Memorandum

TO: Mr. Lawence Threadgill – Universal Companies

FROM: Robert Gould, PE - Pennoni

DATE: September 8, 2026

SUBJECT: **Universal Audenried Charter High School – HVAC Upgrade Summary**

Mr. Threadgill –

As requested, the memorandum below provides the background to our engagement and action taken with regards to the HVAC system at Universal Audenried Charter High School located at 3301 Tasker ave, in Philadelphia PA. Universal Companies has engaged Pennoni to develop bid documents for the replacement of the HVAC systems.

1. **April 2025:** Pennoni releases report to Universal Companies assessing the age and condition of the existing mechanical equipment.
2. **September – October 2025:** Pennoni engages Fisher Balancing to perform testing on the existing rooftop air conditioning units (RTUs). A supplemental memo is issued identifying Fishers findings and reinforcing recommendations for RTU replacement.
3. **January – July 2026:** Pennoni develops and releases Bid Documents which include the following scope.

    a. Replace existing Rooftop Air Handling Units.
    b. Provide new DDC controls for the following HVAC systems:

        i. Boiler System and Associated Pumps
        ii. Rooftop Air Handling Units
        iii. Exhaust Fans
        iv. Fan Powered VAV Boxes
        v. Gym Humidifiers

    c. Provide electrical power connections to new RTUs.
    d. Provide electrical power to DDC control components.
    e. Provide fire alarm interface to new DDC controls and RTUs.
    f. Provide Pre-Demolition Air Balancing of RTUs. Provide Enhanced Pre-Demolition Balancing Of RTU-1A, 1B, 3 and 5. *Note that pre-demolition balancing of RTU_3, 5, 1a and 1b has been moved forward in the August 2026 efforts*
    g. Provide Pre-Demolition Balancing for all exhaust fans.
    h. Provide Allowance For structural reinforcing for the following RTUs.

        i. RTU-2
        ii. RTU-3
        iii. RTU-4
        iv. RTU-5
        v. RTU-7
        vi. RTU-8

4. **July 2026:** Bids were solicited of Dolan Mechanical, Falasca Mechanical, and Elliot Lewis. Only Elliot Lewis submitted RFIs as a Mechanical Contractor. We also received RFIS from Radius Controls as a subcontractor. Only Elliot Lewis submitted. Elliot Lewis's bid is enclosed in the link below.
5. **August 2026:** Fisher Balancing is reengaged to perform deeper investigation into RTU performance to determine. While we are still reviewing the updated balance report, Fisher did identify additional issues on RTU-1A and 1B which Elliot Lewis has since been engaged to address.
6. **August 2026:** Elliot Lewis is engaged to make the repairs to RTU-1A and RTU-1B in attempt to restire the units to working order.

Supporting Documents for iterations of the effort can be found at the link below:

2026-09-08 AUDENRIED SUPPORTING DOCUMENTS

Please let us know if you have any further questions.

PENNONI ASSOCIATES INC

Robert H. Gould, PE

Audenried Charter High School
HVAC System Assessment Report
3301 Tasker Street, Philadelphia, PA 19145

Submitted To:

Universal Companies
Attn to: Tamelia Hinson-Threadgill, COO / Property Manager
800 S. 15th Street
Philadelphia, PA 19146

April 4, 2025

Enerel Munkhzul, Robert H, Gould, PE
MEP Division Manager, Senior Mechanical Engineer

Pennoni

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EXECUTIVE SUMMARY

Pennoni provided assessment of the HVAC system at Audenried Charter High School, located at 3301 Tasker Street in Philadelphia, PA, to evaluate its performance, condition, and ability to provide heating, cooling, and ventilation for the building. The building is approximately 211,515 square feet and serves around 1,100 students in grades 9 through 12. The system includes boilers, rooftop HVAC units, fan-powered terminal units, a Building Automation System (BAS), and exhaust fan systems and were installed in 2008.

The heating system utilizes two (2) Smith Mills 3500A gas-fired cast iron boilers to provide hot water circulated to heating coils within fan-powered terminal units throughout the building. Cooling is primarily achieved through twelve (12) Trane rooftop HVAC units, which include both Variable Air Volume (VAV) and constant volume systems equipped with energy-efficient accessories. Additional cooling for IT rooms is provided by ductless split systems with roof-mounted condensing units.

