Cx Solutions, LLC

Commissioning Report

7815-23 Johnsonville Elementary School Addition/Renovation, Ph. 2
Raleigh, NC

February 22, 2024

Prepared for: Cape Fear A/C & Heating Co.
1139 Robeson St.
Fayetteville, NC 28305

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Lavonia, GA 30553
Office (706) 244-0383
info@cxsolutions.us

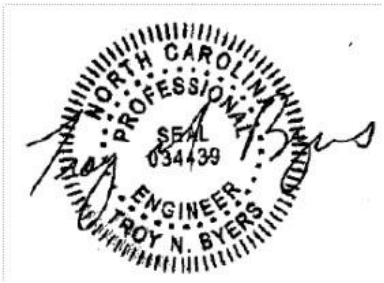
Table of Contents

Certification Statement

The Commissioning services provided on this project have followed the American Society of Heating, Refrigerating and Air Conditioning Engineers' (ASHRAE) Building Commissioning Guideline 0-2013. The commissioning process has been overseen by the AET Commissioning Team.

Commissioning services were provided for the building mechanical systems, controls systems, electrical systems, and other related building environmental systems. The specific commissioning process was comprised of a project review, periodic commissioning meetings, field inspections, TAB performance verification and mechanical functional performance testing. All findings were documented via independent inspection reports, tabulated test data reports, complete with photographic evidence of observed deficiencies and other miscellaneous issues. All information obtained throughout this process has been tabulated and compiled and is included with this final commissioning report.

All recommendations and the analysis of all findings summarized in this report are the opinions of the AET Commissioning Team. The analysis and recommendations are based upon the evidence compiled from the commissioning team. The test results and supporting documentation certify that the performance of the systems and equipment was satisfactory at the time of testing and verification. The results do not imply any future performance of equipment or systems. The Commissioning Team acknowledges the documentation included in this report, based on the data collected, is true and correct within the limits of field test error, and that the proposed recommendations are comprehensive in nature.



Troy N. Byers, PE, CxA
Cx Solutions, LLC

Executive Summary

The intent of this project was to construct a new single story 17,405 SF building and connecting corridors. All HVAC systems are operational and functioning and have been final inspected and accepted.

Cx Solutions was contracted to provide commissioning services for the heating ventilation units and exhaust fans. The final Commissioning Report documents the efforts and contains all the information generated by the Commissioning Team during the course of the project. The structure of the report organizes the documentation to include all phases of the project; construction, acceptance and warranty. This will provide an effective, ongoing system management tool for the building operations team.

The overall goals and commissioning scope of work were conducted as described in the Final Commissioning Plan included in this report. Observations were made to verify the installation and operation of all systems was in accordance with the design intent of the final Construction Set of documents. The Project Commissioning Plan has been supplemented and enhanced by the Commissioning Agent (CxA), Construction Manager (CM), and other contractors throughout the construction process to form the Final Commissioning Record, compiled at the end of the project. Throughout the commissioning process, the CxA updated specific commissioning procedures and forms as necessary to suit project field conditions and actual approved manufacturer's equipment. The Commissioning Record provides a reference to system setup and operational data for the systems commissioned. Once complete, the Project Commissioning Record is then re-organized and combined with other project closeout documentation and submitted as the Final Commissioning Report.

After completion of all commissioning activities, the CxA submits the final report documenting the overall results of the commissioning process and recommending acceptance of the commissioning process and related documentation to the owner. The final commissioning report will include an overview or summary of the commissioning process, major results of the process, the final commissioning issues log, commissioning field reports, deferred testing, list of unresolved issues, and concluding with a recommendation to accept the process as complete.

Systems and Equipment Commissioned

Indoor Units – IDU 1-12
Heat Pumps – HP 1-12
DOAS – DOAS-1, DOAS-2
Exhaust Fans – F-1, F-2
Ductless AC Units - AC-1/ODU-1, AC-2/ODU-2
Electric Wall Heater

The system is functioning as designed. The following should be noted for the commissioning record, all systems were functionally tested, and the testing specifics, notes, and issues are included as part of this report. IDU-11 unit had low airflow, the unit was outside of the allowable deviation of airflow. TAB and mechanical contractors used all available methods to increase airflow but couldn't bring the IDU within range. Unit is still above the allowable minimum outside airflow and overall airflow. Engineer of Record (EOR) has accepted this condition and CxA has closed this issue in the issues log attached to this report.

Deferred Testing

The comprehensive verification of off-season testing is recommended as described in the CX Plan. Since most of the equipment was started and tested in the Winter season, the full functionality of the cooling systems was tested but not verified in seasonal conditions. Cooling system test data should be deferred to the Summer season as listed below:

Cx Deficiency Issues

As of the date of this report, all systems are performing as intended and all open deficiency items have been closed.

Conclusion

In general, the commissioning process for this building, based upon the results of this report, is deemed to be successful and will add significant value to the end user's investment. By ensuring the Mechanical and Lighting systems and Controls are fully integrated and effectively and efficiently performing at their optimum status will continue to provide the desired indoor conditions while reducing operating and maintenance costs.

> *The CxA recommends that the Commissioning process for this project is to be accepted as complete. See certification statement.*

Final Commissioning Record – Attachments

1. Commissioning Plan
2. Commissioning Deficiency Issues Tracking Log
   Final CX Deficiency Log
3. Final Test, Adjust And Balance Report (TAB)
   TAB Report
4. Functional Performance Test Documents
   Functional Performance Tests
5. Training Agenda And Record – (GC to provide)
6. O&M Manuals And Warranty Submittal Record – (GC to provide)
7. As-Built Drawing Submittal Record – (GC to provide)

Cx Solutions, LLC

Commissioning Plan

Johnsonville Elementary School Addition-Renovation

December 29, 2023

Prepared for: Todd McAmis
Cape Fear Air, Electric, and Plumbing

Cx Solutions, LLC
Po Box 181
Lavonia, GA 30553
706-886-5719

Table of Contents

Commissioning Plan

The intent of this project is to expand and renovate Johnsonville Elementary 18495 NC-27 Cameron NC. The goal for this construction was to complete the specified renovation in phases, and to the greatest extent possible, with minimal disruption for the staff, occupants, and operations of the Elementary School. Construction scope for the project included following work within the project limits: relocation of equipment was required by the Owner, demolition of specified interior finishes, HVAC, plumbing and electrical systems, the installation of new interior finishes, HVAC, plumbing and electrical services. The project provided the structural support, utilities, and all other requirements needed to support new equipment.

The Project Commissioning Plan has been supplemented and enhanced by the Commissioning Agent (CxA), Construction Manager (CM), and other contractors throughout the construction process to form the Project Commissioning Record at the end of the project. Throughout the commissioning process, the CxA revised the specific commissioning procedures and forms as necessary to suit project field conditions and actual approved manufacturer's equipment, to incorporate test data and procedure results, and to provide detailed scheduling for all commissioning tasks. The completed Commissioning Plan shall become the owner's Commissioning Record and shall provide a reference to system setup, test results, and operational data for the systems commissioned. Once complete and approved, the Project Commissioning Record is then re-organized and combined with other project closeout documentation.

Abbreviations and Definitions

The following are common abbreviations and definitions used in this document and throughout the commissioning process documentation:

A/E	Architect/Design Engineers	**BOD**	Basis of Design
CM	Construction Manager	**Cx**	Commissioning
CxA	Commissioning Agent	**FPT**	Functional Performance Test
GC	General contractor	**OPR**	Owner's Project Requirements
PFC	Pre-Functional Checklists	**PM**	Project Manager

***Acceptance*:** A contractually defined action that permits an activity to commence or continue.
***Basis of Design (BOD)*:** A document that records the concepts, calculations, decisions, and product selections used to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document includes both narrative descriptions and lists of individual items that support the design process.
***Commissioning*:** A quality-focused process for enhancing the delivery of a project. The process focuses on verifying and documenting that the facility and all of its systems and assemblies are planned, designed, installed, tested, operated, and maintained to meet the Owner's Project Requirements.
***Commissioning Agent (CxA)*:** An entity identified by the owner who plans, schedules, and coordinates the commissioning team to implement the Commissioning Process.
***Commissioning Field Report*:** A document that records the activities and results of the Commissioning Process.
***Commissioning Plan*:** A document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process.
***Commissioning Team*:** The individuals who are responsible for implementing the Commissioning Process.

***Construction Documents*:** This includes a wide range of documents, which will vary from project to project, owner's needs, regulations, laws, and countries. Construction documents usually include the project manual (specifications), plans (drawings) and General terms of the contract, especially those required by subcontractors and vendors, suppliers and manufacturers of equipment, assemblies and systems.

***Continuous Commissioning Process*:** A continuation of the Commissioning Process well into the Occupancy and Operations Phase to verify that a project continues to meet current and evolving Owner's Project Requirements. The Continuous Commissioning Process activities are on-going for the life of the facility.

***Contract Documents*:** This includes a wide range of documents, which will vary from project to project, owner's needs, regulations, laws, and countries. It frequently includes price agreements, construction management process, subcontractor agreements or requirements, requirements and procedures for submittals, changes, and other construction requirements, timeline for completion, and the Construction Documents.

***Coordination Drawings*:** Drawings showing the work of all trades to illustrate that equipment can be installed in the space allocated without compromising equipment function or access for maintenance and replacement. These drawings graphically illustrate and dimension manufacturers' recommended maintenance clearances.

Functional Performance Test (FPT): The purpose of a Functional Performance Test is to verify and document compliance with the stated criteria of acceptance. The CxA develops the specific test procedures and associated test forms to verify and document proper operation of each piece of equipment and system. The contractors execute and pass the functional performance tests for all the systems and equipment. The CxA directs and witnesses a sample of functional performance re-testing until he/she is satisfied that the equipment and systems are in accordance with the stated criteria of acceptance.

***Issues Log*:** A formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the Commissioning Team during the course of the Commissioning Process.

***Owner's Project Requirements (OPR)*:** A written document that details the functional requirements of a project and the expectations of how it will be used and operated. This includes project and design goals, measurable performance criteria, budgets, schedules, success criteria, and supporting information.

Pre-Functional checklist: A checklist of items that are to be completed as part of startup & initial checkout, preparatory to functional testing. Each checklist is for a specific piece/type of equipment and multiple contractors may have items on a checklist. Checklists that do not have an equipment tag, number, or other reference for a specific piece of equipment/system can be copied and used multiple times. For example, an occupancy sensor may not have unique number; therefore, multiple copies of the "occupancy sensor" checklist should be used. The checklists do not take the place of the manufacturer's recommended checkout and startup procedures or report.

***Systems Manual*:** A system-focused composite document that includes the Commissioning Record, operation manual, maintenance manual, and additional information of use to the owner during the Occupancy and Operations Phase.

***Training Plan*:** A written document that details the expectations, schedule, budget, and deliverables of Commissioning Process activities related to training of project operating and maintenance personnel, users, and occupants.

***Verification*:** The process by which specific documents, components, equipment, assemblies, systems, and interfaces among systems are confirmed to comply with the criteria described in the Owner's Project Requirements.

