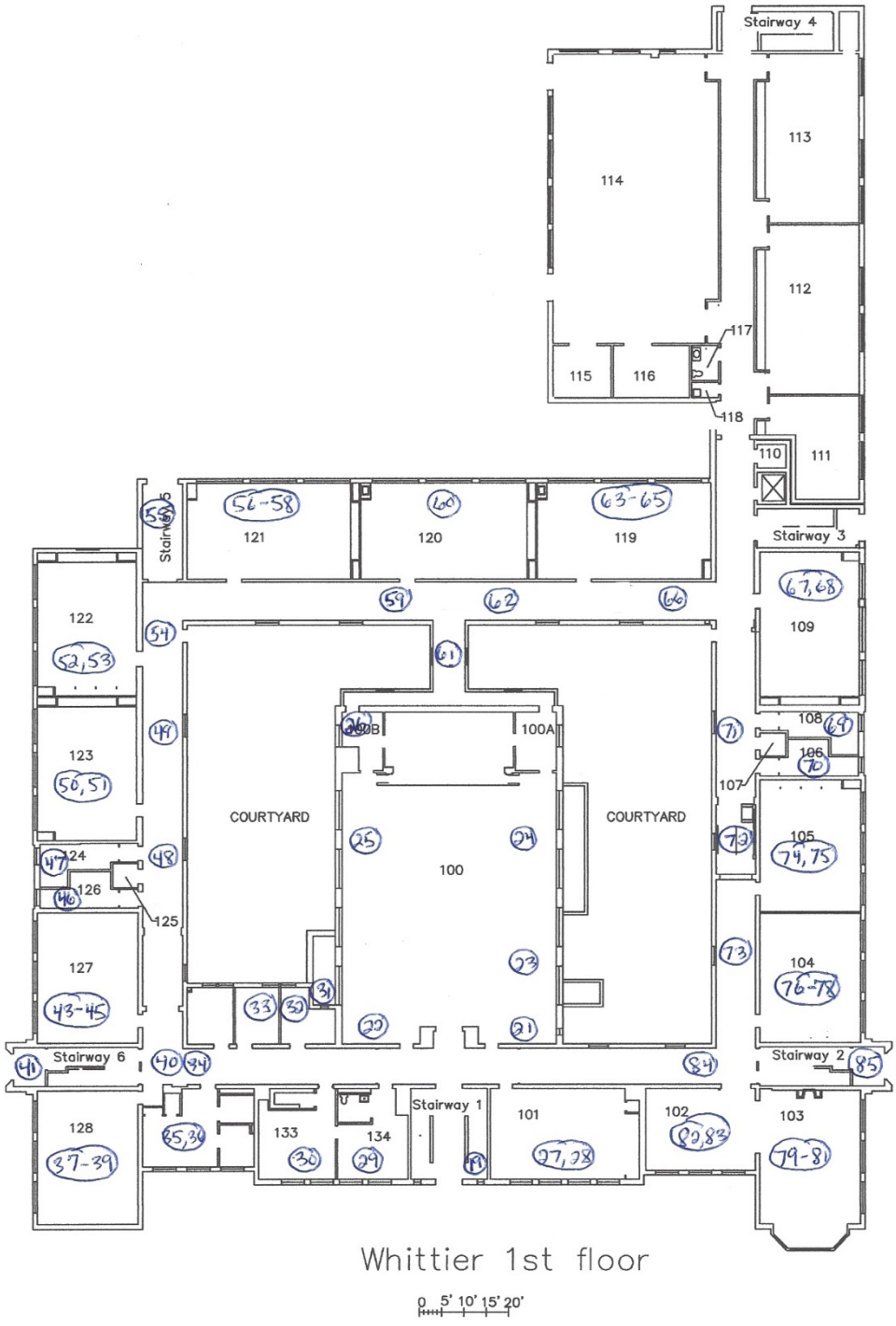
Scale

Whittier Elementary School

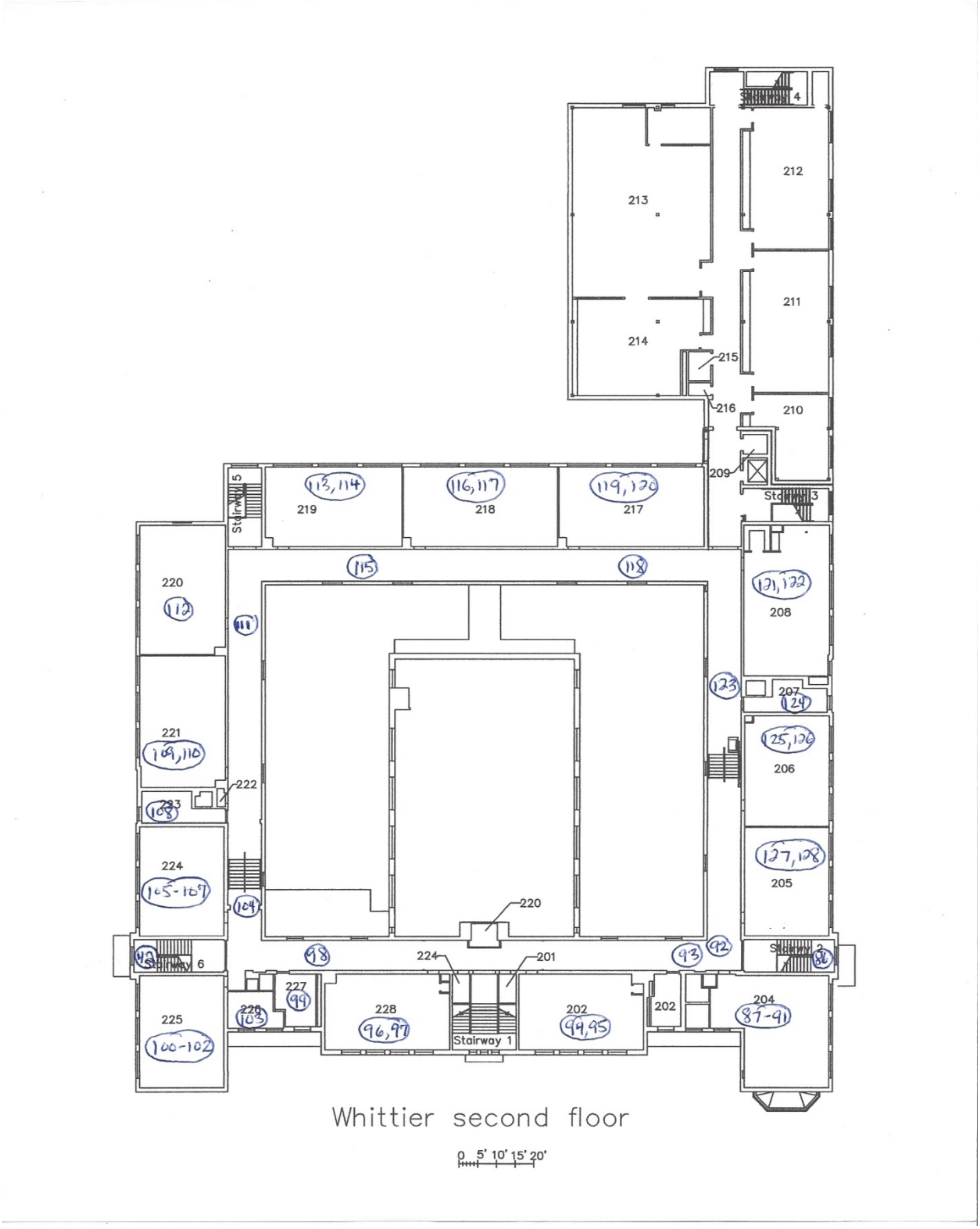
- Boiler pressure: 6-7psig
- No school on day of survey (building unoccupied)
- Survey performed during daytime hours
- Condensate receiver in boiler room is 214F (venting)



Whittier Elementary School Continued



Whittier Elementary School Continued



Whittier second floor

0 5' 10' 15' 20'

Boiler Combustion Report Data

Location	Date	W/S	Boiler	O2 %	CO ppm	Eff.	CO2%	Stack Temp F	Average
Benjamin Franklin MS	11/11/2019	Water	1	14.2 %	23	85.60 %	3.8%	167	
Benjamin Franklin MS	11/11/2019	Water	2	14.1 %	8	88.10 %	3.8%	124	**86%**
Benjamin Franklin MS	11/11/2019	Water	3	15.6 %	11	84.30 %	3.0%	163	
Lowell ES	11/11/2019	Steam	1	4.9 %	2	85.20 %	9.0%	280	
Lowell ES	11/11/2019	Steam	2	3.6 %	3000	83.50 %	9.8%	314	**84.35%**
Whittier ES	11/11/2019	Steam	1	1.9 %	3000	87.00 %	10.7%	194	
Whittier ES	11/11/2019	Steam	2						**87%**
Bryant ES	11/11/2019	Steam	1	9.8 %	14	84.20 %	6.3%	265	
Bryant ES	11/11/2019	Steam	2	13.7 %	18	81.30 %	4.1%	263	**82.75**
Hawthorne ES	11/11/2019	Steam	1	5.4 %	156	86.60 %	8.7%	234	
Hawthorne ES	11/11/2019	Steam	2	4.1 %	43	86.90 %	9.5%	236	**86.75%**
Thomas Jefferson MS	11/11/2019	Water	1	9.9 %	9	88.10 %	6.2%	160	
Thomas Jefferson MS	11/11/2019	Water	2	12.9 %	30	88.00 %	4.5%	144	
Thomas Jefferson MS	11/11/2019	Water	3	17.1 %	90	XXX	XXX	150	**88.05%**
Teaneck HS	11/11/2019	Steam	1	9.7 %	268	84.90 %	6.3%	244	
Teaneck HS	11/11/2019	Steam	2	14.7 %	6	82.70 %	3.5%	220	**83.80%**

Adjusted Boiler Efficiency					
Location	W/S	Avg. Combustion Efficiency	Heat Exchanger Losses	Piping & Thermal Losses	Final Efficiency
Benjamin Franklin MS	Water	86.00%	0.0%	2.0%	**84.0%**
Lowell ES	Steam	84.35%	4.0%	2.0%	**78.4%**
Whittier ES	Steam	87.00%	4.0%	2.0%	**81.0%**
Bryant ES	Steam	82.75%	4.0%	2.0%	**76.8%**
Hawthorne ES	Steam	86.75%	4.0%	2.0%	**80.8%**
Thomas Jefferson MS	Water	88.05%	0.0%	2.0%	**86.1%**

Teaneck High School	Avg. Combustion Efficiency	Stack Loss Factor	Skin and shell factor	Operational Inefficiency Factor	Final Efficiency
Pre – Avg Sys Eff Factors	83.80%	97%	98%	96%	**76%**
Post– Avg Sys Eff Factors	93.50%	100%	98%	98%	**90%**

esg. Teneck...
.....
.....HS.....

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 07:47:34 PM
Date: 11/11/19

Fuel
NGAS

O_2:	9.7 %
CO	269 ppm
Eff	84.9 %
CO_2	6.3 %
T-Stk	244 °F
T-Air	87.6 °F
EA	77.3 %
CO(0)	503 ppm
NO	**** ppm
NO_2	2 ppm
NOx	**** ppm
SO_2	7 ppm
NO(0)	**** ppm
NO_2(0)	3 ppm
NOx(0)	**** ppm
SO_2(0)	14 ppm

Draft Reading
0.00 inwc

Boiler (1)

Comments:

esg. Teneck...
.....
.....HS.....

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 07:53:18 PM
Date: 11/11/19

Fuel
NGAS

O_2:	14.7 %
CO	6 ppm
Eff	82.7 %
CO_2	3.5 %
T-Stk	220 °F
T-Air	88.4 °F
EA	209.3 %
CO(0)	21 ppm
NO	**** ppm
NO_2	0 ppm
NOx	**** ppm
SO_2	2 ppm
NO(0)	**** ppm
NO_2(0)	1 ppm
NOx(0)	**** ppm
SO_2(0)	7 ppm

Draft Reading
0.01 inwc

Boiler (2)

Comments:

esg. Benqiman
Franklin MS

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 04:35:11 PM
Date: 11/11/19

Fuel
NGAS

O_2:	14.2 %
CO	23 ppm
Eff	85.6 %
CO_2	3.8 %
T-Stk	167 °F
T-Air	76.4 °F
EA	189.8 %
CO(0)	73 ppm
NO	### ppm
NO_2	1 ppm
NOx	### ppm
SO_2	1 ppm
NO(0)	### ppm
NO_2(0)	3 ppm
NOx(0)	### ppm
SO_2(0)	4 ppm

Draft Reading
0.01 inwc

Boiler (1)

Comments:

esg. Benqiman
Franklin MC

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 04:30:11 PM
Date: 11/11/19

Fuel
NGAS

O_2:	14.1 %
CO	8 ppm
Eff	88.1 %
CO_2	3.8 %
T-Stk	124 °F
T-Air	75.6 °F
EA	186.2 %
CO(0)	26 ppm
NO	### ppm
NO_2	1 ppm
NOx	### ppm
SO_2	1 ppm
NO(0)	### ppm
NO_2(0)	2 ppm
NOx(0)	### ppm
SO_2(0)	4 ppm

Draft Reading
0.01 inwc

Boiler (2)

Comments:

esg. Benqiman
Franklin MS

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 04:16:25 PM
Date: 11/11/19

Fuel
NGAS

O_2:	15.6 %
CO	11 ppm
Eff	84.3 %
CO_2	3.0 %
T-Stk	163 °F
T-Air	72.3 °F
EA	250.0 %
CO(0)	45 ppm
NO	### ppm
NO_2	0 ppm
NOx	### ppm
SO_2	1 ppm
NO(0)	### ppm
NO_2(0)	1 ppm
NOx(0)	### ppm
SO_2(0)	4 ppm

Draft Reading
0.00 inwc

Boiler (3)

Comments:

esg Lowell....
.....ES.....
.....

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

==========

Time: 05:13:24 PM
Date: 11/11/19

Fuel
NGAS

O_2:	4.9 %
CO	2 ppm
Eff	85.2 %
CO_2	9.0 %
T-Stk	280 °F
T-Air	78.6 °F
EA	27.6 %
CO(0)	3 ppm
NO	**** ppm
NO_2	1 ppm
NOx	**** ppm
SO_2	5 ppm
NO(0)	**** ppm
NO_2 (0)	2 ppm
NOx(0)	**** ppm
SO_2 (0)	6 ppm

Draft Reading
0.00 inwc

Boiler (1)

Comments:

esg. Lowell C...
.....ES.....
.....

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

==========

Time: 05:16:16 PM
Date: 11/11/19

Fuel
NGAS

O_2:	3.6 %
CO	XXX ppm
Eff	83.5 %
CO_2	9.8 %
T-Stk	314 °F
T-Air	80.6 °F
EA	17.8 %
CO(0)	XXX ppm
NO	**** ppm
NO_2	1 ppm
NOx	**** ppm
SO_2	375 ppm
NO(0)	**** ppm
NO_2 (0)	2 ppm
NOx(0)	**** ppm
SO_2 (0)	453 ppm

Draft Reading
0.01 inwc

Boiler (2)

Comments:

esg. Whittier
.....
..... ES...

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 05:42:24 PM
Date: 11/11/19

Fuel
NGAS

O_2	1.9 %
CO	XXX ppm
Eff	87.0 %
CO_2	10.7 %
T-Stk	194 °F
T-Air	89.8 °F
EA	8.1 %
CO(0)	XXX ppm
NO	***** ppm
NO_2	3 ppm
NOx	***** ppm
SO_2	918 ppm
NO(0)	***** ppm
NO_2(0)	3 ppm
NOx(0)	***** ppm
SO_2(0)	1008 ppm

Draft Reading
0.00 inwc

Boiler (1)

Comments:

esg. Bryan T.
ES

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 06:23:51 PM
Date: 11/11/19

Fuel
NGAS

O_2:	9.8 %
CO	14 ppm
Eff	84.2 %
CO_2	6.3 %
T-Stk	265 °F
T-Air	88.8 °F
EA	78.5 %
CO(0)	27 ppm
NO	**** ppm
NO_2	3 ppm
NOx	**** ppm
SO_2	5 ppm
NO(0)	**** ppm
NO_2(0)	5 ppm
NOx(0)	**** ppm
SO_2(0)	10 ppm

Draft Reading
0.00 inwc

Boiler (1)

Comments:

esg. Bryan T.
ES

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 06:28:45 PM
Date: 11/11/19

Fuel
NGAS

O_2:	13.7 %
CO	18 ppm
Eff	81.3 %
CO_2	4.1 %
T-Stk	263 °F
T-Air	88.9 °F
EA	168.4 %
CO(0)	52 ppm
NO	**** ppm
NO_2	2 ppm
NOx	**** ppm
SO_2	4 ppm
NO(0)	**** ppm
NO_2(0)	4 ppm
NOx(0)	**** ppm
SO_2(0)	12 ppm

Draft Reading
0.01 inwc

Boiler (2)

Comments:

esg Hawthorne
ES

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 06:53:04 PM
Date: 11/11/19

Fuel
NGAS

O_2:	5.4 %
CO	156 ppm
Eff	86.6 %
CO_2	8.7 %
T-Stk	234 °F
T-Air	86.8 °F
EA	31.2 %
CO(0)	210 ppm
NO	*** ppm
NO_2	2 ppm
NOx	*** ppm
SO_2	9 ppm
NO(0)	*** ppm
NO_2(0)	3 ppm
NOx(0)	*** ppm
SO_2(0)	12 ppm

Draft Reading
0.01 inwc

Boiler (1)

Comments:

esg Hawthorne
ES

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 06:55:54 PM
Date: 11/11/19

Fuel
NGAS

O_2:	4.1 %
CO	43 ppm
Eff	86.9 %
CO_2	9.5 %
T-Stk	236 °F
T-Air	87.6 °F
EA	21.7 %
CO(0)	53 ppm
NO	*** ppm
NO_2	2 ppm
NOx	*** ppm
SO_2	7 ppm
NO(0)	*** ppm
NO_2(0)	3 ppm
NOx(0)	*** ppm
SO_2(0)	9 ppm

Draft Reading
0.01 inwc

Boiler (2)

Comments:

esg. Thos. Jefferson
MS

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 07:12:41 PM
Date: 11/11/19

Fuel
NGAS

O_2:	9.9 %
CO	9 ppm
Eff	88.1 %
CO_2	6.2 %
T-Stk	160 °F
T-Air	87.2 °F
EA	80.0 %
CO(0)	17 ppm
NO	**** ppm
NO_2	0 ppm
NOx	**** ppm
SO_2	5 ppm
NO(0)	**** ppm
NO_2(0)	1 ppm
NOx(0)	**** ppm
SO_2(0)	9 ppm

Draft Reading
0.00 inwc

Boiler (1)

Comments:

esg. Thos. Jefferson
MS

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 07:15:28 PM
Date: 11/11/19

Fuel
NGAS

O_2:	12.9 %
CO	30 ppm
Eff	88.0 %
CO_2	4.5 %
T-Stk	144 °F
T-Air	87.6 °F
EA	143.8 %
CO(0)	77 ppm
NO	**** ppm
NO_2	0 ppm
NOx	**** ppm
SO_2	6 ppm
NO(0)	**** ppm
NO_2(0)	1 ppm
NOx(0)	**** ppm
SO_2(0)	15 ppm

Draft Reading
0.00 inwc

Boiler (2)

Comments:

esg. Thos. Jefferson
MS

BACHARACH

BACHARACH, INC.
PCA 3
SN: UZ1000

Time: 07:18:23 PM
Date: 11/11/19

Fuel
NGAS

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CO	90 ppm
Eff	--- %
CO_2	--- %
T-Stk	150 °F
T-Air	88.1 °F
EA	--- %
CO(0)	--- ppm
NO	**** ppm
NO_2	0 ppm
NOx	**** ppm
SO_2	16 ppm
NO(0)	**** ppm
NO_2(0)	--- ppm
NOx(0)	**** ppm
SO_2(0)	--- ppm

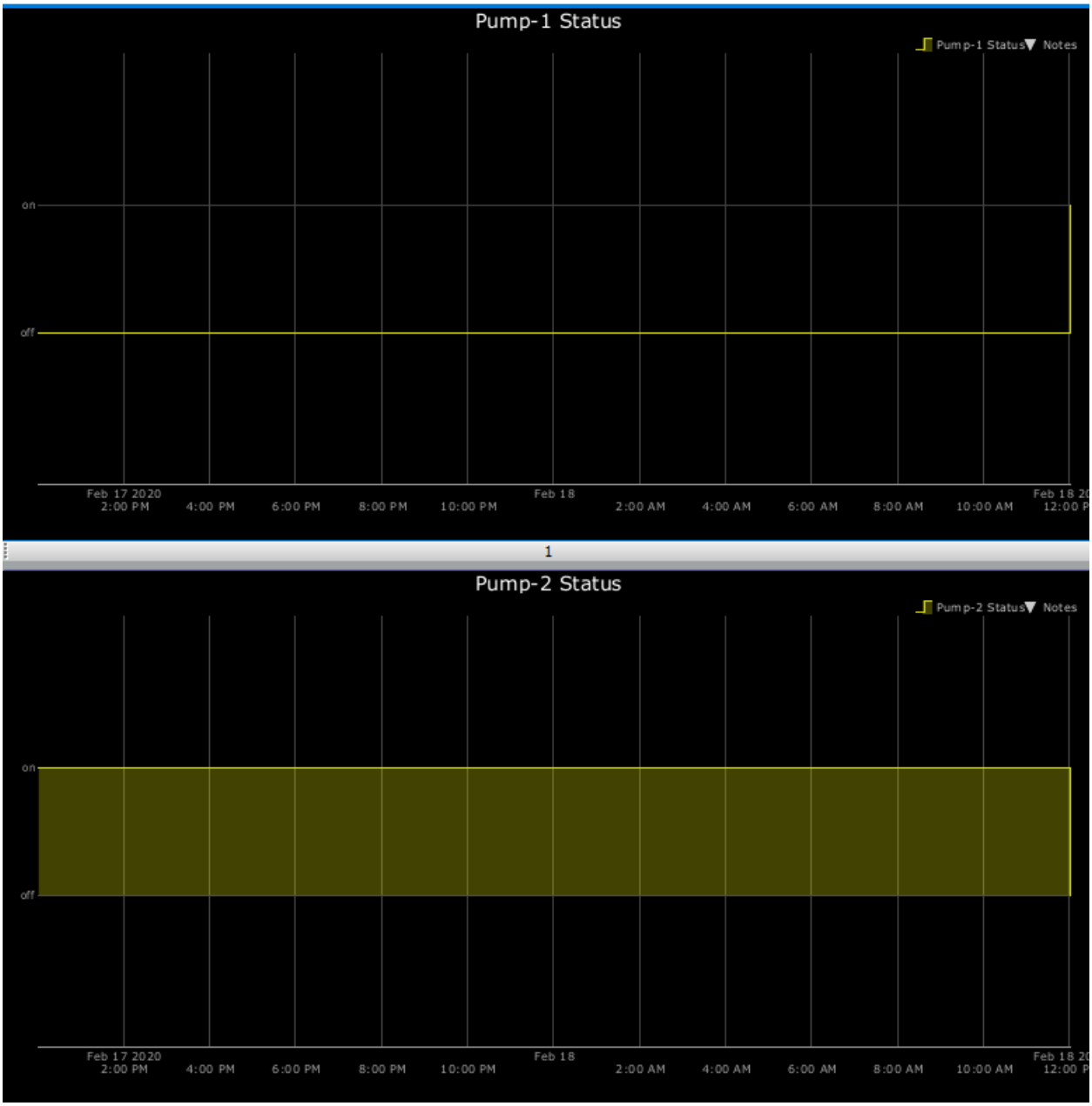
Draft Reading
0.01 inwc

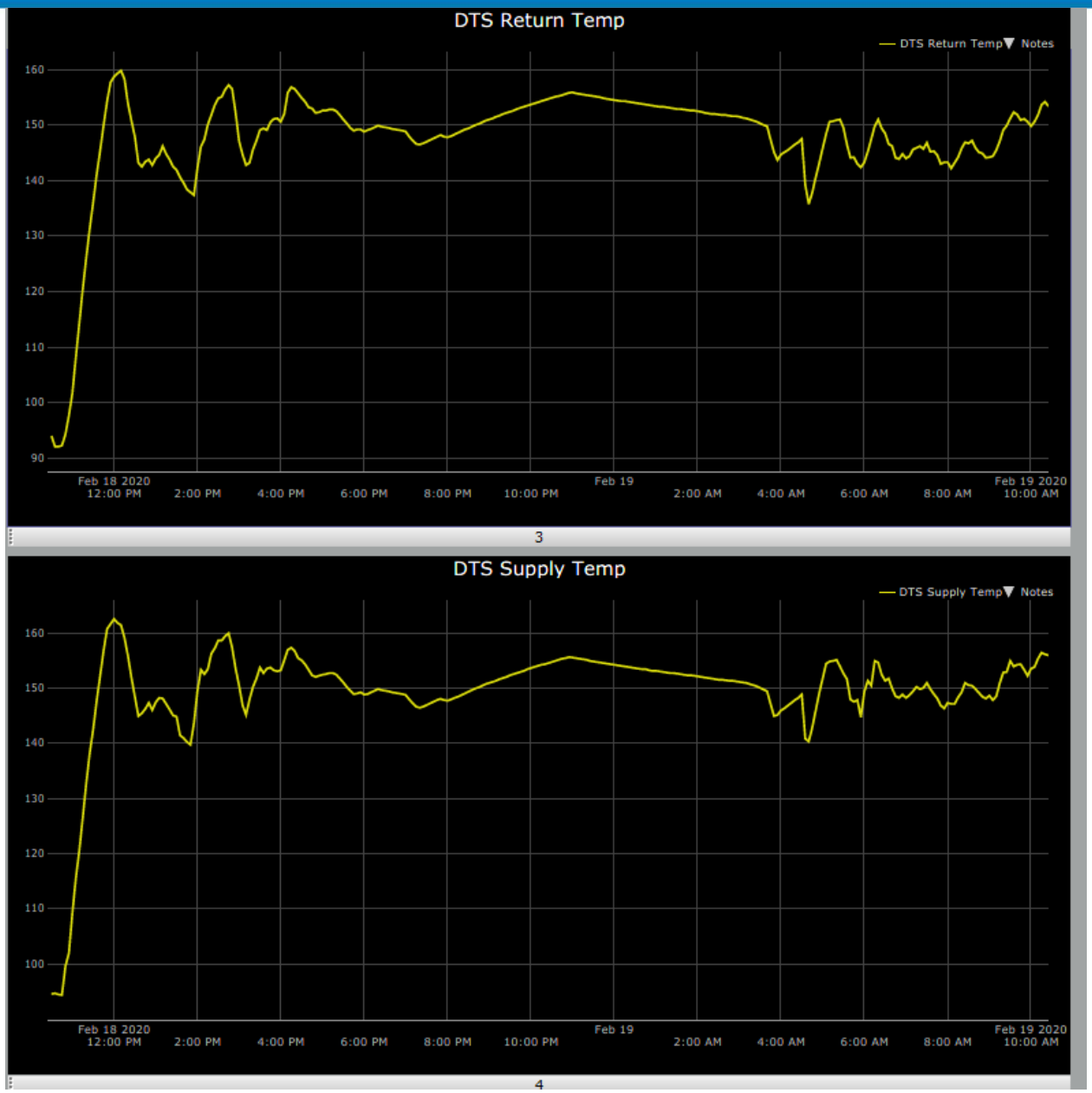
Boiler (3)

