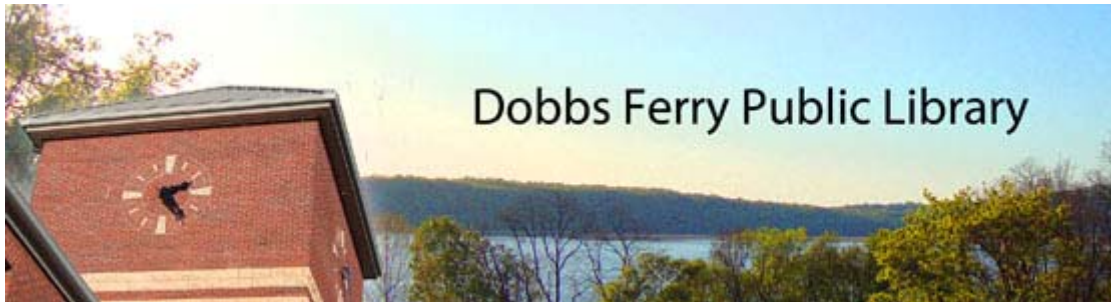




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CONSULTING ENGINEERS

DOBBS FERRY PUBLIC LIBRARY SUMMARY COMMISSIONING REPORT



Dobbs Ferry, NY

OLA Project No.: NDFL0002.00

February 27, 2012

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Section 1.0 Executive Summary

The Dobbs Ferry Library HVAC upgrade project involved complete replacement of the existing building's temperature controls with a digital based Building Automation System (BAS). The Village issued a request for proposal (RFP) to solicit design-build solutions from qualified controls contractors. OLA Consulting Engineers prepared the scope and specifications for the RFP document. The Village of Dobbs Ferry selected PE Controls to serve as prime contractor for this project. The scope of work also included:

- Testing and balancing (TAB) of all the HVAC systems
- New variable speed drives for the HVAC systems
- Demand controlled ventilation strategy and sequence

Commissioning is a process to help verify that systems are installed, functionally tested and are capable of being operated and maintained to perform according to the design documentation and facility requirements. Commissioning also helps ensure the building's energy efficiency measures are incorporated and performing as intended which will result in reduced energy usage, lower operating cost, and better building performance. OLA commissioning efforts began during the submittal phase of the project and continued through the construction phase of the project. Site visits were performed during this phase. Field observation reports are included in the appendices of this report. Issues observed were documented in the commissioning notice which can be found in the appendix of the report as well.

Functional testing of commissioned systems was performed after the construction completion. OLA worked closely with the controls contractor to complete each functional test. A detailed description of the functional test sheets can be found in the appendix of this report. A number of existing issues were identified during the installation phase of the project by PE Controls, and OLA aided in the rectification of many of those issues. OLA identified a number of issues with the BAS during onsite surveys and by remote viewing of the automation system. OLA aided in identifying and resolving these issues which should translate into energy savings for the Library. All issues observed during the installation phase were also documented within the commissioning notice which can be found in the appendix of this report.

At the time of submission of this report to the owner, a small number of items remain open in the commissioning notice. These issues are largely related to future maintenance of the Library systems outside the scope of the project, and should be considered by the Village for future implementation. Below are a few of the notable outstanding issues (see included Cx notice for a full list of open items).

- The air handling units are currently not tied into the Fire Alarm system for fan shutdown in the event of a fire. This was an existing condition and should be corrected by coordinating with a fire alarm vendor.
- The attic has a tendency to overheat which affects the operation of AHU-1. We believe this is due to the unit heaters in the attic that do not have control valves. The Library should consider adding these valves in the future for energy savings and improved performance of AHU-1.

- The condensing units need to be re-tested by the Contractors due to the new sound attenuation equipment provided, to confirm the air flow has not been restricted. This should be done during the upcoming cooling season.

A final commissioning meeting was held on February 24, 2012 to review the project and open items with the Village's representatives. The Owner was made aware of the open issues and plans to address them outside of this project.

As a result of the commissioning process and communication with the Owner and Contractor, OLA concludes that the new building automation system and refurbished HVAC equipment, meets the original design intent of the RFP.

Section 2.0 List of Participants

<p>Owner</p> <p>Dobbs Ferry Library 55 Main Street Dobbs Ferry, NY</p> <p>Contact: Marcus Serrano (Village Administrator)</p> <p>Email: mserrano@dobbsferry.com</p> <p>Phone: (914) 231-8502</p> <p>Fax: (866) 216-0387</p>	<p>Commissioning Authority (CxA)</p> <p>O'Dea Lynch Abbattista Consulting Engineers, P.C. 50 Broadway Hawthorne, NY 10532</p> <p>Contact: James Dolan, P.E., LEED AP Jonathan Katz, P.E., LEED AP</p> <p>Email: jdolan@olace.com jkatz@olace.com</p> <p>Phone: (914) 747-2800</p> <p>Fax: (914) 747-0453</p>
<p>Engineer (RFP Development)</p> <p>O'Dea Lynch Abbattista Consulting Engineers, P.C. 50 Broadway Hawthorne, NY 10532</p> <p>Contact: James Dolan, P.E., LEED AP Jonathan Katz, P.E., LEED AP</p> <p>Email: jdolan@olace.com jkatz@olace.com</p> <p>Phone: (914) 747-2800</p> <p>Fax: (914) 747-0453</p>	<p>Design/Build - Controls Contractor</p> <p>P.E. Control Services, Ltd. 64 main Street Tuckahoe, NY 10707</p> <p>Contact: Greg DiNome</p> <p>Email: GregDiNome@aol.com</p> <p>Phone: (914) 779-0004</p> <p>Fax: (914) 779-0671</p>

Section 3.0 General Project Information

Project:	Dobbs Ferry Library – BAS Upgrade
Location:	55 Main St, Dobbs Ferry, NY
Building Type:	Library
Square Footage:	16,000
Construction Period:	February 2011 – December 201 (BAS Upgrade)

The Dobbs Ferry Library was constructed in 2002 and is approximately 16,000 square feet. The existing building used a pneumatic temperature control system which was installed when the building was constructed. The building experienced poor temperature control of the spaces since it was constructed as well as higher than expected energy usage, and noise issues with the HVAC equipment. The Village issued a request for proposal (RFP) to solicit design-build solutions from qualified controls contractors. OLA Consulting Engineers prepared the scope and specifications for the RFP document. The Village of Dobbs Ferry selected PE Controls to serve as prime contractor for this project.

The BAS project approved scope included providing new DDC temperature controls for all major HVAC equipment and scheduling ability through a web-based graphical user interface. The BAS has alarming and trending functions, and monitors status of all the HVAC equipment in the building. The sequence of operations for the building was developed by OLA and included in the original RFP. Features of the control system include automatic scheduling and control of the heating system boiler and pumps, occupied/unoccupied changeover for the two air handling units and night setback control for all spaces. The BMS controls staging and cycling of the two condensing units as well.

The controls design included installation of new variable frequency drives for the two air handling unit supply and return fans for energy savings. Demand controlled ventilation (CO₂ based) was also incorporated into the project scope using carbon dioxide sensors installed throughout the building for energy savings.

The fan powered VAV boxes are controlled by the new BAS, for which the fans previously ran continuously in an uncontrolled manner. The new sequence cycles the VAV fans at night as needed. Several VAV fans were repaired during the course of the project, and several motors that had failed were replaced as well.

The new controls also integrated the fin tube radiation valves into the automatic controls so that they are active only when needed, which should result in energy savings as well. The BAS also controls miscellaneous HVAC equipment which previously could not be automatically controlled including toilet exhaust fans, pantry exhaust fan, and cabinet unit heaters. The scope of the project ultimately included

replacement of all temperature controls, and eliminated all pneumatic control devices with electric devices for a state of the art control system.

Section 4.0 Overview of Commissioning and Testing Scope

4.1 Overview of Commissioning

Commissioning is a systematic process of helping to ensure that building systems perform interactively according to the design intent and the owner's project requirements. As the CxA, OLA Consulting Engineers supervised the commissioning process. This process is best described as a systematic verification to determine that each individual system functions as intended. In addition to this work, the CxA developed and utilized functional test procedures that were used to verify and document the performance of those systems being commissioned. If there are deficiencies identified within a particular system during the commissioning process, then the CxA will facilitate discussions with the Owner and Contractor. Dependent on the outcome of these discussions, the Owner will finalize their decisions on how they will proceed in bringing the systems to an acceptable standard. Commissioning during the construction of this project is intended to achieve the following specific objectives:

- 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.
- Ensure that O&M documentation left on site is complete.
- Ensure that the Owner's operating personnel are adequately trained.

4.2 Commissioning Documents

In order to gain a complete understanding of the design intent and desired functionality of the systems and equipment to be commissioned the Commissioning Authority (CxA) requires several documents from the Owner, Design Team and the Contractors. It should be noted that the CxA will view the contract documents (plan drawings, specifications, etc.) as taking precedence over any other forms of project documentation.

The documents utilized by the CxA include but are not limited to:

Contract Documents

- Contract Documents include all addenda, trade plan drawings, specifications, sequences of operations, etc. as produced by the Architect and / or Engineer of Record and their consultants to obtain construction bids

Construction Checklists

- Construction checklists are detailed sheets used by the CxA to help ensure all equipment is installed per the contract documents. These sheets are customized by the CxA for the specific piece of equipment or specific system being commissioned.

Submittals

- Equipment Submittals and shop drawings are detailed specification sheets and assembly details of the exact equipment to be installed as part of the project. Submittals and shop drawings are produced by the manufacturer, supplier or fabricator of the equipment for review and approval by the Architect or Engineer of Record. The CxA also reviews applicable submittals to ensure conformance with the commissioning plan.

