

John F Hartranft Elementary School

720 W.Cumberland St., Philadelphia, PA 19133



Uni-Vent and Temperature Control Replacement Project

Scope Determination Report

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1.0 Introduction

This report outlines a Scope of Work (SOW) for removal and replacement of the Building's Automatic Temperature Controls, classroom and hallway unit ventilators, four roof top units and piping throughout John F Hartranft Elementary School. This School is located at 720 W. Cumberland St., Philadelphia, PA 19133

2.0 Background

The John F Hartranft Elementary School building is located at 720 W. Cumberland in Philadelphia, PA. The 2 story, 85,000 square foot main building was originally constructed circa 1967.

1. The building is structurally supported on reinforced concrete foundations and concrete bearing walls.
2. The main structure consists of cast-in-place reinforced concrete columns, beams and 1 and 2-way ribbed reinforced concrete slabs. The roof structure over the main building is similar to floor construction. The roof structure in Gymnasium and Cafeteria/ Auditorium consists of reinforced concrete columns, framing and bar joists supporting precast concrete roof panels and is raised above main roof level.
3. The building envelope is constructed of face brick masonry with CMU backup. The masonry is in fair to good condition; however, masonry at window sills in classroom pods is severely cracked and buckling.
4. The building windows are extruded aluminum double hung windows single acrylic glazed with integral security screens, installed in late 1990's. Some windows in raised sections (above main roof) of the second level are fixed, extruded aluminum, single, acrylic glazed. All windows are generally in very poor condition, most are damaged.
5. The exterior doors are typically hollow metal doors and frames, painted. The doors are in poor condition with air infiltration issues.
6. The existing roof is a built-up system over 25 years old and in poor condition. There is evidence of water ponding spotted throughout all three roof levels.

The Existing Building HVAC System

1. A high pressure 2" city gas service enters the building in the mechanical room. Two gas meters are installed; a 3" and a 2" meter located in the mechanical room downstream of two pressure reducing valves.
2. The reserve oil supply is stored in a 10,000 gallon underground storage tank (UST). Duplex pumps located in the mechanical room circulate oil through the system. Oil is used as a backup fuel and the District receives credit from the gas utility as an interruptible service. The current supply has been in storage for some time and should be tested for quality on a regular schedule. USTs have an anticipated service life of 20 years. The actual condition of the fuel side is unknown.

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3. Heat Generating Systems - Building heating hot water is generated by three (3) cast iron sectional Webster boilers with Buderus Logano GE615 Controls that has a net IBR rating of 2,958 MBH that were installed circa 2010. Two boilers can handle the load in normal winter weather conditions; three units are required to bring the building up to temperature on very cold days. Each boiler is equipped with a Webster burner designed to operate on natural gas or fuel oil. Burner oil pumps are loose and not driven by the fan motor. The gas train serving the boilers does have code required venting of the regulators and dual solenoid valves with venting of the chamber between. Combustion air makeup is supplied by an inline fan installed in the boiler room and equipped with a motorized damper. No major issues with the boilers were reported by the Building Engineer. Cast iron sectional boilers have an anticipated service life of 35 years or more; these units have been in service approximately 8 years. The boilers appear to have been maintained well.
4. Cooling Generating Systems - Chilled water is generated by one 156 nominal ton Carrier 30HX water-cooled twin screw chiller located in the first floor boiler room. Heat from the chillers is rejected by one roof mounted 250 nominal ton Evapco model USS induced draft, counterflow cooling tower. The single chiller is sufficient to hold the building on hot summer days. Screw chillers have an anticipated service life of 20 years; this unit has been in service 8 years. Galvanized metal cooling towers have an anticipated service life of 18 years; this unit has been in service approximately 13 years. Rust stains are forming on the structural support of the cooling tower and the condenser water piping. The Cooling Tower should be replaced.
5. Distribution Systems - Building water distribution piping is black steel with threaded fittings and black steel with flanged fittings in the boiler room. The piping in the boiler room was replaced in 2005, but the original piping remains in the rest of the building. Most of the piping is covered with insulation. The distribution piping in several rooms has been damaged by condensation and has significant rust damage. The piping has been in use beyond its service life and will require more frequent attention from the maintenance staff to address pipe/valve failures as time passes. The piping shall be replaced with copper and/or Pex "A".
6. A two pipe distribution system supplies building heating or cooling water to the unit ventilators, fin tube radiators, air handling units, and heating and ventilation units (hot water only). Two 25HP Bell & Gossett end suction dual temperature water pumps, P-3 and P-4, serve either the hot water or chilled water service depending on valve configuration. Two 7.5HP Bell & Gossett end suction water pumps, P-1 and P-2, serve the building hot water distribution network for the heating and ventilation units. Two 30HP Bell & Gossett end suction pumps, P-5 and P-6, serve the condenser water loop for the cooling tower and chiller. A chemical treatment system for the condenser water system is located in the mechanical room. All pumps were installed in 2010 and are within the anticipated service life of 25 years.
7. Unit ventilators and fin tube radiators provide heating and cooling for the majority of classrooms, offices, and indirectly to the hallways. The unit ventilators and radiators are original to the building and beyond their service life. The existing unit ventilators and radiators will be removed and new Unit Ventilators units shall be installed throughout the building.
8. Conditioned air is provided to several spaces in the building by air handling units located in a penthouse mechanical room. Air handling unit (AHU) AHU-2 serves the Main Office and Engineer's

