

SMYRNA *Elementary School*

Certificate of Necessity



Gipe Associates, Inc.
CONSULTING ENGINEERS

Mechanical / Electrical Engineer
8719 Brooks Drive
Easton, MD 21601
410.822.8688

Project No.: 18047
August 09, 2019

SMYRNA
School District

CONTENTS

1 Executive Summary.....	2
1.1 Property Information and General MEP systems Condition.....	2
1.2 Anticipated Lifecycle Replacement.....	2
1.3 Cost Estimates.....	2
2 Scope and Methodology.....	3
2.1 Scope.....	3
2.2 Methodology.....	3
2.3 Condition Assessment Priority Definitions	3
3 Mechanical and Plumbing Systems.....	4
3.1 Heating, Ventilating and Air Conditioning (HVAC).....	4
3.2 Domestic Water Plumbing Systems.....	9
4 Electrical Systems.....	11
4.1 Electrical Service	11
4.2 Emergency Power	11
4.3 Lighting Systems:	12
4.4 Power	12
4.5 Special Systems	12
4.6 Fire Alarm System	13
4.7 Code Deficiencies	14
Appendix A – Facility Photographs	
Appendix B – Cost Estimates	

1 EXECUTIVE SUMMARY

1.1 Property Information and General MEP systems Condition

Smyrna Elementary School is located at 121 South School Lane Smyrna, DE. The building's primary heating and cooling sources are centrally located delivering chilled and hot water to the building equipment.

SMYRNA ELEMENTARY SCHOOL BUILDING INFORMATION	
Address	121 South School Lane Smyrna DE
Renovation History	1993, 2002, 2006, 2015
Building Area	59,860 SQ-FT
System Types	4-pipe. Central Chiller and Boiler.
Survey Date	19-Jul-18
Point of Contact	Scott Holmes

Central building equipment is in good condition. However, (3) packaged DX rooftop units and (4) rooftop energy recovery units require replacement and all Unit Ventilators are due for refurbishment

1.2 Anticipated Lifecycle Replacement

ANTICIPATED LIFECYCLE REPLACEMENT	
Priority	System / Equipment / Component
Immediate	Packaged DX RTUs, Energy Recovery RTUs, Unit Ventilators, Exterior Disconnect Switches at exterior HVAC units that are replaced
Short-Term	N/A
Mid-Term	Exterior Lighting, Receptacles, Special Systems
Long-Term	Boilers, Chiller, Pumps, Air Handling Unit, Packaged DX Units, Terminal Units, Split DX Units, Fans, Control System, Switchboard, Panelboards, Interior Lighting, Fire Alarm

1.3 Cost Estimates

COST ESTIMATE		
#	Description	Estimated Project Cost
1	Replace (3) packaged DX RTUs	\$ 309,900.00
2	Replace (4) Energy Recovery RTUs	\$ 374,400.00
3	Refurbish (32) Unit Ventilators	\$ 283,000.00
4	Proposed Technology Improvements	\$ 36,900.00
Total		\$ 1,004,200.00

2 SCOPE AND METHODOLOGY

2.1 Scope

The scope of this report is to assess the condition of existing MEP systems and provide the Smyrna School District a means to prioritize upgrades.

2.2 Methodology

Gipe Associates has made assessments and recommendations based on (4) main factors which include:

- Onsite surveys of equipment by visual inspection
- Review of the existing MEP drawings provided by the Smyrna School District
- Interviews with Maintenance Staff to identify chronic system issues, regular maintenance schedules and historical system operation
- American Society of Heating, Refrigerating and Air Conditioning Engineers (ASHRAE) Service Life Database (<https://xp20.ashrae.org/publicdatabase/>)

From these sources, judgements are made to assess equipment condition and determine the expected useful life remaining for MEP systems for this geographical location and use type. Condition assessments have been grouped in order of priority as defined in the next section.

2.3 Condition Assessment Priority Definitions

Code	Priority	Description
P-01	Immediate	Items that are currently overdue or that will be required within the next year (FY19). Equipment condition is either non-operational, in poor condition or not meeting performance needs.
P-02	Short-Term	Items that will be required within the next 2-3 years (FY20-FY22). Equipment condition is fair, signs of wear but still satisfactory as-is, additional maintenance and repair may be required as it continues to age.
P-03	Mid-Term	Items that will be required within the next 4-5 years (FY23-FY25). Equipment condition is good, performing satisfactory and expected to reach its estimated service life with regularly scheduled maintenance.
P-04	Long-Term	Items that will be required 5-10 years in the future (FY26+). Equipment condition is good – excellent, and has many years of useful service life remaining.

The next section tabulates all major equipment, capacities and condition assessments with a priority code.

3 MECHANICAL AND PLUMBING SYSTEMS

3.1 Heating, Ventilating and Air Conditioning (HVAC)

The building utilizes a 4-pipe variable primary flow HVAC system distributing chilled and hot water from an air-cooled chiller and central boilers, respectively. The boilers and pumps are located in the Mechanical Room. The chiller is located in the Mechanical Yard. One variable volume air handler located on the roof serves the newest wing of the building.