Change Orders

- Change Orders are changes to the contract documents that occur after a project price has been bid or negotiated. Regardless of the cause, Change Orders can change the scope of the project or affect the commissioning requirements of the project or specific systems.

Manufacturer Approved Equipment Start-Up Reports

- Equipment manufacturers possess the most detailed knowledge regarding the equipment they provide. All applicable information provided by manufacturers will be incorporated in the commissioning process.

O & M Manuals and Associated Equipment Manufacturer's Documentation

- Operation and Maintenance (O&M) manuals and Associated Equipment Manufacturers Documentation will be used to generate the construction checklists and is a key component of the training of operations and maintenance personnel.

Commissioning Plan

- This is an overall plan, developed before bidding (Design Phase Commissioning Plan) or after bidding (Construction Phase Commissioning Plan), that provides the structure, schedule, and coordination planning for commissioning. The Commissioning Plan is updated as the project progresses from pre-design, through design and construction.

Prefunctional Checklists

- Prefunctional checklists are detailed sheets created by the CxA and used by the installing contractors to help ensure all important equipment details are included in the installation. These sheets are customized by the CxA for the specific piece of equipment or specific system being commissioned.

Functional Test Sheets

- Functional Test Sheets are detailed sheets used by the CxA to help ensure all important equipment parameters are verified during the initial operation of the equipment for the commissioning process. These sheets are customized by the CxA for the specific piece of equipment or specific system being commissioned.

4.3 Overview of Testing Scope

The following equipment/systems were commissioned in this project. All general references to equipment in this document refer only to equipment that is to be commissioned. The system description is meant to include all support equipment, components and controls. The commissioning process includes but is not limited to the following systems:

Systems:

- Heating systems – One (1) hot water boiler/burner
- Hot water systems – Two (2) hot water pumps P-1, P-2 and nine (9) baseboard finned-tube radiation elements, and four (4) cabinet unit heaters.
- Air conditioning systems – Two (2) upgraded and refurbished air handling units AHU-1 and AHU-2 , associated VFD's and associated condensing units CCU-1 and CCU-2.
- Return Fans – Two (2) return fans RF-1 and RF-2 (as part of AHU-1/2 systems)
- Exhaust fans – Elevator MER Exhaust EV-EX-1, Children's Library Toilet Room exhaust TX-1, Main, Upper floor Toilet exhaust TX-2, and Pantry exhaust KIT
- Seventeen (17) Fan powered VAV boxes with hot water reheat coils and associated controllers (no sampling was done).
- Verification of replacement of the existing controls to new DDC controls per the scope.
- Spot-check of testing, adjusting and balancing work

Section 5.0 Description of Testing and Verification Methods

5.1 VAV Air Handling Units Testing and Verification

The variable air volume air handling systems were tested by observing system operation during design outdoor air conditions and/or simulating certain conditions through the use of the control program for different modes of operations of the units. The VAV air handling systems are sequenced to activate based on the building schedule. Upon the activation of the air handling system the supply and return air fans are commanded to run. The supply fan variable frequency drives modulate to maintain the supply air static pressure setpoints which were determined by the balancing contractor, and the return fan variable frequency drives modulate to maintain the return plenum static pressure setpoints. The exhaust damper modulates in response to building static pressure.

The supply temperature of the air handling system is reset up or down depending on the average space temperature from the corresponding VAV box controls.

Economizer cooling will be utilized prior to mechanical cooling when available. Economizer is available when outdoor air drybulb is below the return air drybulb by at least 7 °F, and is locked-out when outside air temperature is greater than 75°F. Discharge air temperature setpoint is reset from 53°F to 73°F based on the average space temperature.

DCV (demand controlled ventilation) is sequenced to provide additional fresh air when return air CO₂ level exceeds the high CO₂ level limit. The modulation range of the outside air damper begins at a CO₂ differential of 600 ppm and reaches maximum at 700 ppm.

Various safeties and alarms were also tested during the verification process by simulating the conditions in the controls system. These alarms included low air temperature alarm, fan failure, and supply air temperature alarm.

A complete step by step VAV air handling system verification process was performed and outlined in the commissioning test sheets which can be found in the appendices of this report for reference.

5.2 VAV Boxes Testing and Verification

VAV box functional testing was performed for all (17) boxes and tested by simulating certain conditions through the use of the control program for different mode of operations of the box, and using a hair dryer and ice pack to simulate calls for cooling and heating respectively.

VAV box cooling mode airflow is verified through lowering the space temperature setpoint below space temperature and to observe the design airflow being achieved with the modulation of the VAV box damper. The design minimum airflow setpoint is observed with the modulation of the VAV box damper when the space temperature is satisfied (within the deadband).

Three (3) VAV boxes were noted unable to achieve the setpoint. It was noted that this likely due to the fan powered boxes being slowed down to reduce their noise effects. OLA recommends continuing to trend these spaces to see if comfort complaints require increasing the static pressure setpoint of the AHU.

A complete step by step VAV box verification process was performed and outlined in the commissioning test sheets which can be found in the appendices of this report for reference.

5.3 Hot Water System Testing and Verification

Hot water system (Boiler-1) and associated hot water pumps, serving perimeter radiators, reheats and unit heaters was verified in the controls system.

Hot water supply temperature setpoint is controlled by BMS by cycling the boiler off/on and by using a firing modulation signal. The boiler was observed to track the hot water setpoint well. When under light heating loads, it was observed the hot water temperature fluctuates around the setpoint +/- 5 degrees. This is likely because the boiler is oversized under those conditions and cannot modulate below a fixed minimum firing rate and therefore has to cycle off. This condition did not appear to create any comfort issues.

A complete step by step hot water system verification process was performed and outlined in the commissioning test sheets which can be found in the appendices of this report for reference.

Section 6.0 Commissioning Issues Log & Field Observation Reports

6.1 Commissioning Notice

A comprehensive commissioning issues list was created and updated frequently throughout the project.

(See attached commissioning notice for item records)

A few of the issues found during the project have not been corrected at the time of this report. The commissioning issues list, which incorporates all issues found during the project, can be found within the appendices of this report.

6.2 Field Observation Reports

The field observation report is a tool that the commissioning agents use to document the progression of a project. Every time a representative from the commissioning firm was on site a report was generated to update the entire construction team about the on-goings relating to the project. This was used for a tracking device of issues along with the commission issues list. This document also serves as a tool to bridge communication between the different trades. The site visit reports can be found in the appendices of this report.

APPENDIX A
Commissioning Plan

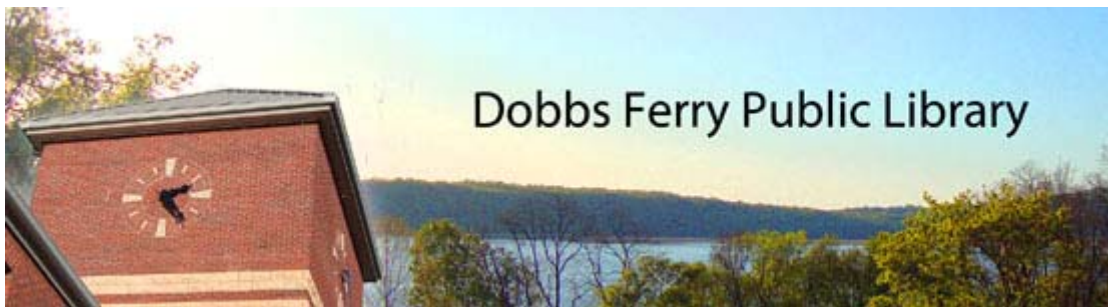


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Dobbs Ferry Library HVAC/BAS Upgrade

Commissioning Plan
Retro-Commissioning



Dobbs Ferry, NY

OLA PROJECT NO.: NDFL0002.00

April 8, 2011

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Commissioning Plan

1.0 General Project Information

Project: Dobbs Ferry Library HVAC/BAS Upgrade
 Location: Dobbs Ferry, NY
 Building Type: Public Library
 Square Footage: 12,000 ft²
 Number of stories: 3
 Const. Period: 2000

2.0 Cx Team

<p>Owner Dobbs Ferry Library 55 Main Street Dobbs Ferry, NY Contact: Marcus Serrano (Village Administrator) Email: mserrano@dobbsferry.com Phone: (914) 231-8502 Fax: (866) 216-0387</p>	<p>Commissioning Authority (CxA) O'Dea Lynch Abbattista Consulting Engineers, P.C. 50 Broadway Hawthorne, NY 10532 Contact: James Dolan, P.E., LEED AP Jonathan Katz, P.E., LEED AP Email: jdolan@olace.com jkatz@olace.com Phone: (914) 747-2800 Fax: (914) 747-0453</p>
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3.0 Overview

The Dobbs Ferry Library was constructed in 2002 and is approximately 12,000 square feet. The existing building uses a pneumatic temperature control system installed when the building was constructed. The building has experienced poor temperature control of the spaces since it was constructed as well as higher than expected energy usage, and noise issues with the HVAC equipment. The Village issued a request for proposal (RFP) to solicit design-build solutions from qualified controls contractors. OLA Consulting Engineers prepared the scope and specifications for the RFP document. The Village of Dobbs Ferry selected a controls contractor to serve as prime contractor for this project.

The scope of this project includes:

- Complete replacement of the existing temperature controls with a direct digital control (DDC) building automation system.
- Testing and balancing (TAB) of all the HVAC systems
- New variable speed drives for the HVAC systems
- Demand controlled ventilation strategy and sequence.
- Acoustical barrier wall for outdoor HVAC equipment
- Acoustical testing of outdoor HVAC equipment.