Commissioning Process Description

The Commissioning Plan is a document that outlines the organization, schedule, allocation of resources, and documentation requirements of the Commissioning Process. The contractor verifies installation, provides scheduling and coordination of commissioning activities, performs training, starts up equipment, conducts test, corrects deficiencies, performs re-tests, and provides documentation of the process. The CxA provides the owner an unbiased, objective view of the systems installation, documentation, operation, and performance. Commissioning procedures and results are observed by the CxA. The contractor is expected to verify the functional readiness of systems to be tested prior to performing the tests in the presence of the witnesses. A high rate of test failure will indicate that the contractor has not adequately verified the readiness of the systems.

This plan is the key means for the CxA to inform all parties as to how each system functions independently and with respect to other systems. This plan shall be updated regularly and redistributed to the commissioning team for review and comment.

Design Phase

Owners Project Requirements
The OPR, relative to the building systems selected for commissioning, will be documented in order to establish a baseline of performance expectations to which the actual installed performance is compared. The CxA, with the assistance of the PM, CM, Owner, and A/E, discusses the Basis of Design Summary that documents the OPR for those building systems selected for commissioning. The OPR Summary reflects the underlying assumptions and requirements that become represented in the construction documents. The OPR is developed by the owner and Commissioning Team. For this project, the OPR is essentially the Project Statement of Work and its referenced design drawings.

Commissioning Plan
The Commissioning Plan is a living document that outlines the organization, schedule, allocation of resources, and documentation requirements of the commissioning process. Ideally, the initial Commissioning Plan is created during the Pre-Design Phase. However, it may also be developed during the Design Phase, depending on when the Commissioning Team is officially formed. The Commissioning Plan serves as the road map for executing the process during the Construction and Occupancy and Operations Phases. The plan is continuously updated and added to until the end of the project, when it then becomes the Project Commissioning Record.

Basis of Design
The Basis of Design (BOD) is a document that records the concepts, calculations, decisions, and product selections used in the design to meet the Owner's Project Requirements and to satisfy applicable regulatory requirements, standards, and guidelines. The document generally includes both narrative descriptions and lists of individual items that support the design process. The BOD is developed by the Architect/Engineer of Record and the Commissioning Team.

Training Requirements

Training requirements are established during the Design Phase and are incorporated into the project specifications for each system that requires training.

Commissioning Issues Log
Also known as deficiency or non-conformance reports, Commissioning Issues provide a record of issues that are discovered through the commissioning process so that they may be tracked and appropriately resolved. The Commissioning Issues Log is a formal and ongoing record of problems or concerns – and their resolution – that have been raised by members of the Commissioning Team during the course of the commissioning process that synopsizes the issues recorded on the Commissioning Issues form. Design review comments are included in the Issues section to track issues raised during the design process separately from the Construction Phase issues. Commissioning Issues forms are completed during the Construction and Occupancy and Operations Phases to track concerns raised during the commissioning process. The Issues Log then synopsizes the issues and provides issue status at-a-glance.

Commissioning Specifications
Commissioning contract documents are developed during the design process and include commissioning specifications and commissioning procedures. Project specifications for commissioning are contained in the following Sections: 01 32 01.00 10 Project Schedule, 01 33 10.05 20 Design Submittal Procedures, 01 78 02.00 Closeout Submittals, and 01 78 23 Operation and Maintenance Data. References are also developed for the technical specification sections to integrate the commissioning process with the project technical requirements. The process is intended to be integrated with the normal construction process and check, test, and start-up activities.

Construction Phase

Commissioning ensures new building systems within our project boundary function per design intent and integrate with existing systems. Commissioning activities in the Construction Phase shall proceed from lower to higher levels of complexity. For each discrete subsystem or system, testing at the lower level shall be completed prior to starting the next higher level of tests. In general, the chronology of testing is as follows:

1. Submittal Review for systems / equipment in the Cx scope of work
2. Start-up and Pre-functional testing
3. Control point-to-point checks
4. Testing, Adjusting, Balancing (TAB)
5. Functional Performance Testing

Submittals
The general contractor will provide the CxA with a set of equipment and system submittals. This equipment data includes installation and start-up procedures, O&M data, performance data and temperature control drawings. The GC shall notify the CxA of any new OPR or operating parameter changes, added control strategies and sequences of operation, or other change orders that may affect commissioned systems

Installation Verification
The CxA will make site visits to witness equipment and system installations, spot checking completed

Construction Checklists submitted by the contractors. Each site visit will have a specific agenda and will be coordinated with the general contractor site supervisor. The GC provides the CxA with information regarding substitutions or change orders that may affect commissioned equipment or the commissioning schedule.

Pre-Functional Checklists

Pre-Functional Checklists are important to ensure that the equipment and systems are connected and operational and that the systems are ready for functional performance testing without unnecessary delays. Each piece of equipment receives full checkout by the contractor. No sampling strategies are used. The contractor will complete Pre-Functional Checklists for all equipment and systems prior to functional performance testing of equipment or subsystems of the given system. These checklists will be verified by the CxA. The Pre-Functional Checklists are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil level verification, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some Pre-Functional Checklist items entail simple testing of the function of a component, a piece of equipment or system which will be combined with the manufacturer's start-up checklist. The table below lists the Pre-Functional Checklists that will be provided for this project. Additional checklists will be added as necessary as the project progresses.

Table 1: List of Pre-Functional Checklists

Item	Quantity	Date Form was Provided to GC	Date Form was Completed
DOAS	2	July 18 2023	-
Heat Pumps (Outdoor Unit)	12	July 18 2023	-
IDU	12	July 18 2023	-
Exhaust Fans	2	July 18 2023	-
Ductless AC Condensing Unit / Indoor	2	July 18 2023	-
Electric Wall heaters	1	July 18 2023	-

Pre-Requisites for Functional Performance Testing

The following applicable prerequisite checklist items are to be completed and checked off by the GC, sub-contractors and CxA prior to functional performance testing.

1. All related equipment has been started up and start-up reports have been submitted and approved by the CxA and A/E.
2. Pre-Functional Checklists for items within the project scope have been completed by contractor.
3. Piping system flushing has been completed for systems within in contract areas that are within the scope of the project, and any required reports are approved.
4. Water treatment systems in the project scope are complete and operational.
5. Testing, Adjusting, and Balancing (TAB) complete and approved for the hydronic and air systems.
6. All control system functions for this and all interlocking systems are programmed and operable per contract documents, including final set-points and schedules with debugging, loop tuning, and sensor calibrations completed.
7. Safeties and operating ranges reviewed by Building Operating Staff.

8. Final sequences of operation confirmed, documented, and submitted to the Owner, CxA and Building Operating Staff.
9. Schedules and set-points established with owner, configured, and given to CxA.
10. Sufficient clearance around equipment for access during testing and for future servicing.
11. All A/E punch list items for this equipment corrected.
12. Certificate of Readiness certifying that the systems are ready for Functional Performance Testing has been submitted and approved.

Functional Performance Testing

Functional Performance Testing is the dynamic testing of systems (rather than just components) under full operation. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc. The systems are run through all of the control system's sequences of operation and components are verified to be responding as the sequences state. The CxA develops the Test Procedures in a sequential written form and tests and documents the actual performance. The end goals of the functional performance testing during the construction of this project are to:

- Ensure that applicable equipment and systems are installed properly and receive adequate operational checkout by installing contractors.
- Verify and document proper performance of equipment and systems.
- Verify and document that systems and assemblies perform according to the OPR.
- Utilize quality-based sampling techniques to detect systemic problems.
- Verify proper coordination among systems and assemblies.
- Verify emergency power system interoperability.

The table below lists the Functional Performance Tests that will be provided for this project. Additional Test Procedures will be added as necessary.

Table 2: List of Functional Performance Tests

Item	Quantity	Date Form was Provided to GC	Date Form was Completed
DOAS	2	July 18 2023	12/13/2023
Heat Pumps (Outdoor Unit)	12	July 18 2023	11/10/23
IDU	12	July 18 2023	11/10/23
Exhaust Fans	2	July 18 2023	11/10/23
Ductless AC Condensing Unit / Indoor	2	July 18 2023	11/10/23
Electric Wall heaters	1	July 18 2023	11/10/23

Functional testing and verification may be achieved by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data loggers. The CxA will follow the specifications and use judgment where needed to determine which method is most appropriate.

For any given system/equipment, the CxA will wait until the GC and subcontractors provide a signed Certificate of Readiness that the system/equipment is ready for functional testing. The GC and subcontractors confirm that the functional performance tests have been passed. The GC will notify the

CxA that the systems/equipment can be functionally tested again in the presence of the CxA. The contractors perform the testing and the CxA oversees, witnesses, and documents the functional testing of all equipment and systems according to the Specifications and the OPR. The CxA will use sampling of the systems as appropriate. The control system is tested before it is used to verify performance of other components or systems. The air balancing and water balancing is completed and debugged before functional testing of air-related or water-related equipment or systems. Testing proceeds from components to subsystems to systems and finally to interlocks and connections between systems.

Occupancy and Operations Phase

Commissioning Issues and Retesting

The CxA records the results of the functional testing on the procedure or test form. All deficiencies identified during the verification testing are documented on an issue list standard form and reported to the owner. The deficiency report includes all details of the components or systems found to be non-compliant with the parameters of the test plans. The report details the adjustments or alterations required to correct system operation, at which time owner will identify the responsible party.

Corrections of minor deficiencies identified may be made during the tests at the discretion of the CxA with the concurrence of the owner. In such cases the deficiency and resolution will be documented on the procedure form. Every effort will be made to expedite the testing process and minimize unnecessary delays, while not compromising the integrity of the procedures.

For identified deficiencies:

If there is no dispute on the deficiency and the responsibility to correct it:

The CxA documents the deficiency and the adjustments or alterations required to correct it. The contractor corrects the deficiency and notifies the CxA that the equipment is ready to be retested. The CxA reschedules the test, and the test is repeated.

If there is a dispute about a deficiency or who is responsible:

The deficiency is documented on the issues form and a copy given the GC/PM. Resolutions are made at the lowest management level possible. Final interpretive authority is with the CM/Owner and the A/E. The CxA documents the resolution process.

Once the interpretation and resolution have been decided, the appropriate party corrects the deficiency and notifies the CxA that the equipment is ready to be retested. The CxA reschedules the test and the test is repeated until satisfactory performance is achieved.

Deferred Testing

Unforeseen Deferred Tests: If any test cannot be completed due to the building structure, required occupancy condition, or other deficiency, the functional testing may be delayed upon

approval of the owner. These tests are conducted in the same manner as the seasonal tests as soon as possible.

Seasonal Testing: Seasonal variation in operations or control strategies will be verified by manual testing (persons manipulate the equipment and observe performance) or by monitoring the performance and analyzing the results using the control system's trend log capabilities or by stand-alone data

Sampling: At the discretion of the CxA, multiple identical pieces of non-life-safety or otherwise non-critical equipment may be functionally tested using a sampling strategy. The sampling rate for identical items is 10%.

Final Commissioning Report

All commissioning activities have been completed. A final report documenting the overall results of the commissioning process and recommended acceptance of the commissioning process and related documentation are included in this packet. The final commissioning report includes an overview or summary of the commissioning process, major results of the process, the final commissioning issues log and resolutions, commissioning progress and field reports, a deferred testing recommendation, and concluding with a recommendation to accept the process as complete.