In the original building, classrooms rely on 4-pipe Unit Ventilators (UV) for space conditioning and ventilation. The gym, cafeteria, library, and kitchen each have a dedicated packaged DX unit located on the roof. Various split systems are utilized for conditioning IDF, MDF and computer rooms.

The following tables group all of the building's mechanical equipment and provide a condition assessment priority code.

HVAC Equipment Tables

CENTRAL HEATING SYSTEM		
System or Unit Type		Service Life Estimate (years)
Boiler(s), Hot Water		25
P-04	Quantity	4
	Input Capacity	850 MBH each
	Performance Efficiency	97.0%
	Fuel	Natural Gas
	Plant Heating Capacity	3,408 MBH
	Location	Mechanical Room
	Service	Entire Building
	Nameplate Date	2015

CENTRAL COOLING SYSTEM		
System or Unit Type		Service Life Estimate (years)
Chiller, Air-Cooled Screw		23
P-04	Quantity	1
	Capacity	140 Tons
	Performance Efficiency	1.21 kW/ton
	Compressor Qty	2
	Refrigerant	R-134A
	Location	Mechanical Yard
	Service	Entire Building
	Nameplate Date	2002

HYDRONIC DISTRIBUTION		
Equipment Type		Service Life Estimate (years)
Pump(s), Base-mounted		20
P-04	Quantity	4
	Capacity	20; 15 HP
	Control	Variable Speed, 2-way control valves
	Location	Mechanical Room

	Service	Chilled/Heating Water Circulation
	Nameplate Date	2005
Pump(s), Inline		18
P-04	Quantity	4
	Capacity	3/4 HP each
	Control	Variable Speed
	Location	Mechanical Room
	Service	Boiler Primary Circulator
	Nameplate Date	2015

AIR DISTRIBUTION SYSTEMS		
Equipment Type		Service Life Estimate (years)
Air Handling Unit(s), Variable Volume		24
P-04	Quantity	1
	Capacity	7,000 CFM
	Location	New Wing Penthouse
	Service	Classrooms
	Nameplate Date	2006
Packaged DX Unit, air-cooled, gas heat		17
P-04	Quantity	3
	Capacity	60; 150; 247 MBH
	Refrigerant	R-410A
	Location	Roof
	Service	Area 'A' Administrative Offices, Library, Kitchen
	Nameplate Date	2007, 2017
Packaged DX Unit, air-cooled, gas heat		17
P-01	Quantity	3
	Capacity	48 - 180 MBH
	Refrigerant	R-22
	Location	Roof
	Service	Area 'A' Library, Gym, Cafeteria
	Nameplate Date	1993, 2002
Air Handling Unit(s), Energy Recovery		17
P-01	Quantity	4
	Capacity	1,000 - 2,250 CFM
	Location	Roof
	Service	Multipurpose, Gym, Cafeteria, Corridors, Classrooms
	Nameplate Date	2002

TERMINAL UNITS		
Equipment Type		Service Life Estimate (years)
Air Terminal, VAV box		20
P-04	Quantity	6
	Capacity	1,100 - 1,200 CFM
	Location	Above Ceiling

	Service	Classrooms
	Nameplate Date	2006
Radiant Heater, Hot Water		25
P-04	Quantity	7
	Capacity	700 BTU/ft
	Location	Exterior Walls
	Service	Corridor, Toilet Rooms, Lockers, Offices
	Nameplate Date	2016
Unit Heater, Hot Water		20
P-04	Quantity	4
	Capacity	512 - 830 CFM
	Service	Vestibules, Kitchen
	Nameplate Date	2003, 2006
Air Terminal, Unit Ventilator		20
P-01	Quantity	32
	Capacity	750 - 1,500 CFM
	Location	Exterior Walls
	Service	Classrooms
	Nameplate Date	2003

SUPPLEMENTAL UNITS		
Equipment Type		Service Life Estimate (years)
Split DX Unit, air-cooled		17
P-04	Quantity	3
	Capacity	24 MBH each
	Refrigerant	R-410A
	Condensing Unit Location	Roof
	Service	IDF, MDF
	Nameplate Date	2015

VENTILATION SYSTEMS		
System or Unit Type		Service Life Estimate (years)
Make-Up Air Unit, Gas Heat		15
P-04	Quantity	1
	Capacity	3,360 CFM
	Location	Roof
	Service	Kitchen
	Equipment Nameplate Date	2015
Fan, Centrifugal		20
P-04	Quantity	11
	Capacity	92 - 1,200 CFM
	Location	Roof, Inline, Ceiling Mounted
	Service	General Exhaust, Bathroom Exhaust, Dishwasher
	Nameplate Date	2015

CONTROL SYSTEM		
System or Unit Type		Service Life Estimate (years)
Controls, Direct Digital (DDC)		25
P-04	Control Panel Location	Mechanical Room
	Service	All major equipment is connected to BAS Control Panels
	Nameplate Date	2015

Planned Improvements

Currently there are no improvement projects planned.