The new BAS system, existing HVAC systems and relevant components, and the acoustical mitigation project shall be retro-commissioned as described herein.

3.1. Abbreviations and Definitions

The following are common abbreviations used in this document.

A/E	Architect and design engineers (Design Team)	GC	General contractor
CxA	Commissioning authority	MC	Mechanical contractor
CC	Controls contractor	PFC	Prefunctional checklist
CM	Construction Manager	PM	Project manager
Cx	Commissioning	Subs	Subcontractors to General
Cx Plan	Commissioning Plan document	TAB	Test and balance contractor
EC	Electrical contractor		
FT	Functional test		

3.2. Commissioning Scope

Commissioning is a systematic process of ensuring that all building systems perform interactively according to the design intent and the owner's project requirements. As the CxA, OLA Consulting Engineers will supervise and oversee the commissioning process. Three primary phases included are the design, construction, and acceptance phases. This process is best described as a systematic verification to determine that each individual system functions as intended. In addition to this work, the CxA will develop and utilize functional test procedures that will be used to verify and document the performance of those systems being commissioned. If there are deficiencies identified within a particular system during the commissioning process, then the CxA will facilitate discussions with the Owner, and the respective contractor. Dependent on the outcome of these discussions, the Owner will finalize their decisions on how they will proceed in bringing the systems to an acceptable standard.

This commissioning plan has been developed by OLA to act as an informational document to clarify how the commissioning process shall proceed. This plan will outline the responsibilities of the CxA, Owner, and Contractor. Three primary phases are included:

- Design
- Construction
- Acceptance

4.0 Process

This Construction-Phase Commissioning Plan outlines the responsibilities and procedures that will be used throughout the duration of the commissioning process. The plan identifies which systems are to be commissioned and provides an overview of the methods of verification and documentation that will be utilized by the CxA. Preliminary schedules for the functional testing of the systems will be outlined. This preliminary Commissioning Plan will be reviewed by the Owner. After the approval of the Commissioning Plan, the CxA will be responsible for presenting and reviewing it with the Commissioning Team. This Commissioning Plan will be updated to more accurately reflect the specific requirements of this project as the job progresses. The members of the Commissioning Team will participate in the commissioning process as outlined below.

4.1. Design Phase Controls Review

The CxA will perform a review of the designed control systems strategy. The intent of the review is to verify that the strategy will meet the owner's project requirements and the needs of commissioning process, i.e., functional testing. The CxA will also review the controls specifications to assure that all necessary requirements for coordination with the Testing, Adjusting and Balancing subcontractor are included. Specifications have already been completed at the time of this issue. Specifications for commissioning are included in the Design Documents (RFP)

4.2. Controls Checkout Plan

The controls contractor will develop and submit a control checkout plan detailing the process they intend to use to verify the installation and functionality of the controls system including a step-by-step description of the process and forms they will use to document the controls checkout. The controls contractor will coordinate with the Testing, Adjusting and Balancing (TAB) subcontractor to ensure that appropriate control equipment is available for use.

4.3. Controls Review Meeting

The CxA will conduct a pre-testing meeting with the controls contractor to verify that the controls programming, including the "Front-end" graphics, is complete prior to the commencement of functional testing. The CxA will supply job specific functional test checklist to the controls contractor in-order to clarify the specific items that the CxA will be testing.

4.4. Testing, Adjusting and Balancing

TAB work must be performed after the controls system has been completed and all checkout and startup documentation has been completed by the controls subcontractor to assure accurate testing, adjusting and balancing. The CxA will verify the air and water balancing by spot checking systems, reviewing completed balancing reports and through selected site observation.

4.5. Site Visits

The CxA will make multiple site visits during the construction phase to generally observe the progress and quality of the work. The CxA will document each visit with a commissioning field observation report and associated issues notice.

4.6. Prefunctional Checklists

Prefunctional checklists (PFC) are important to ensure that the equipment and systems are hooked up and operational and that functional testing may proceed without unnecessary delays. Each piece of equipment receives full prefunctional checkout **by the Contractor**. No sampling strategies are used. In general, the prefunctional checkout for a given system, must be successfully completed prior to formal functional testing of equipment or subsystems of the given system.

PFCs are primarily static inspections and procedures to prepare the equipment or system for initial operation (e.g., oil levels OK, fan belt tension, labels affixed, gages in place, sensor calibration, etc.). However, some PFC items entail simple testing of the function of a component, a piece of equipment or system (such as measuring the voltage imbalance on a three phase pump motor of a chiller system). The word prefunctional refers to before functional testing. PFCs augment and are combined with the manufacturer's start-up checklist.

Contractors typically already perform some, if not many, of the PFC items the commissioning authority will recommend. However, few contractors document in writing the execution of these checklist items. The CxA does not witness prefunctional checklisting, except for testing of larger or more critical pieces of equipment and some spot-checking.

The CxA will produce prefunctional checklists that can be used by the installing contractors. Any deficiencies that are found can then be corrected early in the process when the contractors are fully mobilized on site. The PFCs will be created for all equipment included in the scope of the commissioning process, as defined later in this document.

The CxA still performs a full verification of the installation as part of the functional testing, but the PFCs allow the installing contractors to properly review their own installation prior to the functional testing.

4.7. Functional Testing

The Commissioning Authority will coordinate, supervise and participate in, the functional testing (FT) of the building systems and equipment. This testing will be done in accordance with the approved functional test procedures and the results will be recorded on the functional test sheets provided by the CxA. The Contractors will provide trained technicians that have participated in the installation of the systems and equipment being tested to assist in the functional testing process. The Owner will also provide operational staff to participate in the functional testing if required by the CxA.

The CxA provides a master list of FTs in the appendix of the plan and develops FT procedures in a sequential written form, coordinates, oversees and documents the actual testing. Conditional variations such as emergency modes and opposite seasonal testing are identified in the FTs. Some FTs may include DDC trend logging to confirm system operation.

When a piece of equipment or system has been verified by the Contractors as ready for testing and prefunctional checkout and startup have been completed, they will notify the CxA and that

piece of equipment and/or system will be examined for commissioning readiness. Once deemed complete the functional testing will commence.

If the system appears not ready for testing or fails during the testing process, the CxA will update the Commissioning Deficiency List and notify the contractors and owner that the Commissioning Deficiency List has been updated. This update will describe any and all deficiencies and what the recommended action is to correct any problems. If assistance is needed from the Design Engineer, a request will be incorporated into the Commissioning Deficiency List asking for such recommendations and/or comments from the Design Team. Any review comments should be provided via the Commissioning Deficiency List. After review and approval, this notice shall be given to the respective Contractors. Once the Contractors have made any necessary corrections, they will update the Commissioning Deficiency List stating that the corrective action was taken. Once a corrective item has been completed the Commissioning Authority shall resume testing this outstanding item.

The Commissioning Authority will keep the Owner, Design Engineer and Contractors informed of the process of this testing by providing updates on the Commissioning Deficiency List. If the test results do not comply with the test standards, the CxA will facilitate a meeting between the Owner, Design Engineer and Contractors to resolve the issue. The CxA will provide recommendations of what actions should be taken and moderate discussions concerning any outstanding issues. The Owner and the Design Team will provide the final decision of what approach will be taken and direct the responsible parties to take corrective action.

If the test fails more than one re-test due to the lack of appropriate action by the Contractors, the CxA will call a meeting to discuss appropriate resolutions and procedures. The final testing results for each test will be included in the CxA's Commissioning Report which will be submitted to the Owner upon completion of the Commissioning Process.

5.0 Schedule

Incorporation of commissioning into the project schedule requires coordination among the commissioning team members. During construction it is essential that the flow of information and materials include the CxA and that time for CxA review and any required revisions be allowed. The CxA will work with the lead individuals on overall project scheduling, typically the Design Engineer and Owner or CM to ensure that the commissioning milestones are included.

Detailed testing and training schedules will be developed by the CxA as construction progresses establishing sequential priorities to ensure work progresses in a logical manner that supports the commissioning process. Examples of the sequential priorities that will be required for the project include:

- Functional testing does not begin until prefunctional and startup check-out and TAB have been completed for any given system (this does not preclude a phased approach).
- The controls system and equipment it controls are not functionally tested until all points have been calibrated and pre-functional testing completed.
- TAB is not performed until the controls system has been sufficiently functionally tested and approved by the CxA for TAB work.

Refer to Appendix A for a detailed schedule specific for this project.

6.0 Responsibilities

6.1. Commissioning Authority Responsibilities

The CxA will prepare a preliminary Commissioning Plan and submit this plan to the Owner for review. The Commissioning Authority will adjust the document based on the Owner's assessment and related comments and submit it for final approval. The CxA and the Owner will review the final Commissioning Plan with the Contractors involved. Specific responsibilities vary with the management scenario and the CxA's specific scope of services. Ideally, the same party or firm acts as CxA through all project phases, as detailed below:

Construction Phase

During construction, the CxA is in charge of the commissioning process and makes the final recommendations to the owner about functional performance of commissioned building systems and assemblies. The CxA is an advocate for the owner, acting as independently and objectively as possible. The core commissioning activities during construction are to:

- Review construction submittals
- Observe the progress and quality of work
- Organize, plan, develop, and execute functional testing
- Review traditional O&M manuals
- Verify operator training.

6.2. Owner Responsibilities

The Owner will review the preliminary Commissioning Plan and provide comments to the CxA. As required, they will meet with the CxA to clarify any changes to the document. The Owner will approve the final document. With the CxA, they will review the final Commissioning Plan with the Contractors involved.