Appendix B – Commissioning Team Contact Information

PROJECT: Johnsonville Elementary School					
AGENCY	**NAME**	**OFFICE**	**ROLE/ POSITION**	**E-MAIL**	**PHONE**
GC	Todd McAmis	Cape Fear Air, Electrical & Plumbing	Commercial HVAC Project Manager	todd.mcamis@capefearair.com	910-930-8032
GC					
A/E					
A/E					
MC					
MC					
MC					
EC					
TAB	Rob Stanley	Addison Energy Technologies, LLC	TAB	rstanley@addisonet.com	910-545-2430
MR					
GNG					
CXA	Mark Rogers	Cx Solutions, LLC	CxA	mrogers@cxsolutions.us	803-288-1954

Appendix D – Systems to Be Commissioned

The following systems and equipment were commissioned:

Item	Quantity
DOAS	2
Heat Pumps	12
IDU	12
Exhaust Fans	2
Ductless AC Units	2
Electric Wall heaters	1

Appendix E – Functional Performance Tests

Functional Performance Tests are merged to the end of this document.

Cx Solutions, LLC

7815-23 Johnsonville Elementary School Addition/Renovation, Ph. 2 Commissioning Issue Log

Report Date

Issue ID	Issue Date	Reported By	Issue Title	Issue Description	Location	Unit ID	Responsible Trade	Resolution	Resolved By	Date Completed	Status
1	11/10/23	Mark Rogers	Dehumidification On	DOAS dehumidification not BAS, unable to view this process or edit the setpoint.	Mechanical Space	DOAS-1	Mech	Verified remotely on 12/13/23	MR	12/13/23	Closed
2	11/11/23	Mark Rogers	Dehumidification On	DOAS dehumidification not BAS, unable to view this process or edit the setpoint.	Mechanical Space	DOAS-2	Mech	Verified remotely on 12/13/23	MR	12/13/23	Closed
3	11/11/23	Mark Rogers	Airflow	Low airflow: unit is outside allowable deviation of airflow.TAB and mechanical contractors used all available methods to increase airflow but could not bring the IDU within range. Unit is still above allowable minimum outside airflow and overall airflow	Mechanical Space	IDU	Mech	EOR accepted IDU low on airflow	EOR, TM, MR	12/13/23	Closed
4	11/10/23	Mark Rogers	Unit State	Unit was down for repairs, unable to test	Telecom Rm	AC-1	Mech	Units were repaired and are in working condition.	TM	12/13/23	Closed
5	11/10/23	Mark Rogers	Unit State	Unit was down for repairs, unable to test	Telecom Rm	AC-2	Mech	Units were repaired and are in working condition.	TM	12/13/23	Closed
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7815-23-B

Cape Fear Air, Electric, & Plumbing

B Johnsonville Elementary School
Addition Renovation, Ph 2

Cameron, NC

Addison Energy Technologies, LLC
45 Cannon Road
Toccoa, GA

November 20, 2023

TABLE OF CONTENTS

CERTIFICATION

TEST, ADJUST, AND BALANCE REPORT

Project: **Johnsonville Elementary School Addition-Renovation, Ph 2**
Location: **Cameron, NC**

Declaration:
THE DATA PRESENTED IN THIS REPORT IS A RECORD OF SYSTEM MEASUREMENTS AND FINAL ADJUSTMENTS THAT HAVE BEEN OBTAINED IN ACCORDANCE WITH THE CURRENT EDITION OF THE AABC NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE. ANY VARIANCES FROM DESIGN QUANTITIES, WHICH EXCEED AABC TOLERANCES, ARE NOTED IN THE TEST-ADJUST-BALANCE REPORT PROJECT SUMMARY.

Contractor: **Cape Fear Air, Electric, & Plumbing**
Engineer: **Optima Engineeering, PA**
Architect: **A Architects, PA**

AABC Certified TAB Firm Name: **Addison Energy Technologies, LLC**
45 Cannon Road
Toccoa, GA 30577
Phone: **(706) 886-5719**
Fax: **(706) 297-0156**

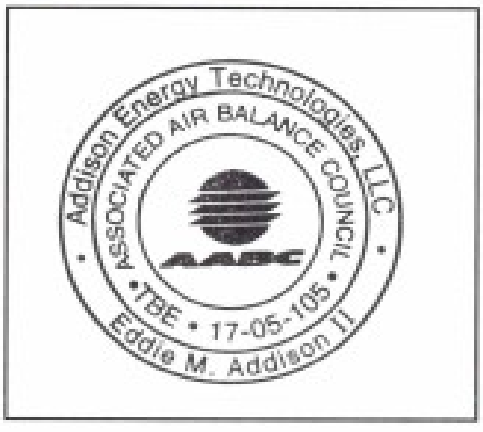
TBE # **17-05-105**

Certification Expiration Date: **12/31/2023**

Report Date: **November 20, 2023**

AABC Qualified TAB Supervisor Name: **Eddie M. Addison II**

AABC Qualified TAB Supervisor Signature:



Report prepared by: Deana Bell

AABC National Performance Guaranty

Pursuant to the agreement between

Addison Energy Technologies, LLC

AABC Certified Testing & Balancing Agency

and Cape Fear Air, Electric, & Plumbing

Client

All systems shall be tested and balanced in accordance with the project plans and specifications and to the optimum performance capabilities of the equipment. Testing and balancing shall be done in accordance with the standards published by the Associated Air Balance Council.

If the Agency listed above fails to comply with the specifications for any reason other than termination of business by the AABC agency or equipment malfunction or inadequacy which prevents proper balancing of the systems, AABC will investigate and, if warranted, will provide supervisory personnel to assist the member Agency to perform work in accordance with AABC Standards. This supervision will be provided at no additional cost to the building owner.

This Guaranty is valid for one year from the date of submission of a test and balance report, provided the Agency is a current member of AABC, and may only be invoked in writing by the building owner, architect, or engineer of record. The Guaranty is limited to the terms and conditions as stated herein.

Project Name Johnsonville Elementary School Addition-Renovation, Ph 2

Address 18495 NC-27

Cameron, NC 28326

Name of Engineer Thomas A. Landen

Engineering Firm Optima Engineeering, PA

Email Address -

Address 150 Fayetteville Street, Suite 520

Raleigh, NC 27601

Date 11/20/2023

TBE # 17-05-105

By Eddie M. Addison II

AABC Certified TBE

AABC

Associated Air Balance Council

1518 K Street, N.W.
Washington, D.C. 20005
202-737-0202 • Fax 202-638-4833
info@aabc.com • www.aabc.com

INSTRUMENT CALIBRATION REPORT

INSTRUMENT	APPLICATION	SERIAL NO.	CALIBRATION TEST DATE
Cooper SH66A-E Temperature Meter; w/ Probes	Water / Temperature Meter	061011054-SH66	4/27/2023
Amprobe / Digital Psychrometer	Dry Bulb / Wet Bulb & Relative Humidity Dew Point	100202417	4/27/2023
PLT-200 Laser Tachometer	RPM	1847198	5/1/2023
Amprobe AC75B	Volts-Amps	09070083	5/3/2023
Shortridge ADM-860C Airdata Multimeter	Air Volume	M12446	3/28/2023
Shortridge ADM-860C Airdata Multimeter	Air Volume	M11507	3/21/2023
Shortridge HDM-250 Hydrodata Multimeter	Hydronics	W14137	2/22/2023
Shortridge HDM-250 Hydrodata Multimeter	Hydronics	W13014	4/20/2023
Quest SP-DL-2-1/3 Soundpro DL Type 2	Sound Volume	BIP060009	6/1/2023
3M AC-300 Calibrator	Sound Volume	AC300005054	6/1/2023
Rotating Vane Anemometer RVA801	Air Volume	A05049	2/6/2023

Note: Not all instruments may be used for this project.

EVERGREEN TELEMETRY

May 27, 2020

Eddie Addison Jr.

Dear Eddie,

This is to confirm that capture hoods manufactured by Evergreen Telemetry are used with a Wrist Reporter to display airflow measurements that are accurate within the specified tolerance. All capture hoods are checked at the factory against a NIST-traceable standard, and a Calibration Certificate is issued. The airflow measurements are correct as displayed, and do not require any further adjustments or factoring by field technicians.

Regards,

Pete Secor
Owner / Manager
602.574.6192

ABBREVIATIONS

#	Number
%	Percentage
Δ	Delta or Difference
˚F	Degrees Fahrenheit
APD	Air Pressure Drop
BHP	Brake Horsepower
CFH	Cubic Feet per Hour
CFM	Cubic Feet per Minute
CHW	Chilled Water
Cv	Coefficient of Velocity
dB	Decibels
DB	Dry Bulb
DIA	Diameter
DIFF	Differential
(E)	Existing
EFF	Efficiency
ENT	Entering
EOF / E.O.F.	Eye Of Fan
FL	Full Load
FPM	Feet per Minute
FT	Feet
GPM	Gallons per Minute
HP	Horsepower
HW	Hot Water / Heating Water
HZ	Hertz
IMP	Impeller
IN	Inches
KW	Kilowatts
LVG	Leaving
MAX	Maximum
MIN	Minimum
MVD	Manual Volume Damper
N/A	Not Applicable
NA	Not Accessible
NIS	Not In Scope
NPSH	Net Positive Suction Head
OBD	Opposed Blade Damper
OD / O.D.	Outside Diameter
OSA	Outside Air
P	Pressure
PF	Power Factor
PSI	Pounds per Square Inch
QTY	Quantity
R.L.A.	Running Load Amps
REQ	Required
RPM	Revolutions Per Minute
SEC	Section
SF	Service Factor
SQFT	Square Feet
TEMP	Temperature
W	Watts
WB	Wet Bulb
W.C. / WC	Water Column
W.G. / WG	Water Gauge

PROJECT SUMMARY

JOB NAME: JOHNSONVILLE ELEMENTARY SCHOOL ADDITION RENOVATIN, PH 2
LOCATION: CAMERON, NC

THE DATA PRESENTED IN THIS REPORT IS A RECORD OF SYSTEM MEASUREMENTS AND FINAL ADJUSTMENTS THAT HAVE BEEN OBTAINED IN ACCORDANCE WITH THE CURRENT EDITION OF AABC'S **NATIONAL STANDARDS FOR TOTAL SYSTEM BALANCE.** ANY VARIANCES FROM DESIGN QUANTITIES, WHICH EXCEED AABC'S TOLERANCES, ARE NOTED ON THIS PROJECT SUMMARY.

IDU 11 DIRECT DRIVE UNIT RUNNING 88% ON HIGHEST SPEED SETTING.

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** DOAS-1

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	IDU-1 - IDU-6
MANUFACTURER	AAON
MODEL NUMBER	V3-BRB-3-0-162C-5T4
SERIAL NUMBER	202208-CJEB07740
FILTERS	1) 24x24x4

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1400	1397
TOTAL OUTLET CFM	1390	1388
RETURN CFM	0	0
OSA CFM	1400	1397
TOTAL STATIC PRESSURE	-	0.49
EXTERNAL STATIC P	1.00	0.09
EYE OF FAN	-	-0.45
SUCTION PRESSURE	-	-0.05
DISCHARGE PRESSURE	-	0.04
DUCT STATIC P SETPOINT	-	

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	-	
HP / BHP	- / -	1.30 / -
PHASE / HZ	3/60	3/60
VOLTAGE	460	500 / 499 / 501
AMPS	1.60	.4 / .5 / .4
MOTOR RPM	2580	VARRIABLE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	-	
SERIAL NUMBER	-	
KW	30.00	*
PHASE / HZ	3/60	3/60
VOLTAGE	460	*
AMPS	37.70	*

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	73.20	60.30
COOL LVG TEMP DB/WB	-	-	55.10	53.40
HEAT ENT TEMP DB	-		73.20	
HEAT LVG TEMP DB	-		112.00	

REMARKS: MOTOR SET AT 5.5 VDC

* ELECTRIC HEAT CONTROLED INTERNALLY TO UNIT NOT ABLE TO COMMAND ON.