Comments:

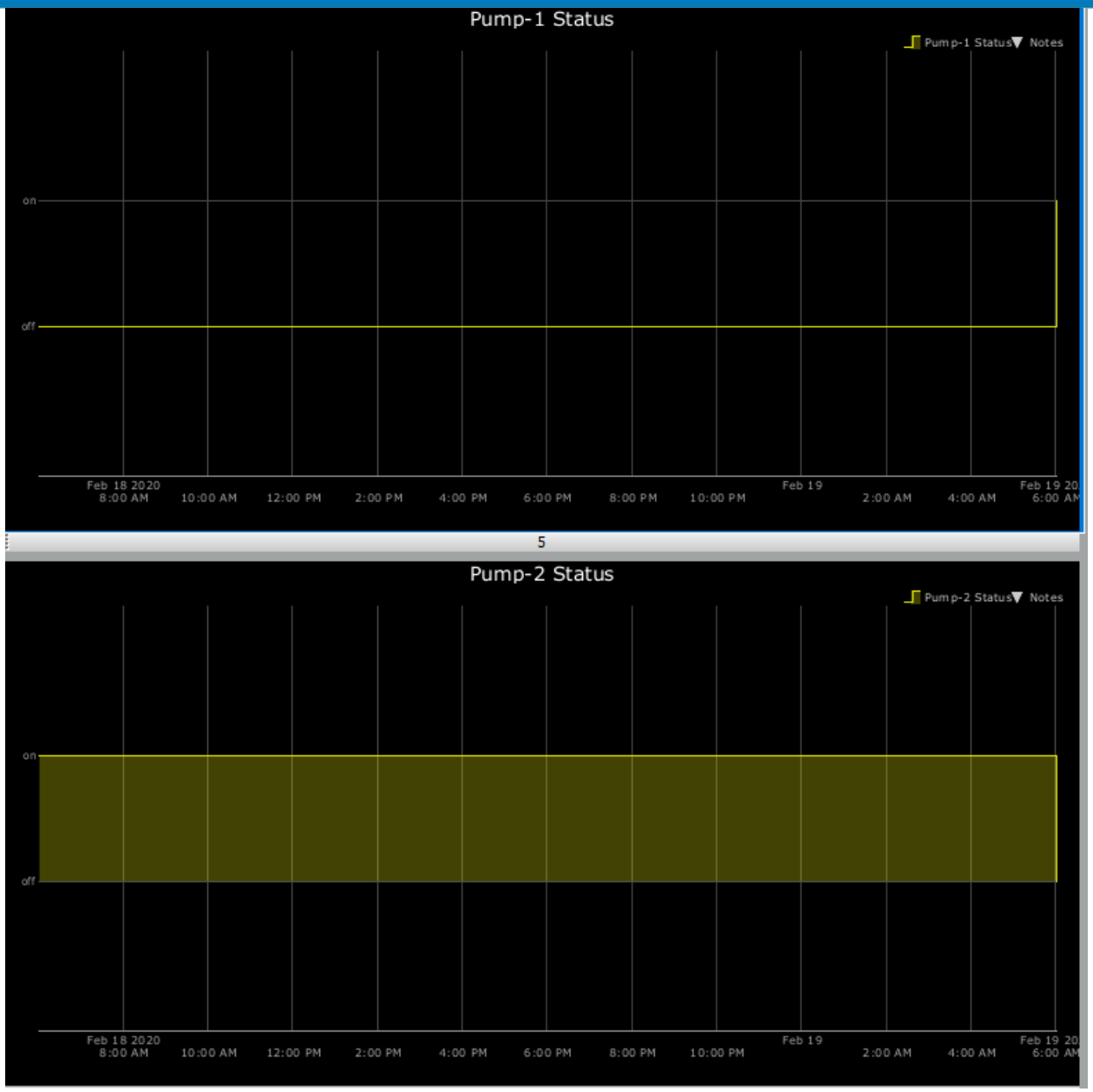
Boiler HW Trends and Data

Thomas Jefferson Middle School





Whittier Elementary School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Pump-2 Status
Pump-2 Status
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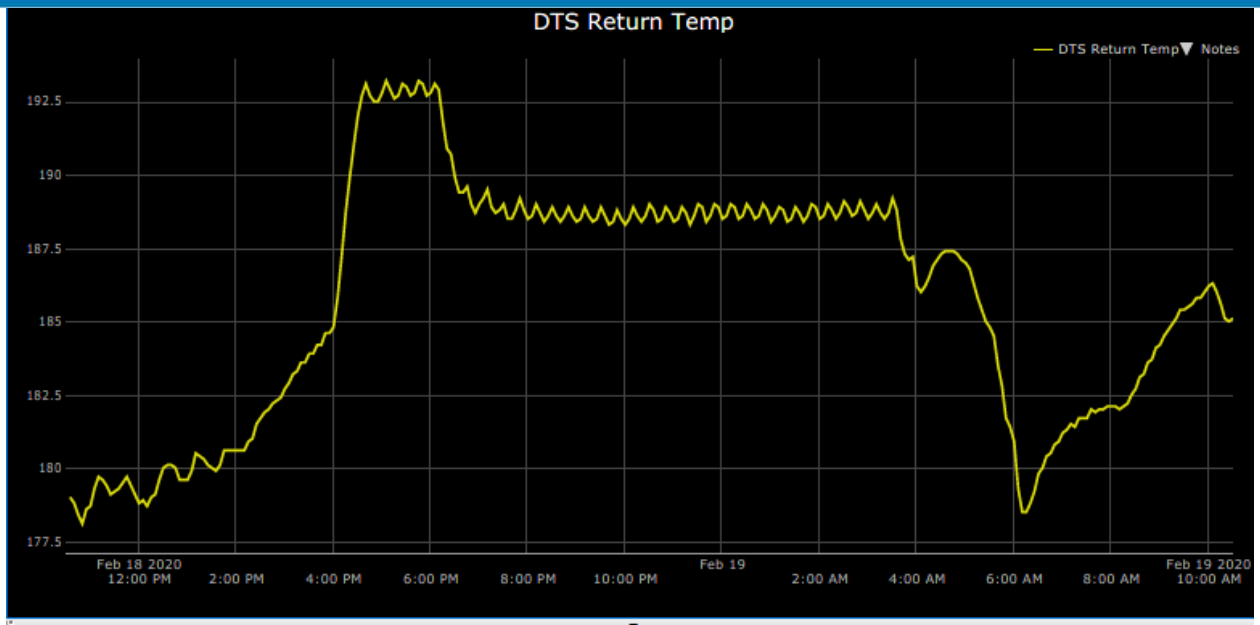

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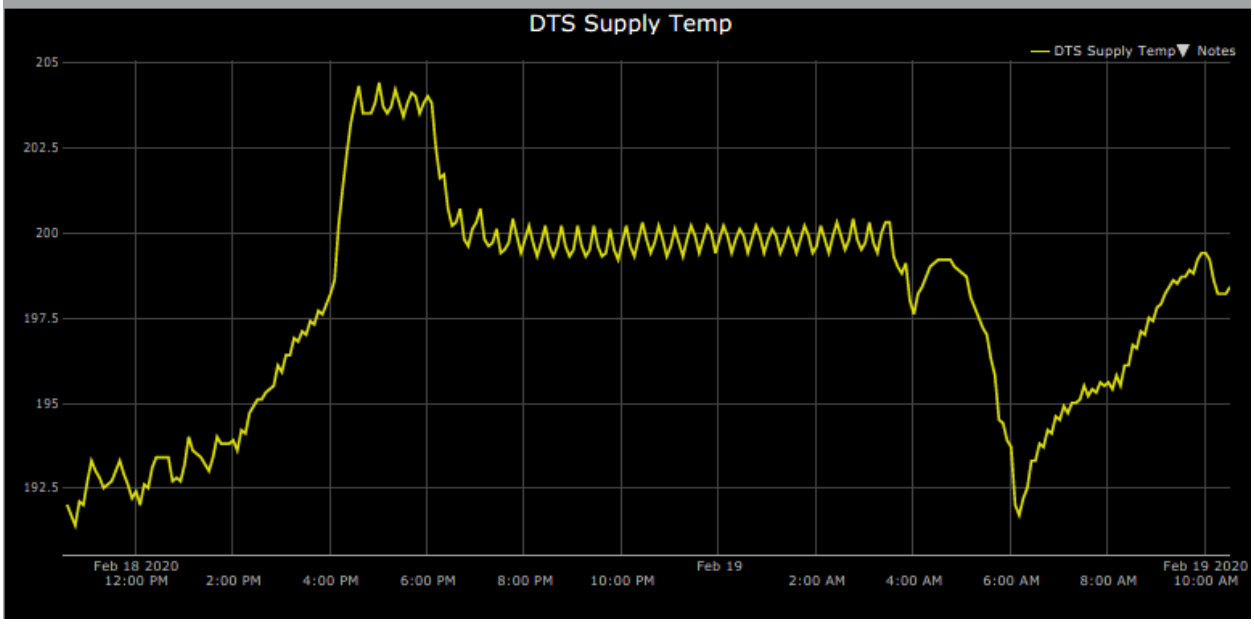

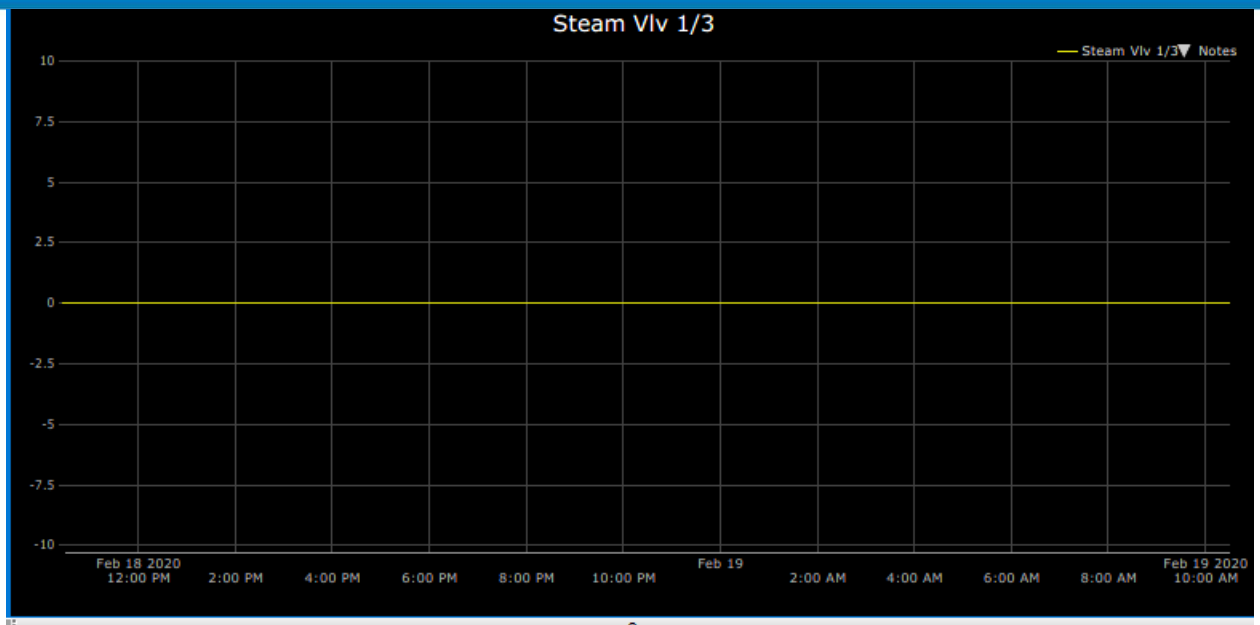
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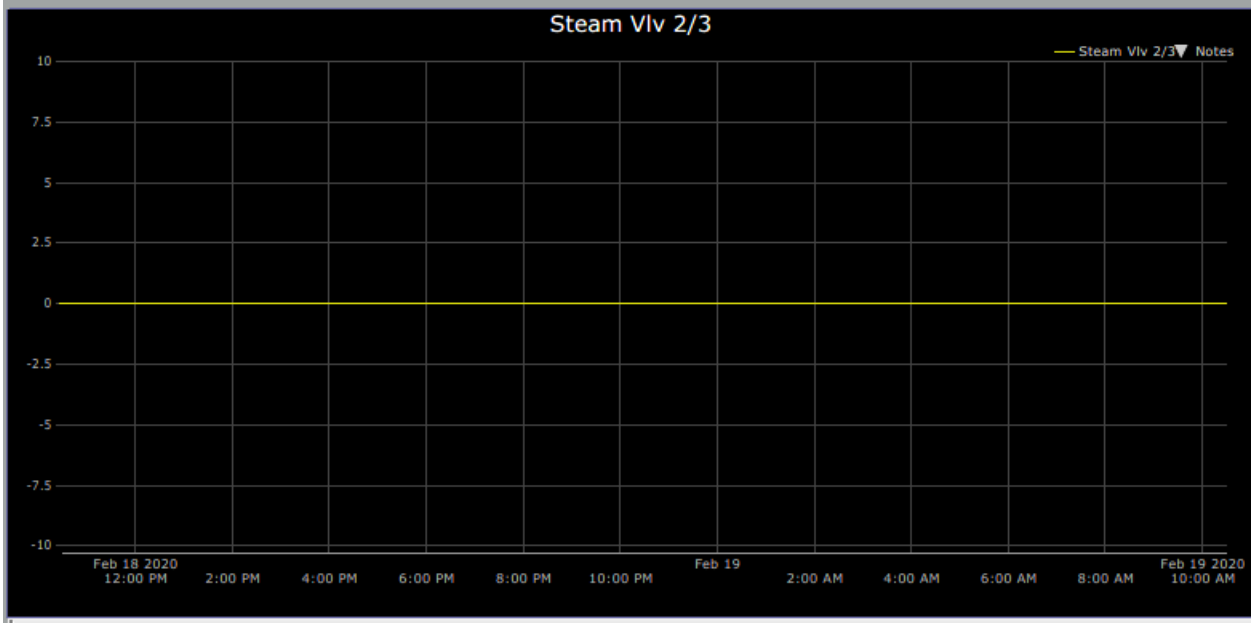
9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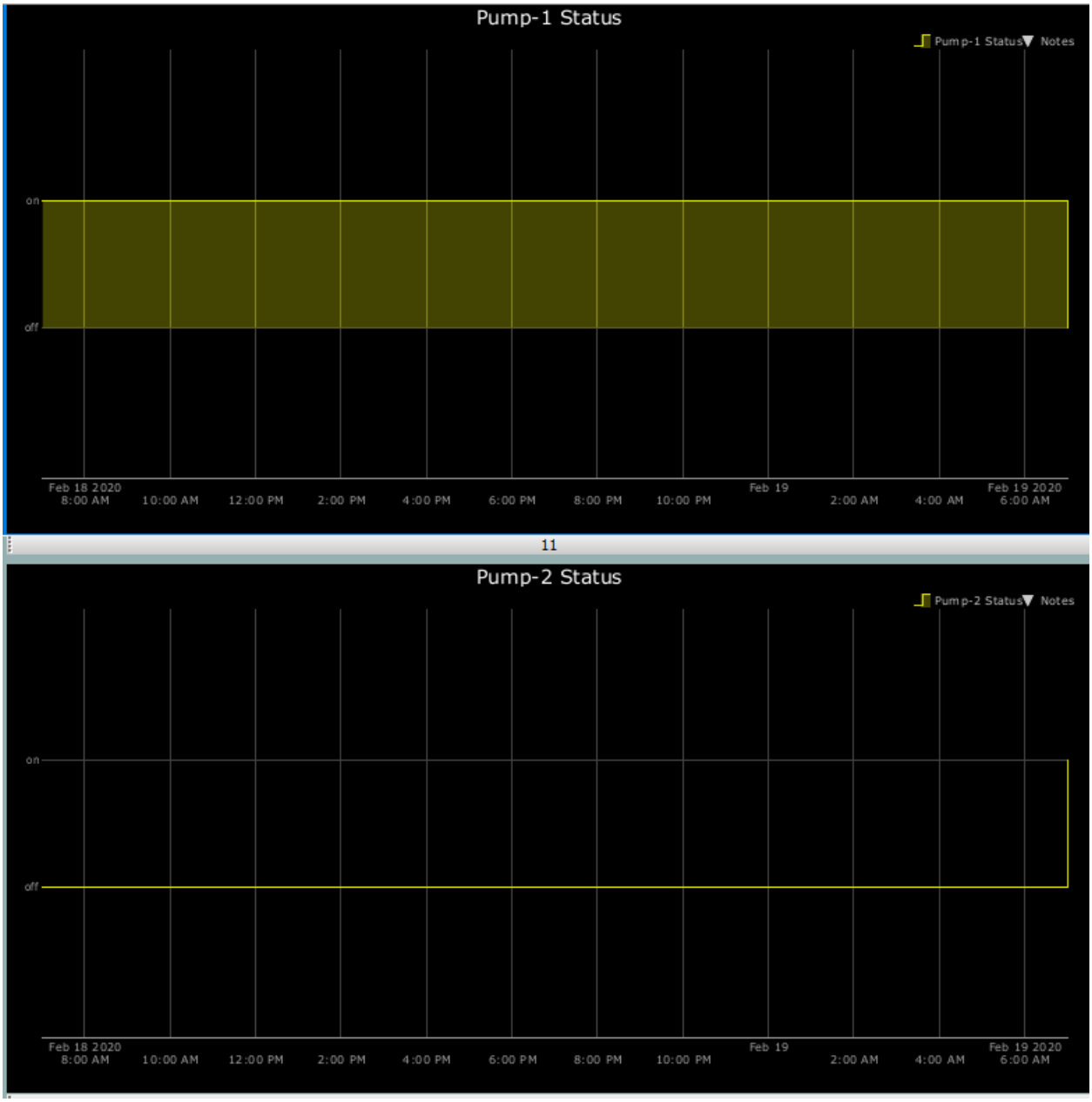
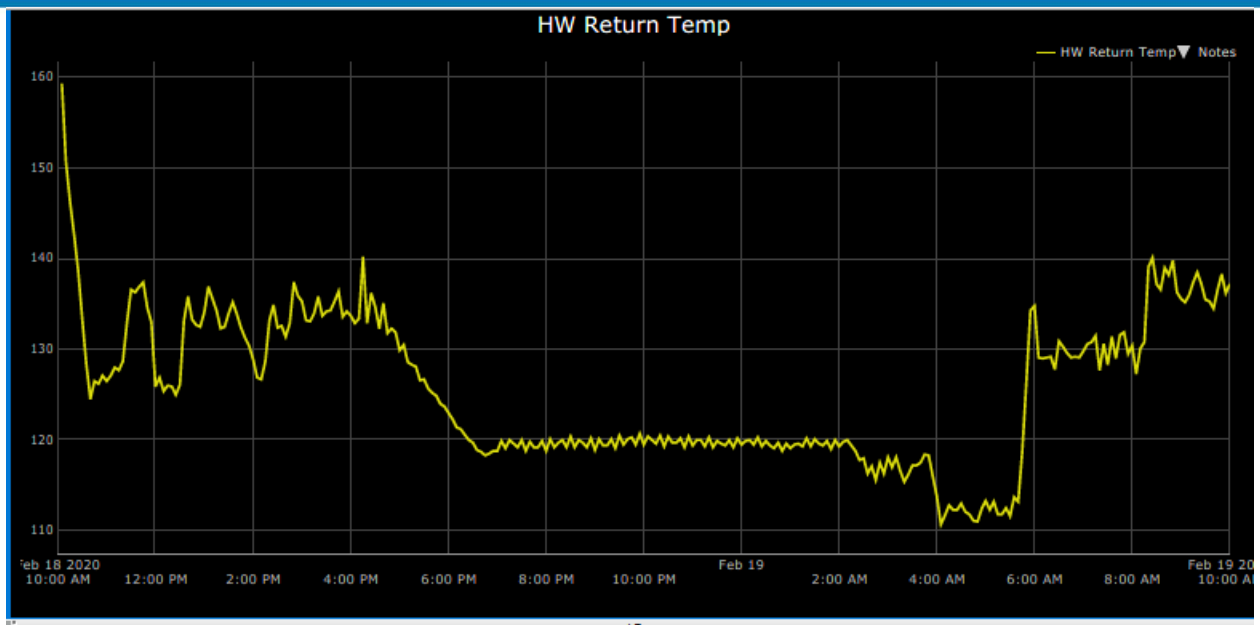
Bryant Elementary School