6.3. Owner's Project Management Staff Responsibilities

The owner's project management staff's ultimate responsibility is to see that the commissioning plan is executed. The owner should:

- Include commissioning responsibilities in all commissioning team members' scopes of services.
- Make sure there is sufficient time for commissioning in the project schedule.
- Ensure the CxA is receiving cooperation from other team members.
- Ensure that other owner responsibilities (developing the OPR, having O&M staff participate during construction) are fulfilled.
- Ensures that all issues identified through commissioning are resolved in a timely manner.

6.4. Owner's Operations Staff Responsibilities

Construction Phase

During construction, this staff may:

- Assist in reviewing selected submittals
- Assist in construction observation, verifying completion of construction checklists and observing start-up

- Participate in or witness testing
- Review O&M and systems manual
- Participate in training.

6.5. Design Team Responsibilities

The Design Team will understand the commissioning process as outlined in the Commissioning Plan and provide participation as detailed in the plan or as requested by the Owner.

Construction Phase

During construction, designers:

- Review the commissioning plan
- Attend selected commissioning meetings
- Answer questions about system design and intended operation
- Update design narratives in the BOD (modification to or initial scope intent) to reflect as-built conditions
- Respond to or incorporate CxA comments on construction submittals and O&M manuals
- Help resolve design-related issues raised during commissioning

6.6. Contractor's Responsibilities

Construction Phase

The responsibilities of the installing trade contractors (and vendors and subcontractors, as appropriate) include:

- Cooperating with the CxA in executing the commissioning plan.
- Providing input into the commissioning plan.
- Coordinating with other trades as necessary to facilitate a smooth and complete commissioning process.
- Participating in commissioning meetings.
- Responding to questions and issues raised by the CxA.
- Executing and documenting tasks in the construction checklist and start-up process
- Performing and documenting tests when in their scope.
- Participating in resolving issues identified during commissioning.
- Correcting identified deficiencies and responding to deficiency notices via the commissioning deficiency list.

Commissioning-related activities of trade contractors are to prepare O&M manuals and submissions to the systems manual and provide training on commissioned systems and assemblies.

6.7. Commissioning Documents

In order to gain a complete understanding of the design intent and desired functionality of the systems and equipment to be commissioned the Commissioning Authority (CxA) requires several documents from the Owner, Design Engineer and the Contractors. It should be noted that the CxA will view the contract documents (plan drawings, specifications, etc.) as taking precedence over any other forms of project documentation.

The documents utilized by the CxA include but are not limited to:

Contract Documents

- Contract Documents include all addenda, trade plan drawings, specifications, sequences of operations, etc. as produced by the Architect and / or Engineer of Record and their consultants to obtain construction bids

Construction Checklists

- Construction checklists are detailed sheets used by the CxA to ensure all equipment is installed per the contract documents. These sheets are customized by the CxA for the specific piece of equipment or specific system being commissioned.

Submittals

- Equipment Submittals and shop drawings are detailed specification sheets and assembly details of the exact equipment to be installed as part of the project. Submittals and shop drawings are produced by the manufacturer, supplier or fabricator of the equipment for review and approval by the Engineer of Record. The CxA also reviews applicable submittals to ensure conformance with the commissioning plan.

Change Orders

- Change Orders are changes to the contract documents that occur after a project price has been bid or negotiated. Regardless of the cause, Change Orders can change the scope of the project or affect the commissioning requirements of the project or specific systems.

Manufacturer Approved Equipment Start-Up Reports

- Equipment manufacturers possess the most detailed knowledge regarding the equipment they provide. All applicable information provided by manufacturers will be incorporated in the commissioning process.

O & M Manuals and Associated Equipment Manufacturer's Documentation

- Operation and Maintenance (O&M) manuals and Associated Equipment Manufacturers Documentation will be used to generate the construction checklists and is a key component of the training of operations and maintenance personnel.

Commissioning Plan

- This is an overall plan, developed before bidding (Design Phase Commissioning Plan) or after bidding (Construction Phase Commissioning Plan), that provides the structure, schedule, and coordination planning for commissioning. The Commissioning Plan is updated as the project progresses from pre-design, through design and construction.

Prefunctional Checklists

- Prefunctional checklists are detailed sheets created by the CxA and used by the installing contractors to ensure all important equipment details are included in the installation. These sheets are customized by the CxA for the specific piece of equipment or specific system being commissioned.

Functional Test Sheets

- Functional Test Sheets are detailed sheets used by the CxA to ensure all important equipment parameters are verified during the initial operation of the equipment for the commissioning process. These sheets are customized by the CxA for the specific piece of equipment or specific system being commissioned.

Commissioning Notices

- The Commissioning Notice is a typically a report generated by the CxA that identifies the project progress as it relates to building commissioning. The Commissioning Notice is a

summary of current issues from the tracking database. The Commissioning Notice is distributed to the Owner, design team, and responsible contractors, when applicable, at commissioning progress meetings. The Commissioning Notice identifies and tracks the corrective action of deficiencies identified by the CxA.

Commissioning Reports

- The CxA will write and submit a final commissioning report detailing, for each piece of commissioned equipment or assembly, the adequacy of equipment or assemblies meeting contract documents. The following components are typically included:
 - Description of the project specifications
 - Verification of installation (commissioning notices)
 - Functional tests sheets
 - O&M documentation evaluation
 - Value of the commissioning process
 - Outstanding issues
 - Systems manual

Noncompliance items will be specifically listed. A brief description of the verification method used (manual testing, trend logs, data loggers, etc.) and observations and conclusions from the testing will be included. The final commissioning report is updated after occupancy / operations-phase commissioning.

7.0 Systems to be Commissioned

The following equipment/ systems will be commissioned in this project. All general references to equipment in this document refer only to equipment that is to be commissioned. The system description is meant to include all support equipment, components and controls. The commissioning process includes but is not limited to the following systems:

Systems

- Heating systems – One (1) hot water boiler/burner
- Hot water systems – Two (2) hot water pumps P-1, P-2.
- Air conditioning systems – Two (2) air handling units AHU-1 (Children's Library) and AHU-2 (Main Library 1st and 2nd floors), associated VFDs and associated condensing units CCU-1 and CCU-2.
- Return Fans – Two (2) return fans RF-1 and RF-2, and VFDs.
- Exhaust fans – Elevator machine room EV-EX-1, Children's Library Toilet TX-1, Toilet Rooms TX-2, and Pantry exhaust KIT.
- Verification of replacement of the existing pneumatic controls to all new DDC controllers and electronic devices.
- Review of Testing, adjusting and balancing work
- Seventeen (17) Fan powered VAV boxes with hot water reheat coils and associated controllers (based on 25% sampling).
- Selected cabinet heaters and fin tube elements (based on 25% sampling).

Appendix B

Sample Prefunctional Checklists (PFC)

Pre-Functional Record Sheets

OLA Consulting Engineers

**Owner Name
Air Conditioning Unit**

PRE-FUNCTIONAL SYSTEM CHECKLIST

Mechanical Contractor	Date	Controls Contractor	Date
Electrical Contractor	Date	Sheet Metal Contractor	Date
Contractor	Date	General Contractor	Date

PROJECT: _____		SYSTEM I.D.# _____	
LOCATION: _____		EQUIPMENT I.D.# _____	
ITEM	OK	COMMENT	
AHU-			
6" housekeeping pad installed			
Check mountings (shipping bolts removed)			
Verify equipment guards installed			
Pulleys aligned and belt tension correct			
Plenums clear and free of loose material			
Fan rotates freely			
Fan motor and linkages lubricated			
Fire and balance dampers free to operate			
Motorized dampers move freely and stroke when commanded			
Temporary start-up construction filters installed.			
Electrical connections complete			
Disconnect switch installed			
VFD installed and started			
Fan room clean for start-up			
Hot water coil clean and clear-piping complete			
Cooling coil clean and piping complete			
Condensate drains clear and piped			
Safety controls operational			
Ductwork clean and sealed			

Pre-Functional Record Sheets

OLA Consulting Engineers

PROJECT: _____		SYSTEM I.D.# _____	
LOCATION: _____		EQUIPMENT I.D.# _____	
ITEM	OK	COMMENT	
ATC controls complete (point to point checkout)			
Bump fan to check rotation (VFD and bypass)			
DX COIL EQUIPMENT			
Refrigerant piping complete.			
Refrigerant charge complete			
Manufacture's refrigeration checkout and startup completed			
Thermometers -supply and return installed.			
DX cooling capacity control verified			
Drain valve installed.			
Condensate drain pan trapped and piped.			
HOT WATER PREHEAT COIL			
Supply shut off valve installed.			
Strainer installed.			
Flow measurement device installed			
Thermometers - supply and return installed.			
Automatic air vent installed.			
Drain valve installed.			
Balancing valve installed.			
Flow measurement device installed			
(2) Way modulating control valve installed.			
Return shut off valve with memory stop installed.			
Check vertically mounted dispersion tube is clean.			
Casing penetrations are sealed and will not leak			
Drain pan trapped and piped			
COMMENTS: _____			
PRE-START BY:		DATE:	
START-UP BY:		DATE:	

Appendix C

Sample of Functional Test

**Functional Performance Test
Record Sheets**



**JOB NAME
JOB LOCATION
Date**

Air Handling Unit(s)
AHU-

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Operations and Maintenance Data
3. Verification of Warranty Periods on Equipment
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. AHU Identification
 - a) Return Fan Identification _____
 - b) Condensing Unit Identification _____
2. AHU Unit Voltage
 - a) Return Fan Voltage _____
 - b) Condensing Unit Voltage _____
3. AHU Full Load Amps – Nameplate
 - a) Return Fan Full Load Amps – Nameplate _____
 - b) Condensing Unit Full Load Amps _____
4. Verify duct insulation is applied in accordance with the Specification. Compliance: _____
Non-compliance: _____

Remarks:

5. Verify fan rotation, lubrication and belt alignment for Compliance: _____

Air Handling Unit(s)
AHU-

Page - 1

Functional Performance Test
Record Sheets



both supply and return fan.