TECHNICIAN: RS **TEST DATE:** 11/16/2023

ADDISON ENERGY TECHNOLOGIES, LLC

DUCT TRAVERSE TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2
LOCATION: CAMERON, NC

SYSTEM: DOAS-1 SUPPLY
DUCT SIZE: 18x12
DUCT AREA: 1.50

DESIGN FPM: 927
DESIGN CFM: 1390
ACTUAL CFM: 1397

889	872	890	878								
908	974	964	902								
979	1010	958	952								

ACTUAL FPM: 931
INITIAL STATIC PRESSURE: 0.18 @ 1875 **CFM**
FINAL STATIC PRESSURE: 0.04 @ 1397 **CFM**

SYSTEM:
DUCT SIZE:
DUCT AREA:

DESIGN FPM:
DESIGN CFM:
ACTUAL CFM:

ACTUAL FPM:
INITIAL STATIC PRESSURE: @ **CFM**
FINAL STATIC PRESSURE: @ **CFM**

REMARKS:

TECHNICIAN: RS
TEST DATE: 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** DOAS-1

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
IDU-5	1	OSA	8	0.35	215	628	220	102%	643	225	105%
IDU-6	2	OSA	10	0.55	270	535	294	109%	484	266	99%
IDU-3	3	OSA	8	0.35	215	571	200	93%	623	218	101%
IDU-4	4	OSA	10	0.55	270	556	306	113%	480	264	98%
IDU-1	5	OSA	8	0.35	205	471	165	80%	600	210	102%
IDU-2	6	OSA	8	0.35	215	703	246	114%	586	205	95%
TOTAL					1390		1431	103%		1388	100%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** DOAS-2

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	IDU-7 - IDU-12
MANUFACTURER	AAON
MODEL NUMBER	V3-BRB-3-0-162C-5S3
SERIAL NUMBER	202208-CJEB07741
FILTERS	1) 24x24x4

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1100	1110
TOTAL OUTLET CFM	1110	1105
RETURN CFM	0	0
OSA CFM	1100	1110
TOTAL STATIC PRESSURE	-	0.32
EXTERNAL STATIC P	1.00	0.11
EYE OF FAN	-	-0.27
SUCTION PRESSURE	-	-0.06
DISCHARGE PRESSURE	-	0.05
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	-	
HP / BHP	- / -	1.30 / -
PHASE / HZ	3/60	3/60
VOLTAGE	460	499 / 498 / 501
AMPS	1.60	.25 /.35 / .3
MOTOR RPM	2580	VARRIABLE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	-	
SERIAL NUMBER	-	
KW	*22.50*	*
PHASE / HZ	*3/60*	*3/60*
VOLTAGE	*460*	*
AMPS	*28.30*	*

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	71.40	59.60
COOL LVG TEMP DB/WB	-	-	50.40	49.80
HEAT ENT TEMP DB	-		72.70	
HEAT LVG TEMP DB	-		113.00	

REMARKS: MOTOR SET AT 4.5 VDC

* ELECTRIC HEAT CONTROLED INTERNALLY TO UNIT NOT ABLE TO COMMAND ON.

TECHNICIAN: RS **TEST DATE:** 11/16/2023

ADDISON ENERGY TECHNOLOGIES, LLC

DUCT TRAVERSE TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2
LOCATION: CAMERON, NC

SYSTEM: DOAS-2 SUPPLY
DUCT SIZE: 18x12
DUCT AREA: 1.50
DESIGN FPM: 740
DESIGN CFM: 1110
ACTUAL CFM: 1110

736	747	766	719								
730	758	743	709								
741	750	765	715								

ACTUAL FPM: 740
INITIAL STATIC PRESSURE: 0.2 @ 2027 CFM
FINAL STATIC PRESSURE: 0.05 @ 1110 CFM

SYSTEM:
DUCT SIZE:
DUCT AREA:
DESIGN FPM:
DESIGN CFM:
ACTUAL CFM:

ACTUAL FPM:
INITIAL STATIC PRESSURE: @ CFM
FINAL STATIC PRESSURE: @ CFM

REMARKS:

TECHNICIAN: RS
TEST DATE: 11/14/2023

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** DOAS-2

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
IDU-7	1	OSA	8	0.35	215	531	186	87%	611	214	100%
IDU-8	2	OSA	8	0.35	215	491	172	80%	583	204	95%
IDU-9	3	OSA	8	0.35	210	557	195	93%	603	211	100%
IDU-10	4	OSA	8	0.35	210	603	211	100%	597	209	100%
IDU-12	5	OSA	8	0.35	120	480	168	140%	360	126	105%
IDU-11	6	OSA	8	0.35	140	500	175	125%	403	141	101%
TOTAL					1110		1107	100%		1105	100%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-1

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	310
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22251LPH1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1204
TOTAL OUTLET CFM	1200	1204
RETURN CFM	995	994
OSA CFM	205	210
TOTAL STATIC PRESSURE	-	0.59
EXTERNAL STATIC P	0.40	0.33
EYE OF FAN	-	-0.46
SUCTION PRESSURE	-	-0.20
DISCHARGE PRESSURE	-	0.13
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	243
AMPS	3.50	2.30
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-008	
KW	14.40	14.54
PHASE / HZ	3/60	3/60
VOLTAGE	480	498 / 498 / 500
AMPS	17.30	16.7 / 16.9 / 16.9

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	75.40	62.30
COOL LVG TEMP DB/WB	-	-	55.10	52.90
HEAT ENT TEMP DB	-		73.00	
HEAT LVG TEMP DB	-		93.60	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-1 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
310	1	CD	10	1.00	280	287	287	103%	287	287	103%
310	2	CD	10	1.00	280	272	272	97%	272	272	97%
310	3	CD	10	1.00	265	257	257	97%	257	257	97%
310	4	CD	10	1.00	245	260	260	106%	260	260	106%
311	5	CD	6	1.00	80	83	83	104%	83	83	104%
310A	6	CD	6	1.00	50	45	45	90%	45	45	90%
TOTAL					1200		1204	100%		1204	100%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-1 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
310	1	RAG	24x24	1.00	985	994	994	101%	994	994	101%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-2

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	301
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22243H541V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1174
TOTAL OUTLET CFM	1200	1174
RETURN CFM	985	969
OSA CFM	215	205
TOTAL STATIC PRESSURE	-	0.58
EXTERNAL STATIC P	0.40	0.31
EYE OF FAN	-	-0.44
SUCTION PRESSURE	-	-0.17
DISCHARGE PRESSURE	-	0.14
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	243
AMPS	3.50	2.20
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-011	
KW	14.40	14.60
PHASE / HZ	3/60	3/60
VOLTAGE	480	499 / 501 / 499
AMPS	17.30	16.8 / 16.9 / 16.9

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	73.30	60.50
COOL LVG TEMP DB/WB	-	-	53.20	51.40
HEAT ENT TEMP DB	-		71.60	
HEAT LVG TEMP DB	-		95.40	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-2 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
301	1	CD	10	1.00	300	286	286	95%	287	287	96%
301	2	CD	10	1.00	300	267	267	89%	275	275	92%
301	3	CD	10	1.00	275	280	280	102%	285	285	104%
301	4	CD	10	1.00	275	267	267	97%	272	272	99%
301A	5	CD	6	1.00	50	67	67	134%	55	55	110%
TOTAL					1200		1167	97%		1174	98%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-2 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
301	1	RAG	24x24	1.00	985	969	969	98%	969	969	98%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-3

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	309
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22243KJL1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1192
TOTAL OUTLET CFM	1200	1192
RETURN CFM	985	974
OSA CFM	215	218
TOTAL STATIC PRESSURE	-	0.55
EXTERNAL STATIC P	0.40	0.31
EYE OF FAN	-	-0.42
SUCTION PRESSURE	-	-0.18
DISCHARGE PRESSURE	-	0.13
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	241
AMPS	3.50	2.10
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-009	
KW	14.40	14.57
PHASE / HZ	3/60	3/60
VOLTAGE	480	499 / 500 / 500
AMPS	17.30	17.0 / 16.8 / 16.7

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	73.40	61.30
COOL LVG TEMP DB/WB	-	-	54.00	52.30
HEAT ENT TEMP DB	-		72.80	
HEAT LVG TEMP DB	-		95.00	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-3 SUPPLY

	OUTLET				DESIGN	PRELIMINARY			FINAL		
AREA SERVED	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
309	1	CD	10	1.00	300	282	282	94%	304	304	101%
309	2	CD	10	1.00	300	295	295	98%	316	316	105%
309	3	CD	10	1.00	275	295	295	107%	251	251	91%
309	4	CD	10	1.00	275	240	240	87%	267	267	97%
309	5	CD	6	1.00	50	88	88	176%	54	54	108%
TOTAL					1200		1200	100%		1192	99%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-3 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
309	1	RAG	24x24	1.00	985	974	974	99%	974	974	99%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-4

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	302
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C48V41DAB
SERIAL NUMBER	22333LAD1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1500	1468
TOTAL OUTLET CFM	1500	1468
RETURN CFM	1230	1204
OSA CFM	270	264
TOTAL STATIC PRESSURE	-	0.65
EXTERNAL STATIC P	0.40	0.38
EYE OF FAN	-	-0.51
SUCTION PRESSURE	-	-0.24
DISCHARGE PRESSURE	-	0.14
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	242
AMPS	3.50	2.50
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-003	
KW	14.40	14.65
PHASE / HZ	3/60	3/60
VOLTAGE	480	499 / 501 / 501
AMPS	17.30	16.8 / 17.0 / 16.9

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	75.30	62.00
COOL LVG TEMP DB/WB	-	-	55.10	53.30
HEAT ENT TEMP DB	-		72.70	
HEAT LVG TEMP DB	-		95.60	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-4 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
302	1	CD	10	1.00	310	267	267	86%	279	279	90%
302	2	CD	10	1.00	310	317	317	102%	311	311	100%
302	3	CD	10	1.00	290	290	290	100%	299	299	103%
302	4	CD	10	1.00	290	297	297	102%	280	280	97%
302A	5	CD	6	1.00	50	66	66	132%	50	50	100%
311	6	CD	10	1.00	250	206	206	82%	249	249	100%
TOTAL					1500		1443	96%		1468	98%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-4 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
302	1	RAG	24x24	1.00	1230	1204	1204	98%	1204	1204	98%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-5

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	308
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22292MX71V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1155
TOTAL OUTLET CFM	1200	1155
RETURN CFM	985	930
OSA CFM	215	225
TOTAL STATIC PRESSURE	-	0.56
EXTERNAL STATIC P	0.40	0.29
EYE OF FAN	-	-0.45
SUCTION PRESSURE	-	-0.18
DISCHARGE PRESSURE	-	0.11
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	243
AMPS	3.50	2.30
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-004	
KW	14.40	14.63
PHASE / HZ	3/60	3/60
VOLTAGE	480	501 / 502 / 499
AMPS	17.30	16.9 / 16.8 / 16.9