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Office. Air handling unit AHU-3 serves the Comm. Area. AHU-4 serves the Cafeteria. Heating and ventilation unit (HV) HV-5 serves the Gymnasium and provides heating only. Heating and ventilation unit (HV) HV-6 serves the Kitchen and provides heating only. Each air handling unit has a chilled water and hot water connection. The heating and ventilation units have only hot water connections. These units are estimated to have been installed in 2005 and are within their service life. All 4 Roof Top Air Handling Units shall be replaced.

9. The AHU and HV units in the penthouse mechanical room are served by pumps located in that space. Pump P-7 is a 2HP inline pump and serves dual temperature water to AHU-2. Pump P-8 is a 1-½HP inline pump and serves dual temperature water to AHU-3. Pump P-9 is a 5HP end suction pump and serves dual temperature water to AHU-4. Pump P-10 is 2HP end suction pump and serves hot water to HV-5. Pump P-12 is 1HP end suction pump and serves hot water to HV-6. All pumps appear to have been installed in 2005, are in good condition, and are within their service life.
10. An exhaust fan on the upper roof serves the kitchen hood. Three (3) large and four (4) small power ventilators are also installed on the upper roof. The main roof has one exhaust fan and ten (10) power ventilators installed. The lower roof has three (3) power ventilators installed. It could not be determined which specific spaces each ventilator served during the site visit. The Building Engineer reports that some of the exhaust fans and power ventilators are operational, but many are not. These roof power ventilators will be replaced.
11. A Mitsubishi split system air conditioning system provides cooling to the LAN room located on the second floor. The installation date of this unit is unknown; the anticipated service life of a split system air conditioner is 15 years. The unit shall remain.
12. Controls & Instrumentation - The original pneumatic systems no longer provide control functions. Pneumatic room thermostats are intended to control the dual temperature unit ventilator control valve and heating coil. In reality the thermostats are not functional and many ventilator control valves are wide open and heating and cooling control are achieved via manual control of the boiler or chiller. Pneumatic control air is no longer supplied; the air compressor has been removed. The pneumatic systems are beyond their service life and require too much attention from the maintenance staff. The original control valves and pneumatic actuators are beyond their service life and should be rebuilt or replaced. These controls shall be converted to DDC with a BacNet interface Protocol.
13. A new building automation system (BAS) with modern DDC modules and communications network should be installed to serve the HVAC systems in this building to improve reliability and energy efficiency. A BacNet interface Protocol shall be provided throughout the school.
14. Sprinklers - The majority of the school building is NOT covered by an automatic sprinkler system. Only the Library is covered by a wet pipe sprinkler system. A 4" sprinkler line enters the first floor education storage room from Seventh Street. No work shall be performed on this system.

3.0. Scope of Work – Unit Ventilator and Temperature Control Replacement

Environmental, Mechanical, Electrical and Plumbing.