Non-compliance: _____

Remarks:

6. Verify construction start-up filters were removed and replaced with new filters.

Compliance: _____
Non-compliance: _____

Remarks:

7. Verify unit is installed with ample clearance for maintenance and repair of all components.

Compliance: _____
Non-compliance: _____

Remarks:

8. Verify unit installation:

Yes No

- Supply Fan Mixing Box
- Supply Fan Air Blender
- 30/30 Flat Filters
- Hot Water Heating Coil
- Medium Access and Service Selection
- Humidifier Section
- DX Cooling Coil
- Medium Access and Service Section
- Supply Fan
- Diffuser Plate
- Final Filters
- Discharge Plenum
- Ductwork Flexible Connectors – Supply Fan
- Fan Spring Isolators – Supply Fan
- Filter Magnahelic Gauges
- Supply Fan Inlet Probes
- Premium Efficient Motors
- Extended Lube Lines
- Fuse Disconnects
- Supply Ductwork Sound Traps
- Return Ductwork Airflow Station
- Return Ductwork Sound Trap
- Relief Motorized Damper
- Return Fan Flexible Connectors
- Return Fan Spring Hanger Isolators

Air Handling Unit(s)
AHU-

Page - 2

**Functional Performance Test
Record Sheets**



- Outside Air Intake – V-1
- Minimum O.A. Electric Heater
- Minimum O.A. Airflow Station
- Maximum O.A. Motorized Damper

9. Verify piping arrangement and support equipment to heating and cooling coils:

- | | Yes | No |
|---|-----|----|
| Refrigeration Liquid Line Strainers | | |
| Refrigerant Line Dryers | | |
| Refrigerant Line Sight Glasses | | |
| Refrigerant Line Discharge Muffler | | |
| Refrigerant Line Flexible Metal Hose Connection | | |
| Refrigerant Line Solenoid Valves | | |
| | | |
| HWS Coil Isolation Valve | | |
| Hot Water Supply Strainer | | |
| HWS Control Valve (two-way mod.) | | |
| | | |
| HWS Thermometer | | |
| HWS Pressure Gauge | | |
| Hot Water Air Vents and Drains | | |
| HWR Thermometer | | |
| HWR Pressure Gauge | | |
| HWR Balancing Valve | | |
| HWR Coil Isolation Valve | | |
| Piping Identification Installed | | |
| Valve Tagging Complete | | |
| | | |
| Humidifier Supply Line Isolation Valve | | |
| Humidifier Supply Line Strainer | | |
| Humidifier Return Line Trap Detail | | |

10. Verify supply fan, return fan and condensing unit are labeled. Compliance: _____
Non-compliance: _____

Remarks:

11. Verify installation of variable speed drives (both supply and return fan with by-pass). Compliance: _____
Non-compliance: _____

Remarks:

Air Handling Unit(s)
AHU-

Page - 3

**Functional Performance Test
Record Sheets**



12. Verify fans have been statically and dynamically balanced.

Compliance: _____
Non-compliance: _____

Remarks:

13. Verify refrigeration lines have been supported properly on roof.

Compliance: _____
Non-compliance: _____

Remarks:

14. Verify refrigeration lines have been insulated properly on roof.

Compliance: _____
Non-compliance: _____

Remarks:

15. Verify installation of stainless steel ductwork 15-feet downstream of humidifier.

Compliance: _____
Non-compliance: _____

Remarks:

16. Verify outdoor air intake has been anchored properly and is a minimum 48-inches off the roof.

Compliance: _____
Non-compliance: _____

Remarks:

17. Verify bottom of O.A. ductwork has been caulked water-tight and a drain installed.

Compliance: _____
Non-compliance: _____

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at EMS. Record times.

Compliance: _____
Non-compliance: _____

Air Handling Unit(s)
AHU-

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**Functional Performance Test
Record Sheets**



Remarks:

- 1. a. Verify ATC program for optimal stop/start. Record parameters.

Compliance: _____
 Non-compliance: _____

Remarks:

- 2. Verify air handler override at starter when in hand position.

Compliance: _____
 Non-compliance: _____

Remarks:

- 3. Measure and record unit static pressure and total airflow.

Compliance: _____
 Non-compliance: _____

Remarks:

- 4. Verify calibration of supply and return and mixed air temperature sensors.

Compliance: _____
 Non-compliance: _____

Remarks:

- 5. Verify installation and calibration of O.A. sensor.

Compliance: _____
 Non-compliance: _____

Remarks:

- 6. Verify calibration and placement of RH sensor.

Compliance: _____
 Non-compliance: _____

Remarks:

- 7. Verify calibration of static pressure sensors and

Compliance: _____

Air Handling Unit(s)
AHU-

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**Functional Performance Test
Record Sheets**



record settings.

Non-compliance: _____

Remarks:

8. Verify unoccupied mode of operation. Verify fans are off, O.A. damper is 100% closed, and humidifier has stopped.

Compliance: _____
Non-compliance: _____

Remarks:

9. Verify in the unoccupied mode that the unit will start whenever one of the OR Rooms requires cooling for temperature or humidity.

Compliance: _____
Non-compliance: _____

Remarks:

10. Verify operation of night setback and set-up operation. Return damper open and O.A. closed. Record setback setpoints.

Compliance: _____
Non-compliance: _____

Remarks:

11. Verify operation of morning warm-up. Verify outdoor air damper is closed and exhaust fans are off in that zone.

Compliance: _____
Non-compliance: _____

Remarks:

12. Verify operation of face and bypass dampers in the occupied mode during warm-up mode.

Compliance: _____
Non-compliance: _____

Remarks:

13. Verify morning warm-up terminates when return air temperature reaches setpoint.

Compliance: _____
Non-compliance: _____

Remarks:

Air Handling Unit(s)
AHU-

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**Functional Performance Test
Record Sheets**



14. Verify when unit becomes occupied that O.A. damper goes to minimum O.A. setting. Record Outdoor air reading at minimum. Compliance: _____
Non-compliance: _____

Remarks:

15. Verify outdoor air electric heater operates to maintain a minimum of 10 deg. F inlet temperature to unit. Compliance: _____
Non-compliance: _____

Remarks:

16. Verify maximum O.A. damper remains closed when unit is in a minimum O.A. condition. Compliance: _____
Non-compliance: _____

Remarks:

17. Verify exhaust fans start when unit goes to an occupied mode. Compliance: _____
Non-compliance: _____

Remarks:

18. Verify fan status at both the supply and return fans through the current sensor switches. Compliance: _____
Non-compliance: _____

Remarks:

19. Verify calibration of supply fan inlet airflow probe. Compliance: _____
Non-compliance: _____

Remarks:

20. Verify calibration of return and outdoor air airflow probes. Compliance: _____
Non-compliance: _____

Air Handling Unit(s)
AHU-

Page - 7

**Functional Performance Test
Record Sheets**



Remarks:

21. Verify supply fan modulates to maintain static pressure sensor setpoint. Record setpoint of sensor.

Compliance: _____
Non-compliance: _____

Remarks:

22. Verify unit will maintain discharge air temperature. Record discharge air reset schedule.

Compliance: _____
Non-compliance: _____

Remarks:

23. Verify mixed air temperature control is such that it will maintain 55 deg. F.

Compliance: _____
Non-compliance: _____

Remarks:

24. Verify economizer control is installed to maintain 55 deg. F discharge air temperature.

Compliance: _____
Non-compliance: _____

Remarks:

25. Verify installation of enthalpy control system for economizer operation.

Compliance: _____
Non-compliance: _____

Remarks:

26. Verify operation of relief air damper during economizer mode.

Compliance: _____
Non-compliance: _____

Remarks:

27. Verify de-activation of economizer mode. Verify that

Compliance: _____

Air Handling Unit(s)
AHU-

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**Functional Performance Test
Record Sheets**



O.A. damper returns to minimum O.A. and relief air damper closes.

Non-compliance: _____

Remarks:

28. Verify DX cooling operation. Verify O.A. damper position is at minimum setting. Record O.A. temperature for lockout of compressors.

Compliance: _____
Non-compliance: _____

Remarks:

29. Verify compressor cooling stages and record. Verify EMS monitoring of cooling stages.

Compliance: _____
Non-compliance: _____

Remarks:

30. Verify HW valve is closed 100% when cooling cycle is energized.

Compliance: _____
Non-compliance: _____

Remarks:

31. Verify operation of C.U. Verify EMS monitoring of cooling stages. Verify hot gas bypass installation and low ambient control.

Compliance: _____
Non-compliance: _____

Remarks:

32. Verify operation of heating hot water control valve. Valve shall operate off of discharge air sensor. Record discharge air temperature off of coil at full heating.