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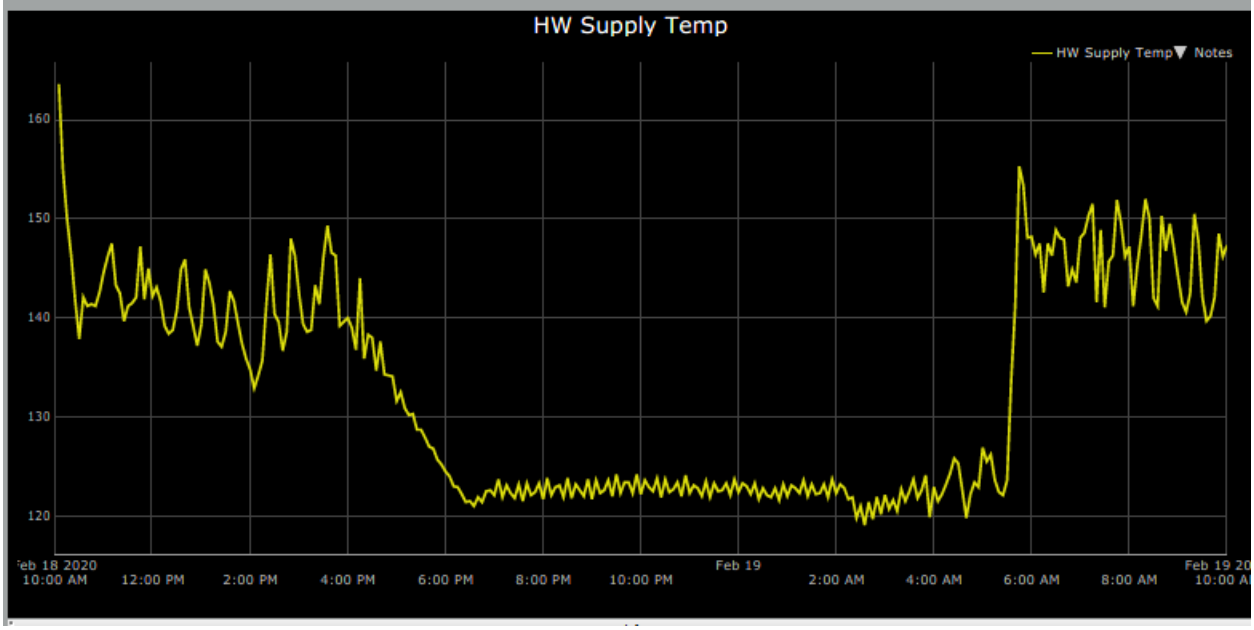
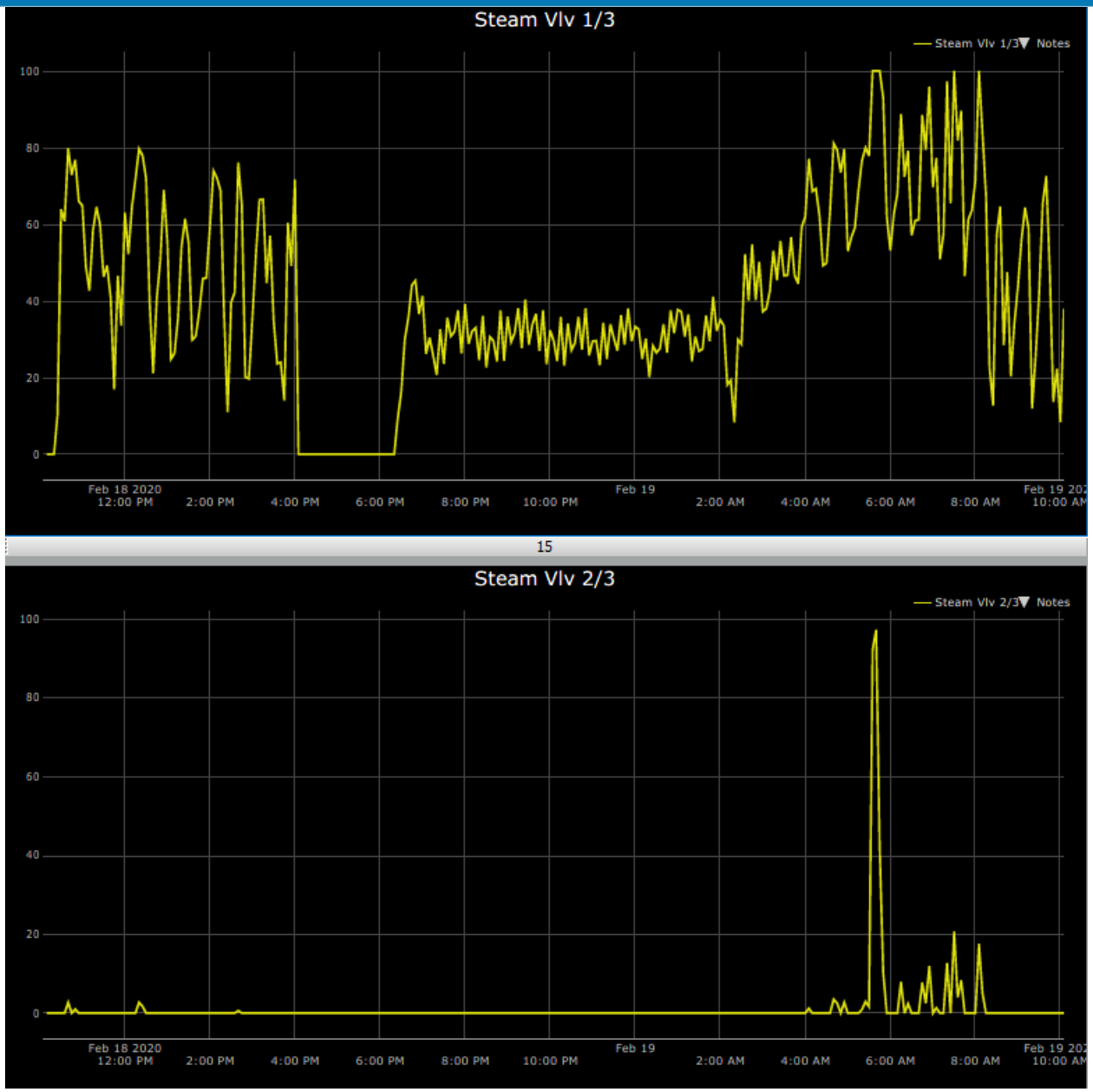
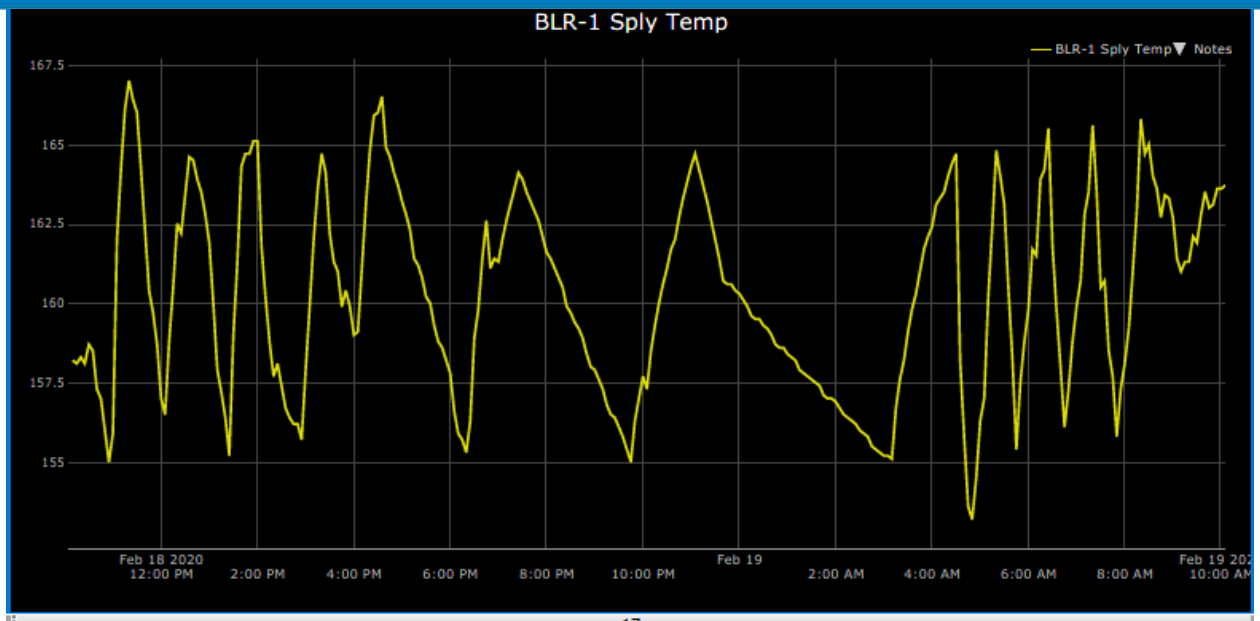




Benjamin Franklin Middle School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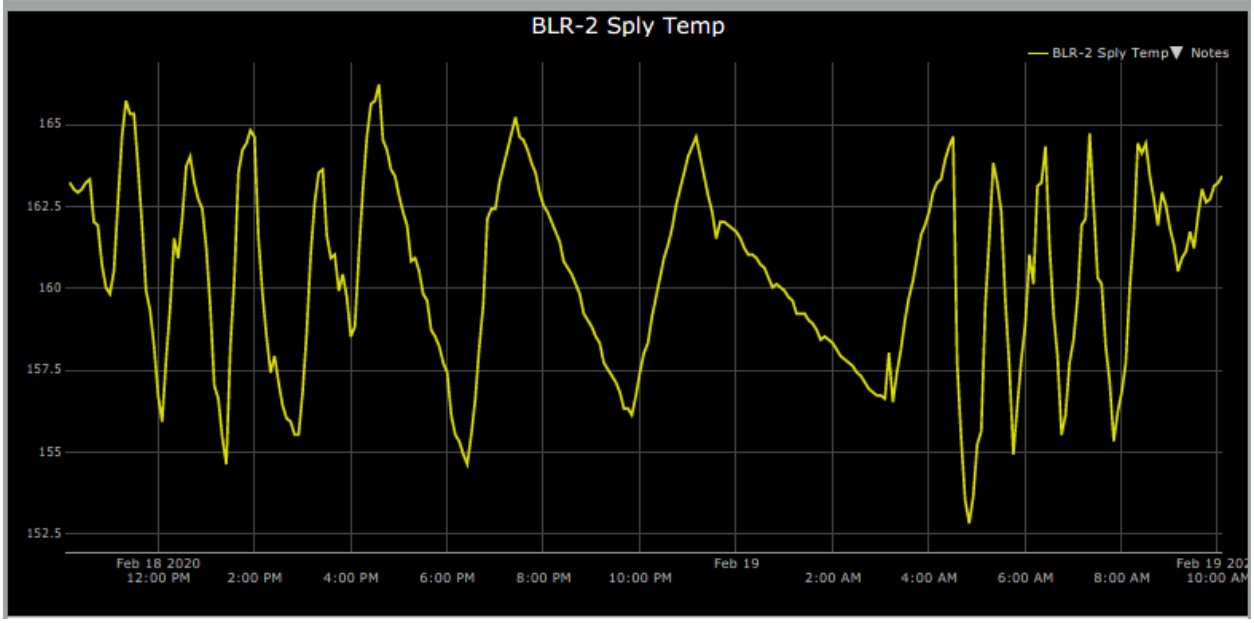
17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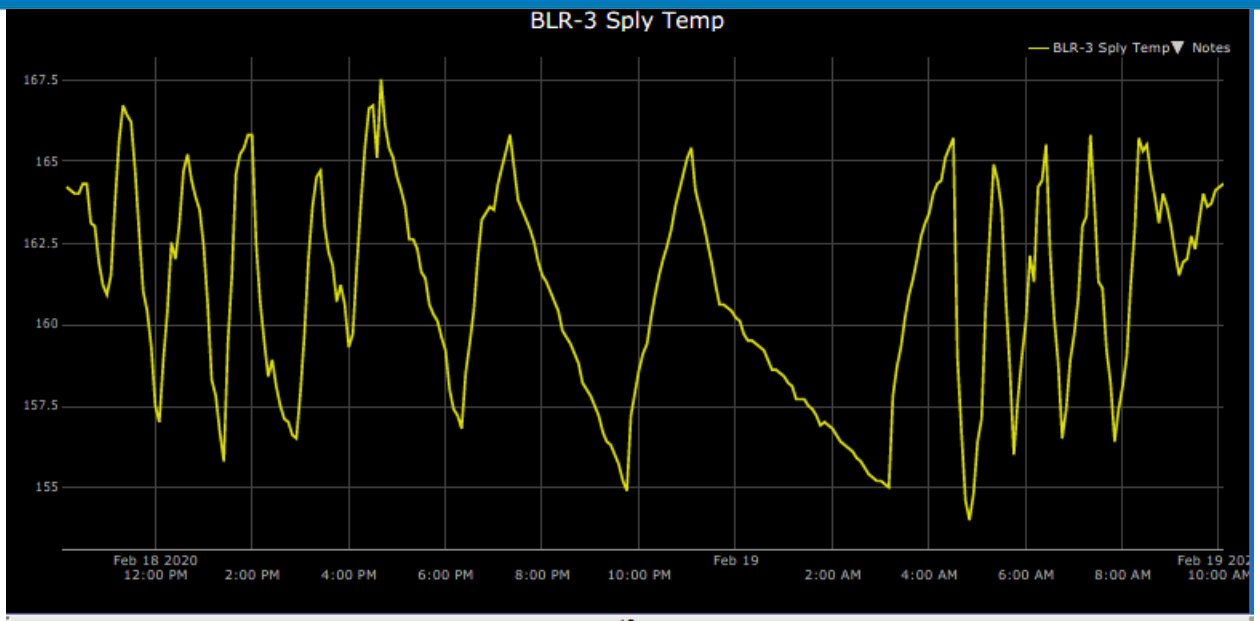
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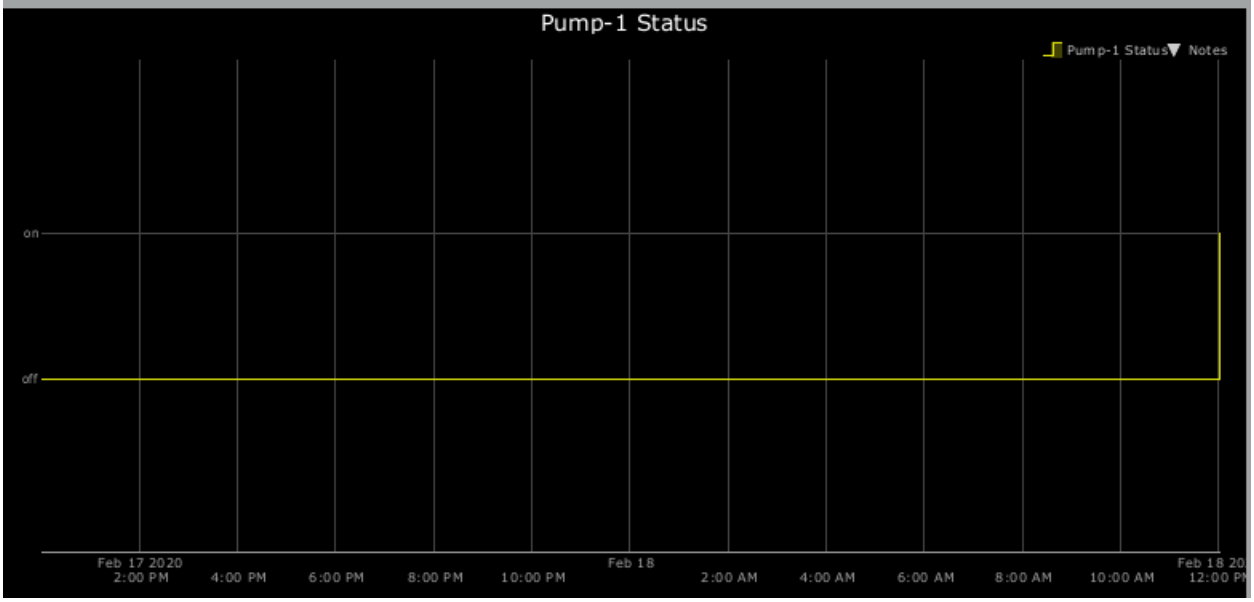
19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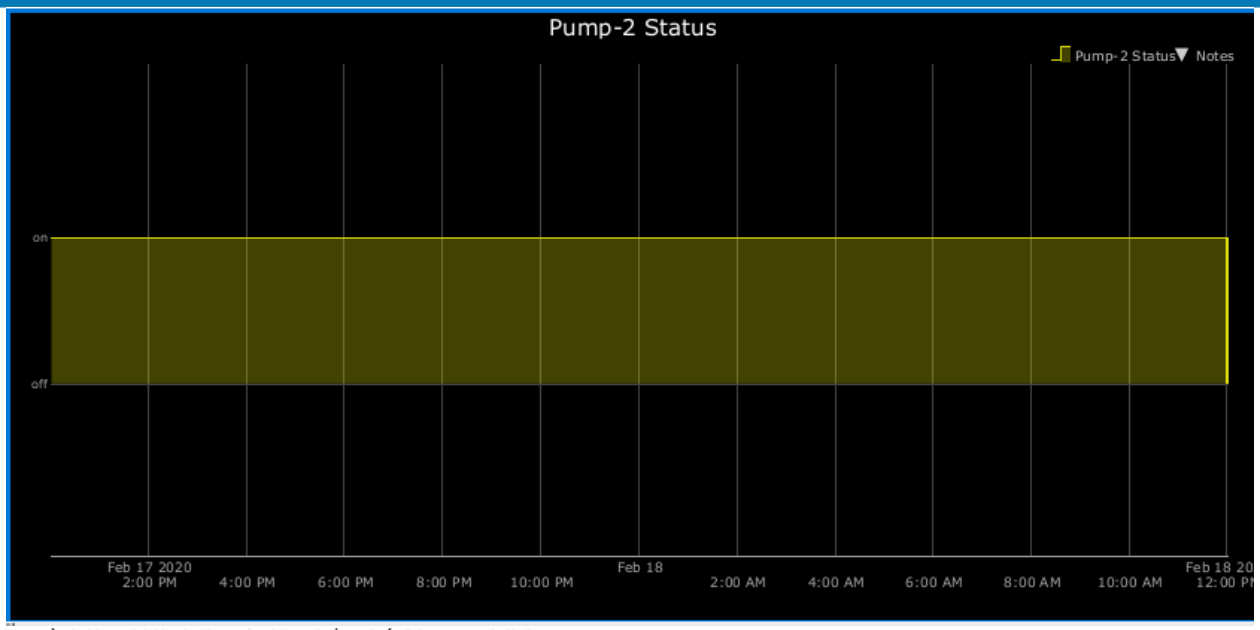

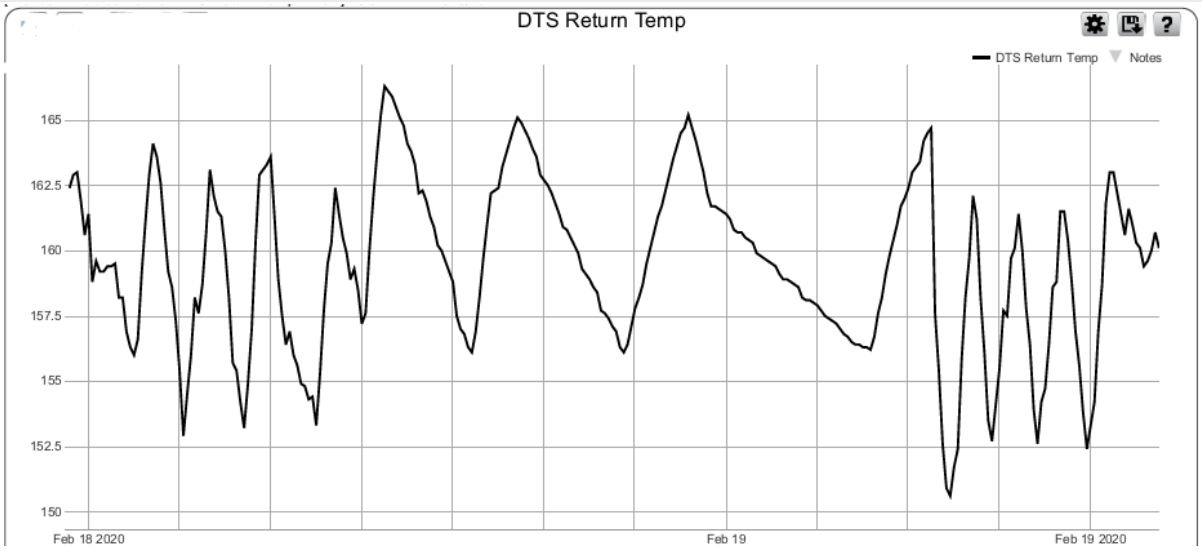

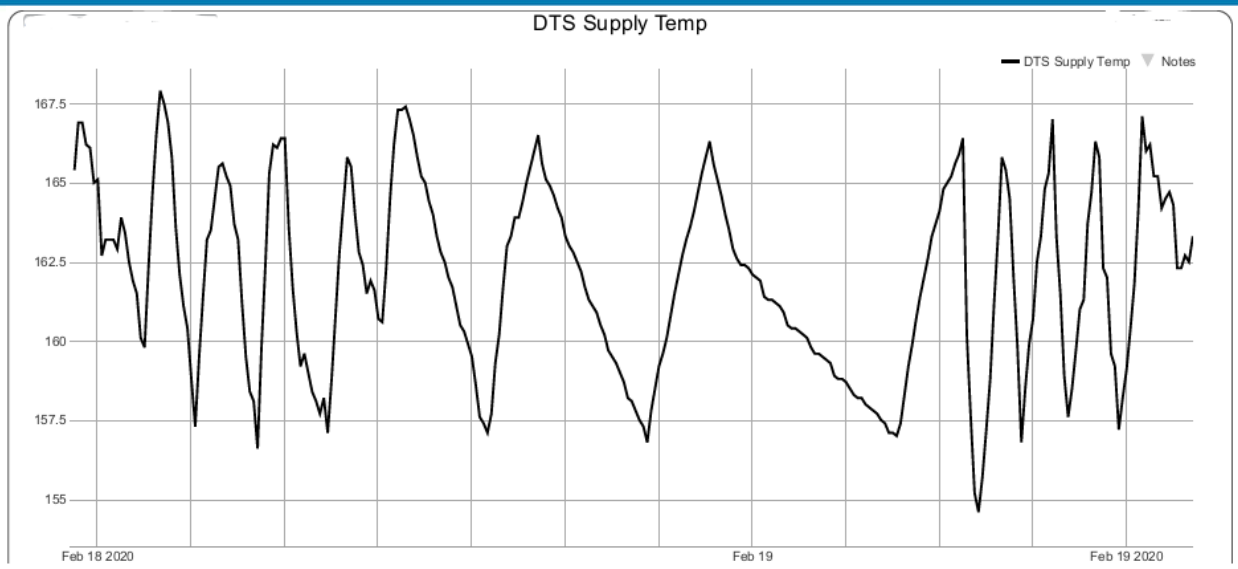
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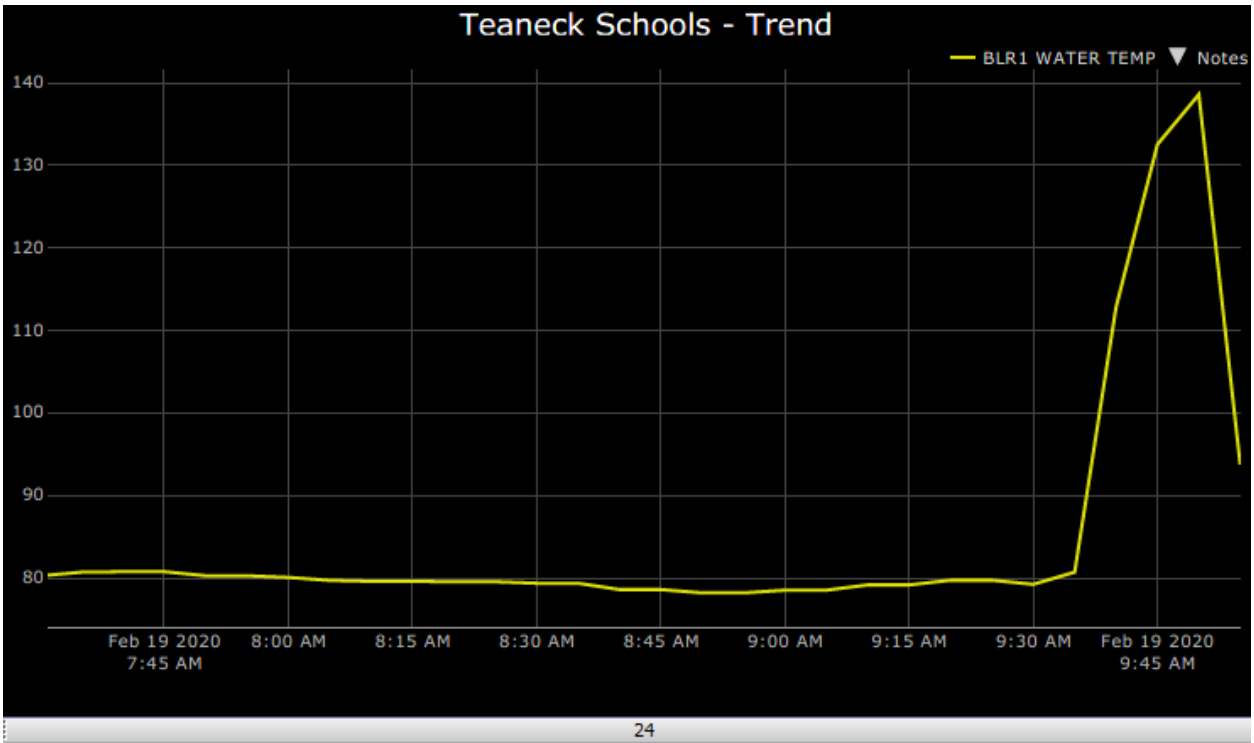
Feb 19 2020