3.1 Environmental

The School District of Philadelphia (SDP) Office of Environmental Management & Services (OEMS) developed the Scope of Work (SOW) for remediation services where applicable. Work will involve removal and proper disposal of asbestos materials prior to any removal, repair and/or construction of piping, insulation, and/or any miscellaneous equipment and materials. Environmental scope of work will also include abatement required for other work described hereinafter.

3.2 Mechanical

A. Automatic Temperature Control(s) (ATC) System

The SOW listed below encompasses the demolition, removal and replacement of the original Classroom Radiators and all associated ancillary valves, piping and controls, located throughout the school.

1. Demolition shall consist of, but not limited to, the following:

- a. Removal of approximately 32 classroom UV's from the classrooms.
- b. Removal of a compressor unit and all pneumatic controls.
- c. Removal of one Air Handling Unit (AHU), located on the roof, servicing the Auditorium.
- d. Removal of one AHU located on the roof, servicing the Gymnasium.
- e. Removal of two AHU's located on the roof that service the Main office and common area(s).
- f. Removal of approximately 15 Unit heaters throughout the school.
- g. Removal of (all) approximately 1500 L.F. of 4" diameter steel piping, valves and insulation located throughout the school.
- h. Removal of (all) approximately 1700 L.F. of 6" diameter steel piping, valves and insulation throughout the school.
- i. Removal of all control wiring and conduit associated with each Unit Ventilator and Unit Heater located in the classrooms, hallways and stairwells.
- j. Removal of all miscellaneous piping and control valves for each UV and UH located throughout the school.
- k. Removal of all convector heaters in the boys and girls bathrooms.

2. Installation shall consist of, but not limited to, the following SOW

- a. Furnish and install approximately 32 new (UV's) and new control valves with electric thermostats in school building classrooms and common areas. The EOR shall confirm the existing UV quantities and capacities in each classroom, hallway and stairwell. Calculations shall be performed on all units to confirm flow rates and heating capacity of each unit.
- b. Furnish and install approximately 4 new Air Handling Units for the Auditorium, Gymnasium, Main Office and Common Area. The EOR shall provide calculations for each unit in accordance with the new 2018 IBC, IECC and IMC codes and the ASHRAE 62.15 IAQ Standard.

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- c. Design approximately 1500 LF of 4" diameter steel/copper water lines throughout the school classrooms, hallways and plenum area(s).
- d. Design approximately 1700 LF of 6" diameter steel/copper water lines throughout the boiler room and crawl space areas.
- e. Design approximately 1200 L.F. of Pex "A" for the branch piping from the main lines to each unit ventilator.
- f. Furnish and install a new DDC system to control all new equipment. A BacNet communications protocol network shall be specified as the Building Management System (BMS) communications software for design purposes.

3.3 Electrical

A. Electrical Service

Furnish and install all new disconnect switches and miscellaneous wiring to each branch panel for the new unit ventilators. The EOR shall confirm wiring replacement to each hot water UV.

All new replaced mechanical equipment listed in the above SOW shall be properly re-wired to coincide with the correct voltage, amperage and frequency and grounded per the local NEC requirements.

Each classroom shall have a thermostat sensor built within the Unit Ventilator for DDC control to the heating and cooling within each classroom and common area.

4.0 Project Cost Estimate

A cost estimate for Major Renovations at John F Hartranft Elementary School is based on the Scope of Work (SOW) described in the aforementioned sections and developed by the Philadelphia BOE estimating department. As-built drawings circa 1967 were used for the development of this SDR and the mechanical and electrical quantity take-offs to estimate the cost to fund this Capital Project. See the attached SDP Construction Estimate of Probable Cost for a detailed line item breakdown.

Cost Estimate Breakdown for Major Renovation

TOTAL	\$ 5,100,000
(Construction Budget)	

Photographs



Photo #1 – New Webster Boiler No.3 installed @ 2010 Located in the Boiler Room.