Compliance: _____
Non-compliance: _____

Remarks:

33. Verify operation of face and bypass damper. Record operation parameters.

Compliance: _____
Non-compliance: _____

Remarks:

Air Handling Unit(s)
AHU-

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**Functional Performance Test
Record Sheets**



34. Record discharge air reset schedule for face and bypass. Compliance: _____
Non-compliance: _____

Remarks:

35. Verify cooling is locked out during the heating mode. Compliance: _____
Non-compliance: _____

Remarks:

36. Verify fan failure alarm at EMS. Verify fan stops and O.A. damper closes. Compliance: _____
Non-compliance: _____

Remarks:

37. Verify dirty filter alarm at EMS for both the pre-filter and final filters. Compliance: _____
Non-compliance: _____

Remarks:

38. Verify operation of low limit thermostat. When activated, the HW valve shall full open, O.A. damper shall close, and fan shall be disabled. Verify alarm at OPS. Compliance: _____
Non-compliance: _____

Remarks:

39. Verify unit discharge high limit alarm feature is installed. Record setting and verify alarm at EMS. Compliance: _____
Non-compliance: _____

Remarks:

40. Verify operation of humidifier and record setpoint. Compliance: _____
Non-compliance: _____

Air Handling Unit(s)
AHU-

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**Functional Performance Test
Record Sheets**



Remarks:

41. Verify operation of hi-limit humidity duct sensor.

Compliance: _____
Non-compliance: _____

Remarks:

Notes:

1.

Air Handling Units

Air Handling Unit(s)
AHU-

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Appendix D

Sample Commissioning Issue Notice



OLA Cx
 50 Broadway
 Hawthorne, NY 10532
 Tel: 914-747-2800
 Fax: 914-747-0453
 www.olace.com

Project Name: _____
 Project Number: _____
 Date: _____
 Date of Issue: _____

Commissioning Notice #

Notification of Items Requiring Correction

- 0 Open Items
- 0 Closed Items
- 0 Items Pending Verification
- 0 Items Out of Contract Scope
- 0 Total Items

The Construction Manager is asked to distribute this commissioning notice to all parties for their review and comment. Once the corrections have been made, the commissioning notice shall be returned to OLA indicating all corrections are complete or exceptions have been taken. OLA will verify the completion of all outstanding items.

Action Code: OLA – OLA Consulting Engineers, GC – General Contractor, MC - Mechanical Contractor, CC - CC Controls Contractor, BC - BC Balancing Contractor, PC - PC Plumbing Contractor, EC - Electrical Contractor, - MEP Engineer, - Owner

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
1						
2						
3						
4						
5						
6						
7						
8						
9						
10						
11						
12						
13						
14						
15						
16						
17						
18						
19						
20						
21						

APPENDIX B
Commissioning Notice

OLA Consulting Engineers Commissioning Notice #3

50 Broadway
Hawthorne, NY 10532
Tel: (914) 747-2800
www.olace.com



Notification of Items Requiring Correction

Date: Monday, February 27, 2012

Project Name: Dobbs Ferry Library -Control Upgrade RCx

Site FT's: Wednesday, February 15, 2012

OLA Project Number: NDFL0002.00

2
35
0
5
42

Open Items
Closed Items
Items Pending Verification
Items Out of Contract Scope
Total Items

CxA will distribute this commissioning notice to all parties for their review and comment. Once the corrections have been made, the commissioning notice shall be returned to OLA indicating all corrections are complete or exceptions have been taken. OLA will verify their completion of all outstanding items.

Action Code: OLA – OLA Consulting Engineers, PEC - PE Controls, Mechanical/Controls Contractor, DFL - Village of Dobbs Ferry, Owner

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
1	VAV	VAV boxes in childrens library, (2) VAVs on 2nd floor library, and (1) on 1st floor, are in need of fan repairs. Fan motors need replacement. PEC provided proposal for repairs. DFL to determine if change order	10/12/2011	PEC	CLOSED	10/12/11 - DFL : the change order was approved to repair the VAVs 11/16/11 - PEC: the repair of the FPBs was completed last week.
2	OA	It was noted that the OA sensor was reading higher than the actual outside air temperature. Sensor found to be located inside the intake duct for AHU-2. When OA damper is mostly closed, sensor provides a false OA reading. Contractor to relocate sensor.	12/21/2011	PEC	CLOSED	PEC: OA sensor was relocated to the rear fire exit, and is now reading properly ** 2/8/12 - OLA checked relocated sensor. Reading was OK in new location.
3	VAV	VAV zone 2-7 (office) was noted as always being warm. Contractor adjusted valve actuator in field and temperature returned to within range.	12/21/2011	PEC	CLOSED	1/12/12 - OLA noted that space is running warmer than setpoint again. Contractor to investigate. PEC: *** Adjusted the valve linkage to assure proper close-off. Will watch trend logs *** 2/8/12 - PE extended trend logs to provide 1 week of data for verification. 2/15/12 - OLA: Trends indicate space being maintained

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
4	BLR	It was noted on the BMS graphics that the boiler modulation signal can drop to 0% even while burner is on. PEC explained that 0% signal actually means burner is at minimum firing rate. OLA suggested a min. value be displayed for clarity (i.e. 20%). Contractor correct in field.	12/21/2011	PEC	CLOSED	
5	VAV	It was noted that zone VAV-1-6 (lobby) was not displaying a CFM reading onscreen.	12/21/2011	PEC	CLOSED	12/21/11: Contractor investigated and corrected. Problem was found to be clogged sensor tubing in VAV box.
6	GEN	DFL noted that a fire extinguisher cover was damaged during the TAB work on the 2 nd floor. Contractor to repair or replace	12/21/2011	PEC	CLOSED	PEC: ** Moved cover from mechanical room to second floor. Will replace cover in mechanical room ** 2/8/12- PEC ordered new cover. 2/10/12 - PEC replaced cover
7	GEN	PE controls to provide (2) hardcopies of the completed O&M manual to DFL and Dobbs Ferry DPW.	12/21/2011	PEC	CLOSED	PEC: ** Not done yet, will complete week of Jan25 ** 2/8/12 - O&Ms and CDs provided to owner. OLA to review CDs.
8	GEN	O&M manuals to updated to include As-Built floor plan indicating VAV tags/locations, thermostat locations and associated VAVs, location of building space pressure sensor, location of OA sensor, and supply duct static pressure sensors.	12/21/2011	PEC	CLOSED	** Documents are complete, need to place on the server and in the hardcopy, will complete week of Jan25 ** 2/8/12 - CDs received. OLA to review.
9	GEN	PE conrols to setup email alerts for alarms to all users as determined by DFL. Library to advise who should receive automatic email alarms if any.	12/21/2011	DFL	CLOSED	** Need to set up a meeting with staff to determine which alarms they want to receive and who should receive them ** 2/8/12 - PEC sent request for information to Library. 2/15/12 - Alerts have been setup
10	VAV	It was noted that 2nd floor spaces were overheating. During Controls checkout meeting, cause appeared to be reheat valves control signal reversed. Contractor to re-check all reheat valves and correct.	12/21/2011	PEC	CLOSED	12/21/2011 - Contractor checked reheat valves in field and corrected control signal for reheat valves. PEC: **Corrected** 2/8/12 - PE extended trend logs to provide 1 week of data for verification. 2/15/12 - trends indicate spaces being maintained
11	VAV	Periodicals VAVs were balanced to lower than design flows however still notably noisy. PEC disabled two (2) of the four (4) VAV fans that serve the Periodicals which resulted in noticeable improvement. PEC to continue to trend to confirm that VAV boxes in lobby can be left off without loss of space comfort. 2/15/12 - PEC disabled all fans for noise control.	12/21/2011	PEC	CLOSED	PEC: ** Trend logs indicate the space is still controlling properly with the fans off ** 2/8/12 - OLA recommended including staging of fans in sequence for cooling mode in response to space temperature. 2/24/12 - Owner to keep as is for now, owner accepted. Owner can enable fans if they need to. PEC can automate Fan activation at a later date.

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
12	GEN	DFL Library staff indicated that since the controls installation, an loud water-hammering sound has been occurring in the lobby. PEC tried to duplicate the problem without success. The problem is suspected to be related to the valves closing too quickly, or cycling on of the 2 nd hot water pump before the 1 st pump has been shutdown. PEC controls changed program onsite. PEC to continue to investigate.	12/21/2011	PEC	CLOSED	12/21/11- DFL: The "freight train" came back this morning; it lasted about 10 minutes, so we were able to trace. It is coming from the base board heating in Periodical room. I called Greg; he's pretty sure it a problem with the valve and will send someone this week. Will keep you posted. ** Valve was installed backwards and has been corrected *** 2/8/12 - verified complete.
13	AHU	Email from PEC - 9/2/11: PE Controls advised that they discovered that the fire alarm relay was still not connected to the fan VFDs. This is the same condition we found before we started the job. The F/A contractor was there and we were advised that he had corrected it months ago but it still has not been corrected.	12/21/2011	DFL	OPEN	OLA 1-16-11: DFL needs to contact their fire alarm vendor to confirm the Fan shutdown device is active and working. 2/24/12: Owner accepts and will address in future.
14	FTR	It was found that even though the BMS graphics indicated the Fin tube radiation valves were closed (0% signal), in some cases, the valves were actually still open. This was noted in the Periodicals area, Pantry and rear staircase. PEC to investigate.	12/21/2011	PEC	CLOSED	PEC 1-12-12: All the Reheat and FTR valves are now working properly. **Found bad 2 controller outputs damaged during installation, replaced both controllers. All valves now functional ** 2/8/12 - verified complete
15	PANTRY	Contractor to label the pantry exhaust fan button (Exhaust ON/OFF)	12/21/2011	PEC	CLOSED	** Not done yet, will complete week of Jan25 ** 2/8/12 - Not completed, PEC to complete today. 2/24/12 - PEC completed.
16	O&M	O&M Manual: Include TAB data indicating the measurements of the Outside air and the corresponding damper position setpoints that were measured, that are currently used in the sequence/program.	2/8/2012	PEC	CLOSED	PEC to provide update to O&M TAB data. 2/24/12 - Completed per PEC
17	VAV	Trends for VAVs only show 1 to 2 days of data. Extend trends to show 1 week of data for all VAVs.	2/8/2012	PEC	CLOSED	PEC to extend trend logging setup for VAVs. 2/14/12 - verified complete
18	VAV	The CO2 sensor in Director's office was reading 2000 ppm. PEC to investigate.	2/8/2012	PEC	CLOSED	2/8/12 - PEC indicated the controller was replaced due to bad outputs, and CO2 input has to be reconfigured. Will be done today. 2/11/12 - verified corrected
19	VAV	It was reported by PEC that the exhaust damper on AHU-2 is broken internally. The actuator was replaced under the project, but the damper was not. The damper range of modulation is limited as result.	2/8/2012	DFL	CLOSED	DFL to determine if they want PEC to repair the exhaust damper. 2/15/12 - PEC disconnected actuator to avoid damaging actuator. 2/24/12 - Owner understands. PEC to provide separate proposal to fix damper. Village will need a second quote.