Deferred Maintenance and Replacement

The following items have been identified either during the survey effort or by the maintenance staff as items that require immediate repair or replacement:

- (3) packaged DX RTUs serving the Gym, Cafeteria and Library have been underperforming and require frequent maintenance due to their age. All (3) units should be replaced.
- All (4) Energy Recovery Units (ERU) have been underperforming and require frequent maintenance due to their age. These ERUs are installed to exhaust classrooms and provide “fresh air” ventilation to corridors. Existing drawings indicate that design airflows and leaving air conditions that are typically not recommended for this application and space type. The cost estimates provided are to replace these units “in-kind” as requested by maintenance staff. **However, we recommend further investigation and possible re-design before replacing these units.**
- Per maintenance schedules, all Unit Ventilators are due for refurbishment.

Anticipated Lifecycle Replacement

The following list summarizes all major mechanical equipment in fair – excellent condition that will eventually require replacement, refurbishment or repair once they age past their estimated useful life.

- Boilers
- Chillers
- Pumps
- Air Handling Unit
- Packaged DX Units
- Split DX Systems
- Fans
- Heating Units
- VAV Boxes
- Expansion Tanks

Future Use and Replacement Recommendations

Long-Term HVAC System Recommendations

Ideally, ventilation systems and space conditioning systems are decoupled. This approach provides the most effective control over space temperature, humidity, and indoor air quality with minimal energy

consumption. However, depending on life cycle costs and maintenance preferences, replacement in-kind should also be considered.

When existing building systems have reached the end of their lifecycle the following system types are recommended as possible replacements:

1. Air-Cooled Variable Refrigerant Flow (VRF) - Air side heat pump units are located on the roof. Heat pumps are interlocked with ductless type terminal equipment through refrigerant piping. Simultaneous heating and cooling is possible with VRF system. All heat pump equipment utilizes variable speed compressors and fan motors. Decouple energy recovery ventilators would provide both the building exhaust and ventilation airflow. ERV units shall utilize enthalpy wheels and demand controlled ventilation components. Exterior condensing units serving ERV units will be located on the ground. Heat for ERV units will be provided by the central boiler.
2. Ground Source Water-Cooled VRF - Ground coupled heat pumps are connected to the geothermal loop condenser water system. The ground coupled heat pumps are interlocked with ductless type terminal equipment through refrigerant piping. Simultaneous heating and cooling is possible with the VRF system. All heat pump equipment utilizes variable speed compressors and fan motors. Decoupled energy recovery ventilators would provide both the building exhaust and ventilation airflow. ERV units shall utilize enthalpy wheels and demand controlled ventilation components.

It is crucially important to calculate life cycle costs to identify the most cost effective system replacement that is specific to this building.

Unit Ventilators

Unit Ventilators (UV) were standard HVAC equipment for school classrooms built in the 1990's and earlier, however they have several disadvantages that are well documented compared to modern HVAC system solutions which include:

- Source of noise within the classroom
- Valuable floor space is occupied within the classroom
- Outdoor air control limitations
- Humidity control limitations

Some, if not all of these issues have been documented at SES.

We strongly recommend refraining from UVs for all new construction and major renovations going forward. As described in the section above, a decoupled design approach is ideal.

However, since there is already a central chiller and boiler in place with useful remaining service life, it is unrealistic to recommend a complete system replacement. The best compromise is to modify existing UV controls to only provide space cooling (no ventilation) with economizer function. New Energy Recovery Units (ERU) would be installed on the roof or in mechanical mezzanines. This system modification maximizes the use of existing equipment while decoupling ventilation and should be considered a mid-term solution until the next major renovation.

3.2 Domestic Water Plumbing Systems

Plumbing Equipment Tables

PLUMBING SYSTEMS		
Plumbing System		Description
P-04	Domestic Supply	PEX/Galvanized Steel (4" Service)
	Waste/Sewer Piping	Cast Iron
	Vent Piping	Cast Iron/Copper
	Fire Protection	Wet Pipe Sprinkler System (6" Service)
	Water Meter Location	Mechanical Room

PLUMBING EQUIPMENT		
System or Unit Type		Service Life Estimate (years)
Domestic Hot Water Heater, natural gas		15
P-04	Quantity	2
	Input Capacity	200 MBH each
	Storage Capacity	90 Gallons each
	Expansion Tank?	Yes
	Location	Mechanical Room
	Service	Entire Building
	Nameplate Date	2015
Pump(s), Inline		18
P-04	Quantity	2
	Capacity	1/2 HP each
	Location	Mechanical Room
	Service	Domestic Hot Water Recirculation
	Nameplate Date	2015

PLUMBING FIXTURES		
Typical Plumbing Fixture		Flush Rating / Flow Rate / Size
P-04	Water Closet	1.6 GPF
	Urinal	1.0 GPF
	Lavatory	0.5 - 2.2 GPM
	Janitor Sink	3.0 GPM
	Kitchen Sink	2.2 GPM
	Drinking Fountain	0.25 GPM

Planned Improvements

There are no planned improvements for the plumbing system.