The HVAC system also includes exhaust fan systems for the shop, kitchen, and auditorium. The building's HVAC systems are integrated and monitored via a building management system (BMS) by Niagara Controls.

The evaluation confirms that the existing HVAC system is adequately sized to meet the building's heating, cooling, and ventilation demands. However, most of the major equipment is approaching the end of its expected service life. The estimated cost to replace all twelve (12) rooftop HVAC units, along with a portion of the fan-powered VAVs and a controls upgrade, is approximately $5.5 million, inclusive of materials and labor.

Our recommendations include conducting testing and balancing of the existing ductwork distribution and developing a phased replacement plan for aging equipment. This report presents the findings, cost estimates, and recommended actions to sustain and enhance the HVAC system at Audenried Charter High School.

INTRODUCTION

Scope of Work

This Scope of Work outlined the assessment of existing HVAC systems at Audenried Charter High School to evaluate performance, condition, and adequacy concerning standards, energy efficiency, indoor air quality, and occupant comfort.

The assessment was based on a review of record drawings, architectural plans, mechanical plans, HVAC equipment schedules, and maintenance logs to gain a thorough understanding of the existing systems. No stakeholder meetings or detailed site investigations were conducted as part of this assessment.

System capacity and performance were evaluated in relation to the building's heating, cooling, and ventilation needs. This included reviewing zoning, control strategies, and sequences of operation. Where applicable, testing and measurements were performed to verify airflow rates, temperature control, humidity control, and system pressures. Findings were compared against design specifications and industry standards.

The findings were analyzed to identify deficiencies, inefficiencies, and areas requiring improvement. Recommendations for repairs, upgrades, replacements, or modifications were provided to enhance system performance, energy efficiency, and occupant comfort. Potential improvements to the Building Automation System (BAS) were also suggested.

EXISTING CONDITIONS

Building Description

Audenried Charter High School is a three-story, 211,515 square-foot educational facility located at 3301 Tasker Street, Philadelphia, PA 19145. The building was constructed in 2008 and serves approximately 1,107 students in grades 9 through 12.

The facility features various classrooms, laboratories, libraries, administrative spaces, gymnasiums, an auditorium, and specialized vocational areas such as the Culinary School, Electricity Academy, and Automotive Shop. Other specialized

spaces include science labs, computer labs, music labs, a body shop, and ceramic labs with kilns. Additionally, the school houses the Arts, Entertainment and Communications Academy, and the Culinary Human Services Academy.

System Description - HVAC

The HVAC system at Audenried Charter High School is designed to provide efficient heating, cooling, and ventilation to meet the needs of a modern educational facility. The system comprises several components, including heating, cooling, ventilation, humidification, and smoke control systems, all integrated through a digital building automation system for optimal performance. The building's HVAC systems include hot water boilers, rooftop HVAC units, fan-powered terminal units, and a Building Automation System (BAS) by Niagara Controls. The HVAC systems were part of the original construction and remain largely unmodified since installation.

Heating System

The primary heating system at Audenried Charter High School consists of two (2) Smith Mills 3500A cast iron boilers located in the mechanical room. These boilers provide hot water to heating coils installed in fan-powered terminal units, unit heaters, and cabinets unit heaters to provide primary heating throughout the building. The boiler system uses primary and secondary loop system and associated pumping systems as listed below.

Additionally, twelve (12) packaged rooftop units equipped with gas heating coils are used for pre-heating to supplement the primary heating system. Refer to the Cooling System section for details of these rooftop units.

Unit	Service	Capacity
Boiler B-1	Fan-Powered Terminal Units, UHs, CUHs	2,668-MBH (input) / 2,103-MBH (output)
Boiler B-2	Fan-Powered Terminal Units, UHs, CUHs	2,668-MBH (input) / 2,103-MBH (output)
Boiler Pump P-1	Boiler Primary Loop	270 GPM @ 35 FTHD
Boiler Pump P-2	Boiler Primary Loop	270 GPM @ 35 FTHD
System Pump P-3	System	270 GPM @ 120 FTHD
System Pump P-4	System	270 GPM @ 120 FTHD

Cooling System

The building primary cooling and ventilation system consists of twelve (12) single and multi-zone Trane Intellipak packaged rooftop units with DX cooling coils and modulating gas-fired heating coils. Additional rooftop unit features include energy recovery wheels and enthalpy-controlled economizer for RTU-1 through RTU-7. RTU-6 and RTU-7 serving the gymnasiums are also provided with hot gas reheat for de-humidification.