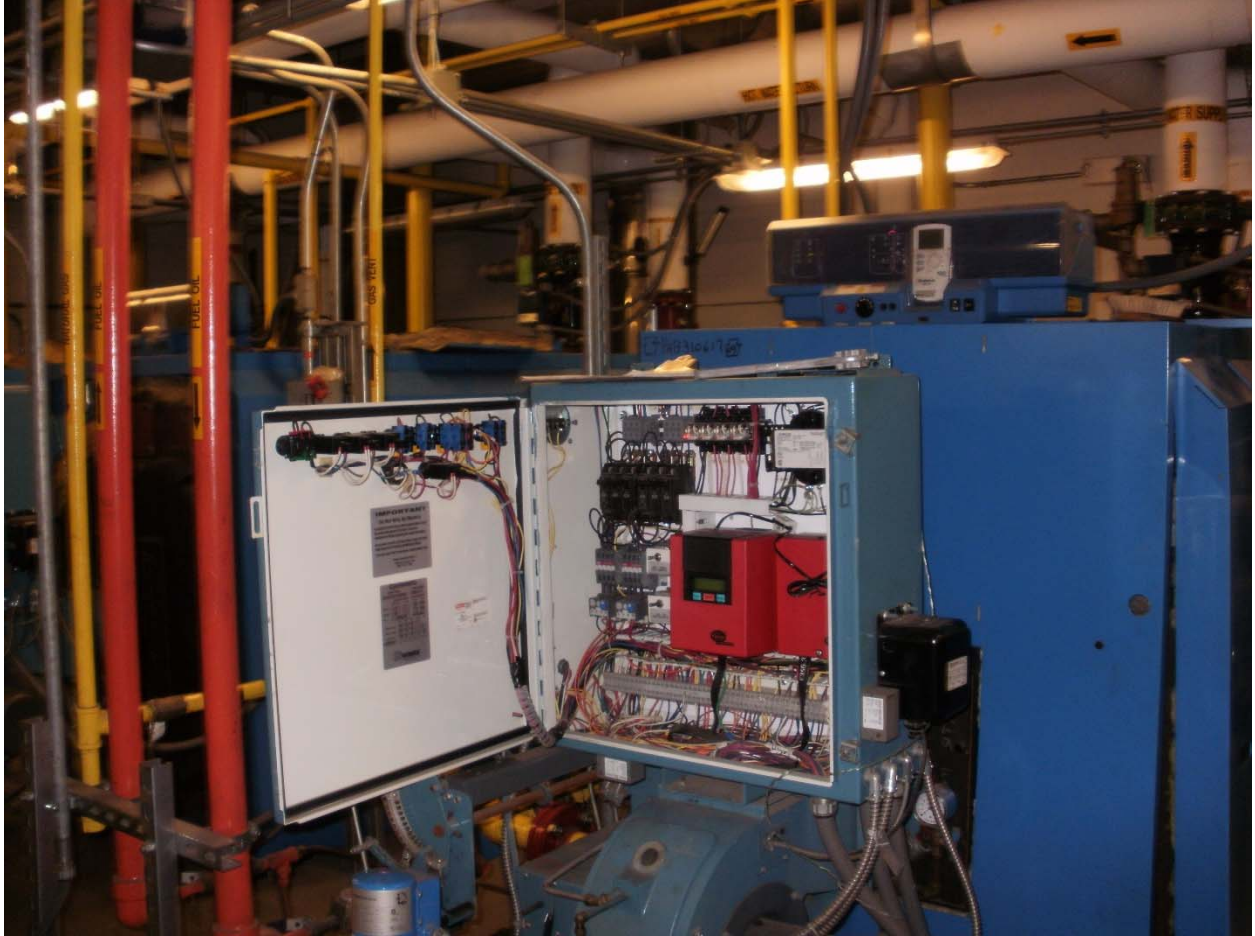


Photo No. 2 – New Webster Boiler No.2 installed @ 2010 located in the Boiler Room



Photo No. 3 - Typical Classroom Unit Ventilator.



Photo No. 4 – Typical Classroom Unit Ventilator.



Photo No. 5 – Atypical Classroom Unit Ventilator Coil, Filter and Fan Assembly.



Photo No. 6 – The 3 Boilers in the Basement Boiler Room