Hawthorne Elementary School



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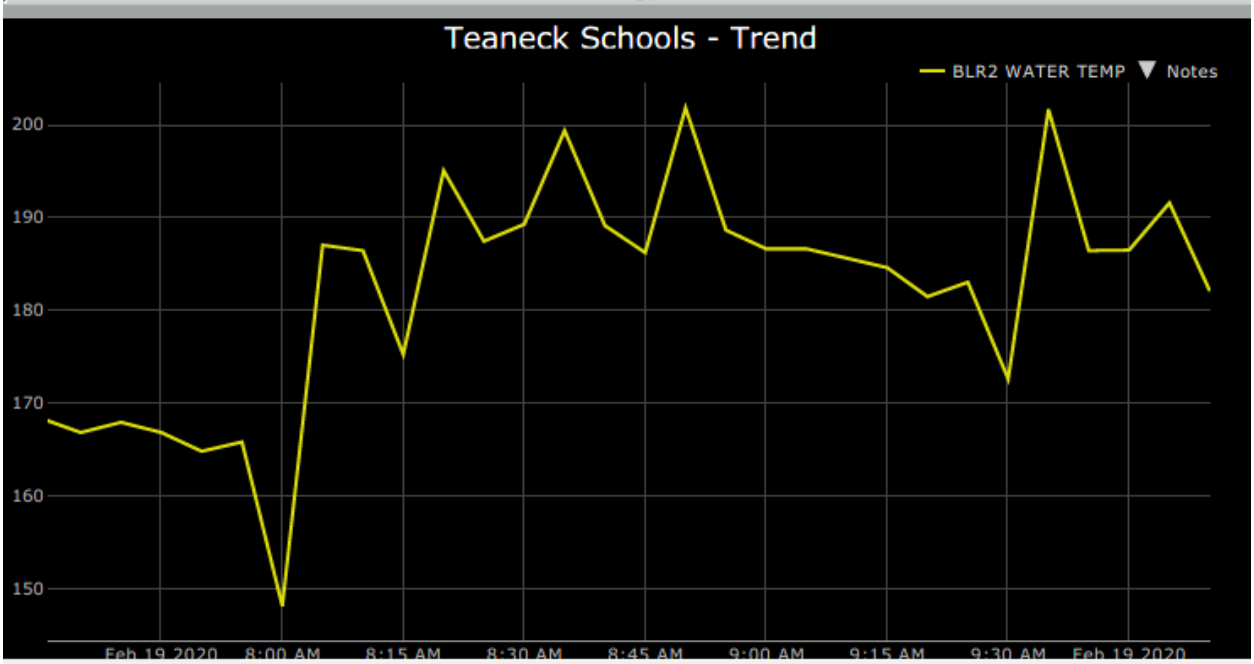

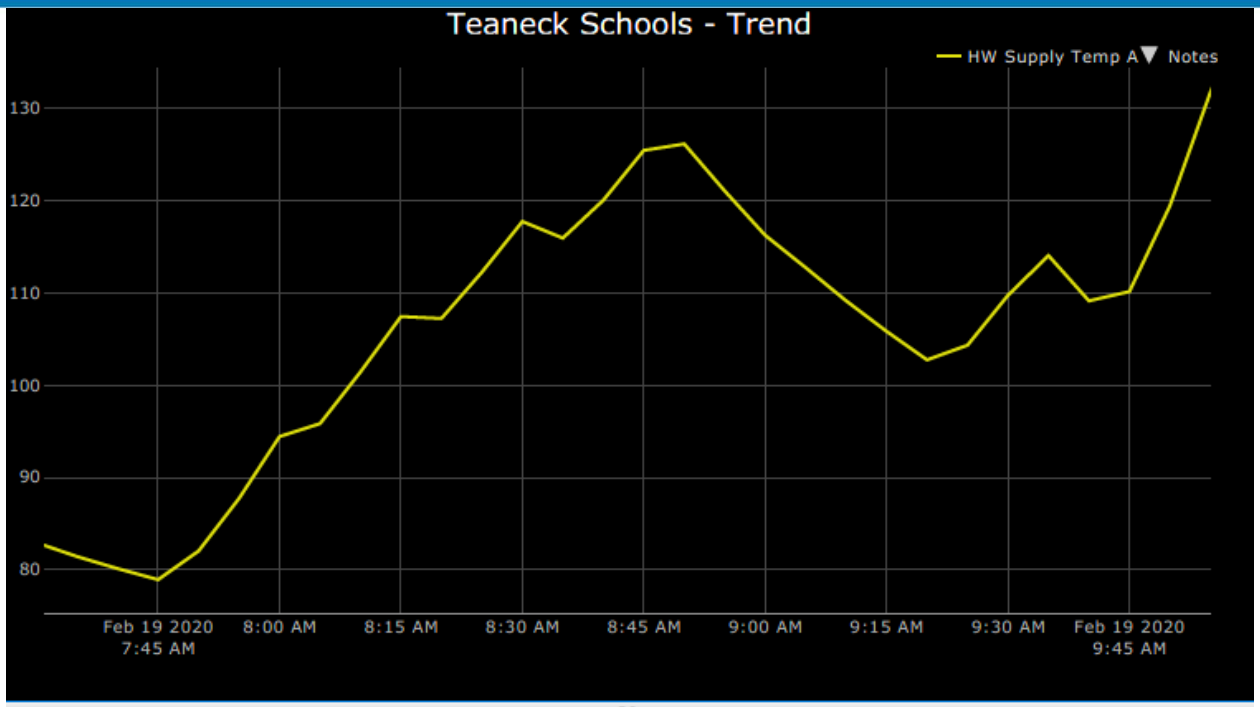

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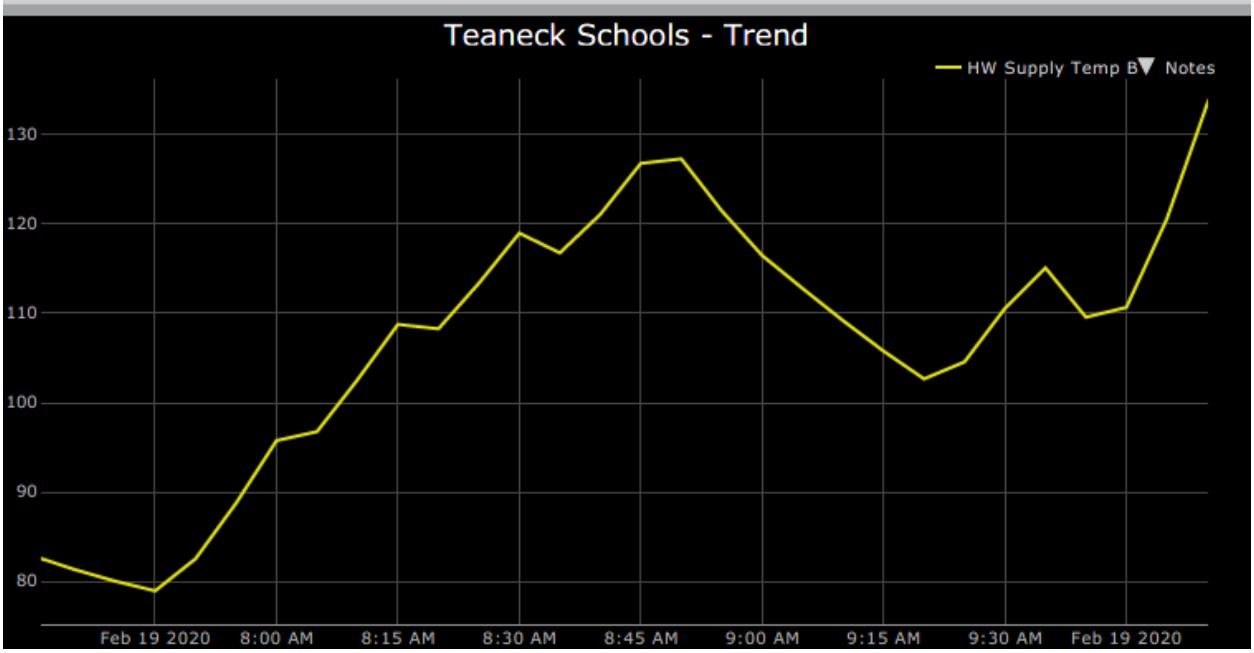
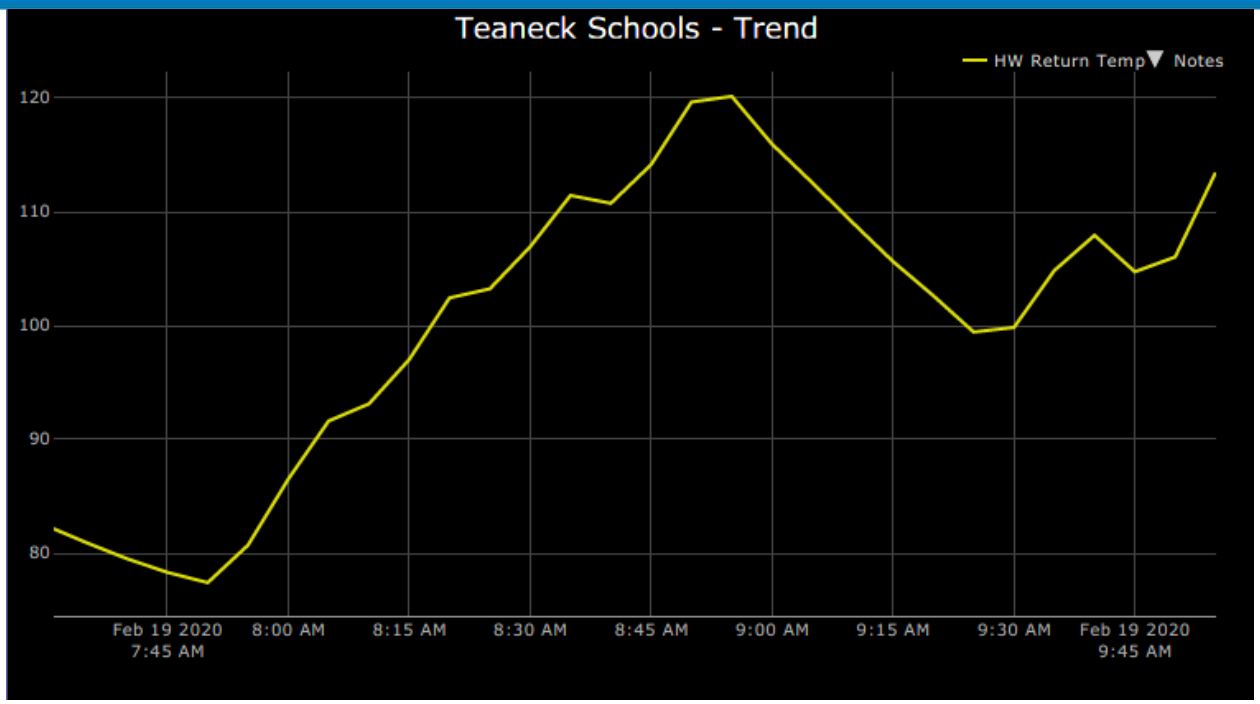
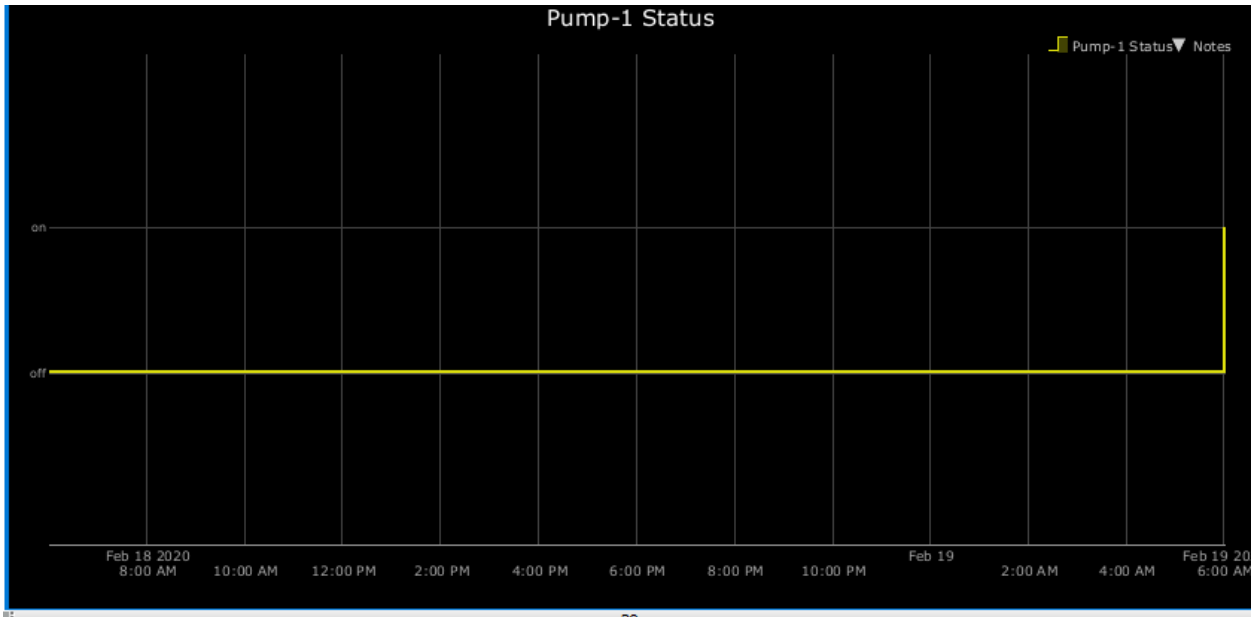




Lowell Elementary School



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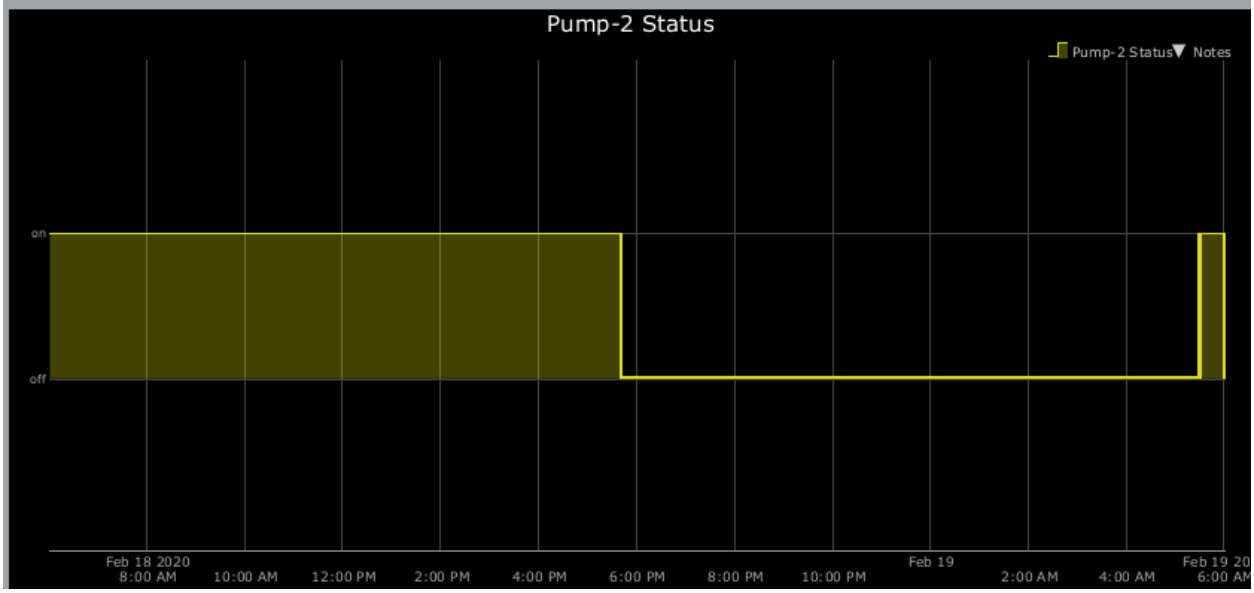

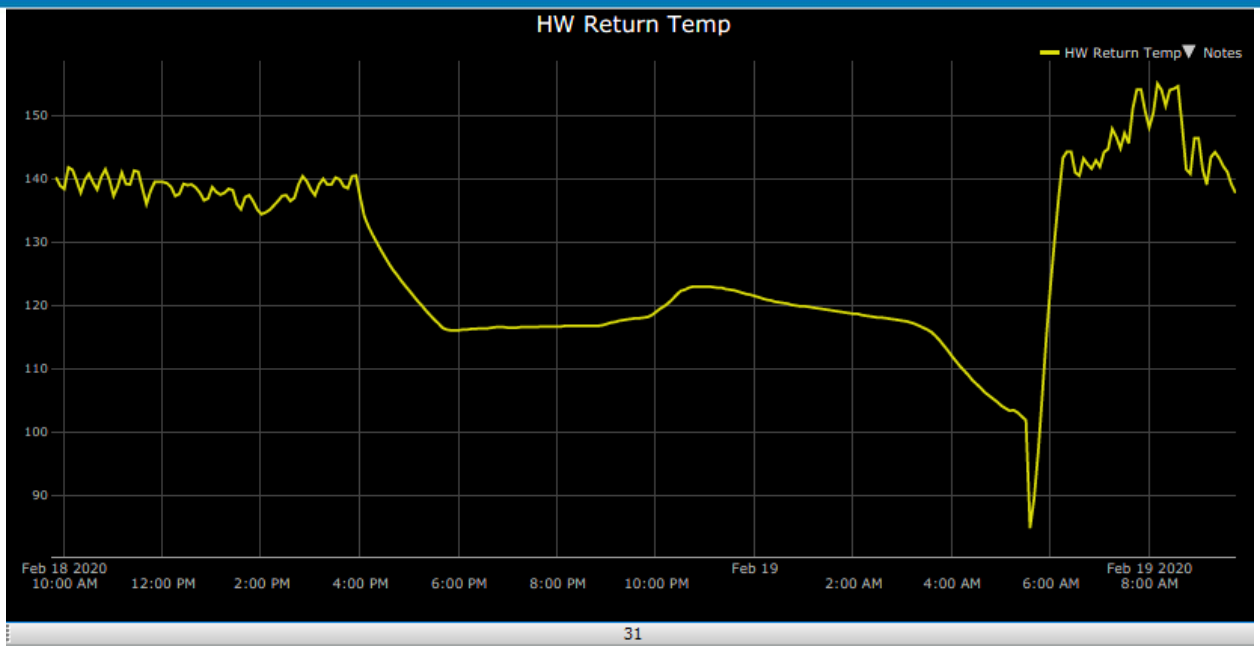

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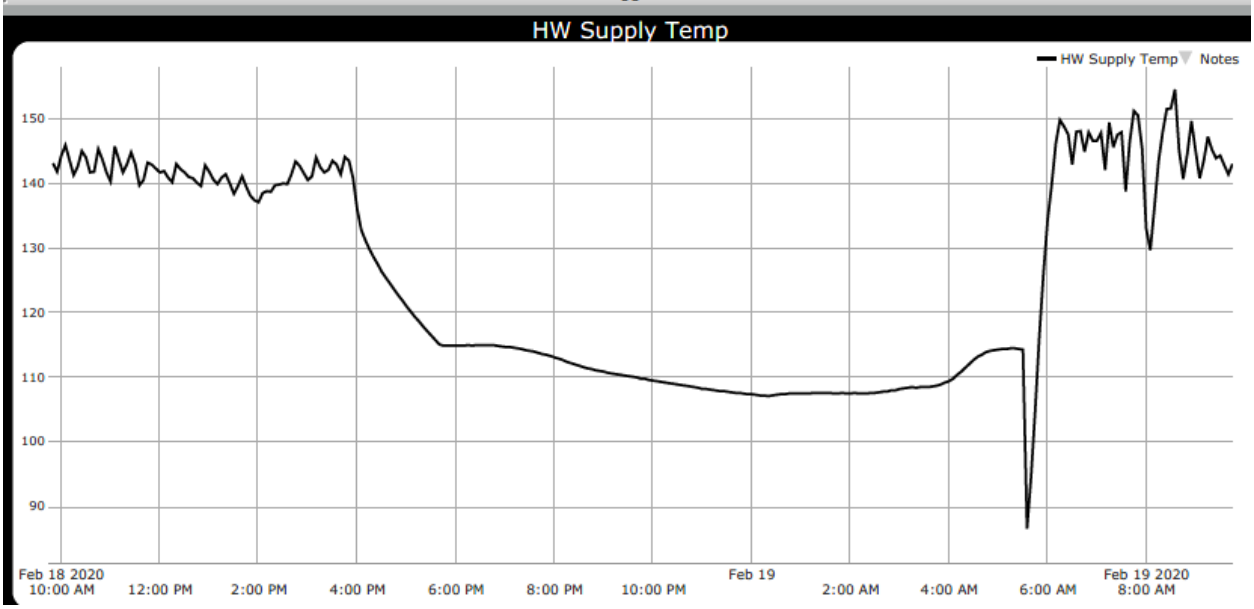
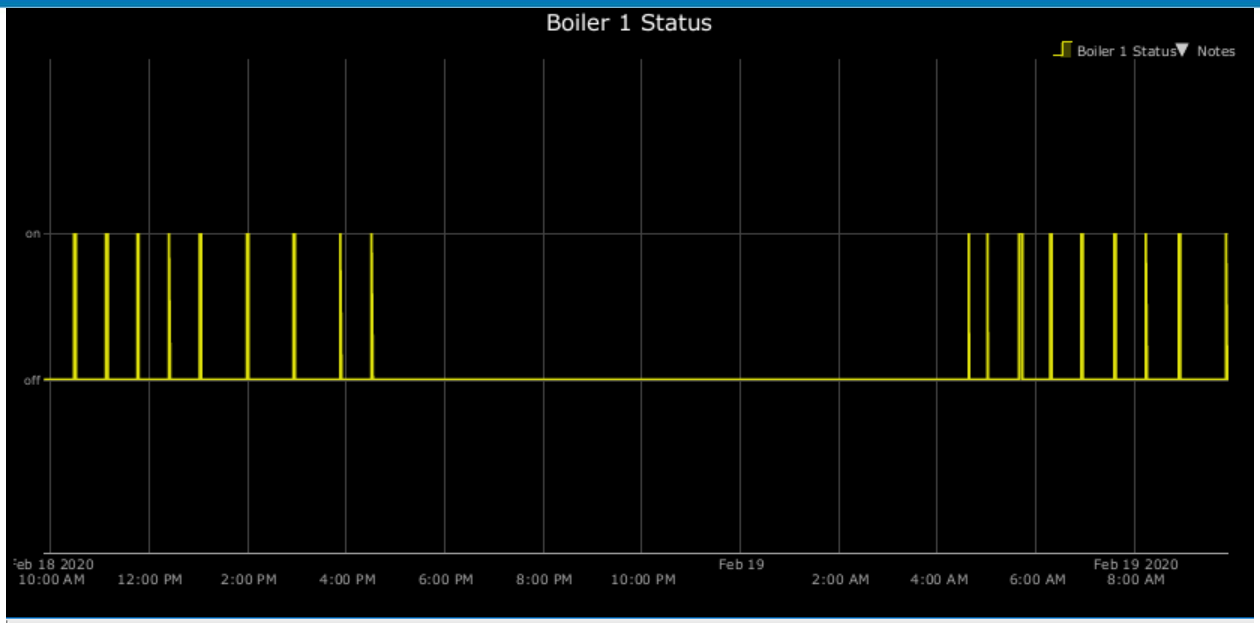