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
20	AHU-1	OLA noted that AHU-1 experiences 20 deg. F rise from OA to MA duct section even while unit is in 100% economizer. Possible hot water valve leakage, or Return damper leakage. PEC to investigate.	2/9/2012	PEC	CLOSED	PEC 2/10/12: We checked the operation of the valves and dampers on AHU-1. The dampers open properly and have rubber gaskets that shut tight when closed, but the MAT is still 15 degrees above OAT with OAD fully open, RAD fully closed. The attic is above 80 deg and there is significant leakage into the ducts. We adjusted the linkage on the HCV on AHU1 and that has improved the SAT. 2/15/12: - OLA: After further investigation by OLA, we believe the condition is caused by the attic overheating (see issue #22).
21	AHU-1	12/21/11: It was noted that the attic has been reading warm temperatures. CxA and Contractor investigated cause during the site visit. OLA investigated children's library comfort complaints also. OLA measured 105 °F discharge air temperature at ceiling level, and 90 – 95 °F at return register. Floor temperature was measured at 69 °F. Probable short circuiting of warm air is occurring in the children's library. This may warrant a change to the diffusers and locations in the future (not part of current scope of work).	2/15/2012	DFL	Out of contract scope	
22	AHU-1	The Attic has always measured very warm temperatures. 2/15/12: OLA investigated further and believes the existing unit heaters are the most likely cause of attic overheating, since they do not have control valves to stop the supply of hot water to them.	2/15/2012	DFL	Out of contract scope	2/21/12: OLA: DFL should consider adding control valves to these unit heaters to reduce attic overheating. 2/24/12 -Owner requested proposal from PE to provide control valves to address.
23	O&M	O&M Manual: As-built drawings do not indicate Space pressure sensors and VAV tags. PEC to add to As-builts	2/15/2012	PEC	CLOSED	PEC corrected
24	VAV	During testing, it was noted that VAV flow goes to max. during unoccupied mode. They should go to min.	2/15/2012	PEC	CLOSED	2/15/12: PEC corrected VAV-2-11 during testing. Agreed to correct all VAVs. 2/24/12 - PEC corrected this week
25	FTR	2nd FI Toilets radiation valve does not close off.	2/15/2012	PEC	CLOSED	PEC investigated and found bad actuator. PEC to replace week of 2/21/12
26	FTR	1stf FI Toilet Mens Room radiation valve does not close off.	2/15/2012	PEC	CLOSED	PEC investigated and found bad actuator. PEC to replace week of 2/21/12
27	FTR	All the fan powered boxes do not report fan status feedback via a CT. Fan status was required per the specification.	2/15/2012	PEC	CLOSED	PEC confirmed they will provide CTs for fan status week of 2/21/12
28	EL-EX-1	The elevator machine room exhaust fan appears to need a fan belt installed. Control sequence was verified, however fan wheel does not turn.	2/15/2012	DFL	CLOSED	PEC confirmed that they advised DFL to change belt during the project. 2/24/12 - Owner understands and will address.

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
29	TX-1	DFL advised that the children's library toilet does not close since the fan was balanced.	2/15/2012	PEC	CLOSED	2/8/12 : OLA advised PEC that the original design rate of 400 CFM seems excessive for the children's toilet. Recommend adjusting volume damper. 2/15/12 - OLA adjusted the volume damper to reduce the exhaust amount from the bathroom until door closes.
30	RF-2	Return fan RF-2 (main library) was making a squeeling sound. It is possible it may need bearing maintenance in the near future. We recommend fan receive regular maintenance in the near future.	2/15/2012	DFL	Out of contract scope	2/24/12 - Owner understands and accepts.
31	AHU-1	AHU-1 supply fan vibrates when at high speeds. (PEC email 7/25/11). OLA 2/15/12: Supply fan appears to be out of mechanical balance, and vibrates when fan is at a high speed. Recommend the fan be further evaluated as a maintenance item.	2/15/2012	DFL	Out of contract scope	2/24/12 - Owner understands and accepts, and will address outside of contract.
32	ACC-2	6/1/11 - DFL reported warm temperatures in the Library	2/15/2012	PEC	CLOSED	6/2/11 - PEC: The only temperature control problem that I am aware of is in the Main Library. When we started up the AC units last week, we were told that one stage out of four serving the main library was not working. Despite this expectation, I saw all four stages start. On Tuesday when the outdoor temperature increased towards 90 degF, we saw two stages lock out on their internal safety circuit. We reset the AC unit and these stages restarted. After running a short time, all four stages locked out on pressure safeties. Again we reset the unit and only two stage restarted. Evidently this unit is in need of service. It could be over or under charged with refrigerant, have a refrigerant leak or simply require cleaning of the condensor coils. 6/8/11 - PEC provided service to the ACC-2 to try and correct the above issues noted. 6/13/11 - PEC advised that one of the compressors on ACC-2 was in need of additional service 6/22/11 - PEC advised they performed service on the AC unit compressor yesterday, it was not a bad compressor, but just needed to be serviced to correct the refrigerant charge. PEC advised they found several bad wiring connections in the ACC-2 which they repaired.

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
33	VAV	7/8/11: DFL: Noise from VAV above 2nd fl office is excessive. 12/21/11: It was noted that the fan powered box over the librarian's office on the 2nd floor is extremely noisy. DFL noted that the room was originally intended for storage. The expectation was that TAB work would be able to reduce the noise levels. DFL may consider a re-design of that VAV unit – both the distribution ductwork and the support of the unit.	2/15/2012	DFL	Out of contract scope	7/10/11: PEC: The noise is a result of the unit's original improper installation. It may be louder now since it was balanced for proper flow. 2/24/12: DFL Requested proposal from PEC to address this item.
34	ACC	7/11/11 - The small condensing unit ACC-1 cannot stay on-line since the Acoustic wall went up. Contractors looking into increasing airflow into the enclosure. 7/21/11 - Larger condensing unit ACC-2 also tripping out on high temperature. 8/3/11 - Complaint from DFL that noise is more audible up the driveway now.	2/15/2012	PEC / VP	OPEN	7/21/11 - Contractor installed Plywood baffles on ACC-1 to improve heat removal from enclosure. 7/22/11 - PEC cut holes into Acoustic enclosure to alleviate lack of air flow. OLA: Additional holes appear to have stopped units from tripping out. 8/8/11: VP hung acoustical blankets in garage to reduce noise up the driveway. Prelim. sound test provided. 1/26/12 - VP provided additional air openings and installed duct silencers into openings. 2/15/12: OLA: Seasonal observation required to determine if silencers have negatively impacted airflow. Testing required by VP to demonstrate system meets sound requirements. (Note OLA is documenting for owner only and is not contractually responsible for Cx of this effort).
35	ACC	7/23/11 - VFDs were tripping out. PEC was called to investigate. 7/25/11 - AHU-2 VFD continues to trip out after being reset.	2/15/2012	PEC	CLOSED	7/24/11 - at 7am the library had a power surge which caused all four fan VFDs to lockout. 7/25/11- PEC: Found the fan belts on AHU2 (Adult Library) were worn and over-tightened to make up for the wear and the fan pulleys was too small. This causes the fan to operate at higher amperage than it is designed to handle when it needs to operate at high speed to satisfy the extreme load. I spoke with Gary at DPW and we are in the process of replacing the belts and adjusting the pulley this afternoon and you may notice the fans off for short periods of time.
36	AHU-1	7/24/11 - A problem wit AHU-1 freezestat tripping was encountered over weekend.	2/15/2012	PEC	CLOSED	7/25/11 - PEC: The probelm with AHU1 (Childrens Room) is caused by the existing supply fan VFD operating at too low a speed. This caused the freezestat to trip when both cooling circuits were operating. We did not see this problem before since one circuit had always been sufficient to cool the library in the less extreme weather.

No.	Tag	Item Description	Posted On	Responsibility	Status	Comment
37	AHU-2	1/20/12: OLA noticed on AHU-2, the Exhaust damper seems to be 70 – 80% open the past few weeks, and the building space pressure setpoint is not being maintained as result. The OA damper was at minimum the whole time, so does not look like economizer mode is overriding.	2/15/2012	PEC	CLOSED	PEC: Exhaust dampers will open in response to the building pressure as well as the return air plenum pressure. If the return fan is at the minimum and the return plenum is still above setpoint, the exhaust damper will open to relieve pressure. You noticed that the dampers were open even though the RF was not at minimum. I corrected that. 2/15/12: OLA: observed corrected.
38	AHU-1	1/20/12: OLA noticed an AHU-1, space pressure setpoint not being maintained, but Exhaust damper still opening and fluctuating.	2/15/2012	PEC	CLOSED	PEC: same as above
39	AHU-1	1/20/12: On the AHU-1 graphic, we noticed that a number of the trend buttons actually take you to the trend for AHU-2 (the Static pressure, outside air and exhaust air dampers)	2/15/2012	PEC	CLOSED	PEC : All corrected.
40	AHU-2	1/20/12: On AHU-2, the AHU2-Temperature Trend, looks like the point being trended is actually the AHU-1 Supply temperature.	2/15/2012	PEC	CLOSED	PEC : All corrected.
41	AHU-2	1/20/12: On AHU-2, the FAN trend , looks like a AHU-1 SP point is being trended.	2/15/2012	PEC	CLOSED	PEC : All corrected.
42	GEN	1/20/12: On the Home screen, the OA temp and humidity was not being displayed. And the outdoor trend, not displaying OAT or OAH correctly (scale does not seem to adjust to show those two points correctly).	2/15/2012	PEC	CLOSED	PEC: The problem was created when I moved the OA sensor and didn't update the graphic to match. All corrected.