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	73.50	61.00
COOL LVG TEMP DB/WB	-	-	54.20	52.50
HEAT ENT TEMP DB	-		71.80	
HEAT LVG TEMP DB	-		94.60	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-5 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
308	1	CD	10	1.00	300	242	242	81%	273	273	91%
308	2	CD	10	1.00	300	263	263	88%	272	272	91%
308	3	CD	10	1.00	275	308	308	112%	282	282	103%
308	4	CD	10	1.00	275	251	251	91%	275	275	100%
308A	5	CD	6	1.00	50	85	85	170%	53	53	106%
TOTAL					1200		1149	96%		1155	96%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-5 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
308	1	RAG	24x24	1.00	985	930	930	94%	930	930	94%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-6

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	303
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C48V41DAB
SERIAL NUMBER	22334L2P1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1500	1534
TOTAL OUTLET CFM	1500	1534
RETURN CFM	1230	1268
OSA CFM	270	266
TOTAL STATIC PRESSURE	-	0.79
EXTERNAL STATIC P	0.40	0.37
EYE OF FAN	-	-0.66
SUCTION PRESSURE	-	0.24
DISCHARGE PRESSURE	-	0.13
DUCT STATIC P SETPOINT	-	

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	242
AMPS	3.50	2.20
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-001	
KW	14.40	14.63
PHASE / HZ	3/60	3/60
VOLTAGE	480	499 / 501 / 502
AMPS	17.30	17.0 / 16.8 / 16.8

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	75.20	62.00
COOL LVG TEMP DB/WB	-	-	54.50	52.60
HEAT ENT TEMP DB	-		72.50	
HEAT LVG TEMP DB	-		94.00	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-6 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
303	1	CD	10	1.00	310	277	277	89%	312	312	101%
303	2	CD	10	1.00	310	275	275	89%	317	317	102%
303	3	CD	10	1.00	290	258	258	89%	285	285	98%
303	4	CD	10	1.00	290	285	285	98%	308	308	106%
303A	5	CD	6	1.00	50	88	88	176%	55	55	110%
311	6	CD	10	1.00	250	282	282	113%	257	257	103%
TOTAL					1500		1465	98%		1534	102%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-6 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
303	1	RAG	24x24	1.00	1230	1268	1268	103%	1268	1268	103%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-7

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	307
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22282M0F1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1135
TOTAL OUTLET CFM	1200	1135
RETURN CFM	985	921
OSA CFM	215	214
TOTAL STATIC PRESSURE	-	0.59
EXTERNAL STATIC P	0.40	0.31
EYE OF FAN	-	-0.46
SUCTION PRESSURE	-	-0.18
DISCHARGE PRESSURE	-	0.13
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	243
AMPS	3.50	2.20
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-002	
KW	14.40	14.62
PHASE / HZ	3/60	3/60
VOLTAGE	480	502 / 501 / 498
AMPS	17.30	16.9 / 16.8 / 16.9

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	74.00	62.10
COOL LVG TEMP DB/WB	-	-	55.40	52.90
HEAT ENT TEMP DB	-		73.30	
HEAT LVG TEMP DB	-		95.40	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-7 SUPPLY

	OUTLET				DESIGN	PRELIMINARY			FINAL		
AREA SERVED	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
307	1	CD	10	1.00	300	250	250	83%	282	282	94%
307	2	CD	10	1.00	300	268	268	89%	282	282	94%
307	3	CD	10	1.00	275	244	244	89%	257	257	93%
307	4	CD	10	1.00	275	306	306	111%	265	265	96%
307	5	CD	6	1.00	50	96	96	192%	49	49	98%
TOTAL					1200		1164	97%		1135	95%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/3/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-7 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
307	1	RAG	24x24	1.00	985	921	921	94%	921	921	94%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-8

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	304
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22282L2N1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1234
TOTAL OUTLET CFM	1200	1234
RETURN CFM	985	1030
OSA CFM	215	204
TOTAL STATIC PRESSURE	-	0.63
EXTERNAL STATIC P	0.40	0.34
EYE OF FAN	-	-0.50
SUCTION PRESSURE	-	-0.21
DISCHARGE PRESSURE	-	0.13
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	242
AMPS	3.50	2.30
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-010	
KW	14.40	14.63
PHASE / HZ	3/60	3/60
VOLTAGE	480	498 / 498 / 501
AMPS	17.30	16.9 / 16.8 / 17.1

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	74.50	61.60
COOL LVG TEMP DB/WB	-	-	53.90	51.40
HEAT ENT TEMP DB	-		72.60	
HEAT LVG TEMP DB	-		93.40	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-8 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
304	1	CD	10	1.00	300	239	239	80%	307	307	102%
304	2	CD	10	1.00	300	261	261	87%	329	329	110%
304	3	CD	10	1.00	275	210	210	76%	291	291	106%
304	4	CD	10	1.00	275	237	237	86%	253	253	92%
304A	5	CD	6	1.00	50	87	87	174%	54	54	108%
TOTAL					1200		1034	86%		1234	103%

REMARKS: 400 TON

TECHNICIAN: RS **TEST DATE:** 11/3/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-8 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
304	1	RAG	24x24	1.00	985	1030	1030	105%	1030	1030	105%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-9

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	306
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22263N2K1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1263
TOTAL OUTLET CFM	1200	1263
RETURN CFM	990	1052
OSA CFM	210	211
TOTAL STATIC PRESSURE	-	0.72
EXTERNAL STATIC P	0.40	0.36
EYE OF FAN	-	-0.58
SUCTION PRESSURE	-	-0.22
DISCHARGE PRESSURE	-	0.14
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	243
AMPS	3.50	2.50
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-005	
KW	14.40	14.67
PHASE / HZ	3/60	3/60
VOLTAGE	480	498 / 499 / 501
AMPS	17.30	16.8 / 17.1 / 17.0

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	73.50	61.30
COOL LVG TEMP DB/WB	-	-	53.40	51.50
HEAT ENT TEMP DB	-		72.80	
HEAT LVG TEMP DB	-		94.40	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-9 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
306	1	CD	10	1.00	300	224	224	75%	330	330	110%
306	2	CD	10	1.00	300	201	201	67%	293	293	98%
306	3	CD	10	1.00	275	217	217	79%	288	288	105%
306	4	CD	10	1.00	275	210	210	76%	299	299	109%
306A	5	CD	6	1.00	50	75	75	150%	53	53	106%
TOTAL					1200		927	77%		1263	105%

REMARKS: 410 TON

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-9 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
306	1	RAG	24x24	1.00	985	1052	1052	107%	1052	1052	107%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-10

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	305
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22263N191V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1162
TOTAL OUTLET CFM	1200	1162
RETURN CFM	990	953
OSA CFM	210	209
TOTAL STATIC PRESSURE	-	0.58
EXTERNAL STATIC P	0.40	0.30
EYE OF FAN	-	-0.48
SUCTION PRESSURE	-	-0.20
DISCHARGE PRESSURE	-	0.10
DUCT STATIC P SETPOINT	-	

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	242
AMPS	3.50	2.30
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-007	
KW	14.40	14.65
PHASE / HZ	3/60	3/60
VOLTAGE	480	498 / 501 / 502
AMPS	17.30	16.8 / 17.0 / 16.9

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	74.70	61.40
COOL LVG TEMP DB/WB	-	-	53.50	51.70
HEAT ENT TEMP DB	-		73.10	
HEAT LVG TEMP DB	-		95.40	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-10 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
305	1	CD	10	1.00	300	211	211	70%	281	281	94%
305	2	CD	10	1.00	300	190	190	63%	274	274	91%
305	3	CD	10	1.00	275	202	202	73%	277	277	101%
305	4	CD	10	1.00	275	214	214	78%	282	282	103%
305A	5	CD	6	1.00	50	79	79	158%	48	48	96%
TOTAL					1200		896	75%		1162	97%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 10/3/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-10 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
305	1	RAG	24x24	1.00	985	953	953	97%	953	953	97%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-11

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	313
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0B30V31DAB
SERIAL NUMBER	22382L0T1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1000	868
TOTAL OUTLET CFM	1000	868
RETURN CFM	860	727
OSA CFM	140	141
TOTAL STATIC PRESSURE	-	0.27
EXTERNAL STATIC P	0.40	0.16
EYE OF FAN	-	-0.18
SUCTION PRESSURE	-	-0.07
DISCHARGE PRESSURE	-	0.09
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	243
AMPS	3.50	2.60
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1002	
SERIAL NUMBER	325134-002-001	
KW	9.60	9.53
PHASE / HZ	1/60	1/60
VOLTAGE	240	243
AMPS	40.00	39.20

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	74.00	61.70
COOL LVG TEMP DB/WB	-	-	53.40	51.90
HEAT ENT TEMP DB	-		73.50	
HEAT LVG TEMP DB	-		94.90	

REMARKS: DIRECT DRIVE UNIT RUNNING 88% ON HIGHEST SPEED SETTING.

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-11 SUPPLY

AREA SERVED	OUTLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
313	1	CD	8	1.00	200	133	133	67%	177	177	89%
312	2	CD	8	1.00	200	154	154	77%	182	182	91%
317	3	CD	8	1.00	200	87	87	44%	150	150	75%
313	4	CD	8	1.00	175	133	133	76%	155	155	89%
313A	5	CD	6	1.00	50	72	72	144%	44	44	88%
312	6	CD	8	1.00	175	138	138	79%	160	160	91%
TOTAL					1000		717	72%		868	87%

REMARKS: BALANCED PROPORTIONATLEY; UNIT ON HIGHEST SPEED SETTING

450 TON

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-11 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
313	1	RAG	24x24	1.00	430	371	371	86%	371	371	86%
312	2	RAG	24x24	1.00	430	356	356	83%	356	356	83%
TOTAL					860		727	85%		727	85%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR MOVING EQUIPMENT TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-12

UNIT DATA	
LOCATION	MECHANICAL LOFT
SERVICE	317
MANUFACTURER	TRANE
MODEL NUMBER	TAM9A0C36V31DAB
SERIAL NUMBER	22292MYK1V
FILTERS	1) 20x22x1

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	1200	1196
TOTAL OUTLET CFM	1200	1196
RETURN CFM	1080	1070
OSA CFM	120	126
TOTAL STATIC PRESSURE	-	0.69
EXTERNAL STATIC P	0.40	0.35
EYE OF FAN	-	-0.53
SUCTION PRESSURE	-	-0.19
DISCHARGE PRESSURE	-	0.16
DUCT STATIC P SETPOINT	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	- / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	230	242
AMPS	3.50	2.20
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	
FRAME	-	
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

ELECTRIC HEAT		
DATA	DESIGN	ACTUAL
MODEL NUMBER	WGM1505A	
SERIAL NUMBER	325134-001-006	
KW	14.40	14.67
PHASE / HZ	3/60	3/60
VOLTAGE	480	497/495/497
AMPS	17.30	17.2/17.0/17.0

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	72.40	60.40
COOL LVG TEMP DB/WB	-	-	53.60	51.60
HEAT ENT TEMP DB	-		71.50	
HEAT LVG TEMP DB	-		92.30	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-12 SUPPLY