Teaneck High School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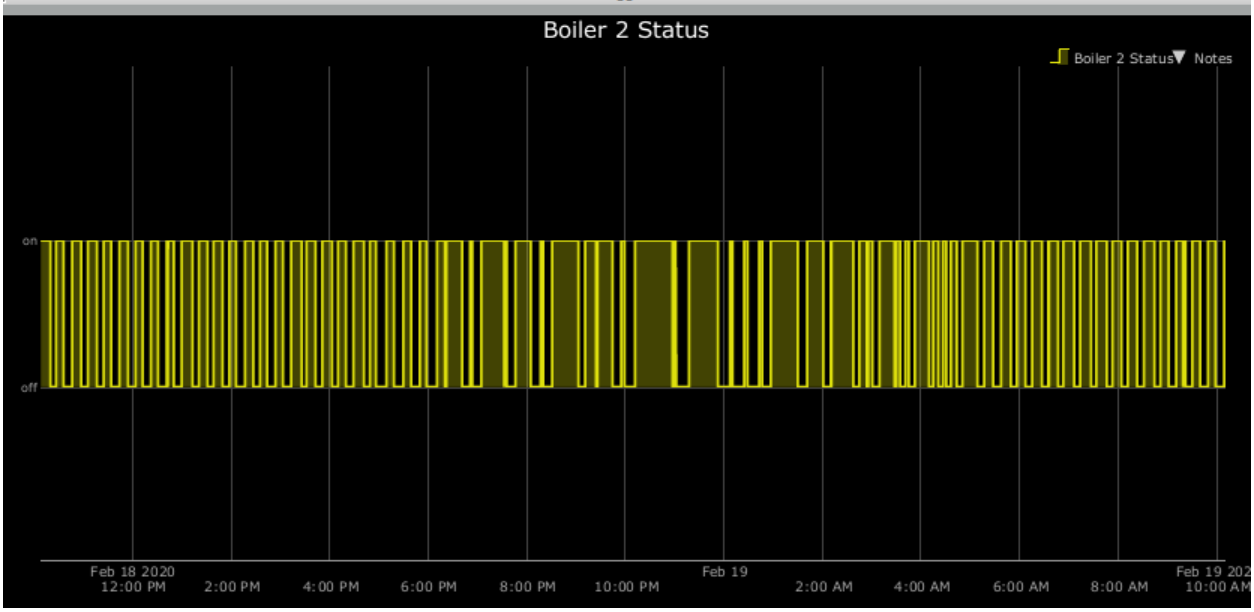
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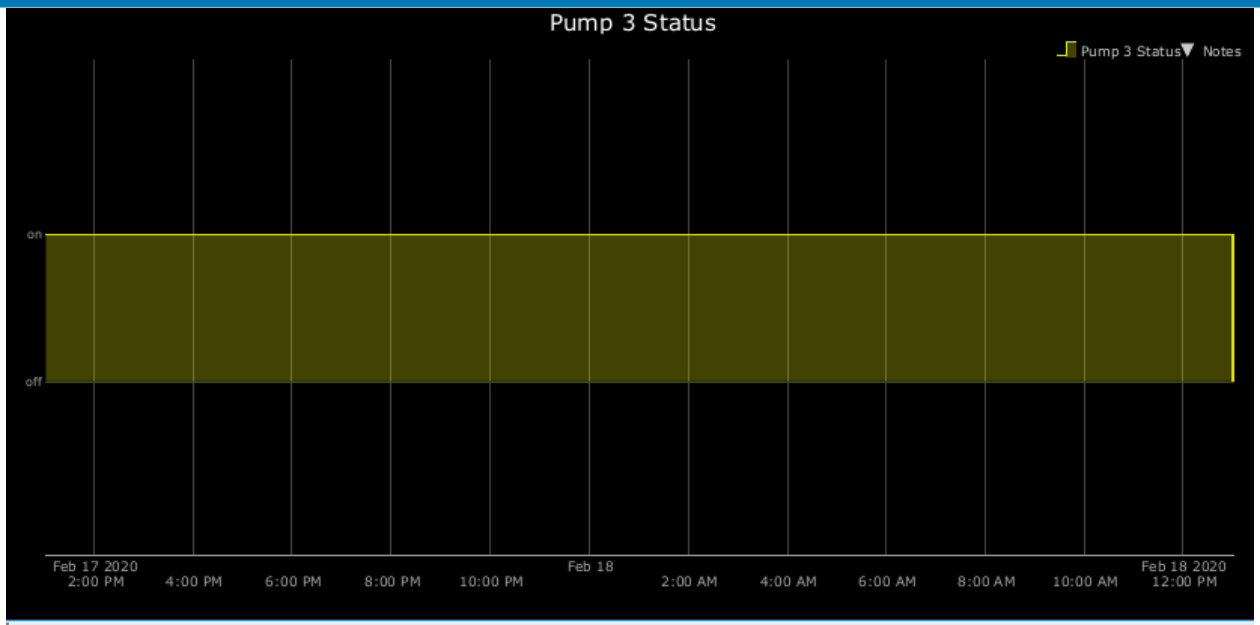

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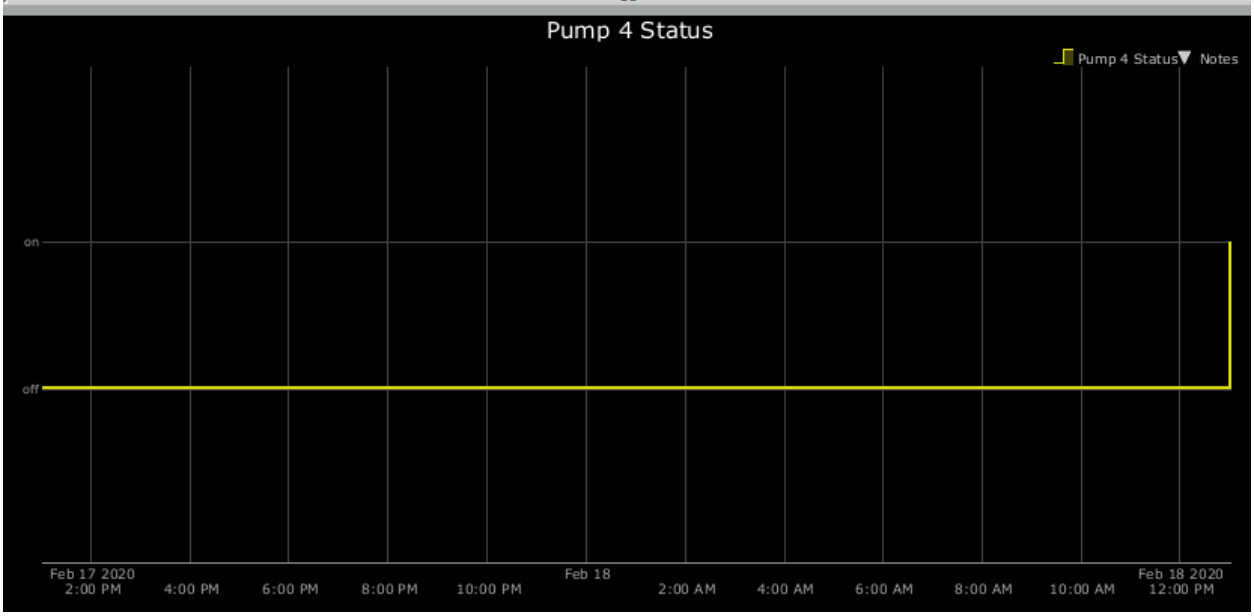

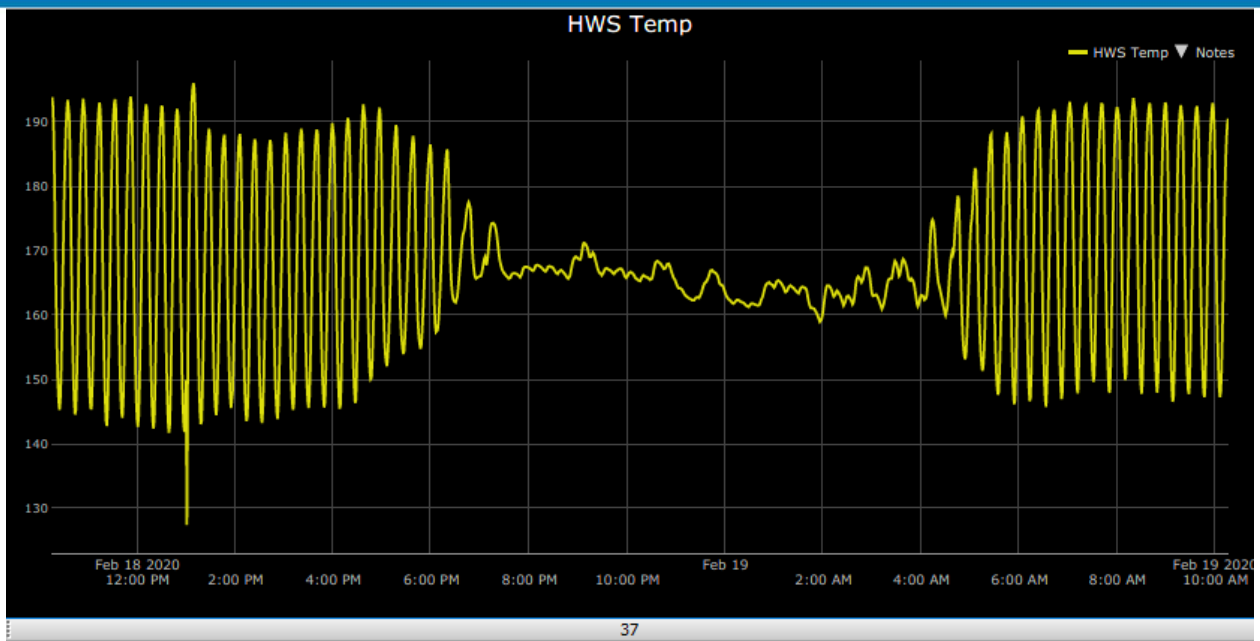
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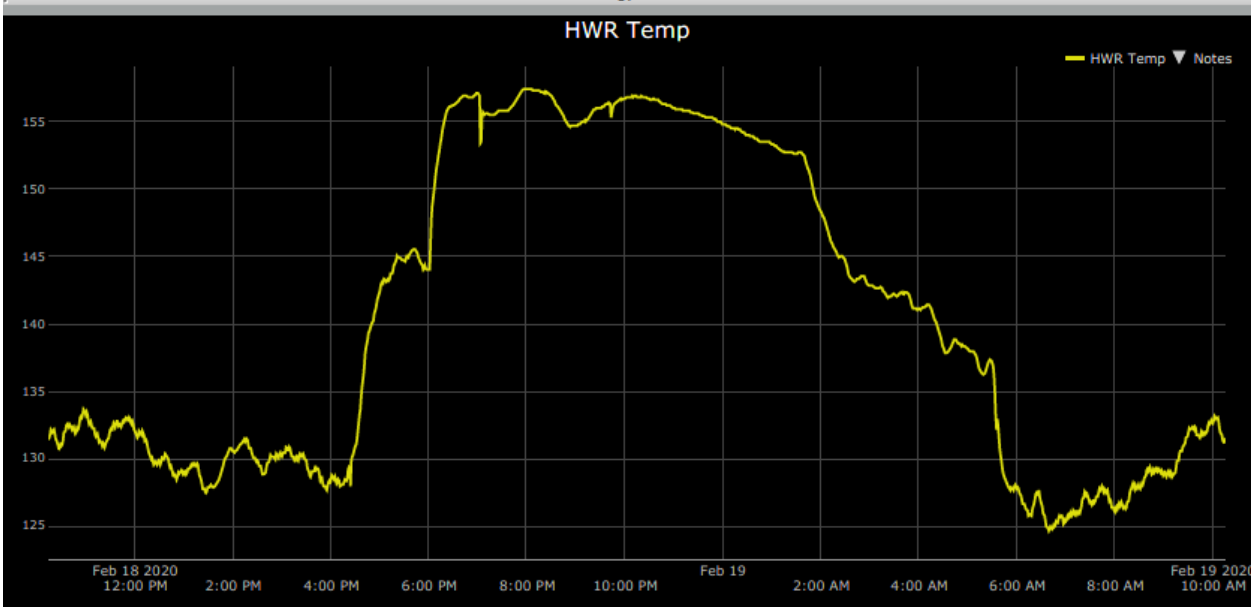
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APPENDIX 5. RECOMMENDED PROJECT - ESP

ECM #	ECM	Year 1 Savings ($/Yr)	ECM Cost	Simple Payback	Installation Plan	Recommend Installation
1	Comprehensive LED Lighting Upgrades - Teaneck HS	$53,668	$357,574	6.7	Public Bidding	Yes
2	Install VFD's and Premium Motor Upgrades for HVAC	$ 4,609	$ 33,685	7.3	Public Bidding	Yes
3	Direct Install Program (Lighting)	$ 74,283	$ 696,698	9.4	DI Installer	Yes
4	Plug Load Controls	$ 4,994	$ 44,952	9.0	Public Bidding	Yes
5	Combined Heat and Power (35kW)	$ 14,122*	$ 335,500	23.8	Public Bidding	Yes
6	Computer Power Management Software	$ 15,401	$ 30,875	2.0	Public Bidding	Yes
7	Refrigeration Controls	$ 4,096	$ 42,684	10.4	Public Bidding	Yes
8	Fuel Use Economizers (Hot Water Boilers)	$ 5,513	$ 39,270	7.1	Public Bidding	Yes
9	Direct Install Program Fuel Use Economizers (Steam Boilers)	$ 9,979	$ 4,916	0.5	DI Installer	Yes
10	Direct Install Program Low-flow Domestic Hot Water Devices	$ 790	$ 597	0.8	DI Installer	Yes
11	Replace Rooftop Cooling Unit at Whittier Elementary School	$ 1,126	$ 134,922	119.8	Public Bidding	Yes
12	Replace Cooling in Media Center – Benjamin Franklin Middle School	$ 1,016	$ 70,018	68.9	Public Bidding	Yes
13	Replace Cooling in Media Center – Lowell Elementary School	$ 96	$ 34,312	355.7	DI Installer	Yes
14	Condensing Hot Water Boiler Plant (Teaneck High School - Fan Room Upgrades)	$ 10,493	$ 1,037,479	98.9	Co-op Mechanical Installer	Yes
15	Condensing Hot Water Boiler Plant (Teaneck High School – Hot Water Header Pipe)	$ 0	$ 284,900	100+	Co-op Mechanical Installer	Yes
16	Replace Steam Traps	$ 13,070	$ 198,580	15.2	Public Bidding	Yes
17	Replace Domestic Hot Water Storage Tank at Benjamin Franklin Middle School	$ 370	$ 50,070	135.2	Public Bidding	Yes
18	Refurbish Cooling Tower	$ 1,599	$ 22,638	14.2	Public Bidding	Yes
19	Upgrade Building Management System	$ 22,529	$ 413,584	18.4	Co-op Controls Installer	Yes
20	Operational Verification and HVAC Improvements	$ 38,938	$ 163,130	4.2	Co-op Controls Installer	Yes
21	Building Envelope Weatherization	$ 21,429	$ 257,632	12.0	Public Bidding	Yes
22	Repair Missing Piping Insulation	$ 7,484	$ 113,334	15.1	Public Bidding	Yes
23	Construction Contingency	$ 0.0	$ 542,500		Public Bidding	Yes
24	Unit Ventilator Refurbishment at Teaneck High School – First Floor	$ 1,744	$ 132,000	75.7	Public Bidding	Yes
25	Unit Ventilator Replacement at Teaneck High School – Second Floor	$ 1,581	$ 438,625	277.5	Public Bidding	Yes
26	Unit Ventilator Replacement at Teaneck High School – Third Floor	$ 2,453	$ 680,625	277.5	Public Bidding	Yes

*Savings from Combined Heat and Power is Energy Savings & Distributed Generation (Capacity & Generation: $20,093; Energy: ($5,971)

APPENDIX 6. LIGHTING UPGRADES

Lighting Upgrades Ben Franklin Middle School

PROJECT:	Teaneck PS - Ben Franklin MS - New Fixtures - R3				
Room Info		Existing Fixture Info		Lighting Fixture Upgrades	
x		x	x	x	x
Floor	Location	No. of Fix.	Fixture Type	ECM No.	Upgrade Description
First	Maintenance Storage	10	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First		4	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First		5	2x4-4FO28-W	T4L44	(4) 10.5w 4' T8 LED B
First		4	1x8-4FO28-Fin	5NE30	New 41w 1x8 LED Low Bay
First		1	1x4-2F40-IH	T4L22	(2) 10.5w 4' T8 LED B
First	Lounge	9	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Storage	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Corridor	1	1x8-4FO28-W	5NE30	New 41w 1x8 LED Low Bay
First	Shop	3	1x4-2FO28-S	3NE46	New 23w 1x4 LED Low Bay
First		1	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
First		1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First	Restroom	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Maintenance Shop	10	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
First	Shop	2	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
First	Maintenance Garage	5	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
First	Cages	2	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
First		1	1x8-4FO28-W	T4L44	(4) 10.5w 4' T8 LED B
First	Conference Room	4	2x4-4FO28-P.5	7NE24	New 30w 2x4 LED Flat Panel
First	Corridor	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Operations Office	6	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel
First		3	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
First	Office	4	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
First	Office	6	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
First	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	6	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	11	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Women's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Men's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Storage	4	Bare-CF42	ID10	(1) 17w Dimmable LED A
First	Classroom	6	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Custodial Supplies	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First	Restroom	3	Drum-(3)CF23	ID09	(1) 12w Dimmable LED A
First	Stairwell	2	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
First	Storage	5	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
First		1	Bare-CF42	ID10	(1) 17w Dimmable LED A
First	Classroom	10	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Child Study	3	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Office	2	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel

Lighting Upgrades Ben Franklin Middle School Continued

First	Offices	4	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Guidance	6	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Office	4	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Office	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Art Room	18	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First		1	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First		2	1x4-1FO28-L	3NE28	New 40w 1x4 LED Flat Panel
First	Storage	3	Bare-CF42	ID10	(1) 17w Dimmable LED A
First	Stairwell	3	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First		1	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
First	Corridors	41	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First	Men's Locker Room	16	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First		2	Square-60A	ID08	(1) 10w Dimmable LED A
First	Custodian	1	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Storage	1	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Vestibule	2	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First	Office - Phy Ed	2	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First	Restroom	1	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First	Gym	24	High Bay-6FP54HO	9NE11	New 177w Linear LED High Bay
First	Office	2	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First	Office - Phy Ed	2	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First	Restroom	1	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First	Women's Locker Roo	21	1x4-2FO28-VAP	3NE18	New 37w 1x4 LED Vapor Tite
First		2	Square-60A	ID08	(1) 10w Dimmable LED A
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Nurse	3	1x8-4FO28-L	3NE28	New 40w 1x4 LED Flat Panel
First	Restroom	1	Drum-(3)CF23	ID09	(1) 12w Dimmable LED A
First	Storage	1	Drum-(3)CF23	ID09	(1) 12w Dimmable LED A
First	Stairwell	2	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
First		1	Square-60A	ID08	(1) 10w Dimmable LED A
First	Receiving	4	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
First	Boiler Room (Locked)	20	1x4-2FO28-IH	T4L22	(2) 10.5w 4' T8 LED B
First	Men's Restroom	3	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Vestibule	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First	Corridor	25	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Women's Restroom	3	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Custodian	1	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Mechanical	1	Bare-CF42	ID10	(1) 17w Dimmable LED A
First	Stairwell	1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Dressing Room	16	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Women's Locker Roo	3	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Men's Locker Room	3	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Lobby	18	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel

Lighting Upgrades Ben Franklin Middle School Continued

Second	Main Office	12	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second		2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second		1	Square-60A	ID08	(1) 10w Dimmable LED A
Second	Principal	6	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Vestibule	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Restroom	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Asst Principal	4	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Restroom	1	Drum-(2)CF13	ID09	(1) 12w Dimmable LED A
Second	Closet	1	Bare-60A	ID08	(1) 10w Dimmable LED A
Second	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second		3	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
Second	Men's Restroom	1	1x4-2LED18-W	-	No Upgrade
Second	Faculty	4	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Second	Women's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second		2	1x2-LED20-W	-	No Upgrade
Second	Asst Principal	4	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Second		1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Stairwell	3	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
Second	Men's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Lobby	4	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
Second		1	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Women's Restroom	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Cafeteria	42	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second		1	Soda Machine	S01	Vending Miser
Second	Kitchen	30	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second		4	Jelly-CF23	ID09	(1) 12w Dimmable LED A
Second	Cooler	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Closet	1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Second	Restroom	1	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Second	Office	1	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Second	Storage	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Second	Coolers	4	Jelly-CF23	ID09	(1) 12w Dimmable LED A
Second	Faculty Dining	10	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
Second	Stairwell	2	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
Second	Corridor	19	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second		2	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Second	Media Center	21	1x8-4FO28-Fin	5NE30	New 41w 1x8 LED Low Bay
Second		7	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Second		3	1x8-4FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Second	Classroom	6	2x4-3FO28-P18 (2 Bal)	7NE24	New 30w 2x4 LED Flat Panel
Second	Computer Room	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Stairwell	3	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
Second	Storage (Locked)	1	1x8-4FO28-Fin	5NE30	New 41w 1x8 LED Low Bay
Second	Classroom	3	1x8-4FO28-W	7NE25	New 40w 2x4 LED Flat Panel
Second	Women's Restroom	3	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Men's Restroom	3	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Classroom	6	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	8	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	8	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel

Lighting Upgrades Ben Franklin Middle School Continued

Second	Prep Room	1	1x8-4FO28-Fin	5NE30	New 41w 1x8 LED Low Bay
Second		1	1x4-2FO28-FIN	3NE46	New 23w 1x4 LED Low Bay
Second	Greenhouse (Locked)	2	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Second	Corridor	22	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second		2	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Second	Stairwell	3	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
Second	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	12	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Vestibule	2	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Stage	4	Work-LED27A	-	No Upgrade
Second	Chair Storage	4	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Auditorium	23	HH-300R40	-	No Upgrade
Second	Dance Studio	8	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Vestibule	4	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Mezzanine	1	Bare-100A	ID09	(1) 12w Dimmable LED A
Second		2	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Catwalk	5	Bare-100A	ID09	(1) 12w Dimmable LED A
Second	Instrumental Music	15	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Office	2	1x8-4FO28-Fin	5NE30	New 41w 1x8 LED Low Bay
Second	Vestibule	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Practice Room	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Practice Room	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Storage	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Second	Vestibule	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Third	Stairwell	3	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
Third	Office	3	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Third	Classroom	8	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Third	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Third	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Third	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Third	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Third	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Third	Stairwell	3	2x2-MV100	6NE04	New 30w 2x2 LED Flat Panel
Third	Men's Restroom	2	2x4-4FO28-W	7NE24	New 30w 2x4 LED Flat Panel
Third	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Women's Restroom	4	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Third	Classroom	10	2x4-3FO28-L (2 Bal)	7NE24	New 30w 2x4 LED Flat Panel
Third		1	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
Third	Classroom	12	2x4-3FO28-L (2 Bal)	7NE24	New 30w 2x4 LED Flat Panel
Third	Classroom	9	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Third	Classroom	12	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Third	Corridor	28	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Exterior	Building Perimeter	11	Square-CF23	ID09	(1) 12w Dimmable LED A
Exterior		3	Flood-LED100	-	No Upgrade
Exterior		3	Square-CF23	ID09	(1) 12w Dimmable LED A

Lighting Upgrades Ben Franklin Middle School Continued

Exterior		1	Wallpack-Cut-LED30	-	No Upgrade
Exterior		1	Jelly-CF23	ID09	(1) 12w Dimmable LED A
Exterior		3	Wallpack-LED30	-	No Upgrade
Exterior		2	Square-CF23	ID09	(1) 12w Dimmable LED A
All Areas	Emergency BB	30	(Battery Backup)	\E28	Emergency Back-Up LED Strip
	Total	1116			

Lighting Upgrades Bryant Elementary School

PROJECT:	Teaneck PS - Bryant Elementary - R3				
Room Info		Existing Fixture Info		Lighting Fixture Upgrades	
x		x	x	x	x
Floor	Location	No. of Fix.	Fixture Type	ECM No.	Upgrade Description
Ground Floor	Lobby	6	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor		2	1x2-1F20-S	T211	(1) 7w 2' T8 LED B
Ground Floor	Corridor	10	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Classroom	10	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Corridor	1	HH-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Classroom	10	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Vestibule	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Men's Restroom	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Library	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Restroom	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Women's Restroom	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Corridor	7	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Vestibule	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Boiler Room (Locke	10	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
Ground Floor		1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Corridor	5	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor	Office Speech	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	1	1x2-2FO17-W	1NE03	New 18w 1x2 LED Wrap
Ground Floor		4	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Ground Floor		6	2x4-4FO28-W	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Ground Floor	Vestibule	1	HH-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Vestibule	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Classroom	4	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Ground Floor		6	2x4-4FO28-W	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Ground Floor	Corridor	28	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor	Telecom	1	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B

Lighting Upgrades Bryant Elementary School Continued

Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	2x2-3FO17-L	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	HH-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Therapy	1	2x2-3FO17-L	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor		4	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Men's Restroom	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Custodian	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Ground Floor		1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Storage (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Women's Restroom	3	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Vestibule	1	HH-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Restroom	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Corridor	3	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor	Corridor	10	2x4-2FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Cafeteria	28	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		3	2x2-2FO17-L	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor	Restroom	1	1x4-2FO28-Up/Down	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Restroom	1	1x4-2FO28-Up/Down	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Kitchen	4	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Electrical	4	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Classroom	11	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	1x4-2FO28-Up/Down	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Office	3	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Office	6	2x4-2FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		1	2x2-2FO17-L	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor	Nurse	7	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Restroom	1	1x4-2FO28-Up/Down	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Closet	2	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Corridor	1	HH-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Restroom	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Storage (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Women's Restroom	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Vestibule	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Main Office	12	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor	Office	8	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Corridor	17	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Corridor	12	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Ground Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Electrical (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Electrical (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Gym	20	High Bay-6FP54HO	9NE11	New 177w Linear LED High Bay

Lighting Upgrades Bryant Elementary School Continued

Ground Floor	Stage	2	Bare-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Office	4	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Restroom	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Vestibule	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Study Room	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Men's Restroom	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Ground Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Restroom	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Open Office	3	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor	Office	2	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor		1	Drum-60A	ID08	(1) 10w Dimmable LED A
Ground Floor	Restroom	1	Drum-60A	ID08	(1) 10w Dimmable LED A
Ground Floor	Office	2	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
Ground Floor	Office	2	2x2-2FO28U-P9	6NE04	New 30w 2x2 LED Flat Panel
Basement	Corridor	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Basement	Storage	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Basement	Closet (Locked)	1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Second Floor	Stairwell	1	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Faculty	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Restroom	1	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Second Floor	Corridor	2	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Women's Restroom	1	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Roof Access	1	Bare-CF32	ID09	(1) 12w Dimmable LED A
Exterior	Building Perimeter	1	Chandelier-CF23	ID09	(1) 12w Dimmable LED A
Exterior		2	Flood-HPS70	HN95	New 31w LED Flood
Exterior		5	Wallpack-Cut-LED30	-	No Upgrade
Exterior		1	Flood-LED45	-	No Upgrade
Exterior		1	Wallpack-LED40	-	No Upgrade
Exterior		1	Canopy-HPS70	HN230	New 30w LED Canopy
Exterior		3	Wallpack-HPS70	HN72	New 28w LED Cutoff Wallpack
Exterior		2	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Exterior	Courtyard	2	Flood-HPS100	HN95	New 31w LED Flood
Exterior		1	Flood-LED25	-	No Upgrade
All Areas	Emergency BB	30	(Battery Backup)	\E28	Emergency Back-Up LED Strip
	Total	**512**			