Deferred Maintenance

There are no deferred maintenance items for the plumbing system.

Anticipated Lifecycle Replacement

The following list summarizes all major plumbing equipment in fair – excellent condition that will eventually require replacement, refurbishment or repair once they age past their estimated useful life.

- Water Heater
- Expansion Tanks
- Thermostatic Mixing Valves
- Plumbing Fixtures
- Piping Systems and valves

4 ELECTRICAL SYSTEMS

4.1 Electrical Service

Equipment Type			
Overhead Conductors		Underground Conductors	X
P-04	Transformer	(1) 500kVA @ 208V, Customer Owned	
	Utility Company	Town of Smyrna	
	Service Size	(1) 1,200A @ 208V, (1) 1,200A @ 208V	
	Meter	Primary Meter	Location:
	Main Service Ground	Yes	
	Main Switchboard	(1) MDP – 1,200A (1) MDS – 1,200A	Main Distribution Panelboard
	Manufacturer	Square D	Installation Date MDP-1993, MDS-2003

Equipment Type		
Panelboard(s)		
P-04	Type	A-Series
	Manufacturer	General Electric (GE)
P-04	Type	A-II Series
	Manufacturer	GE
P-04	Type	NQOD
	Manufacturer	Square D

The building has two 1,200A, 120/208V, three phase switchboards located in the main electrical room in the school basement. Based on the existing drawings, each of these switchboards are fed directly from the pad mounted transformer located outside. Based on information we received from the Town of Smyrna, the peak demand for the building in the last 12 months is 296 kW which converts to 357 Amperes (A). The existing two main switchboards have a combined maximum capacity of 1,920A. With the school having a primary meter located ahead of the pad mounted transformers that serve the school, we are not able to determine the peak demand on each switchboard. However, it appears that the existing switchboards have adequate space and capacity to support additional load.

There are no immediate or significant repairs that need to be made to the electrical service or panelboards. The switchboards and the majority of the panelboards throughout the school are manufactured by GE and were installed in 1993 or 2003 and appear to be in fair condition. There are a few panelboards that are manufactured by Square D and were installed in 2015 as part of a lighting replacement project.

4.2 Emergency Power

There is not a generator located at this building. The emergency lighting is controlled by wall mounted fixtures that have an internal battery pack.

4.3 Lighting Systems:

Equipment Type		
Lighting		
P-04	Interior Lighting	Type: Linear Fluorescent, T8,
P-03	Exterior Lighting	Type: Wall mounted - MH, Wall mounted around kitchen – LED, Parking lot poles with LED light source
	MH fixtures	Fair condition
P-04	LED fixtures	Good condition
P-04	Emergency Lighting	Type: Wall mounted
P-04	Illuminated Exit Signs	Yes
P-04	Lighting Switches (MH)	46" to center of switch
P-04	Lighting Switches (MH) ADA Compliant	Yes

4.4 Power

Equipment Type		
Power		
P-03	GFCI receptacles at required locations	Yes
	Duplex receptacles (Grounding or no)	Grounding
	Duplex receptacles at HVAC equipment	Yes
P-04	Building Wire	Copper
P-04	Step-down transformer	Good condition
P-04	Interior disconnects	Good condition
P-01	Exterior disconnects	Replace exterior disconnects for all HVAC units that are replaced. Otherwise exterior disconnect switches to remain.

4.5 Special Systems

Equipment Type		
Special Systems		
P-03	Telephone Entrance	MDF Room
	Cable TV Service	No
	Fiber/Data on site	Yes
	Data racks (Location or spare capacity)	MDF Room, IDF rooms – Yes spare capacity
	Data Cabling	CAT 6

	CCTV	Yes
	Security (Manufacturer)	Honeywell
	Intercom (Aiphone)	No
	Card Reader(s)	Yes

The majority of the lighting fixtures throughout the school were replaced with 2'x4' fluorescent recessed acrylic lensed type fixtures in 2015. As part of this lighting replacement, occupancy sensors were installed in all areas that the lighting fixtures were replaced except for the gymnasium and stage area. The only area that didn't have their lighting fixtures replaced was the 6-classroom addition that was built in 2006. This area still has fluorescent linear fixtures as were originally installed. While the lighting systems are not in immediate need of replacement, as part of general improvements to the building, changing from fluorescent and metal halide light sources to LED light sources would result in energy savings. Some of the wall mounted exterior lights (particularly on the 2006 addition) are beginning to show signs of wear due to the weather and will probably need to start being replaced within the next 4-5 years. Routine and periodic maintenance of the lighting systems is recommended.