	OUTLET				DESIGN	PRELIMINARY			FINAL		
AREA SERVED	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
317	1	CD	8	1.00	175	163	163	93%	180	180	103%
317	2	CD	8	1.00	175	45	45	26%	172	172	98%
316	3	CD	10	1.00	250	433	433	173%	244	244	98%
315	4	CD	10	1.00	250	307	307	123%	252	252	101%
317	5	CD	8	1.00	175	196	196	112%	160	160	91%
317	6	CD	8	1.00	175	48	48	27%	188	188	107%
TOTAL					1200		1192	99%		1196	100%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/7/2023

ADDISON ENERGY TECHNOLOGIES, LLC

AIR DISTRIBUTION TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** IDU-12 RETURN

AREA SERVED	INLET				DESIGN	PRELIMINARY			FINAL		
	#	TYPE	SIZE	FACTOR	CFM	FPM	CFM	%	FPM	CFM	%
317	1	RAG	24x24	1.00	1080	1070	1070	99%	1070	1070	99%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

DUCTLESS SPLIT SYSTEM TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC

UNIT DATA	
UNIT NUMBER	A/C-1
LOCATION	CEILING
SERVICE	CORRIDOR
MANUFACTURER	MITSUBISHI
MODEL NUMBER	TPLA0A0181EA70B
SERIAL NUMBER	2ZM0047965TMAJ
FILTERS	MANUFACTURE WASHABLE

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	600	620
RETURN CFM	600	620
OSA CFM	-	-
FAN RPM	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	-	
HP / BHP	- / -	0.07 / -
PHASE / HZ	1/60	1/60
VOLTAGE	208	212
AMPS	0.34	0.20
MOTOR RPM	-	HIGH
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	72.60	60.10
COOL LVG TEMP DB/WB	-	-	52.40	50.30
HEAT ENT TEMP DB	-		71.80	
HEAT LVG TEMP DB	-		96.20	

UNIT DATA	
UNIT NUMBER	A/C-2
LOCATION	CEILING
SERVICE	CORRIDOR
MANUFACTURER	MITSUBISHI
MODEL NUMBER	TPLA0A0181EA70B
SERIAL NUMBER	2ZM0047665TMAJ
FILTERS	MANUFATURE WASHABLE

PERFORMANCE		
DATA	DESIGN	ACTUAL
TOTAL FAN CFM	600	605
RETURN CFM	600	605
OSA CFM	-	-
FAN RPM	-	-

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	-	
HP / BHP	- / -	0.07 / -
PHASE / HZ	1/60	1/60
VOLTAGE	208	213
AMPS	0.34	0.20
MOTOR RPM	-	HIGH
SF / EFF / PF	1.00 / - / -	
STARTER HEATER ELEMENTS	TP	

TEMPERATURES ˚F	DESIGN		ACTUAL	
COOL ENT TEMP DB/WB	-	-	72.90	60.20
COOL LVG TEMP DB/WB	-	-	53.00	51.60
HEAT ENT TEMP DB	-		72.00	
HEAT LVG TEMP DB	-		95.70	

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

EXHAUST FAN TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** F-1

UNIT DATA	
LOCATION	CEILING
SERVICE	RESTROOMS/JANITORIAL
MANUFACTURER	COOK
MODEL NUMBER	120 SQN
SERIAL NUMBER	413SK23186-00/0000701

PERFORMANCE DATA		
AIRFLOW	DESIGN	ACTUAL
TOTAL FAN CFM	1150	1214
TOTAL OUTLET CFM	1150	1214
EXTERNAL STATIC P	0.75	0.51
SUCTION PRESSURE	-	-0.42
DISCHARGE PRESSURE	-	0.09

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	-	
HP / BHP	0.50 / -	0.50 / -
PHASE / HZ	1/60	1/60
VOLTAGE	115	122
AMPS	2.30	1.80
MOTOR RPM	-	DIRECT DRIVE
SF / EFF / PF	1.00 / - / -	
FRAME	-	

DRIVE SYSTEM	DESIGN	ACTUAL
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

UNIT AIR INLETS

AREA SERVED	INLET #	TYPE	SIZE	FACTOR	DESIGN CFM	PRELIMINARY FPM	CFM	%	FINAL FPM	CFM	%
315	1	EAG	24x24	1.00	450	494	494	110%	484	484	108%
320	2	EAG	12x12	1.00	75	49	49	65%	72	72	96%
319	3	EAG	12x12	1.00	75	50	50	67%	81	81	108%
314	4	EAG	12x12	1.00	100	110	110	110%	108	108	108%
316	5	EAG	24x24	1.00	450	556	556	124%	469	469	104%
TOTAL					1150		1259	109%		1214	106%

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

EXHAUST FAN TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC **UNIT NUMBER:** F-2

UNIT DATA	
LOCATION	CEILING
SERVICE	318
MANUFACTURER	COOK
MODEL NUMBER	GEMENI 800
SERIAL NUMBER	*

PERFORMANCE DATA		
AIRFLOW	DESIGN	ACTUAL
TOTAL FAN CFM	800	874
TOTAL OUTLET CFM	800	874
EXTERNAL STATIC P	0.25	0.16
SUCTION PRESSURE	-	-
DISCHARGE PRESSURE	-	0.16

MOTOR DATA	DESIGN	ACTUAL
MANUFACTURER	GENTEQ	
HP / BHP	438 W / -	0.33 / -
PHASE / HZ	1/60	1/60
VOLTAGE	115	122
AMPS	4.30	4.30
MOTOR RPM	1100	HIGH
SF / EFF / PF	1.00 / - / -	
FRAME	-	

DRIVE SYSTEM	DESIGN	ACTUAL
MOTOR SHEAVE SZ / BORE	DIRECT DRIVE	
FAN SHEAVE SZ / BORE	DIRECT DRIVE	
# BELTS / SIZE	DIRECT DRIVE	
FAN RPM	-	DIRECT DRIVE
CENTER DISTANCE	DIRECT DRIVE	

UNIT AIR INLETS

AREA SERVED	INLET #	INLET TYPE	INLET SIZE	INLET FACTOR	DESIGN CFM	PRELIMINARY FPM	PRELIMINARY CFM	PRELIMINARY %	FINAL FPM	FINAL CFM	FINAL %

REMARKS: * NO TAG; MODEL CAME FROM MOTOR TAG.

TECHNICIAN: RS **TEST DATE:** 11/14/2023

ADDISON ENERGY TECHNOLOGIES, LLC

ELECTRIC HEATER TEST SHEET

PROJECT: JOHNSONVILLE ELEM SCHOOL ADD/RENO-PHASE 2

LOCATION: CAMERON, NC

UNIT DATA	
UNIT NUMBER	EWH-1
LOCATION	WALL
SERVICE	318
MANUFACTURER	TPI
MODEL NUMBER	F3326TD-RP
SERIAL NUMBER	-

PERFORMANCE	DESIGN	ACTUAL
CFM	175	184
KW	4.00	4.00
PHASE	1	1
VOLTAGE	208	213
AMPS	19.20	18.80
ENT AIR TEMP ˚F	-	71.40
LVG AIR TEMP ˚F	-	105.70

UNIT DATA	
UNIT NUMBER	
LOCATION	
SERVICE	
MANUFACTURER	
MODEL NUMBER	
SERIAL NUMBER	

PERFORMANCE	DESIGN	ACTUAL
CFM		
KW		
PHASE		
VOLTAGE		
AMPS		
ENT AIR TEMP ˚F		
LVG AIR TEMP ˚F		

UNIT DATA	
UNIT NUMBER	
LOCATION	
SERVICE	
MANUFACTURER	
MODEL NUMBER	
SERIAL NUMBER	

PERFORMANCE	DESIGN	ACTUAL
CFM		
KW		
PHASE		
VOLTAGE		
AMPS		
ENT AIR TEMP ˚F		
LVG AIR TEMP ˚F		

UNIT DATA	
UNIT NUMBER	
LOCATION	
SERVICE	
MANUFACTURER	
MODEL NUMBER	
SERIAL NUMBER	

PERFORMANCE	DESIGN	ACTUAL
CFM		
KW		
PHASE		
VOLTAGE		
AMPS		
ENT AIR TEMP ˚F		
LVG AIR TEMP ˚F		

REMARKS:

TECHNICIAN: RS **TEST DATE:** 11/14/2023

Addison Energy Technologies, LLC
Johnsonville Elem. School Addition/Renovation-
Phase 2
Cameron, NC

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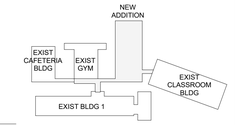
1 FIRST FLOOR MECHANICAL DUCTWORK PLAN - PHASE 2
1/8" = 1'-0"



KEYPLAN

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NORTH CAROLINA PROFESSIONAL ENGINEER SEAL 040311 THOMAS A. LINDSEY 03/25/2022

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150 Fayetteville St., Suite 520, Raleigh, NC 27601
1927 South Tryon St., Suite 300, Charlotte NC 28203
Phone: 919-926-2200 - www.optimaengineering.com
North Carolina License Number C-0914

Harnett County Schools

Johnsonville Elementary School Addition/Renovation Phase 2

18495 NC-27, Cameron, NC 28326

No.	Date	Description

ISSUE DATE: 03/25/2022
PROJECT #: 02103.000
DRAWN BY: TAL
CHECKED BY: GPK

FIRST FLOOR MECHANICAL PLAN - NEW WORK

M1-102
Sheet No. 5 of 7

OPTIMA # 21-0266R

Addison Energy Technologies, LLC
Johnsonville Elem. School Addition/Renovation-
Phase 2
Cameron, NC