Lighting Upgrades Hawthorne Elementary School

PROJECT:	Teaneck PS - Hawthorne ES - R3				
Room Info		Existing Fixture Info		Lighting Fixture Upgrades	
	x	x	x	x	x
Floor	Location	No. of Fix.	Fixture Type	ECM No.	Upgrade Description
Ground Floor	Main Office	6	2x4-3FO28-P18 (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		1	HH8-2PL26	IN18	New 12w 8-Inch LED Downlight
Ground Floor	Office	4	2x4-3FO28-P18 (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Copy Room	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Ground Floor	Corridor	14	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		6	HH8-2PL26	IN18	New 12w 8-Inch LED Downlight
Ground Floor		2	2x4-4FO28-Drop	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Conference Room	4	2x4-3FO28-P18 (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Women's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		2	HH8-2PL26	IN18	New 12w 8-Inch LED Downlight
Ground Floor	Storage	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Men's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		2	HH8-2PL26	IN18	New 12w 8-Inch LED Downlight
Ground Floor	Electrical	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Custodian	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Nurse	7	2x4-3FO28-L (2 Bal)	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Restroom	1	1x4-2FO28-WW	3NE46	New 23w 1x4 LED Low Bay
Ground Floor	Exam Room	1	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Storage	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Storage	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Corridor	12	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Custodian	1	Bare-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Restroom	1	2x2-2LED9-L	-	No Upgrade
Ground Floor	Lobby	10	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Ground Floor		7	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		1	1x3-1FO25-S	T311	(1) 12w 3' T8 LED B
Ground Floor	Closet	2	Bare-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Office	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Office	4	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel

Lighting Upgrades Hawthorne Elementary School Continued

Ground Floor	Corridor	13	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Men's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		2	HH8-2PL26	IN18	New 12w 8-Inch LED Downlight
Ground Floor	Electrical	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Custodian	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Storage	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Women's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		2	HH8-2PL26	IN18	New 12w 8-Inch LED Downlight
Ground Floor	Cafeteria	32	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Kitchen	4	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Storage	5	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Corridor	13	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		2	2x4-4FO28-Drop	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor		6	HH8-2PL26	IN18	New 12w 8-Inch LED Downlight
Ground Floor	Classroom	9	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	10	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Corridor	13	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	10	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Storage (Locked)	1	1x4-2F40-L	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Classroom	3	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Vestibule	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Classroom	15	1x4-2FO28-W	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Restroom	1	Drum-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Closet	1	Bare-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Classroom	17	1x4-2FO28-W	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Restroom	1	Drum-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Closet	1	Bare-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Classroom	8	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Vestibule	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Corridor	15	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Corridor	5	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Men's Restroom	4	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Ground Floor	Office	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Conference Room	3	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Office	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Restroom	1	1x4-2F40-L	3NE28	New 40w 1x4 LED Flat Panel
Ground Floor	Women's Restroom	4	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Custodian	1	Bare-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Storage	2	2x4-4F40-W	T4L42	(2) 10.5w 4' T8 LED B
Ground Floor	Classroom	8	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	8	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Classroom	12	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Stage	2	Jelly-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Gym	24	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel

Lighting Upgrades Hawthorne Elementary School Continued

Ground Floor	Storage	1	2x4-4F40-Surf	T4L42	(2) 10.5w 4' T8 LED B
Ground Floor	Classroom	9	2x4-3FO28-P18 (2 Ba	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Copy Room	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Men's Restroom	3	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Ground Floor	Custodian	1	Bare-CF32	ID09	(1) 12w Dimmable LED A
Ground Floor	Storage	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Women's Restroom	4	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Ground Floor	Classroom	10	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor	Library	22	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Ground Floor		1	1x4-2FO28-S	T4L22	(2) 10.5w 4' T8 LED B
Ground Floor	Workroom (Locked)	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground Floor	Storage (Locked)	1	1x4-2F40-L	T4L22	(2) 10.5w 4' T8 LED B
Second Floor	Stairwell	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Second Floor	Lounge	10	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second Floor	Restroom	1	Drum-CF32	ID09	(1) 12w Dimmable LED A
Second Floor	Kitchenette	1	Drum-CF32	ID09	(1) 12w Dimmable LED A
Second Floor	Restroom	1	Drum-CF32	ID09	(1) 12w Dimmable LED A
Basement	Boiler Room	4	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Basement		1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Basement		1	1x4-2LED18-W	-	No Upgrade
Exterior	Building Perimeter	4	Wallpack-LED30	-	No Upgrade
Exterior		8	Wallpack-HPS150	HN72	New 28w LED Cutoff Wallpack
Exterior		14	Flood-HPS150	HN102	New 74w LED Flood
Exterior	Courtyard	4	Wallpack-HPS150	HN72	New 28w LED Cutoff Wallpack
Exterior	Canopy	12	1x4-1FO28-VAP	T4L11	(1) 10.5w 4' T8 LED B
All Areas	Emergency BB	30	(Battery Backup)	\E28	Emergency Back-Up LED Strip
	Total	**687**			

Lighting Upgrades Lowell Elementary School

PROJECT: **Teaneck PS - Lowell Elementary - R3**

Room Info		*Existing Fixture Info*		*Lighting Fixture Upgrades*	
x		x	x	x	x
Floor	**Location**	**No. of Fix.**	**Fixture Type**	**ECM No.**	**Upgrade Description**
Second	Office	3	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Classroom	2	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	4	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Women's Restroom	1	2x2-2FO28U-L	6NE01	New 20w 2x2 LED Flat Panel
Second		2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second	Stairwell	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Men's Restroom	1	2x2-2FO28U-L	6NE01	New 20w 2x2 LED Flat Panel
Second		2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	6	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	6	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	6	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Storage (Locked)	2	1x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
Second	Corridor	21	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second	Corridor	12	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Stairwell	4	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Classroom	6	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	6	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	9	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Library (Locked)	20	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second		9	HH8-2PL18	IN18	New 12w 8-Inch LED Downlight
Second	Copy Room (Locked)	5	2x4-3FO28-L (2 Bal)	7NE24	New 30w 2x4 LED Flat Panel
Second	Closet (Locked)	1	2x2-2F40U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
Second	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
Second	Gym	3	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second	Mechanical	6	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Second	Stairwell	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Men's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Women's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Custodian	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
Second	Corridor	8	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Custodian	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B

Lighting Upgrades Lowell Elementary School Continued

Second	Storage	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
First	Open Office	6	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Office	4	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Work Area	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Nurse	8	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel
First	Restroom	1	1x4-2FO28-Dir/Ind	T4L22	(2) 10.5w 4' T8 LED B
First	Closet	1	2x2-2F40U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	Classroom	16	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Closet	1	Bare-200A	ID09	(1) 12w Dimmable LED A
First	Vestibule	1	Bare-200A	ID09	(1) 12w Dimmable LED A
First	Classroom	5	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First	Stairwell	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First		1	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	Classroom	11	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	7	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
First	Lounge	8	2x4-3FO28-L (2 Bal)	7NE24	New 30w 2x4 LED Flat Panel
First	Restroom	1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Restroom	1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Vestibule	2	1x4-4FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	Classroom (Locked)	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	12	2x4-3FO28-L (2 Bal)	7NE25	New 40w 2x4 LED Flat Panel
First	Cafeteria	35	2x4-3FO28-L (2 Bal)	7NE24	New 30w 2x4 LED Flat Panel
First	Elevator Machine (Loc	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Pantry	4	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
First	Electrical	4	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Vestibule	3	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First		4	1x8-4FO28-Up/Dow	T8L44	(4) 10.5w 4' T8 LED B
First	Men's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Women's Restroom (L	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Custodian (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Custodian	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
First	Storage	1	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
First	Gym	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First		8	High Bay-6FP54HO	9NE11	New 177w Linear LED High Bay
First	Stage	2	Bare-CF32	ID10	(1) 17w Dimmable LED A
First		2	Flood-300Q	HN95	New 31w LED Flood
First		4	Bare-200A	ID10	(1) 17w Dimmable LED A
First	Storage	1	2x4-4F40-Egg	3NE10	New 23w 1x4 LED Wrap
First	Storage (Locked)	1	2x4-4F40-Egg	3NE10	New 23w 1x4 LED Wrap
First	Corridor	12	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Corridor	8	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Corridor	4	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First		3	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First	Vestibule	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First	Custodian (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Women's Restroom	1	2x2-2FO28U-L	6NE01	New 20w 2x2 LED Flat Panel
First		2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel

Lighting Upgrades Lowell Elementary School Continued

First	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First	Restroom (Locked)	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First	Men's Restroom	1	2x2-2FO28U-L	6NE01	New 20w 2x2 LED Flat Panel
First		2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First	Restroom (Locked)	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First	Corridor	15	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First		1	1x3-1FO25-S	T311	(1) 12w 3' T8 LED B
Basement	Stairwell	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Basement		2	1x4-2FO28-VAP	3NE10	New 23w 1x4 LED Wrap
Basement	Electrical	2	1x4-2FO28-VAP	3NE10	New 23w 1x4 LED Wrap
Basement	Corridor	2	1x4-2FO28-VAP	3NE10	New 23w 1x4 LED Wrap
Basement		1	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Basement	Corridor	4	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Basement	Storage (Locked)	8	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Basement	Pump	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Basement	Boiler Room	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Basement		4	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Basement		2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Basement		1	1x4-2FO28-IH	3NE10	New 23w 1x4 LED Wrap
Basement	Fire Control	1	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
Exterior	Building Perimeter	2	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Exterior		1	Wallpack-Cut-HPS7	HN72	New 28w LED Cutoff Wallpack
Exterior		2	Square-CF23	ID09	(1) 12w Dimmable LED A
Exterior		1	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Exterior		2	Wallpack-HPS150	HN74	New 42.7w LED Cutoff Wallpack
Exterior		2	Flood-HPS150	HN103	New 89w LED Flood
Exterior		8	Wallpack-LED20	-	No Upgrade
Exterior		2	Flood-LED25	-	No Upgrade
Exterior		1	Canopy-LED15	-	No Upgrade
All Areas	Emergency BB	30	(Battery Backup)	\E28	Emergency Back-Up LED Strip
	Total	**588**			

Lighting Upgrades Teaneck High School

PROJECT:	Teaneck PS - High School - R3				
Room Info		Existing Fixture Info		Lighting Fixture Upgrades	
x	x	x	x	x	x
Floor	Location	No. of Fix.	Fixture Type	ECM No.	Upgrade Description
Basement	Stairwell	1	1x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
Basement		1	Jelly-CF23	ID09	(1) 12w Dimmable LED A
Basement	Vestibule	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Basement	Storage	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Basement	Storage	4	1x8-4FO28-S	T8L44	(4) 10.5w 4' T8 LED B
Basement	Storage (Locked)	2	1x8-4FO28-S	T8L44	(4) 10.5w 4' T8 LED B
Basement	Stairwell	1	1x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
Basement		1	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
Basement	Vestibule	1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Basement	Storage	2	1x4-2FO28-IH	T4L22	(2) 10.5w 4' T8 LED B
Basement	Storage	1	1x8-2FO28-W	T8L22	(2) 10.5w 4' T8 LED B
Basement	Storage	2	2x4-4FO28-W	T4L42	(2) 10.5w 4' T8 LED B
Basement		1	1x8-2FO28-W	T8L22	(2) 10.5w 4' T8 LED B
Basement		1	1x4-2FO28-S	T4L22	(2) 10.5w 4' T8 LED B
Basement	Storage	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Gym Lobby	12	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First		4	2x4-3FO28-L (E)	T4EL32	(2) 10.5w 4' T8 LED B-BB
First	Closet	1	1x4-2FO28-S	T4L22	(2) 10.5w 4' T8 LED B
First	Women's RR	1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Men's RR	1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Vestibule	2	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Corridor	3	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First		3	1x4-2FO28-L (E)	T4EL22	(2) 10.5w 4' T8 LED B-BB
First		1	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	Football LR	9	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First		3	1x4-2FO28-L (E)	T4EL22	(2) 10.5w 4' T8 LED B-BB
First	Vestibule	1	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	Volleyball LR	5	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First		3	1x4-2FO28-L (E)	T4EL22	(2) 10.5w 4' T8 LED B-BB
First	Men's LR	12	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First		5	1x4-2FO28-L (E)	T4EL22	(2) 10.5w 4' T8 LED B-BB
First		1	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	Locker Room	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
First	Office	4	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B

Lighting Upgrades Teaneck High School Continued

First	Restroom	1	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
First	Storage	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
First	Storage	1	Square-60A	ID08	(1) 10w Dimmable LED A
First	Vestibule	1	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Gym	34	High Bay-6FP54HO	9NE24	New 150w Linear LED High Bay
First		4	(Battery Backup)	\E28	Emergency Back-Up LED Strip
First	Women's LR	10	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First		7	1x4-2FO28-L (E)	T4EL22	(2) 10.5w 4' T8 LED B-BB
First		1	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	LR (Locked)	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
First	Office (Locked)	4	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	RR (Locked)	1	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
First	Corridor	4	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Stairwell	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Women's RR	3	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Book Room	1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Storage	2	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Classroom	8	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Corridor	3	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First		2	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Mechanical	1	1x4-2FO28-S	T4L22	(2) 10.5w 4' T8 LED B
First	Corridor	14	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First		1	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
First	Men's RR	3	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First		2	2x2-3F31U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
First	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Stairwell	1	1x4-2LED15-W	-	No Upgrade
First		1	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	10	2x4-4FO28-P.5	T4L44	(4) 10.5w 4' T8 LED B
First	Guidance	2	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Office	4	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Office	3	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Break Room	2	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Vestibule	1	Drum-(2)CF13	IN30	w 24w 16-Inch LED Deco Flush Mo
First	Office	2	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Corridor	13	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Stairwell	1	1x4-2FP28-Dir/Ind	3NE10	New 23w 1x4 LED Wrap
First		1	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	8	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A

Lighting Upgrades Teaneck High School Continued

First	Open Office	4	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Vestibule	1	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Storage	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First	Conference Rm	1	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Open Office	8	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Lobby	16	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First		3	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
First		2	1x3-1FO25-S	T311	(1) 12w 3' T8 LED B
First	Corridor	5	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First		1	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Nurse	11	2x2-2F40BX-Dir/Ind	6NE04	New 30w 2x2 LED Flat Panel
First	Storage	2	2x2-3F40BX-L	6NE01	New 20w 2x2 LED Flat Panel
First	Office	4	2x2-2F40BX-Dir/Ind	6NE04	New 30w 2x2 LED Flat Panel
First	Conference Rm	2	2x2-2F40BX-Dir/Ind	6NE04	New 30w 2x2 LED Flat Panel
First	Storage	1	2x2-3F40BX-L	6NE01	New 20w 2x2 LED Flat Panel
First	Exam Room	2	2x2-2F40BX-Dir/Ind	6NE04	New 30w 2x2 LED Flat Panel
First	Restroom	1	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Shop	6	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Storage	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Classroom	5	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First		2	2x2-3F31U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
First	Classroom	4	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Restroom	3	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Office	5	2x4-3FO28-P18	T4L33	(3) 10.5w 4' T8 LED B
First	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Storage	2	1x8-2FO28-W	T8L22	(2) 10.5w 4' T8 LED B
First	Storage	2	Bare-100A	ID09	(1) 12w Dimmable LED A
First	Storage (Locked)	3	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Storage (Locked)	3	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Fire Alarm	3	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Maintenance	3	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
First	Lounge	2	1x8-2FO28-W	T8L22	(2) 10.5w 4' T8 LED B
First	Storage	2	1x8-2FO28-W	T8L22	(2) 10.5w 4' T8 LED B
First		1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Office	1	1x8-4FO28-S	T8L44	(4) 10.5w 4' T8 LED B
First	Corridor	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Boiler Room	9	2x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
First		13	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Electrical	1	2x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
First	Office	3	2x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
First	Pump Room	2	2x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
First	Electrical	1	1x8-4F40-W	T8L44	(4) 10.5w 4' T8 LED B
First	Stairwell	2	Bare-LED8A	-	No Upgrade
First	Corridor	6	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First		3	1x8-2FO28-W	T8L22	(2) 10.5w 4' T8 LED B
First	Storage	11	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Stairwell	1	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
First	Stairwell	2	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Corridor	9	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First		2	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
First	Open Office	3	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel

Lighting Upgrades Teaneck High School Continued

First		4	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
First		2	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
First		6	2x2-3F31U-P9	T2UR3	(3) 7w 2' T8 LED B-Ref
First		4	2x4-3FO28-P18	T4L33	(3) 10.5w 4' T8 LED B
First		1	Soda Machine	S01	Vending Miser
First	Locker Room	3	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First	Workroom	2	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Workroom	2	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Stairwell	2	1x4-2LED15-W	-	No Upgrade
First	Mail Room	2	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Copy Room	2	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First	Open Office	9	2x2-LED30-Vol	-	No Upgrade
First	Office	4	2x2-LED30-Vol	-	No Upgrade
First	Office	4	2x2-LED30-Vol	-	No Upgrade
First	Office	6	2x2-LED30-Vol	-	No Upgrade
First	Office	4	2x2-LED30-Vol	-	No Upgrade
First	Office	6	2x2-LED30-Vol	-	No Upgrade
First	Office	4	2x2-LED30-Vol	-	No Upgrade
First	Office	4	2x2-LED30-Vol	-	No Upgrade
First	Restroom	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First	Restroom	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First	Restroom	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First	Custodian	1	Bare-LED8A	-	No Upgrade
First	Corridor	7	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Wellness Ctr	12	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First		1	2x2-3F31U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
First	Office	4	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Weight Room	27	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Storage	1	1x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
First	Storage	1	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Corridor	13	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Men's LR	14	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Men's RR	3	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Women's RR	3	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Women's LR	14	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
First	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Stairwell	1	1x4-2FP54HO-Dir/Ind	3NE10	New 23w 1x4 LED Wrap
First	Corridor	7	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Studio	12	2x4-LED30-L	-	No Upgrade
First		2	2x2-LED20-L	-	No Upgrade
First	Locker Room	2	2x4-LED30-L	-	No Upgrade
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Corridor	23	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
First		1	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
First	Office	1	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Stairwell	1	1x4-2FP54HO-Dir/Ind	3NE10	New 23w 1x4 LED Wrap
First		1	1x4-2LED15-W	-	No Upgrade
First	Aux Gym	12	2x2-4F40BX-L	6NE40	New 92w 2x2 LED Troffer

Lighting Upgrades Teaneck High School Continued

First	Storage	2	1x4-2FO28-IH	T4L22	(2) 10.5w 4' T8 LED B
First	Storage	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First	Office	1	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Restroom	1	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Vestibule	1	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Mechanical	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Aux Gym	12	2x2-4F40BX-L	6NE40	New 92w 2x2 LED Troffer
First	Vestibule	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Office	1	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Restroom	1	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
First	Storage	2	1x4-2FO28-IH	T4L22	(2) 10.5w 4' T8 LED B
First	Stairwell	1	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
First		1	1x4-2LED15-W	-	No Upgrade
First	Home Econ.	17	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Vestibule	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
First	Office	2	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Storage	1	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First		1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Closet	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
First	Closet	1	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
First	Classroom	15	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Storage	2	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
First	Office	1	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Classroom	12	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
First	Stairwell	1	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
First		1	1x4-2LED15-W	-	No Upgrade
Second	Lobby	44	Chandelier-CF9C	I16	(1) 5w LED Clear Candle
Second		6	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
Second	Asst Principal	12	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Vault	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Office	8	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Office	8	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Restroom	2	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Stairwell	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second		1	1x4-2LED15-W	-	No Upgrade
Second	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Book Room	3	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Office	2	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Second	Restroom	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Storage	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Vestibule	1	Drum-(3)CF23	IN30	v 24w 16-Inch LED Deco Flush Mo
Second	Open Office	5	2x2-LED30-Vol	-	No Upgrade
Second	Office	4	2x2-LED30-Vol	-	No Upgrade
Second	Office	4	2x2-LED30-Vol	-	No Upgrade
Second	Office	4	2x2-LED30-Vol	-	No Upgrade

Lighting Upgrades Teaneck High School Continued

Second	Office	4	2x2-LED30-Vol	-	No Upgrade
Second	Office	4	2x2-LED30-Vol	-	No Upgrade
Second	Office	4	2x2-LED30-Vol	-	No Upgrade
Second	Stairwell	2	1x4-2LED15-W	-	No Upgrade
Second	Restroom	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Men's RR	5	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	3	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		5	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second		4	2x2-2FO28U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
Second	Storage	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Classroom	3	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		4	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second		1	2x2-2FO28U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
Second	Storage	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Classroom	3	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		5	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second		1	2x2-2FO28U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
Second	Storage	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Classroom	5	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		4	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second	Classroom	2	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		6	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second		1	2x2-2FO28U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
Second	Office	1	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Second	Classroom	3	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		5	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second		4	2x2-2FO28U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
Second	Storage	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Women's RR	5	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Second	Restroom	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Stairwell	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Corridor	37	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
Second	Office	2	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Second	Vocal Music	24	2x4-LED30-L	-	No Upgrade
Second		3	2x2-LED30-Vol	-	No Upgrade
Second	Practice Rm	2	2x4-LED30-L	-	No Upgrade
Second	Office	2	2x4-LED30-L	-	No Upgrade
Second	Corridor	8	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
Second	Stairwell	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Book Room	6	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Corridor	20	1x4-2FO28-Van	T8L22	(2) 10.5w 4' T8 LED B
Second	Guidance	23	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second		4	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		5	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second	Storage	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Second	Office	6	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel

Lighting Upgrades Teaneck High School Continued

Second	Office	2	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Office	2	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Office	2	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Office	2	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Office	2	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Conference Rm	4	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Office	4	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Closet	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Second	Office	4	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Office	4	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Library	24	1x12-6FO28-Dir/Ind	T8L66	(6) 10.5w 4' T8 LED B
Second		12	1x8-4FO28-Dir/Ind	T8L44	(4) 10.5w 4' T8 LED B
Second		1	1x4-2FO28-Dir/Ind	T8L22	(2) 10.5w 4' T8 LED B
Second		11	2x2-4FP14-Dir/Ind	6NE04	New 30w 2x2 LED Flat Panel
Second		4	1x4-2FO28-Tube	T8L22	(2) 10.5w 4' T8 LED B
Second		9	HH6-2PL26	IN22	New 13.5w 6-Inch LED Downlight
Second		8	2x2-3F40BX	6NE04	New 30w 2x2 LED Flat Panel
Second		10	Sconce-50MR16	I04	(1) 7w LED MR16 (12v)
Second		2	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
Second	Workroom	8	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Second	Workroom	2	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Corridor	4	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Second	Classroom	12	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second		12	HH6-2PL26	IN22	New 13.5w 6-Inch LED Downlight
Second	Storage	2	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Second	Storage	2	HH6-2PL26	IN22	New 13.5w 6-Inch LED Downlight
Second	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Stairwell	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Electrical	1	1x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
Second	Main Office	15	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Copy Room	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Office	6	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Second	Storage	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Vestibule	1	1x2-2F20-W	T222	(2) 7w 2' T8 LED B
Second	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Restroom	1	1x2-2F20-W	T222	(2) 7w 2' T8 LED B
Second	Stairwell 4	2	1x4-2LED15-W	-	No Upgrade
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Custodian	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Storage	2	1x8-4FO28-W	T8L44	(4) 10.5w 4' T8 LED B
Second	Women's RR	3	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second		1	2x2-3F31U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
Second	Closet	1	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Second	Restroom	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Vestibule	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Stairwell 5	2	2x4-2FP54HO-Vol	3NE10	New 23w 1x4 LED Wrap
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B