While the building appears to be in good condition, the recessed receptacles installed in the building are beginning to show signs of aging. Over the years, additional receptacles have been installed using surface metal raceway. We would assume that the building wiring to the recessed receptacles are the same age as the receptacle, so both would probably need replacement within the next 5 years. In addition, the current National Electrical Code (NEC) requires that all child care facilities have tamper resistant receptacles. The code defines a child care facility as a building or portion thereof, for educational, supervisory, or personal care services for more than four children 7 years old or less. So, this elementary school would fit this definition so we would recommend that all non-locking-type 125V, 15 and 20 ampere(A) existing receptacles be replaced with tamper-resistant receptacles. Many of the exterior disconnects are showing signs of rusting, so we would recommend that new NEMA 4X, stainless steel disconnects be provided for all exterior HVAC equipment that is replaced. The technology department has some planned improvements for buildings special systems as outlined below in the planned improvements section of this report.

4.6 Fire Alarm System

Equipment Type			
Fire Alarm System			
P-04	Item	Yes	No
	Horns or Bells	X	
	Strobe Lights	X	
	Voice Evacuation		X
	Battery Back-up	X	
	Automatic Dialer	X	
	Smoke Detectors	X	
	Outdoor Bell	X	
	Duct Detectors	X	
	Smoke Dampers	X	
	Manual Stations at Exit	X	
	ADA compliant	X	
	Location of FACP	MDF Room	

	Fire Alarm (Addressable or Analog)	Addressable
	Manufacturer	Silent Knight
	Date of Installation	2013
Annunciator		
P-04	Remote Annunciator	Yes
	Annunciator (Graphic or Alphanumeric)	Alphanumeric
	Remote Annunciator Location	Front Lobby

There are no immediate or significant repairs that need to be made to the building fire alarm system. Routine and periodic testing and maintenance of the fire alarm system is recommended. While the existing fire alarm is in good condition, it utilizes audible horns and visual strobe notification devices and does not have a voice evacuation system. The 2015 NFPA 101 Life Safety Code requires that any new schools with 100 or more occupants have a fire alarm system utilize an emergency voice/alarm communications system to notify occupants. Even though a change is not required now, if a major renovation was to occur to the existing school, then the existing fire alarm system would need to be upgraded to a voice evacuation system.

4.7 Code Deficiencies

1. Replace all existing building non-locking-type 125V, 15 and 20 ampere receptacles with tamper-resistant receptacles to comply with the current National Electrical Code.
2. Upgrade Fire Alarm system to voice evacuation system to comply with current NFPA 101 Life Safety Code.

Planned Improvements

- Add two (2) external cameras throughout school in areas designated by school administrators.
- Add card readers at doors designated by school administrators/ technology department. (cost estimate based on 5 devices)
- Add wireless access points to non-educational (cafeteria, gym, guidance office) spaces. (cost estimate based on 6)
- Provide uninterruptible power supply (UPS) at all access door control panels. (cost estimate based on 7 devices)

Deferred Maintenance

- Replace exterior disconnect switches for all exterior HVAC units that are replaced.

General Improvements

- Replace interior lighting for 6-classroom addition and exterior wall mounted Metal Halide fixtures with LED light source fixtures.
- Provide lighting controls in the 6-classroom addition to automatically turn lights off in spaces that are empty.

Anticipated Lifecycle Replacement

The following list summarizes all major equipment that is currently in fair – excellent condition that will eventually need replacement:

- Switchboard(s)
- Panelboard(s)
- Lighting

- Receptacles
- Fire Alarm Panel
- Security System
- Video Cameras

APPENDIX A

FACILITY PHOTOGRAPHS



Photo #1

Air Cooled Chiller



Photo #2

Boiler Circulators



Photo #3

Chilled and Hot Water Pumps



Photo
#4

Domestic Water Heaters



Photo #5 Exterior



Photo #6 Fire Pump



Photo #7 Kitchen Makeup Air and Exhaust Unit



Photo #8 RTU Serving Library



Photo #9 Typical Energy Recovery Unit



Photo #10 Typical Unit Ventilator



Photo
#11

Packaged DX Rooftop Air Handling Unit
serving Kitchen



Photo
#12

Typical Bathroom Sink



Photo
#13

Typical Bathroom Toilet



Photo
#14

Typical Bathroom

Appendix A

Smyrna Elementary School Mechanical Photographs



Photo #15 Typical Boilers in Mechanical Room



Photo #16 Typical Classroom Sink



Photo #17 Typical Exhaust Fan



Photo #18 Typical Fin Tube Radiator



Photo #19 Typical Packaged DX Rooftop Air Handling Unit



Photo #20 Typical Split DX Condenser Unit



Photo #21 Typical Water Fountain



Photo #22 Typical Urinal



Photo #23 Typical Vestibule Cabinet Heater



Photo
#1

Exterior of 2006 Addition



Photo
#2

Fire Alarm Control
Panel



Photo
#3

Motor Control Center



Photo
#4

PMH-3 Switch and
500kVA Transformer

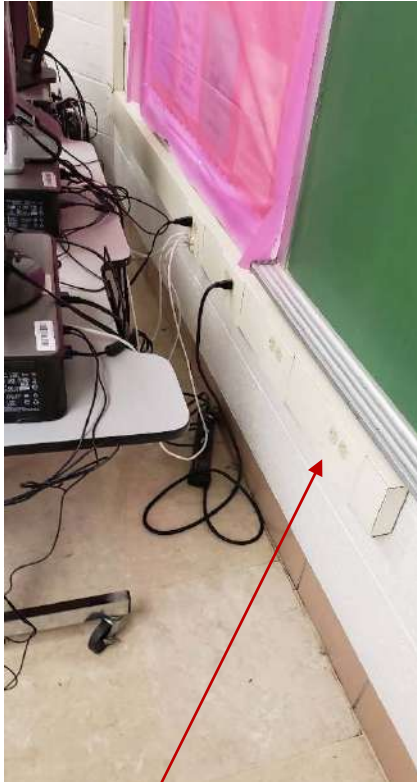


Photo #5 Receptacle in Surface Mounted Raceway



Photo #6 Rescue Assist Station and Fire Alarm Remote Annunciator



Photo #7 Switchboard MDP



Photo #8 Switchboard MDS



Photo #9 Typical 2006 Addition Classroom



Photo #10 Typical Branch Panelboard installed in 1993



Photo #11 Typical Branch Panelboard installed in 2002



Photo #12 Typical Branch Panelboard installed in 2015



Photo
#13

Typical Classroom with 2'x4'
Lights and Occupancy
Sensor



Photo
#14

Typical Data Rack



Photo
#15

Typical Duct
Detector Remote
Test Switches



Photo #16 Typical LED Parking Lot Lights



Photo #17 Typical LED Wall Mounted Light on Kitchen Exterior Walls



Photo #18 Typical Receptacle



Photo #19 Typical Wall Mounted Emergency Light



Photo #20 Typical Wall Mounted Occupancy



Photo
#21

AHU-2 Rusty
Disconnect Switch (B)



Photo #22

AHU-2 Rusty Disconnect Switch

APPENDIX B

COST ESTIMATE



Gipe Associates, Inc.

CONSULTING ENGINEERS

Mechanical | Electrical | Plumbing

8719 BROOKS DRIVE

EASTON, MARYLAND

PHONE: 410-822-8688

FAX: 410-822-6306

CONSTRUCTION COST ESTIMATE

PROJECT: SMYRNA ELEMENTARY SCHOOL
GAI PROJECT NO: 18047
DATE: 08/08/18
PREPARED BY: MEO

GENERAL PROJECT INFORMATION

PROJECT SQUARE FOOTAGE: 30,000
FACILITY TYPE: EDUCATION - CLASSROOMS
OF FLOORS: 2
ARCHITECT: FEARN-CLENDANIEL
BASIS FOR ESTIMATE: CERT. OF NECESSITY
SUMMARY: PRELIMINARY ESTIMATE

1 - (3) RTU REPLACEMENTS	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. OF UNITS	UNIT OF MEASURE	PER UNIT	TOTAL	PER UNIT	TOTAL	
BASE BID COST ESTIMATE							
DUCTWORK DEMOLITION	3.0	EA		\$ -	\$ 1,000.00	\$ 3,000.00	\$ 3,000.00
RTU REMOVAL	3.0	EA		\$ -	\$ 1,500.00	\$ 4,500.00	\$ 4,500.00
PIPING DEMOLITION	3.0	EA		\$ -	\$ 500.00	\$ 1,500.00	\$ 1,500.00
PACKAGED RTU (45-180 MBH)	3.0	EA	\$ 32,000.00	\$ 96,000.00	\$ 15,000.00	\$ 45,000.00	\$ 141,000.00
DUCTWORK FOR RTU	3.0	EA	\$ 16,000.00	\$ 48,000.00	\$ 8,000.00	\$ 24,000.00	\$ 72,000.00
GAS PIPING, VALVES AND FITTINGS	3.0	EA	\$ 750.00	\$ 2,250.00	\$ 2,200.00	\$ 6,600.00	\$ 8,850.00
DUCT DETECTORS	6.0	EA	\$ 300.00	\$ 1,800.00	\$ 500.00	\$ 3,000.00	\$ 4,800.00
RTU ATC CONTROLS	3.0	EA	\$ 2,000.00	\$ 6,000.00	\$ 3,000.00	\$ 9,000.00	\$ 15,000.00
DUCT INSULATION	3.0	EA	\$ 3,000.00	\$ 9,000.00	\$ 3,500.00	\$ 10,500.00	\$ 19,500.00
CONDENSATE PIPING	60.0	LF	\$ 5.00	\$ 300.00	\$ 10.00	\$ 600.00	\$ 900.00
TESTING AND BALANCING	3.0	EA		\$ -	\$ 3,500.00	\$ 10,500.00	\$ 10,500.00
COMMISSIONING	3.0	EA		\$ -	\$ 3,500.00	\$ 10,500.00	\$ 10,500.00
ELECTRICAL DISCONNECTS	3.0	EA	\$ 1,000.00	\$ 3,000.00	\$ 500.00	\$ 1,500.00	\$ 4,500.00
CONDUIT AND WIRE							
	3.0	EA	\$ 1,700.00	\$ 5,100.00	\$ 2,200.00	\$ 6,600.00	\$ 11,700.00
FIREALARM INTERFACE OF DUCT	3.0	EA	\$ 300.00	\$ 900.00	\$ 250.00	\$ 750.00	\$ 1,650.00
COST ESTIMATE SUMMARY							
DESCRIPTION			MATERIAL		LABOR		TOTAL
BASE BID TOTAL COST			\$ 172,350.00		\$ 137,550.00		\$ 309,900.00
TOTAL BASE BID:			\$ 172,350.00		\$ 137,550.00		\$ 309,900.00
TOTAL BASE BID COST PER SQUARE FOOT:			\$5.75 PER S.F.		\$4.59 PER S.F.		\$10.33 PER S.F.
GRAND TOTAL COST ESTIMATE SUMMARY							
ADDITIONAL PROJECT COST ITEM DESCRIPTION (APPLIES TO BASE BID ONLY)			PERCENTAGE (%)		% X TOTAL BASE BID		REMARKS
CONTRACTOR OVERHEAD			0.0%		\$ -		
CONTRACTOR PROFIT			0.0%		\$ -		
GENERAL CONDITIONS			0.0%		\$ -		
BUILDER'S RISK INSURANCE			0.0%		\$ -		
PERMIT FEES			0.0%		\$ -		
CONTRACTOR INSURANCE			0.0%		\$ -		
PAYMENT BOND			0.0%		\$ -		
PERFORMANCE BOND			0.0%		\$ -		
TOTAL ADDITIONAL PROJECT COST ITEMS					\$ -		
GRAND TOTAL CONSTRUCTION COST (BASE BID + ADDITIONAL PROJECT COSTS)					\$ 309,900.00		\$10.33 PER S.F.