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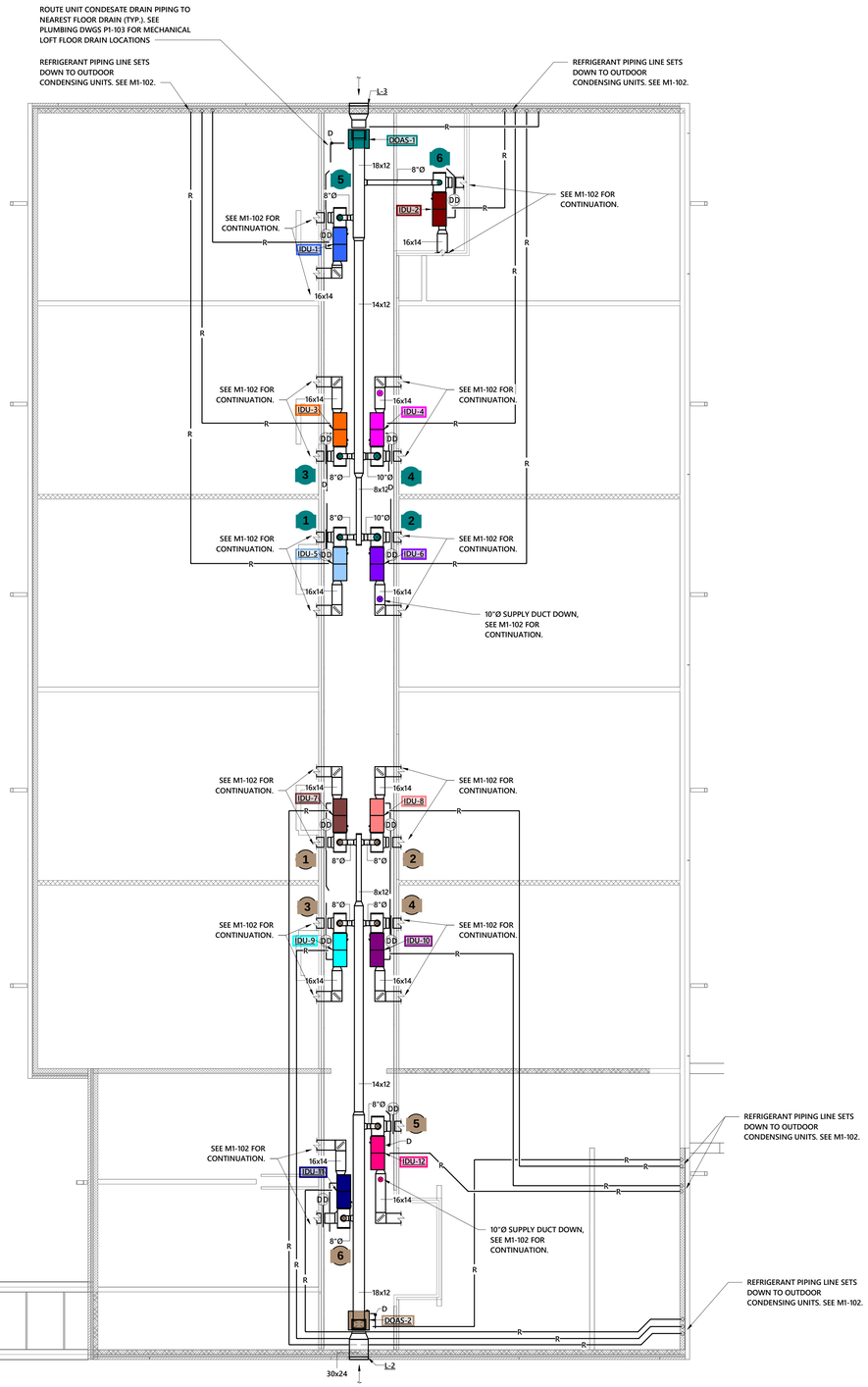

1 MECHANICAL LOFT MECHANICAL PLAN - PHASE 2
1/8" = 1'-0"

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Harnett County Schools

Johnsonville Elementary School Addition/Renovation Phase 2

18495 NC-27, Cameron, NC 28326

No.	Date	Description

ISSUE DATE: 03/25/2022
PROJECT #: 02103.000
DRAWN BY: TAL
CHECKED BY: Checker

MECHANICAL LOFT MECHANICAL PLAN - NEW WORK

M1-103

Sheet No. 6 of 7

OPTIMA # 21-0266R

Cx Solutions, LLC

Functional Checklists

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC

Date: Original Test date - 11/10/23 - Additional Remote Verification 12/13/23

Tech / CxA: Mark Rogers

Item	Quantity	Tag
Indoor Units	12	IDU
Heat Pumps	12	HP
DOAS	2	DOAS
Exhaust Fans	2	F1, F2
Condensing/Indoor Units	2	AC-1/ODU-1, AC-2/ODU-2
Electric Wall Heater	1	Electric Wall Heater

Performance Verification Test
DOAS

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: DOAS-1
Date: 12/13/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Safeties**		Pass	
2	**SF motor failure alarm**		Pass	
3	Verify DOAS is operating in normal conditions		Pass	
4	Shut down the SF at the motor disconnect		Pass	
5	Verify an SF motor failure alarm is sent to the BAS	Alarmed on the Alarm Summary and System Graphic	Pass	30 Second Delay
6	Return the unit to normal operation		Pass	
17	**High LAT alarm**		NA	Not Configured
18	Verify DOAS is operating in normal conditions		NA	
19	Record the high LAT alarm		NA	
20	Record the current LAT		NA	
21	Override the alarm setpoint to below the current LAT		NA	
22	Verify an alarm is sent to the BAS		NA	
23	Return the system to normal conditions		NA	
24	**Low LAT alarm**		NA	Not Configured
25	Verify DOAS is operating in normal conditions		NA	
26	Record the low LAT alarm		NA	
27	Record the current LAT		NA	
28	Override the alarm setpoint to above the current LAT		NA	
29	Verify an alarm is sent to the BAS		NA	
30	Verify the SF de-energizes		NA	
31	Verify the EF de-energizes		NA	
34	Return the system to normal conditions		NA	
35	**Dirty filters alarm**		NA	Not Configured
36	Verify DOAS is operating in normal conditions		NA	
37	Record the dirty filter DP alarm setpoint		NA	
38	Record the current filter DP		NA	
39	Override the setpoint to below the current DP		NA	
40	Verify a dirty filter alarm is sent to the BAS		NA	
41	Return the system to normal conditions		NA	
49	**Unit smoke detection alarm**	Does generate a BAS alarm	Pass	Tested as part of the FA system
50	Verify DOAS is operating in normal conditions		NA	
51	Trip the unit smoke detector		NA	
52	Verify the SF stops		NA	
53	Verify a smoke detection alarm is sent to the BAS		NA	
64	**Occupied**		Pass	
65	Verify DOAS is operating in normal conditions		Pass	
70	Unoccupy the building Schedule		Pass	
71	Verify All systems Unoccupied		Pass	
72	Enable an IDU units using the Temporary Occupancy button		Pass	
73	Verify the DOAS unit Occupies and starts		Pass	
74	Force the Temporary Occupancy Override to expire		Pass	
75	Verify the DOAS is Unoccupied		Pass	
77	Return the unit to normal conditions		Pass	
87	**Cooling**		Pass	
88	Verify the unit is operating in normal conditions		Pass	
89	Record the leaving Air setpoint	68DegF	Pass	
90	Record the current Leaving Air temperature	65DegF	Pass	
91	Override the setpoint to below the current Temperature	55DegF	Pass	Unit Controlled, Spec calls for DOAS mode to be determined by the majority of IDU modes
92	ooling command increases without going over		Pass	
93	Return the unit to normal operation		Pass	
113	**Unoccupied**		Pass	
114	Record the unit occupancy schedule		Pass	
115	Override the unit into unoccupied mode		Pass	
116	Verify the SF remains off		Pass	
119	Verify Both Compressorsis OFF		Pass	
122	Release all override and return the unit to normal operations		Pass	

************END FUNCTIONAL CHECKS************

Performance Verification Test
DOAS

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: DOAS-2
Date: 12/13/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Safeties**		Pass	
2	**SF motor failure alarm**		Pass	
3	Verify DOAS is operating in normal conditions		Pass	
4	Shut down the SF at the motor disconnect		Pass	
5	Verify an SF motor failure alarm is sent to the BAS	Alarmed on the Alarm Summary and System Graphic	Pass	30 Second Delay
6	Return the unit to normal operation		Pass	
17	**High LAT alarm**		NA	Not Configured
18	Verify DOAS is operating in normal conditions		NA	
19	Record the high LAT alarm		NA	
20	Record the current LAT		NA	
21	Override the alarm setpoint to below the current LAT		NA	
22	Verify an alarm is sent to the BAS		NA	
23	Return the system to normal conditions		NA	
24	**Low LAT alarm**		NA	Not Configured
25	Verify DOAS is operating in normal conditions		NA	
26	Record the low LAT alarm		NA	
27	Record the current LAT		NA	
28	Override the alarm setpoint to above the current LAT		NA	
29	Verify an alarm is sent to the BAS		NA	
30	Verify the SF de-energizes		NA	
31	Verify the EF de-energizes		NA	
34	Return the system to normal conditions		NA	
35	**Dirty filters alarm**		NA	Not Configured
36	Verify DOAS is operating in normal conditions		NA	
37	Record the dirty filter DP alarm setpoint		NA	
38	Record the current filter DP		NA	
39	Override the setpoint to below the current DP		NA	
40	Verify a dirty filter alarm is sent to the BAS		NA	
41	Return the system to normal conditions		NA	
49	**Unit smoke detection alarm**	Does generate a BAS alarm	Pass	Tested as part of the FA system
50	Verify DOAS is operating in normal conditions		NA	
51	Trip the unit smoke detector		NA	
52	Verify the SF stops		NA	
53	Verify a smoke detection alarm is sent to the BAS		NA	
64	**Occupied**		Pass	
65	Verify DOAS is operating in normal conditions		Pass	
70	Unoccupy the building Schedule		Pass	
71	Verify All systems Unoccupied		Pass	
72	Enable an IDU units using the Temporary Occupancy button		Pass	
73	Verify the DOAS unit Occupies and starts		Pass	
74	Force the Temporary Occupancy Override to expire		Pass	
75	Verify the DOAS is Unoccupied		Pass	
77	Return the unit to normal conditions		Pass	
87	**Cooling**		Pass	
88	Verify the unit is operating in normal conditions		Pass	
89	Record the leaving Air setpoint	68DegF	Pass	
90	Record the current Leaving Air temperature	67DegF	Pass	
91	Override the setpoint to below the current Temperature	55DegF	Pass	Unit Controlled, Spec calls for DOAS mode to be determined by the majority of IDU modes
92	ooling command increases without going over		Pass	
93	Return the unit to normal operation		Pass	
113	**Unoccupied**		Pass	
114	Record the unit occupancy schedule		Pass	
115	Override the unit into unoccupied mode		Pass	
116	Verify the SF remains off		Pass	
119	Verify Both Compressorsis OFF		Pass	
122	Release all override and return the unit to normal operations		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-1, IDU-1
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	176.9DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 71.5 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	49DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Pass	Tested by raising the freeze temperature locally on the device
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		Pass	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Contractor to add condensate alarm
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-2, IDU-2
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	145.22DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 68.6 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	49.5DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and stuts
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Pass	Tested by raising the freeze temperature locally on the device
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		Pass	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Contractor to add condensate alarm
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-3, IDU-3
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	147.4DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 69.7 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	47.5DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		pass	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and stuts down unit. Not alarmed on Jace. 50% complete
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	Mismatch Alarm command vs Status
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured

76	Verify there is an alarm sent to the BAS.		NA	
77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		Pass	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-4, IDU-4
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	157.79 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 64.3 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	43.8 DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Pass	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and shuts down the unit.
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	Mismatch Alarm (Command vs Status)
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	not configured

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		NA	not configured
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-5, IDU-5
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	170.99 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 69.4 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	45.98 DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Fail	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and shuts the unit down.
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	is a Missmatch alarm command vs Status
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		NA	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.		NA	Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-6, IDU-6
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	176.9DegF	Pass	DOAS supplying 65 Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 72.1 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	52DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Pass	Tested by raising the freeze temperature locally on the device
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		Pass	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Contractor to add condensate alarm
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-7, IDU-7
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	113.36 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 71.1 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	52DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and stuts
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Pass	Tested by raising the freeze temperature locally on the device
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		Pass	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Contractor to add condensate alarm
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-8, IDU-8
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	189.1 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 72.1 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	50.3DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		pass	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and stuts down unit. Not alarmed on Jace. 50% complete
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	Mismatch Alarm command vs Status
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured

76	Verify there is an alarm sent to the BAS.		NA	
77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		Pass	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-9, IDU-9
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	157.79 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 71.5 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	51.3 DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Pass	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and shuts down the unit.
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	Mismatch Alarm (Command vs Status)
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	not configured