Dedicated cooling is provided to Electrical and IT Rooms via Daikin ductless split system with a single condensing unit located on the roof.

Unit Tag	Service	Nominal Cooling	Gas Input
RTU-1A	Classrooms Part A	130 TR	1,000 MBH
RTU-1B	Classrooms Part B	130 TR	1,000 MBH
RTU-2	Auditorium Part C	75 TR	850 MBH
RTU-3	Restaurant, 1st and 2nd Floor Classrooms	75 TR	500 MBH

Unit Tag	Service	Nominal Cooling	Gas Input
RTU-4	Cafeteria	75 TR	850 MBH
RTU-5	1st Floor Music, PE Office, Store, and 2nd Floor Classrooms Part D	75 TR	850 MBH
RTU-6	Gymnasium	75 TR	850 MBH
RTU-7	2nd Level Gym	50 TR	350 MBH
RTU-8	Deisel Academy	n/a	1,200 MBH
RTU-9	Food Lab	40 TR	1,393 MBH
RTU-10	Kitchen MUA	30 TR	796 MBH
RTU-11	Academy Classroom & MUA	n/a	300 MBH
AC-1	Transformer Vault	20 TR	n/a

Ventilation System

The ventilation system is designed to maintain indoor air quality throughout the building. Approximately forty fan-powered terminal units with hot water coils are utilized to provide zoning control. Air distribution is achieved via sheet metal ductwork connected to ceiling diffusers, sidewall grills, and exposed spiral ductwork where necessary.

Special ventilation is provided in the diesel shop through an overhead carbon monoxide exhaust system with flexible hoses designed to capture engine exhaust effectively. Additionally, there are gravity smoke relief vents installed on the roof above the auditorium to facilitate smoke removal during emergency situations.

Humidification System

Two gas-fired humidification systems are installed on the roof to provide adequate humidification where required. This feature is particularly important for maintaining comfortable indoor air quality during colder months when indoor air tends to be dry.

Kitchen Ventilation

The building houses two kitchens: the main kitchen and the culinary school kitchen. The main kitchen features four hoods, two of which are equipped with fire suppression systems. The culinary school kitchen has three hoods installed over cooking equipment and one above the dishwasher, with one hood having a fire suppression system. Make-up air is supplied through low-velocity ceiling grills located near the hoods to ensure proper ventilation of cooking areas.

Building Automation System

The HVAC system is managed by a digital building automation system provided by Niagara Controls. This system offers graphic displays for monitoring and control, enhancing the overall efficiency of the HVAC system. Reports indicate that the building automation system is functioning as intended and provides reliable performance.

ANALYSES AND RECOMMENDATIONS

Known Issues:

Equipment Failure – Based on the discussion with the school maintenance team on site, there are known compressor failures in the rooftop units, particularly RTU-7 serving the gymnasium. The unit currently operates at partial capacity with 1-2 compressors out of service.

Space Temperature Issues – We understand there have been issues with maintaining temperature in various spaces recently, particularly in Wing A. Wing A is served by RTU-1A based on the record drawings.

BMS System / Control Issues – The building management system (Niagara Controls) currently experience issue with reading information from space thermostats. We understand this could be due to software upgrade. Further investigation and/or discussion with the controls vendor is recommended to mitigate this issue.

Given an initial review of the Record Documents, it is our opinion the systems, as originally designed should be able to provide sufficient heating and cooling to satisfy the building demands. Other issues that can lead to poor temperature control can also be the following:

1. Changes in system usage/occupancy.
2. Poorly performing outside air dampers; seized outside air dampers.
3. Lack of heat on systems that experience.
4. Systems air or water flows to spaces and terminals no longer as designed. We see this from adjustments being made over the life of the building to address temporary conditions.
5. Out of calibration VAV boxes.
6. Blockages of the water piping, blocked strainers.
7. Losses of DX refrigerant and compressor failures.

We understand that that several of the rooftop units are presently working with at least one failed compressor.

It is our opinion that the system as originally design, is an appropriate system for the building and use, and it can be leveraged to maximize energy savings and performance. To bring system operation back to their original performance and/or adjusted to present day demands, we recommend a 3-step process.