Gipe Associates, Inc.

CONSULTING ENGINEERS

Mechanical | Electrical | Plumbing

8719 BROOKS DRIVE
EASTON, MARYLAND
PHONE: 410-822-8688
FAX: 410-822-6306

CONSTRUCTION COST ESTIMATE

PROJECT: SMYRNA ELEMENTARY SCHOOL
GAI PROJECT NO: 18047
DATE: 08/08/18
PREPARED BY: MEO

GENERAL PROJECT INFORMATION

PROJECT SQUARE FOOTAGE: 55,000
FACILITY TYPE: EDUCATION - CLASSROOMS
OF FLOORS: 2
ARCHITECT: FEARN-CLENDANIEL
BASIS FOR ESTIMATE: CERT. OF NECESSITY
SUMMARY: PRELIMINARY ESTIMATE

2 - (4) ERV REPLACEMENTS	QUANTITY		MATERIAL		LABOR		TOTAL COST
	NO. OF UNITS	UNIT OF MEASURE	PER UNIT	TOTAL	PER UNIT	TOTAL	
BASE BID COST ESTIMATE							
DUCTWORK DEMOLITION	4.0	EA		\$ -	\$ 3,000.00	\$ 12,000.00	\$ 12,000.00
ERU REMOVAL	4.0	EA		\$ -	\$ 3,000.00	\$ 12,000.00	\$ 12,000.00
INDOOR ERV UNIT (1,000 CFM)	4.0	EA	\$ 35,000.00	\$ 140,000.00	\$ 12,000.00	\$ 48,000.00	\$ 188,000.00
DUCTWORK FOR ERV	1.0	LS	\$ 20,000.00	\$ 20,000.00	\$ 20,000.00	\$ 20,000.00	\$ 40,000.00
DUCT DETECTORS	8.0	EA	\$ 300.00	\$ 2,400.00	\$ 500.00	\$ 4,000.00	\$ 6,400.00
AHU ATC CONTROLS	2.0	EA	\$ 9,000.00	\$ 18,000.00	\$ 12,000.00	\$ 24,000.00	\$ 42,000.00
DUCT INSULATION	2.0	EA	\$ 2,000.00	\$ 4,000.00	\$ 4,000.00	\$ 8,000.00	\$ 12,000.00
TESTING AND BALANCING	4.0	EA		\$ -	\$ 5,000.00	\$ 20,000.00	\$ 20,000.00
COMMISSIONING	4.0	EA		\$ -	\$ 4,000.00	\$ 16,000.00	\$ 16,000.00
ELECTRICAL DISCONNECTS	4.0	EA	\$ 1,000.00	\$ 4,000.00	\$ 500.00	\$ 2,000.00	\$ 6,000.00
CONDUIT AND WIRE	4.0	EA	\$ 1,700.00	\$ 6,800.00	\$ 2,200.00	\$ 8,800.00	\$ 15,600.00
FIREALARM INTERFACE OF DUCT	8.0	EA	\$ 300.00	\$ 2,400.00	\$ 250.00	\$ 2,000.00	\$ 4,400.00

COST ESTIMATE SUMMARY

DESCRIPTION	MATERIAL	LABOR	TOTAL
BASE BID TOTAL COST	\$ 197,600.00	\$ 176,800.00	\$ 374,400.00
TOTAL BASE BID:	\$ 197,600.00	\$ 176,800.00	\$ 374,400.00
TOTAL BASE BID COST PER SQUARE FOOT:	\$3.59 PER S.F.	\$3.21 PER S.F.	\$6.81 PER S.F.