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		NA	not configured
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-10, IDU-10
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	170.99 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 72.3 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	48.3 DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Fail	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and shuts the unit down.
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	is a Missmatch alarm command vs Status
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		NA	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.		NA	Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-11, IDU-11
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	121.8 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 73.1 DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	49.9 DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Pass	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and shuts down the unit.
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	Mismatch Alarm (Command vs Status)
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	not configured

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		NA	not configured
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.			Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test
Heat Pump with Indoor Unit

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: HP-12, IDU-12
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	**Installation**			
2	Verify the outdoor air condensing unit is mounted securely.		Pass	
3	Verify the outdoor air condensing unit has an electrical disconnect.		Pass	
4	Verify there is no damage to the outdoor air condensing unit.		Pass	
5	Verify the heat pump is mounted securely.		Pass	
6	Verify the heat pumpt has an electrical disconnect.		Pass	
7	Verify there is no damage to the heat pump.		Pass	
8	Confirm discharge air temperature is indicated at the BAS.		Pass	
9	Verify heating and cooling setpoints can be changed by the occupant using the zone sensor.	(+- 3) Deg F	Pass	In classroom user has (+-) 3 DegF warm cool adj setpoint can be changed from the Graphic
11	**Unoccupied Mode**			
12	Using the time schedule, place the unit into unoccupied mode.		Pass	Setpoints are adjustable
13	Verify the heating space temperature setpoint is 58°F (adj.)		Pass	Setpoints are adjustable
14	Verify the cooling space temperature setpoint is 80°F (adj.)		Pass	Setpoints are adjustable
15	Verify the heat pump fan is off and the outdoor air damper is closed. Verify the outdoor air condensing unit is not operating.		Pass	
16	**Unoccupied Override**			
17	Record the time the unoccupied overide control is programmed to override in occupied mode before returning to unoccupied mode.		Pass	Occupancy Override is 1 hour and Adjustable
18	Activate the occupant override control to place the unit into occupied mode.		Pass	
19	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
20	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	
21	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	
22	After the unoccupied override control timer has expired, verify the unit returns to unoccupied mode.		Pass	
23	**Occupied Mode**		Pass	
24	Using the time schedule, place the unit into occupied mode.		Pass	
25	Verify the heating space temperature setpoint is 70°F (adj.)		Pass	Setpoints are adjustable
26	Verify the cooling space temperature setpoint is 72°F (adj.)		Pass	Setpoints are adjustable
27	Verify the heat pump starts, the fan is on, and the outdoor air damper opens.		Pass	
28	**Fan Speed**			
29	Record the Low Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
30	Record the Medium Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	Fan is 2 speed controlled internally by trane ECM
31	Record the High Fan Speed setpoints (difference between space temperature and space temperature setpoint).		NA	
32	Test the low, medium, and high fan speeds by overriding the space temperature setpoints by the values listed above.		NA	
33	Return the space temperature setpoint back to normal.		NA	
34	**Compressor Minimum Runtime**			
35	Record the user defined (adj.) minimum runtime currently entered for the compressor.	2min on time 5min off minnimum	Pass	
36	**Heating & Cooling**			
37	Verify heating is enabled and cooling is disabled if outdoor air temperature < 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
38	Verify the cooling is enabled and heating is disabled if outdoor air temperature is > 65°F. Note: Outdoor air temperature sensor to be factory mounted.		Pass	OA supplied by DOAS and is conditioned
39	**Heating**			
40	Verify the heating mode is enabled based on outdoor air temperature.		Pass	Had to force heating by overridding Outside Air
41	Override the zone heating setpoint to a temperature above the current space temperature.		Pass	

42	Verify the heat pump is in heating mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging cool air.	122.26 DegF	Pass	DOAS supplying 65Degree Air
43	Remove the override on the zone heating setpoint and let the heat pump return to normal operation.		Pass	
44	**Cooling**			
45	Verify the cooling mode is enabled based on outdoor air temperature.		Pass	
46	Override the zone cooling setpoint to a temperature below the current space temperature.	Zone Temperature 72. DegF	Pass	
47	Verify the heat pump is in cooling mode by the discharge air temperature. Verify the outdoor air condensing unit is operating and discharging warm air.	51.2 DegF	Pass	
48	Remove the override on the zone cooling setpoint and let the heat pump return to normal operation.		Pass	
49	**Alarms**			
50	Record the high zone air temperature alarm setpoint		Pass	alarm is configured as a deviation from zone setpoint +- 10Deg
51	Test the high zone air temperature alarm by changing the setpoint value to a temperature below the current space temperature and verify there is an alarm sent to the BAS.		Pass	
52	Place the high zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
53	Record the low zone air temperature alarm setpoint		pass	alarm is configured as a deviation from zone setpoint +- 10Deg
54	Test the low zone air temperature alarm by changing the setpoint value to a temperature above the current space temperature and verify there is an alarm sent to the BAS.		pass	
55	Place the low zone air temperature alarm setpoint back to its original setpoint. Verify the alarm clears at the BAS.		Pass	
56	Test the freeze stat and verify the unit shuts off and there is an alarm sent to the BAS.		Fail	Tested by raising the freeze temperature locally on the device. Freeze Stat is hardwired and shuts the unit down.
57	Verify the smoke detector is wired to shut down the heat pump upon activation.		NA	Tested as part of FA system
58	Record the heat pump "Compressor Runtime Exceeded" alarm setpoint.		NA	not configured
59	Verify the operating of the compressor runtime exceeded by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
60	Put the compressor runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
61	Record the low discharge air temperature alarm setpoint (40°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
62	Test the low discharge air temperature alarm by changing the setpoint value to a temperature above the current discharge temperature.		Pass	
63	Verify an alarm is sent to the BAS		Pass	
64	Restore the low discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
65	Record the high discharge air temperature setpoint (120°F - adj.).		Pass	Value is alarmed by a deviation from setpoint +- 10DegF
66	Test the high discharge air temperature alarm by changing the setpoint value to a temperature below the current discharge temperature.		Pass	
67	Verify an alarm is sent to the BAS		Pass	
68	Restore the high discharge air temperature alarm setpoint to its original value. Verify the alarm clears at the BAS.		Pass	
69	Record the heat pump "Fan Runtime Exceeded" alarm setpoint.		NA	not configured
70	Verify the operating of the fan runtime exceeded alarm by overriding the timer to a value less than its current value. Verify there is an alarm received at the BAS.		NA	not configured
71	Put the fan runtime exceeded alarm setpoint back to its previous value. Verify the alarm clears at the BAS.		NA	not configured
72	Test the "Fan Failure" alarm by commanding the heat pump on using the time schedule and then shut the fan off.		Pass	is a Missmatch alarm command vs Status
73	Verify there is an alarm sent to the BAS.		Pass	
74	Restore the fan operation. Verify the alarm clears at the BAS.		Pass	
75	Test the "Fan in Hand" alarm by commanding the heat pump off using the time schedule and then manually start the heat pump.		NA	not configured
76	Verify there is an alarm sent to the BAS.		NA	

77	Put the heat pump back into automatic operation. Verify the alarm clears at the BAS.		NA	
78	Verify a condensate overflow alarm is not required. It did not appear to be in the documentation.		NA	Units have a sensor in the Pan. Need more information
79	Put the schedule back to its original values, remove all overrides, and put the unit back into normal operation.		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test

AC Unit Split System

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC

Tag ID: AC-1, ODU-1

Date: 11/10/2023

Tech / CxA: Mark Rogers

Prefunctional checklist items are to be completed as part of startup and initial checkout, preparatory to functional testing. This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report. The installing contractor's startup and checkout plan shall make reference to incorporating this checklist or have it attached when submitting the plan to the commissioning agent for approval, prior to execution. Note that sometimes more than one sheet needed for each test. If there are notes indicating there are "15 in Project" then 15 copies of that sheet will be needed - one for each piece of equipment.

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	Override the cooling alarm setpoint to 10 F below the current space temperature		Pass	
2	Verify an alarm is sent to the BAS		Pass	
3	Release all overrides		Pass	
4	Verify or override the unit cooling setpoint to match the current space temperature		Pass	
5	Verify the unit de-energizes		Pass	
6	Override the cooling setpoint to 4 F below the current space temperature		Pass	
7	Verify the unit energizes		Pass	
8	Verify no alarm is sent to the BAS		Pass	
9	Release all overrides		Pass	
10	Return the unit to normal operation		Pass	

************END FUNCTIONAL CHECKS************

Functional Performance Test

AC Unit Split System

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: AC-2, ODU-2
Date: 11/10/2023
Tech / CxA: Mark Rogers

Prefunctional checklist items are to be completed as part of startup and initial checkout, preparatory to functional testing. This checklist does not take the place of the manufacturer's recommended checkout and startup procedures or report. The installing contractor's startup and checkout plan shall make reference to incorporating this checklist or have it attached when submitting the plan to the commissioning agent for approval, prior to execution. Note that sometimes more than one sheet needed for each test. If there are notes indicating there are "15 in Project" then 15 copies of that sheet will be needed - one for each piece of equipment.

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	Override the cooling alarm setpoint to 10 F below the current space temperature		Pass	
2	Verify an alarm is sent to the BAS		Pass	
3	Release all overrides		Pass	
4	Verify or override the unit cooling setpoint to match the current space temperature		Pass	
5	Verify the unit de-energizes		Pass	
6	Override the cooling setpoint to 4 F below the current space temperature		Pass	
7	Verify the unit energizes		Pass	
8	Verify no alarm is sent to the BAS		Pass	
9	Release all overrides		Pass	
10	Return the unit to normal operation		Pass	

************END FUNCTIONAL CHECKS************

Performance Verification Test

Exhaust Fan

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC

Tag ID: F-1

Date: 11/10/2023

Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	Verify the building is in occupied mode		Pass	
2	Verify fan is energized		Pass	
3	Verify sufficient air flow at intake and exhaust dampers		Pass	
4	Override the building to unoccupied mode		Pass	
5	Verify fan de-energizes		Pass	
6	Verify any related dampers modulate closed		Pass	

************END FUNCTIONAL CHECKS************

Performance Verification Test

Exhaust Fan

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: F-2
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	Verify the building is in occupied mode		Pass	
2	Verify fan is energized		Pass	
3	Verify sufficient air flow at intake and exhaust dampers		Pass	
4	Override the building to unoccupied mode		Pass	
5	Verify fan de-energizes		Pass	
6	Verify any related dampers modulate closed		Pass	

**********END FUNCTIONAL CHECKS**********

Performance Verification Test
Electric Wall Heater

Project: Johnsonville Elementary School Addition-Renovation, Phase 2, Raleigh NC
Tag ID: EWH-1
Date: 11/10/2023
Tech / CxA: Mark Rogers

#	Sequence	Data	Pass / Fail / Not Applicable	Comments
1	Verify the following points at the BAS		Pass	
2	Fan status		Pass	
3	Fan on/off		Pass	
4	Sensor normal/fail status		Pass	
5	Override the space temperature setpoint to below the current space temperature		Pass	
6	Verify the UH energizes		Pass	
7	Verify the LAT is appropriate for heating		Pass	
8	Release the space temperature heating setpoint override		Pass	
9	Verify the UH de-energizes		Pass	

************END FUNCTIONAL CHECKS************