PHASE 1: PERFORM AIR AND WATER BALANCING:

As mentioned above, many factors in the building's ductwork and piping distribution can render a buildings mechanical systems less effective, despite how new or how well performing the pumps and air handling units are. Air and water balancing will create a baseline to identify which systems' lives can be extended, what systems' distribution needs correction, and what equipment requires replacement. This will bring systems back to their original operating conditions and identify leaks in the ductwork or blockages in the system.

PHASE 2: CONTROLS UPGRADES

Control systems can be or improved to provide better control of the building spaces. CO2 monitoring, demand control ventilation and enhanced humidity control sequences can help improve efficiency system operations.

PHASE 3: SYSTEM REPLACEMENT

All equipment reviewed in this assessment except for the boiler system is anticipated to be nearing the end of its useful life (est. 15 – 20 years). IF systems are well-maintained, this lifespan can be extended. The information obtained in Step 1 can be used to inform the school in developing a master plan of how to pace system upgrades and replacements with annual budgets.

Overall, we recommend the school consider the following replacements:

Boiler and Hot Water Pumping System: A condensing boiler system with variable-primary pumping (no boiler circulator pumps) would provide better efficiency and control. The condensing boiler will allow the hot water system to operate at lower supply water temperatures that will allow for better control in milder winters as well as the spring and fall. The lower water temperature will allow the boiler to operate at a higher thermal efficiency which will improve energy efficiency.

Consider replacing the existing boilers with condensing hot water boilers and primary variable hot water pumps at the end of the current boiler system's expected useful life in 5 to 10 years.

Rooftop Units RTU-1A, 1B, 2 thru 7: These units are nearing the end of their useful life. We recommend replacing these units with similar style units and with inverter compressors (improved capacity control) and fan array technology (improved resiliency). Associated fan-powered VAV boxes should be considered for replacement at the same time.

Consider adding destratification fans in the Gymnasiums to counteract stratification of heat in these tall areas.

Rooftop Unit RTU-8 (Deisel Academy): We recommend replacing this unit with similar.

Rooftop Units RTU-9 & 10 (Food Lab & Kitchen): Thes units should be replaced in kind. The kitchen hoods and associated exhaust fans should also be replaced. Consider providing hoods equipped to vary exhaust based on cooking activities.

Rooftop Unit RTU-11: (Science Hood Make-Up): We recommend replacing this unit with similar.

IT Closet Split Systems Unit: The typical lifespan of a split system unit is 15 years. These units should be considered for replacement.

Gas-Fired Humidifiers: This should be explored. These may be able to be eliminated with the introduction of demand control ventilation sequences on Units RTU-1A and RTU-1B.

ENGINEERING ESTIMATE OF CONSTRUCTION COSTS

Phase 1: We estimate approx. $20,000 to perform preliminary testing and balancing of the existing ductwork distribution system. This allows for (1) week of work in the field, TABB reports from the balancer, and our review of the reports with recommendations. If we are able to gain access to your control system, we may be able to make the balancing more targeting by reviewing that data first.

Phase 2: A controls upgrade is estimated to cost approximately $500,000. This is based on the ability to save much of the controls infrastructure but provide upgrade and integration with the replacement of equipment.

Phase 3: System replacement has been reviewed in (3) options:

- Option 1: Complete RTU and VAV replacement is approximately $6.5 million. This scope assumes the majority of ductwork can be saved and reused.
- Option 2: Complete replacement of the RTUs and partial (50%) replacement of the VAVs is approximately $5.5 million. This scope assumes the majority of ductwork can be saved and reused.
- Option 3: Replacement of RTUs only is approximately $4.0 million. This scope assumes the majority of ductwork can be saved and reused.

LIMITATIONS

The HVAC system assessment as described herein represents our professional judgement in accordance with current published standards for property condition assessments. No other warranty is made, either expressed or implied. Our assessment is based on visible features at the time of our survey of the facility. The evaluation of existing HVAC systems requires that certain assumptions be made regarding the existing conditions. Some of these assumptions may not be confirmed without additional effort beyond the scope of this report and / or destroying otherwise or serviceable portions of the systems. Therefore, Pennoni Associates cannot be held responsible for any latent deficiencies which may exist in the systems, but which have not been discovered as a part of the scope of this evaluation.

APPENDICES

APPENDIX A – BOMA Preventative Maintenance Guidebook

APPENDIX B – HVAC System Zone

APPENDIX C – HVAC System Summary Table

Project Number: UNCOM25001
Project Name: Audenried Charter High School – HVAC System Assessment

Appendix A: BOMA Preventative Maintenance Guidebook