GRAND TOTAL COST ESTIMATE SUMMARY

ADDITIONAL PROJECT COST ITEM DESCRIPTION (APPLIES TO BASE BID ONLY)	PERCENTAGE (%)	% X TOTAL BASE BID	REMARKS
CONTRACTOR OVERHEAD	0.0%	\$ -	
CONTRACTOR PROFIT	0.0%	\$ -	
GENERAL CONDITIONS	0.0%	\$ -	
BUILDER'S RISK INSURANCE	0.0%	\$ -	
PERMIT FEES	0.0%	\$ -	
CONTRACTOR INSURANCE	0.0%	\$ -	
PAYMENT BOND	0.0%	\$ -	
PERFORMANCE BOND	0.0%	\$ -	
TOTAL ADDITIONAL PROJECT COST ITEMS		\$ -	
GRAND TOTAL CONSTRUCTION COST (BASE BID + ADDITIONAL PROJECT COSTS)		\$ 374,400.00	\$6.81 PER S.F.



Gipe Associates, Inc.

CONSULTING ENGINEERS

Mechanical | Electrical | Plumbing

8719 BROOKS DRIVE
EASTON, MARYLAND
PHONE: 410-822-8688
FAX: 410-822-6306

CONSTRUCTION COST ESTIMATE

PROJECT: SMYRNA ELEMENTARY SCHOOL
GAI PROJECT NO: 18047
DATE: 08/08/18
PREPARED BY: MEO

GENERAL PROJECT INFORMATION

PROJECT SQUARE FOOTAGE: 40,000 (CLASSROOM SQUARE FOOTAGE = 5,845 S.F., KITCHEN/CAFETERIA = 6,254 S.F.)
FACILITY TYPE: EDUCATIONAL - CLASSROOMS
OF FLOORS: 1 (BUILDING IS MULTISTORY BUT STUDY AREA INCLUDES BASEMENT ONLY)
ARCHITECT: FEARN-CLENDANIEL
BASIS FOR ESTIMATE: CERT. OF NECESSITY
SUMMARY: PRELIMINARY ESTIMATE

3 - UNIT VENT REFURBISHMENT

QUANTITY		MATERIAL		LABOR		TOTAL COST
NO. OF UNITS	UNIT OF MEASURE	PER UNIT	TOTAL	PER UNIT	TOTAL	

BASE BID COST ESTIMATE

REFURBISHMENT OF UNIT VENTILATORS	32.0	EA	\$ 1,500.00	\$ 48,000.00	\$ 2,000.00	\$ 64,000.00	\$ 112,000.00
TESTING AND BALANCING	1.0	LS		\$ -	\$ 12,000.00	\$ 12,000.00	\$ 12,000.00
COMMISSIONING (CONTRACTOR ASSIST)	1.0	LS		\$ -	\$ 15,000.00	\$ 15,000.00	\$ 15,000.00
ATC CONTROLS	32.0	EA	\$ 2,000.00	\$ 64,000.00	\$ 2,500.00	\$ 80,000.00	\$ 144,000.00

COST ESTIMATE SUMMARY

DESCRIPTION	MATERIAL	LABOR	TOTAL
BASE BID TOTAL COST	\$ 112,000.00	\$ 171,000.00	\$ 283,000.00
TOTAL BASE BID:	\$ 112,000.00	\$ 171,000.00	\$ 283,000.00
TOTAL BASE BID COST PER SQUARE FOOT:	\$2.80 PER S.F.	\$4.28 PER S.F.	\$7.08 PER S.F.

GRAND TOTAL COST ESTIMATE SUMMARY

ADDITIONAL PROJECT COST ITEM DESCRIPTION (APPLIES TO BASE BID ONLY)	PERCENTAGE (%)	% X TOTAL BASE BID	REMARKS
CONTRACTOR OVERHEAD	0.0%	\$ -	
CONTRACTOR PROFIT	0.0%	\$ -	
GENERAL CONDITIONS	0.0%	\$ -	
CONTRACTOR INSURANCE	0.0%	\$ -	
PAYMENT BOND	0.0%	\$ -	
PERFORMANCE BOND	0.0%	\$ -	
DESIGN CONTINGENCY	0.0%	\$ -	
	0.0%	\$ -	
	0.0%	\$ -	
TOTAL ADDITIONAL PROJECT COST ITEMS		\$ -	
GRAND TOTAL CONSTRUCTION COST (BASE BID + ADDITIONAL PROJECT COSTS)		\$ 283,000.00	\$7.08 PER S.F.