Lighting Upgrades Teaneck High School Continuted

Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Stairwell 6	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Men's RR	3	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Second	Bookroom	1	Square-CF23	ID09	(1) 12w Dimmable LED A
Second		4	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Closet (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Corridor	16	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Storage	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Office	1	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Second	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Second	Elevator Lobby	1	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Second		2	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Second	Telecom	1	1x8-4F40-W	T8L44	(4) 10.5w 4' T8 LED B
Second	Corridor	20	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Display Case	1	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
Second	Auditorium	28	HH-150Q	HN183	New 43w 10-Inch LED Downlight
Second		13	HH10-MH175	HN183	New 43w 10-Inch LED Downlight
Second		11	HH-150Q	HN183	New 43w 10-Inch LED Downlight
Second		2	HH-CF23	ID09	(1) 12w Dimmable LED A
Second	Balcony	15	HH-150Q	HN183	New 43w 10-Inch LED Downlight
Second	Stage	8	1x4-2FO28-VAP	T8L22	(2) 10.5w 4' T8 LED B
Second	Stairwell	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second		1	Bare-LED12A	-	No Upgrade
Second	Stairwell	2	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Student Center	5	1x8-4FO28-Up	T8L44	(4) 10.5w 4' T8 LED B
Third		16	1x12-6FO28-Up/Dowr	T8L66	(6) 10.5w 4' T8 LED B
Third		36	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Open Office	8	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Closet	1	2x2-3F31U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
Third	Electrical	1	2x2-3F31U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
Third	Office	2	2x2-3F31U-L	6NE04	New 30w 2x2 LED Flat Panel
Third	Stairwell 8	1	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third		1	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Holocaust Ctr (Lo	6	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Third	Corridor	1	1x12-6FO28-Up/Dowr	T8L66	(6) 10.5w 4' T8 LED B
Third		1	1x8-4FO28-Up	T8L44	(4) 10.5w 4' T8 LED B
Third	Asian Center	6	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Third	African Center	6	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Third	Latin Center	6	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Third	Peer Center	5	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Third	Cashier	1	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Closet	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Third	Storage	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Third	Storage	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Third	Storage	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Third	Display Case	2	1x4-1F40-S	T4L11	(1) 10.5w 4' T8 LED B
Third	Corridor	2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Office	3	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B

Lighting Upgrades Teaneck High School Continuted

Third		1	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Classroom	16	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Women's RR	4	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Third	Classroom	18	2x4-3FO28-P18	T4L33	(3) 10.5w 4' T8 LED B
Third	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Lab	1	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Third	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Faculty Rm	8	2x2-2FO28U-L	T2UR3	(3) 7w 2' T8 LED B-Ref
Third	Restroom	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Third	Restroom	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Third	Classroom	15	2x4-3FO28-L (2 Bal)	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Laundry	2	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Third		4	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
Third	Corridor	2	2x2-2F31U-L	6NE01	New 20w 2x2 LED Flat Panel
Third	Storage	6	1x4-2FO28-Dir/Ind	T8L22	(2) 10.5w 4' T8 LED B
Third	Storage	6	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Storage	6	1x4-2FO28-Dir/Ind	T8L22	(2) 10.5w 4' T8 LED B
Third	Music Room	36	1x4-2FO28-Dir/Ind	T8L22	(2) 10.5w 4' T8 LED B
Third		8	1x4-2FO28-Up	T8L22	(2) 10.5w 4' T8 LED B
Third		4	1x8-4FO28-Up	T8L44	(4) 10.5w 4' T8 LED B
Third	Office	10	2x2-3F31U-L	6NE01	New 20w 2x2 LED Flat Panel
Third	Practice Rm	1	1x4-2F40-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Practice Rm	1	1x4-2F40-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Office	2	2x4-3FO28-P18	T4L33	(3) 10.5w 4' T8 LED B
Third	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Stairwell 1	2	2x4-2FP54HO-Vol	3NE10	New 23w 1x4 LED Wrap
Third	Office (Locked)	2	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Cafeteria D	43	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Third	Counter	6	2x4-3FO28-P18	T4L33	(3) 10.5w 4' T8 LED B
Third		14	HH7-PL26	IN12	New 19w 8-Inch LED Downlight
Third		5	1x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Third	Corridor	3	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Kitchen	5	Jelly-CF23	ID09	(1) 12w Dimmable LED A
Third		11	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Cooler	1	Jelly-LED8A	-	No Upgrade
Third	Cooler	1	1x4-2FO28-VAP	T8L22	(2) 10.5w 4' T8 LED B
Third	Pantry	3	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Cafeteria B	43	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Third	Stairwell 2	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third		1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Classroom	20	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Office	2	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Classroom	17	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third		5	2x2-3F31U-P9	T2UR3	(3) 7w 2' T8 LED B-Ref
Third	Office	3	2x4-3FO28-L (2 Bal)	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Lab	2	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
Third	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Custodian	1	Dome-Circ54	IN30	v 24w 16-Inch LED Deco Flush Mo
Third	Men's RR	2	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Third	Closet (Locked)	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Classroom	15	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi

Lighting Upgrades Teaneck High School Continuted

Third	Classroom	15	2x4-3FO28-P18	T4L33	(3) 10.5w 4' T8 LED B
Third	Stairwell 3	2	1x4-2LED15-W	-	No Upgrade
Third	Classroom	6	Chandelier-(4)PL42	I84	4) 10.5w Horizontal LED 4-Pin PL
Third		6	Chandelier-(5)PL42	I85	5) 10.5w Horizontal LED 4-Pin PL
Third	Workroom	3	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Classroom	4	Chandelier-(4)PL42	I84	4) 10.5w Horizontal LED 4-Pin PL
Third		4	Chandelier-(5)PL42	I85	5) 10.5w Horizontal LED 4-Pin PL
Third	Workroom	2	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Electrical	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Stairwell 4	2	1x4-2LED15-W	-	No Upgrade
Third	Classroom	6	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Classroom	18	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Custodian (Locke	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Women's RR	4	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Third	Classroom	19	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Closet	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Storage	3	2x4-3FO28-Surf	T4L32	(2) 10.5w 4' T8 LED B
Third	Break Room	1	2x4-3FO28-Surf	T4L32	(2) 10.5w 4' T8 LED B
Third	Restroom	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Third	Storage	1	2x4-3FO28-Surf	T4L32	(2) 10.5w 4' T8 LED B
Third	Closet	1	1x4-2FO28-VAP	T8L22	(2) 10.5w 4' T8 LED B
Third	Closet	1	Bare-60A	ID08	(1) 10w Dimmable LED A
Third	Storage	1	1x4-2FO28-VAP	T8L22	(2) 10.5w 4' T8 LED B
Third	Closet	1	Bare-60A	ID08	(1) 10w Dimmable LED A
Third	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Stairwell 5	2	1x4-2LED15-W	-	No Upgrade
Third	Classroom	15	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Classroom	12	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Stairwell	2	1x4-2LED15-W	-	No Upgrade
Third	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Men's RR	4	2x4-2FO28-L	T4L22	(2) 10.5w 4' T8 LED B
Third	Open Office	2	2x4-3FO28-P18	T4L33	(3) 10.5w 4' T8 LED B
Third		3	1x4-2FO28-Dir/Ind	T8L22	(2) 10.5w 4' T8 LED B
Third	Classroom	16	2x4-3FO28-P18 (2 Ba	T4BL33	(3) 10.5w 4' T8 LED B-Bi
Third	Classroom	9	2x4-3FO28-L	T4L33	(3) 10.5w 4' T8 LED B
Third	Office	3	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Elevator Lobby	3	2x4-4FO28-L	T4L44	(4) 10.5w 4' T8 LED B
Third	Mechanical	2	1x4-2F40-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Control Room	1	2x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
Third	Corridor	3	HH-LED12A	-	No Upgrade
Third		13	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Corridor	20	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third		6	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Display Case	6	1x4-2FO28-IH	T4L22	(2) 10.5w 4' T8 LED B
Third	Above Display Ca	4	1x4-2FO28-S	T4L22	(2) 10.5w 4' T8 LED B
Third	Corridor	17	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Corridor	10	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Corridor	26	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Third	Display Case	1	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
Exterior	Building Perimete	7	Wallpack-LED20	-	No Upgrade
Exterior		1	Bare-CF23	ID09	(1) 12w Dimmable LED A

Lighting Upgrades Teaneck High School Continuted

Exterior		3	Square-CF23	ID09	(1) 12w Dimmable LED A
Exterior		1	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Exterior		3	Canopy-(2)PL18	HN190	New 14w LED Canopy
Exterior		1	Flood-HPS150	HN95	New 31w LED Flood
Exterior		3	Wallpack-CF23	ID09	(1) 12w Dimmable LED A
Exterior		2	Flood-LED25	-	No Upgrade
Exterior		2	Wallpack-Cut-LED30	-	No Upgrade
Garage	Garage (Locked)	4	1x8-2F96-VAP	5NE30	New 41w 1x8 LED Low Bay
All Areas	Emergency BB	50	(Battery Backup)	\E28	Emergency Back-Up LED Strip
	Total	**2599**			

Lighting Upgrades Thomas Jefferson Middle School

PROJECT:	Teaneck PS - Thomas Jefferson MS - New Fixtures - R3				
Room Info		Existing Fixture Info		Lighting Fixture Upgrades	
	x	x	x	x	x
Floor	Location	No. of Fix.	Fixture Type	ECM No.	Upgrade Description
Second	Stairwell	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Stairwell	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Women's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second		1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
Second	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Men's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second		1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
Second		1	Square-CF23	ID09	(1) 12w Dimmable LED A
Second	Women's Restroom	2	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
Second		1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Asst Principal	4	1x8-4FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second	Restroom	1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
Second	Book Room	8	Drum-CF23	ID08	(1) 10w Dimmable LED A
Second	Classroom	8	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Prep Room	3	1x8-4FO28-Fin	7NE27	New 30w 2x4 LED Flat Panel
Second	Greenhouse	1	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Second	Classroom	8	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE27	New 30w 2x4 LED Flat Panel
Second		2	1x4-2FO28-FIN	7NE27	New 30w 2x4 LED Flat Panel
Second	Corridor	16	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Corridor	11	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second	Classroom	15	2x4-3FO28-L (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
Second	Stairwell	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second	Art Room	29	1x4-2FO28-FIN	3NE28	New 40w 1x4 LED Flat Panel
Second	Storage	4	Drum-CF18	ID07	(1) 6w Dimmable LED A
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Men's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second		1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
Second	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second	Custodian	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
Second	Women's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second		1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
Second	Stairwell	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap

Lighting Upgrades Thomas Jefferson Middle School Continued

Second	Classroom	2	1x8-4FO28-Fin	7NE27	New 30w 2x4 LED Flat Panel
Second		2	1x4-2FO28-FIN	7NE27	New 30w 2x4 LED Flat Panel
Second	Media Center	48	1x4-2FO28-Surf	3NE28	New 40w 1x4 LED Flat Panel
Second		4	2x4-4FO28-Surf	7NE26	New 50w 2x4 LED Flat Panel
Second		4	HH-CF23	ID09	(1) 12w Dimmable LED A
Second	Office	3	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
Second	Mechanical	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second		3	1x8-4FO28-W	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Second	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Garage (Locked)	3	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First	Corridor	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Men's Locker Room	27	1x4-2FO28-VAP	3NE10	New 23w 1x4 LED Wrap
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First		4	HH-CF23	ID09	(1) 12w Dimmable LED A
First	Closet	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Office	2	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
First	Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Closet	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Gym	20	High Bay-6FP54H(	9NE11	New 177w Linear LED High Bay
First	Storage	1	1x4-2LED15-W	-	No Upgrade
First	Storage	2	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Closet	1	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Women's Locker Roor	28	1x4-2FO28-VAP	3NE10	New 23w 1x4 LED Wrap
First		3	Square-CF23	ID09	(1) 12w Dimmable LED A
First		7	HH-CF23	ID09	(1) 12w Dimmable LED A
First	Office	2	2x4-4FO28-Surf	7NE24	New 30w 2x4 LED Flat Panel
First	Restroom	2	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Closet	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Closet	1	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Closet	1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Vestibule	1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Cafeteria	32	1x8-4FO28-W	5NE31	New 78w 1x8 LED Low Bay
First		1	Soda Machine	S01	Vending Miser
First		1	Snack Machine	S02	Snack Miser
First	Faculty Dining	10	2x2-LED20-L	-	No Upgrade
First		1	Soda Machine	S01	Vending Miser
First	Copy Room	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Closet	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Kitchen	22	1x8-4FO28-IH	5NE31	New 78w 1x8 LED Low Bay
First		6	1x4-2FO28-IH	3NE46	New 23w 1x4 LED Low Bay
First		8	Jelly-CF23	ID09	(1) 12w Dimmable LED A
First	Storage	1	2x4-4FO28-L	T4L42	(2) 10.5w 4' T8 LED B
First	Storage	4	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First	Closet (Locked)	1	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Office	2	1x4-2FO28-IH	3NE46	New 23w 1x4 LED Low Bay
First	Cooler	1	Jelly-CF23	ID09	(1) 12w Dimmable LED A

Lighting Upgrades Thomas Jefferson Middle School Continued

First	Restroom	3	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Child Study	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Office	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Office	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Office	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Classroom	6	2x4-4FO28-L	7NE26	New 50w 2x4 LED Flat Panel
First	Guidance	4	2x4-3FO28-P18 (2	7NE24	New 30w 2x4 LED Flat Panel
First	Office	3	2x4-3FO28-P18 (2	7NE24	New 30w 2x4 LED Flat Panel
First	Closet	1	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Office	3	2x4-3FO28-P18 (2	7NE24	New 30w 2x4 LED Flat Panel
First	Office	3	2x4-3FO28-P18 (2	7NE24	New 30w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-W	7NE28	New 40w 2x4 LED Flat Panel
First		3	2x4-4FO28-L	7NE26	New 50w 2x4 LED Flat Panel
First	Custodian	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
First		1	1x8-4FO28-Fin	5NE30	New 41w 1x8 LED Low Bay
First	Boiler Room	4	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
First		1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First		3	1x8-4FO28-W	T4L44	(4) 10.5w 4' T8 LED B
First	Classroom	9	2x4-3FO28-L (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
First	Book Room	4	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Corridor	13	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Stairwell	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Women's Restroom	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	School Store	4	Drum-60A	ID08	(1) 10w Dimmable LED A
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Men's Restroom	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Classroom	6	2x4-4FO28-L	7NE26	New 50w 2x4 LED Flat Panel
First		2	HH8-2PL26	IN12	New 19w 8-Inch LED Downlight
First	Classroom	4	2x4-4FO28-L	7NE26	New 50w 2x4 LED Flat Panel
First		2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Classroom	6	2x4-4FO28-L	7NE26	New 50w 2x4 LED Flat Panel
First	Classroom	6	2x4-3FO28-L (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
First		2	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
First	Classroom	6	2x4-LED40-L	-	No Upgrade
First		3	1x4-2LED15-W	-	No Upgrade
First	Classroom	6	2x4-LED40-L	-	No Upgrade
First		3	1x4-2LED15-W	-	No Upgrade
First	Kiln	2	1x4-2LED15-W	-	No Upgrade
First	Stairwell	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Classroom	2	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Nurse	6	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel
First	Restroom	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Exam Room	1	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel
First	Exam Room	1	2x4-3FO28-P18	7NE24	New 30w 2x4 LED Flat Panel
First	Restroom	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Men's Restroom	1	Square-CF23	ID09	(1) 12w Dimmable LED A
First		1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Women's Restroom	1	Square-CF23	ID09	(1) 12w Dimmable LED A
First		1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap

Lighting Upgrades Thomas Jefferson Middle School Continued

First	Storage	1	Bare-60A	ID08	(1) 10w Dimmable LED A
First	Vestibule	2	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Classroom	8	2x4-3FO28-L (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
First	Classroom	6	2x4-3FO28-L (2 Ba	7NE24	New 30w 2x4 LED Flat Panel
First	Corridor	9	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Vestibule	1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Lobby	10	Chandelier-LED27	-	No Upgrade
First		3	1x4-1FO28-S	T4L11	(1) 10.5w 4' T8 LED B
First		1	HH-CF23	ID09	(1) 12w Dimmable LED A
First	Vestibule	6	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Corridor	7	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Storage	1	Bare-60A	ID08	(1) 10w Dimmable LED A
First	Vocal Music	24	1x4-2FO28-Surf	3NE28	New 40w 1x4 LED Flat Panel
First	Office	4	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	Band Room	33	1x4-2FO28-Surf	3NE28	New 40w 1x4 LED Flat Panel
First	Vestibule	1	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	Practice Room	1	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	Practice Room	1	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	Practice Room	2	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	Stairwell	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Studio	4	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First		2	1x4-2FO28-FIN	7NE27	New 30w 2x4 LED Flat Panel
First	Dressing Room	4	Square-CF23	ID09	(1) 12w Dimmable LED A
First		30	Bare-CF13	ID07	(1) 6w Dimmable LED A
First	Mechanical	2	Work-75A	ID09	(1) 12w Dimmable LED A
First	Wardrobe	6	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Women's Locker Roor	3	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Men's Locker Room	3	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Stairwell	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	Sconce-CF23	ID09	(1) 12w Dimmable LED A
First	Stage	7	Work-CF42	ID10	(1) 17w Dimmable LED A
First	Auditorium	35	HH-250R40	-	No Upgrade
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Vestibule	4	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Main Office	10	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First		4	1x4-2FO28-Surf	3NE10	New 23w 1x4 LED Wrap
First	File Room	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First	Restroom	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Open Office	3	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Principal	4	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Closet	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Closet	4	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Closet	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Asst Principal	4	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Restroom	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Vestibule	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Closet	2	Drum-CF18	ID07	(1) 6w Dimmable LED A
First	Corridor	15	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First	Classroom	10	2x4-4FO28-L	7NE26	New 50w 2x4 LED Flat Panel

Lighting Upgrades Thomas Jefferson Middle School Continued

First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Stairwell	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
First	Stairwell	1	1x4-2LED15-W	-	No Upgrade
First		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First	Women's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
First	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First	Men's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
First	Women's Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First		1	1x4-2FO28-W (E)	3NE10	New 23w 1x4 LED Wrap
First	Server (Locked)	3	1x8-4FO28-W	T4L44	(4) 10.5w 4' T8 LED B
First	Faculty (Locked)	3	1x8-4FO28-W	5NE30	New 41w 1x8 LED Low Bay
First	Restroom	1	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
First	Mechanical	1	1x4-2FO28-Surf	T4L22	(2) 10.5w 4' T8 LED B
Ground	Stairwell	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Ground		1	Square-CF23	ID09	(1) 12w Dimmable LED A
Ground	Classroom	12	2x4-4FO28-W	7NE26	New 50w 2x4 LED Flat Panel
Ground	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Ground	Corridor	5	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Ground		1	HH6-PL26	IN22	New 13.5w 6-Inch LED Downlight
Ground	Classroom	13	2x4-3FO28-P18 (2	7NE24	New 30w 2x4 LED Flat Panel
Ground		12	HH6-2PL26	IN22	New 13.5w 6-Inch LED Downlight
Ground	Classroom	10	2x4-3FO28-P18 (2	7NE24	New 30w 2x4 LED Flat Panel
Ground		2	2x2-3F31U-P9	6NE04	New 30w 2x2 LED Flat Panel
Ground		2	2x2-2FO28U-L	6NE04	New 30w 2x2 LED Flat Panel
Ground		7	HH6-2PL26	IN22	New 13.5w 6-Inch LED Downlight
Ground	Storage	2	2x4-4FO28-Surf	T4L42	(2) 10.5w 4' T8 LED B
Ground	Classroom	6	1x8-4FO28-Fin	7NE28	New 40w 2x4 LED Flat Panel
Ground	Classroom	12	2x4-4FO28-W	7NE26	New 50w 2x4 LED Flat Panel
Exterior	Building Perimeter	19	Square-CF23	ID09	(1) 12w Dimmable LED A
Exterior		4	Flood-LED100	-	No Upgrade
Exterior		1	Wallpack-Cut-LED	-	No Upgrade
Exterior		2	Flood-MH250	HN103	New 89w LED Flood
Exterior	Canopy	9	1x4-1FO28-VAP	T4L11	(1) 10.5w 4' T8 LED B
All Areas	Emergency BB	30	(Battery Backup)	\E28	Emergency Back-Up LED Strip
	Total	**1160**			

Lighting Upgrades Whittier Elementary School

PROJECT:	Teaneck PS - Whittier Elementary - R3				
Room Info		Existing Fixture Info		Lighting Fixture Upgrades	
x		x	x	x	x
Floor	Location	No. of Fix.	Fixture Type	ECM No.	Upgrade Description
Second Floor	Custodian (Locked)	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Women's Restroom	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second Floor	Speech	1	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Restroom	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Men's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Custodian (Locked)	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Second Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	8	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Custodian	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second Floor	Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second Floor	Computer Room	9	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Media Center	21	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Storage	3	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
Second Floor	Stairwell	1	2x4-2FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor		1	2x4-2FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Classroom	16	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	16	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	7	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Corridor	8	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Storage	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second Floor	Corridor	4	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor		3	HH6-2PL9	IN20	New 8.5w 6-Inch LED Downlight
Second Floor	Stairwell	1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor		1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Classroom	9	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Closet	1	Bare-60A	ID08	(1) 10w Dimmable LED A
Second Floor		1	Bare-CF23	ID08	(1) 10w Dimmable LED A
Second Floor	Corridor	28	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Second Floor	Women's Restroom	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Second Floor	Restroom	1	Drum-CF23	ID09	(1) 12w Dimmable LED A
Second Floor	Corridor	4	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay

Lighting Upgrades Whittier Elementary School Continued

Second Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor		1	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Break Room	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second Floor	Men's Restroom	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Second Floor	Corridor	15	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Second Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Second Floor	Storage (Locked)	1	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Second Floor	Stairwell	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Second Floor	Closet	1	Bare-60A	ID08	(1) 10w Dimmable LED A
Second Floor	Corridor	9	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
Second Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First Floor	Main Office	5	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Mail Room	1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Office	5	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Restroom	1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First Floor		1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom	6	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom	14	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First Floor		1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First Floor	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First Floor	Classroom (Locked)	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom (Locked)	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Women's Restroom	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Custodian	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First Floor	Men's Restroom	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Classroom (Locked)	12	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Stairwell	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First Floor		2	HH6-2PL9	IN20	New 8.5w 6-Inch LED Downlight
First Floor	Corridor	7	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First Floor		23	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First Floor	Elevator Machine	1	1x4-1FO28-W	T4L11	(1) 10.5w 4' T8 LED B
First Floor	Classroom	7	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom (Locked)	6	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom	8	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom	16	2x4-3FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Stairwell	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First Floor	Cafeteria	32	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Office	2	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First Floor	Kitchen	4	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Restroom	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
First Floor	Custodian (Locked)	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First Floor	Corridor	11	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Classroom	12	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom	12	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel

Lighting Upgrades Whittier Elementary School

First Floor	Classroom	12	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First Floor		1	Square-CF23	ID09	(1) 12w Dimmable LED A
First Floor	Classroom	9	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Classroom	9	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Men's Restroom	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Restroom	1	Round-LED15	-	No Upgrade
First Floor	Women's Restroom (I	2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Corridor	25	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First Floor		1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First Floor		3	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor		2	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Vestibule	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
First Floor	Gym	20	High Bay-6FP54HO	9NE11	New 177w Linear LED High Bay
First Floor	Office	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Stage	12	Bare-CF23	IRD25	(1) 8w Dimmable LED R30
First Floor	Pump (Locked)	2	1x4-2FO28-VAP	T4L22	(2) 10.5w 4' T8 LED B
First Floor	Child Study Team	2	2x4-4FO28-L	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Closet	2	Drum-CF23	ID09	(1) 12w Dimmable LED A
First Floor	Restroom	2	Drum-CF23	ID09	(1) 12w Dimmable LED A
First Floor	Office	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Nurse	5	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Restroom	1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Exam Room	1	2x4-3FO28-L	7NE24	New 30w 2x4 LED Flat Panel
First Floor	Storage (Locked)	1	2x4-3FO28-L	T4L32	(2) 10.5w 4' T8 LED B
First Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
First Floor	Stairwell	1	1x8-2FO28-W	5NE30	New 41w 1x8 LED Low Bay
First Floor	Vestibule	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
First Floor	Classroom	6	2x4-4FO28-Surf	7NE25	New 40w 2x4 LED Flat Panel
Basement	Stairwell	1	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Basement		1	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Basement	Office	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Basement	Open Office	3	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Basement		2	2x2-3FO17-L	6NE04	New 30w 2x2 LED Flat Panel
Basement	Server Room	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Basement		1	1x4-2FO28-L	3NE28	New 40w 1x4 LED Flat Panel
Basement	Corridor	5	1x4-2FO28-W	3NE10	New 23w 1x4 LED Wrap
Basement		1	1x8-4FO28-W	5NE30	New 41w 1x8 LED Low Bay
Basement		1	1x2-2FO17-W	1NE03	New 18w 1x2 LED Wrap
Basement	Restroom	1	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Basement	Storage	5	1x8-4FO28-W	T8L44	(4) 10.5w 4' T8 LED B
Basement		3	2x2-2FO28U-L	T2UR2	(2) 7w 2' T8 LED B-Ref
Basement	Boiler Room	10	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
Basement	Office	6	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Basement	Storage	4	1x8-4FO28-W	T8L44	(4) 10.5w 4' T8 LED B
Basement		2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Basement	Water Meter	1	2x4-4FO28-Surf	T4L44	(4) 10.5w 4' T8 LED B
Basement		1	Bare-60A	ID08	(1) 10w Dimmable LED A
Basement	Stairwell	1	1x4-1FO28-W	3NE46	New 23w 1x4 LED Low Bay
Basement	File Room	2	2x4-4FO28-L	7NE24	New 30w 2x4 LED Flat Panel
Basement	Storage	2	1x8-4FO28-W	T8L44	(4) 10.5w 4' T8 LED B

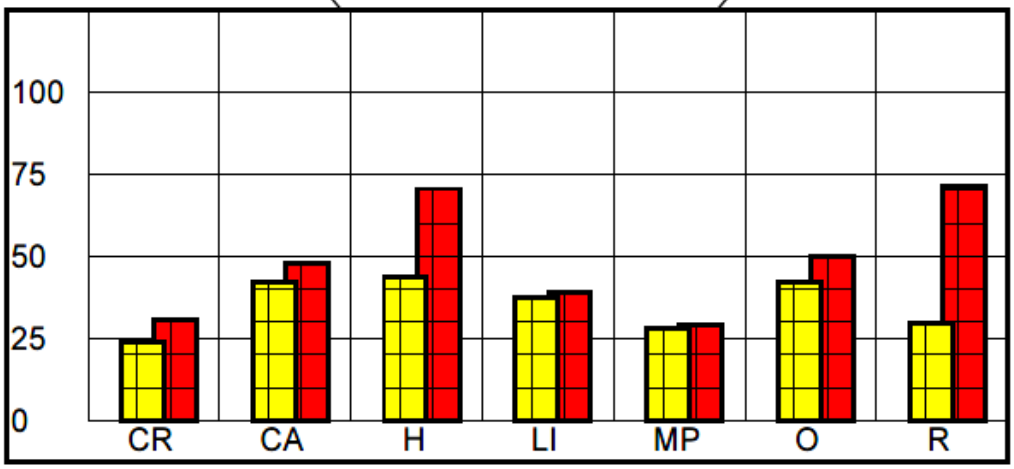
Lighting Upgrades Whittier Elementary School

Basement		2	1x4-2FO28-W	T4L22	(2) 10.5w 4' T8 LED B
Basement	Crawl Space	1	Bare-CF23	ID09	(1) 12w Dimmable LED A
Exterior	Building Perimeter	3	Sconce-CF23	ID09	(1) 12w Dimmable LED A
Exterior		3	Flood-LED15	-	No Upgrade
Exterior		6	Square-(2)PL18	HN190	New 14w LED Canopy
Exterior		4	Wallpack-LED40	-	No Upgrade
Exterior		2	Flood-HPS150	HN102	New 74w LED Flood
Exterior	Flag	1	Flood-90PAR38	IRD24	(1) 13w Wet Location LED Par38
Exterior	Courtyard	1	Square-(2)PL18	HN190	New 14w LED Canopy
All Areas	Emergency BB	30	(Battery Backup)	\E28	Emergency Back-Up LED Strip
	Total	**700**			

Data Logger Reports

Benjamin Franklin Middle School

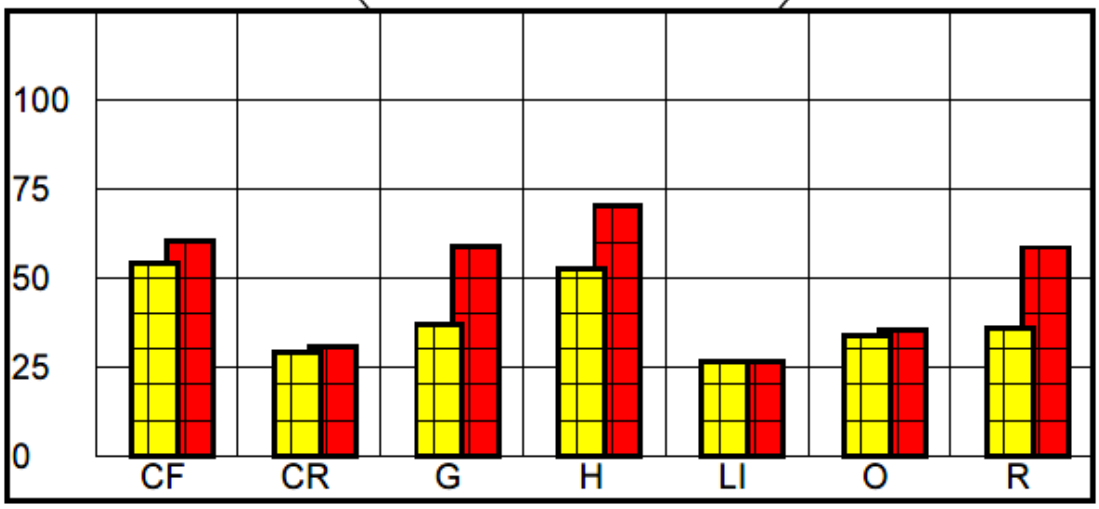
Area Type Averages				Normalized Weekly Lights On					Normalized Weekly Occupied					
Area Type		Qty	Watts	Peak	Off	Shldr 1	Shldr 2	Total	Peak	Off	Shldr 1	Shldr 2	Total	% sav
Classroom	CR	4	100	30.51	0.00	0.00	0.00	30.51	24.26	0.00	0.00	0.00	24.26	20.49
Common Area	CA	1	100	48.22	0.00	0.00	0.00	48.22	42.41	0.00	0.00	0.00	42.41	12.06
Hallway	H	4	100	70.99	0.00	0.00	0.00	70.99	43.72	0.00	0.00	0.00	43.72	38.41
Library	LI	1	100	39.09	0.00	0.00	0.00	39.09	37.72	0.00	0.00	0.00	37.72	3.52
MultiPurpose Rm	MP	1	100	29.19	0.00	0.00	0.00	29.19	28.07	0.00	0.00	0.00	28.07	3.83
Office	O	3	100	50.44	0.00	0.00	0.00	50.44	42.19	0.00	0.00	0.00	42.19	16.36
Restroom	R	3	100	71.77	0.00	0.00	0.00	71.77	29.66	0.00	0.00	0.00	29.66	58.67
Building Average for 17 rooms			100	52.31	0.00	0.00	0.00	52.31	35.05	0.00	0.00	0.00	35.05	33.00



Hours per Week for each Area Type.

Whittier Elementary School

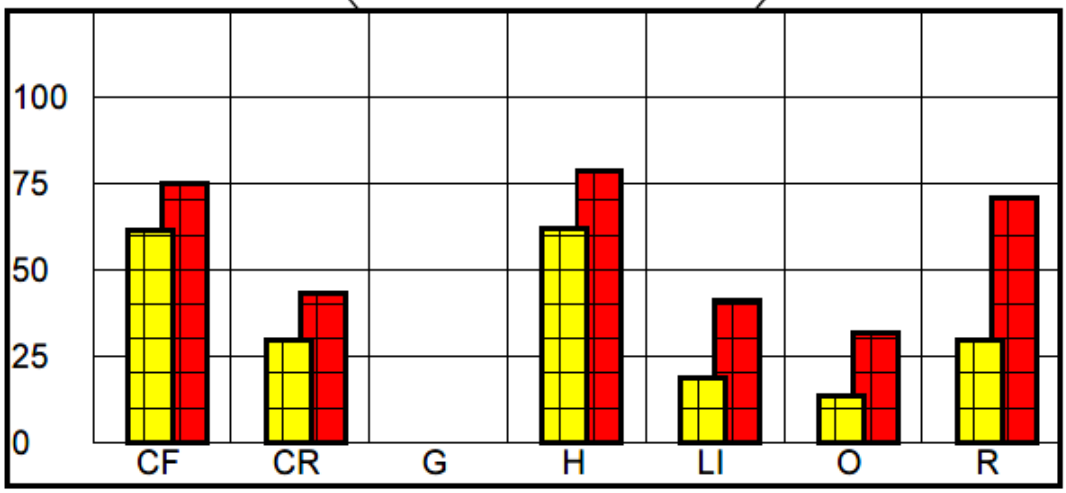
Area Type Averages				Normalized Weekly Lights On					Normalized Weekly Occupied					
Area Type		Qty	Watts	Peak	Off	Shldr 1	Shldr 2	Total	Peak	Off	Shldr 1	Shldr 2	Total	% sav
Cafeteria	CF	1	100	60.88	0.00	0.00	0.00	60.88	54.06	0.00	0.00	0.00	54.06	11.21
Classroom	CR	5	100	30.74	0.00	0.00	0.00	30.74	29.34	0.00	0.00	0.00	29.34	4.56
Gym	G	1	100	59.45	0.00	0.00	0.00	59.45	37.40	0.00	0.00	0.00	37.40	37.08
Hallway	H	3	100	70.08	0.00	0.00	0.00	70.08	52.50	0.00	0.00	0.00	52.50	25.08
Library	LI	1	100	26.61	0.00	0.00	0.00	26.61	26.61	0.00	0.00	0.00	26.61	0.00
Office	O	2	100	35.64	0.00	0.00	0.00	35.64	34.45	0.00	0.00	0.00	34.45	3.35
Restroom	R	1	100	58.59	0.00	0.00	0.00	58.59	36.05	0.00	0.00	0.00	36.05	38.47
Building Average for 14 rooms			100	45.80	0.00	0.00	0.00	45.80	37.68	0.00	0.00	0.00	37.68	17.74



Hours per Week for each Area Type.

Bryant Elementary School

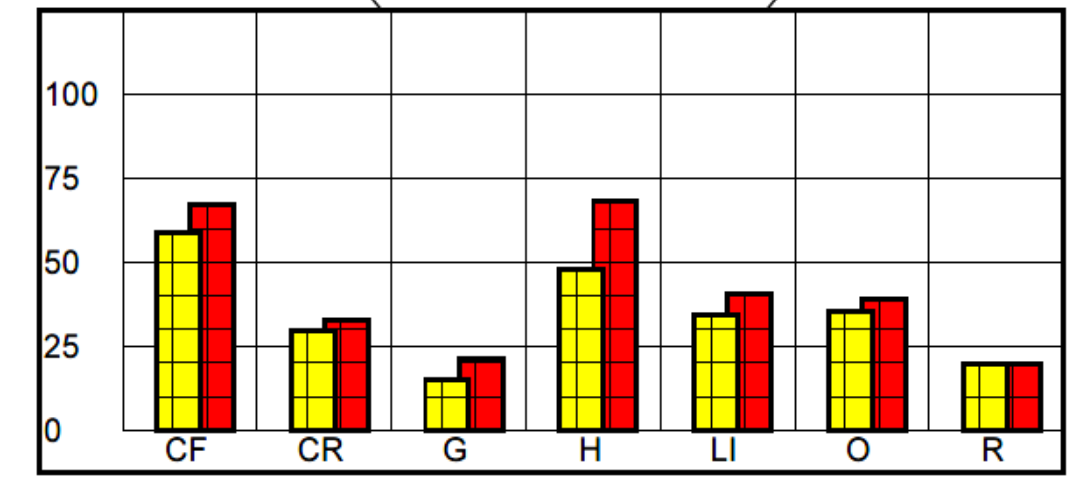
Area Type Averages				Normalized Weekly Lights On					Normalized Weekly Occupied					
Area Type		Qty	Watts	Peak	Off	Shldr 1	Shldr 2	Total	Peak	Off	Shldr 1	Shldr 2	Total	% sav
Cafeteria	CF	1	100	75.29	0.00	0.00	0.00	75.29	61.98	0.00	0.00	0.00	61.98	17.68
Classroom	CR	5	100	43.11	0.00	0.00	0.00	43.11	29.98	0.00	0.00	0.00	29.98	30.45
Gym	G	1	100	0.35	0.00	0.00	0.00	0.35	0.33	0.00	0.00	0.00	0.33	5.88
Hallway	H	3	100	78.97	0.00	0.00	0.00	78.97	62.25	0.00	0.00	0.00	62.25	21.16
Library	LI	1	100	41.36	0.00	0.00	0.00	41.36	18.81	0.00	0.00	0.00	18.81	54.52
Office	O	1	100	31.75	0.00	0.00	0.00	31.75	13.56	0.00	0.00	0.00	13.56	57.29
Restroom	R	2	100	71.35	0.00	0.00	0.00	71.35	29.79	0.00	0.00	0.00	29.79	58.25
Building Average for 14 rooms			100	53.13	0.00	0.00	0.00	53.13	35.07	0.00	0.00	0.00	35.07	34.00



Hours per Week for each Area Type.

Hawthorne Elementary School

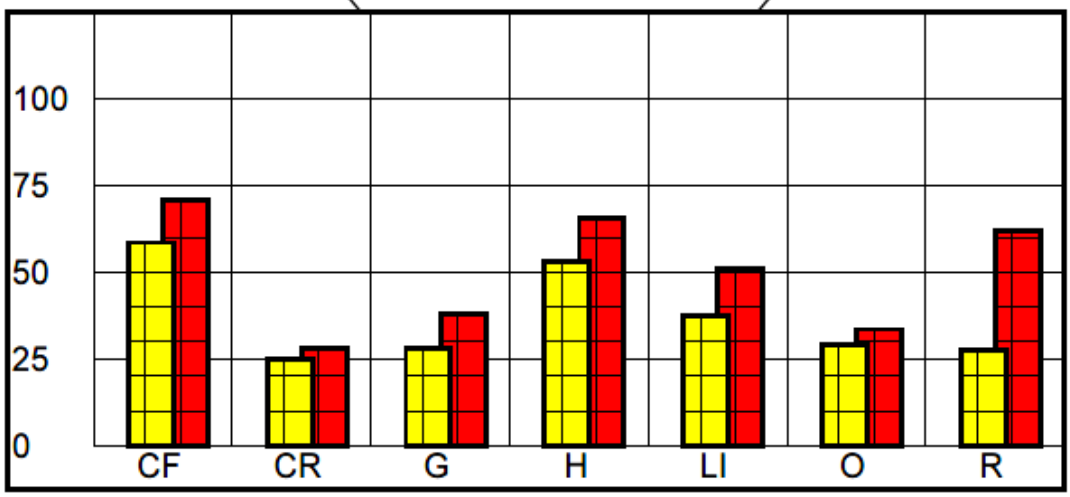
Area Type Averages				Normalized Weekly Lights On					Normalized Weekly Occupied					
Area Type		Qty	Watts	Peak	Off	Shldr 1	Shldr 2	Total	Peak	Off	Shldr 1	Shldr 2	Total	% sav
Cafeteria	CF	1	100	67.29	0.00	0.00	0.00	67.29	59.42	0.00	0.00	0.00	59.42	11.69
Classroom	CR	4	100	32.56	0.00	0.00	0.00	32.56	29.91	0.00	0.00	0.00	29.91	8.16
Gym	G	1	100	21.72	0.00	0.00	0.00	21.72	15.43	0.00	0.00	0.00	15.43	28.93
Hallway	H	3	100	68.33	0.00	0.00	0.00	68.33	48.02	0.00	0.00	0.00	48.02	29.72
Library	LI	1	100	40.66	0.00	0.00	0.00	40.66	34.88	0.00	0.00	0.00	34.88	14.22
Office	O	2	100	39.01	0.00	0.00	0.00	39.01	36.00	0.00	0.00	0.00	36.00	7.72
Restroom	R	1	100	19.88	0.00	0.00	0.00	19.88	19.88	0.00	0.00	0.00	19.88	0.00
Building Average for 13 rooms			100	43.29	0.00	0.00	0.00	43.29	35.79	0.00	0.00	0.00	35.79	17.32



Hours per Week for each Area Type.

Lowell Elementary School

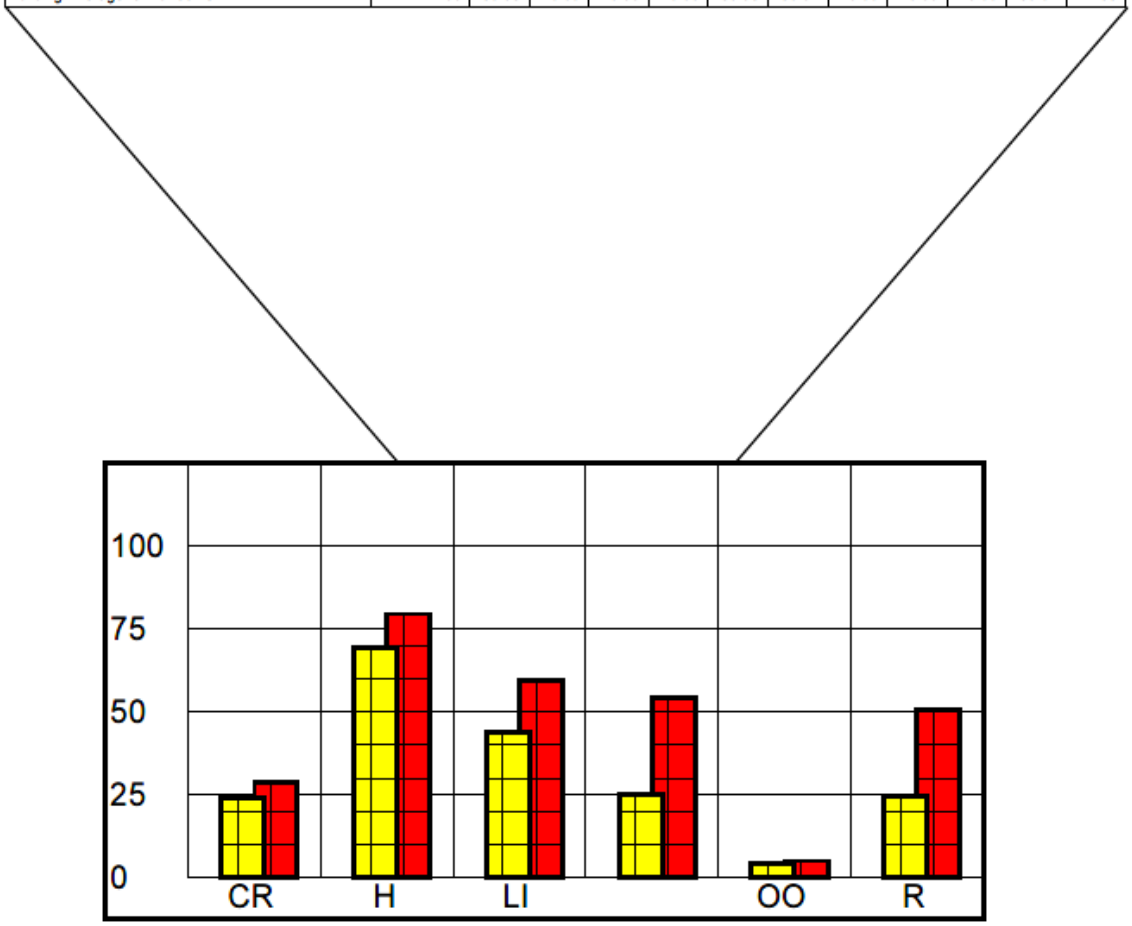
Area Type Averages				Normalized Weekly Lights On					Normalized Weekly Occupied					
Area Type		Qty	Watts	Peak	Off	Shldr 1	Shldr 2	Total	Peak	Off	Shldr 1	Shldr 2	Total	% sav
Cafeteria	CF	1	100	71.04	0.00	0.00	0.00	71.04	58.85	0.00	0.00	0.00	58.85	17.16
Classroom	CR	5	100	28.46	0.00	0.00	0.00	28.46	25.28	0.00	0.00	0.00	25.28	11.17
Gym	G	1	100	38.10	0.00	0.00	0.00	38.10	28.21	0.00	0.00	0.00	28.21	25.95
Hallway	H	3	100	65.58	0.00	0.00	0.00	65.58	53.11	0.00	0.00	0.00	53.11	19.01
Library	LI	1	100	51.47	0.00	0.00	0.00	51.47	37.56	0.00	0.00	0.00	37.56	27.03
Office	O	2	100	33.91	0.00	0.00	0.00	33.91	29.13	0.00	0.00	0.00	29.13	14.11
Restroom	R	2	100	62.19	0.00	0.00	0.00	62.19	27.53	0.00	0.00	0.00	27.53	55.74
Building Average for 15 rooms			100	46.09	0.00	0.00	0.00	46.09	34.88	0.00	0.00	0.00	34.88	24.32



Hours per Week for each Area Type.

Thomas Jefferson Middle School

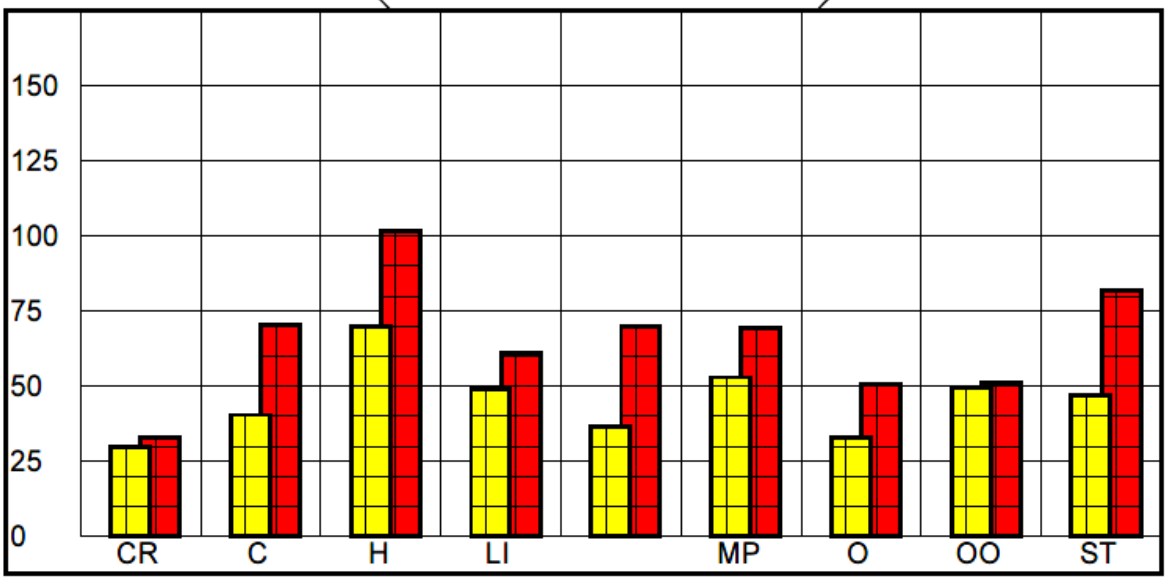
Area Type Averages				Normalized Weekly Lights On					Normalized Weekly Occupied					
Area Type		Qty	Watts	Peak	Off	Shldr 1	Shldr 2	Total	Peak	Off	Shldr 1	Shldr 2	Total	% sav
Classroom	CR	9	100	28.74	0.00	0.00	0.00	28.74	24.19	0.00	0.00	0.00	24.19	15.85
Hallway	H	2	100	79.90	0.00	0.00	0.00	79.90	69.55	0.00	0.00	0.00	69.55	12.95
Library	LI	1	100	59.93	0.00	0.00	0.00	59.93	44.45	0.00	0.00	0.00	44.45	25.83
Locker Rm		1	100	54.35	0.00	0.00	0.00	54.35	25.20	0.00	0.00	0.00	25.20	53.63
Open Office	OO	1	100	5.07	0.00	0.00	0.00	5.07	4.03	0.00	0.00	0.00	4.03	20.53
Restroom	R	2	100	50.55	0.00	0.00	0.00	50.55	24.93	0.00	0.00	0.00	24.93	50.68
Building Average for 16 rooms			100	39.93	0.00	0.00	0.00	39.93	30.01	0.00	0.00	0.00	30.01	24.83



Hours per Week for each Area Type.

Teaneck High School

Area Type Averages				Normalized Weekly Lights On					Normalized Weekly Occupied					
Area Type		Qty	Watts	Peak	Off	Shldr 1	Shldr 2	Total	Peak	Off	Shldr 1	Shldr 2	Total	% sav
Classroom	CR	6	100	33.27	0.00	0.00	0.00	33.27	30.37	0.00	0.00	0.00	30.37	8.72
Copy Rm	C	1	100	70.58	0.00	0.00	0.00	70.58	40.69	0.00	0.00	0.00	40.69	42.35
Hallway	H	5	100	101.91	0.00	0.00	0.00	101.91	70.35	0.00	0.00	0.00	70.35	30.98
Library	LI	1	100	61.09	0.00	0.00	0.00	61.09	49.08	0.00	0.00	0.00	49.08	19.65
Locker Rm		1	100	70.10	0.00	0.00	0.00	70.10	36.97	0.00	0.00	0.00	36.97	47.26
MultiPurpose Rm	MP	1	100	69.88	0.00	0.00	0.00	69.88	53.26	0.00	0.00	0.00	53.26	23.78
Office	O	5	100	50.86	0.00	0.00	0.00	50.86	33.14	0.00	0.00	0.00	33.14	34.84
Open Office	OO	1	100	51.35	0.00	0.00	0.00	51.35	49.94	0.00	0.00	0.00	49.94	2.74
Stairwell	ST	2	100	82.19	0.00	0.00	0.00	82.19	47.29	0.00	0.00	0.00	47.29	42.46
Building Average for 23 rooms			100	63.07	0.00	0.00	0.00	63.07	44.52	0.00	0.00	0.00	44.52	29.41



Hours per Week for each Area Type.

APPENDIX 7. THIRD PARTY ENERGY SAVINGS PLAN REVIEW COMMENTS & CORRESPONDENCE (DLB ASSOCIATES)