APPENDIX C
Commissioning Field Observation Reports



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COMMISSIONING FIELD OBSERVATION REPORT

PROJECT: Dobbs Ferry Library – Controls Upgrade, RCx

PROJECT NO.: NDFL0002.00

DATE OF OBSERVATION: December 21, 2011

OBSERVER: Jonathan Katz – OLA CxA
Jim Dolan – OLA CxA

Please find below a summary of findings from our site visit on Wednesday December 21, 2011. The primary purpose of this visit was to have a controls checkout meeting to review the operation of the DDC control system, and provide an initial training session to the building operators and staff.

Controls Checkout Meeting:

1. It was noted that the OA sensor was reading higher than the actual outside air temperature. Sensor found to be located inside the intake duct for AHU-2. When OA damper is mostly closed, sensor provides a false OA reading. PEC to relocate sensor.
2. It was noted that the attic has been reading warm temperatures. CxA and Contractor investigated cause during the site visit. OLA investigated children's library comfort complaints also. OLA measured 105 °F discharge air temperature at ceiling level, and 90 – 95 °F at return register. Floor temperature was measured at 69 °F. Probable short circuiting of warm air is occurring in the children's library. This may warrant a change to the diffusers and locations in the future (not part of current scope of work).
3. Zone VAV-2-7 (director's office) was reported by DFL to be warm. PE Controls (PEC) and OLA investigated during site visit. Contractor closed isolation valve to reheat coil and temperature dropped from 81 °F to 74 °F, indicating control valve is not closing to the off position. Contractor found reheat coil valve actuator needed to be adjusted. After contractor adjustment, temperature came down to within setpoint after some time. PEC to monitor temperatures to verify proper operation.

4. It was noted on the BMS graphics that the boiler modulation signal can drop to 0% even while burner is on. PEC explained that 0% signal actually means burner is at minimum firing rate. OLA suggested a min. value be displayed for clarity (i.e. 20%). Contractor corrected in field.
5. It was noted that zone VAV-1-6 (lobby) was not displaying a CFM reading onscreen. Contractor investigated and corrected onsite. Problem was found to be clogged sensor tubing in VAV box.
6. DFL noted that a fire extinguisher cover was damaged during the TAB work on the 2nd floor. Contractor to repair or replace
7. A potential safety issue exists with the access to/from the attic MER which can be accessed only by the window. DFL should consider installing doorway to roof access or similar solution. Existing condition and not part of current scope of work.
8. It was noted that the fan powered box over the librarian's office on the 2nd floor is extremely noisy. DFL noted that the room was originally intended for storage. The expectation was that TAB work would be able to reduce the noise levels. Should this remain an office, which appears likely, DFL may consider a re-design of that VAV unit – both the distribution ductwork and the support of the unit.
9. It was noted that 2nd floor spaces were overheating (during controls checkout meeting). The cause appeared to be reheat valves control signal reversed. Contractor re-checked the reheat valves and made correction in field. Contractor to continue to trend for verification that correction worked.
10. Periodicals VAV's were balanced to lower than the original design flows however still notably noisy. PEC disabled two (2) of the four (4) VAV fans that serve the Periodicals which resulted in noticeable improvement. PEC to continue to trend to confirm that (2) VAV boxes in Periodicals can be left off without loss of space comfort.
11. DFL Library staff indicated that since the controls installation, a loud water-hammering sound has been intermittently occurring in the lobby. PEC tried to duplicate the problem without success. The problem is suspected to be related to a valve closing too quickly, or the cycling on of the lag hot water pump before the lead pump has been shutoff. PEC controls changed program onsite to prevent pump staging before lead pump cycles off. PEC to continue to investigate.
12. It was found that even though the BMS graphics indicated the Fin tube radiation valves were closed (0% signal), in some cases, the valves were actually still open. This was noted in the Periodicals area, Pantry and rear staircase. PEC to investigate and correct.
13. OLA spot checked cabinet unit heaters start/stop command from BMS. Tested successfully.

14. OLA spot checked pantry fan start/stop switch. Tested successfully. Contractor to label the pantry exhaust fan button.

Training

15. A training session was held from approximately 1:00 to 2:00. Training materials were provided. Attendees included:
 - Jeff Ault – Library Director
 - Ned Canora – Library Staff
 - Gary Gardner – DPW
 - James Dunn – DPW (*partial attendance*)
 - Jonathan Katz – OLA
 - Greg DiNome – PE Controls (*instructor*)
16. It was discussed that PE controls to provide (2) hardcopies of the completed O&M manual to DFL and Dobbs Ferry DPW.
17. O&M manuals to be updated to include As-Built floor plans indicating VAV tags, thermostat locations and associated VAVs, location of building space pressure sensor, location of OA sensor, and supply duct static pressure sensors.
18. It was discussed that the Library/DPW staff may opt for an additional training session. PEC advised that after staff have had some time to utilize the BMS software, they can call him with any questions.

Distribution:

Project PM (Cx) – Jim Dolan / OLACE
CxA – Jonathan Katz / OLACE
Owner – Jeff Ault / Dobbs Ferry Library Director
Owner – James Dunn - Dobbs Ferry DPW
Owner – Marcus Serrano, Village Administrator

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APPENDIX D
Functional Test Sheets



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date: 2/15/12

Heating Hot Water System

Hot Water Boiler
B-1

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Boiler/Burner Unit Identification Smith G-28A-W-7 /
PowerFlame J50A-15HBS-7

2. Verify installation of the outdoor air temperature and humidity sensor:
 ➤ Verify calibration.
 ➤ Record location.
Compliance: ✓
Non-compliance: _____

Remarks: _____

3. Verify installation of primary HWS and HWR temperature sensors.
 ➤ Verify calibration.
 ➤ Record location.
Compliance: ✓
Non-compliance: _____

Remarks: _____



C. Functional Performance Tests

1. Verify start/stop capability for each boiler and programmed function operation:

- Record parameters.
2 min. DELAY BEFORE ANY RESTART

Remarks:

Compliance: ✓
Non-compliance: _____

2. Verify each boiler status is generated correctly at the facilities workstation.

- Record parameters.

Remarks:

Compliance: ✓
Non-compliance: _____

3. Verify HWS temperature setpoint reset capability through the BAS according to the following schedule:

OAT	HWS
35 deg F	180 deg F
70 deg F	140 deg F

Remarks:

Compliance: ✓
Non-compliance: _____

4. Verify boiler/burner interlocks:

- When hot water pump status has been proved boiler is allowed to be enabled
- When BAS is indexed to cooling mode, boiler shall be disabled.
- **2 min run prior to boiler fire**
- > Pump stays on for 30 min. after boiler shutdown**

Remarks: **Boiler shuts on pump failure.**

Compliance: ✓
Non-compliance: _____

5. Verify BAS enables boiler operation on a call for heating hot water:

- The BAS modulates the burner capacity to maintain the HWS setpoint.
- Record operating parameters.
-

Remarks:

Compliance: ✓
Non-compliance: _____

Alarms & Safeties:

6. Verify that if any boiler fails to prove status the

Compliance: N/A



following occurs:

- The lead boiler/pump combination is de-energized.
- The lag boiler/pump combination is energized.
- An alarm is generated at the workstation.

Non-compliance:

N/A

Remarks: **NOT Applicable, 1 boiler Arrangement**

7. Verify operation of factory provided manual reset low water cut-off switch: **(Jumped LWCO switch)**

- The boiler/pump combination is disabled.
- An alarm is generated at the workstation. ✓
- Verify BAS monitors boiler safety circuit ✓

Compliance:

✓

Non-compliance:

Remarks: **Pump REMAINS ON. OK**

8. Verify operation of factory provided manual reset high limit device: ✓

- The boiler/pump combination is disabled.
- An alarm is generated at the workstation.

Compliance:

✓

Non-compliance:

Remarks: **Adjusted high temp to 160° to simulate.**

9. Verify operating of heating hot water high and low temperature alarms:

- Record parameters.
- An alarm is generated at the facilities workstation.

Compliance:

✓

Non-compliance:

Remarks: **HIGH TEMP: 7210°F FOR 5 MIN. (RESET AT 205°F)
LOW TEMP: SETPOINT -20°F FOR 5 MIN. (RESET AT -10°F)**

10. Verify boiler flame failure alarm:

- An alarm is generated at the workstation.

CLOSED GAS VALVE, FLAME FAIL.

Compliance:

✓

Non-compliance:

Remarks:

11. Verify the following points are available and accurate at the operator's workstation.		
	Yes	No
a. Outdoor Air Temperature and Humidity	✓	
b. Boiler B-1 Status	✓	
c. Boiler B-1 General Fault Alarm (Safety Circuit status)	✓	
d. Boiler B-1 Flame Failure Alarm	✓	
e. Primary HWS Temperature	✓	
f. Primary HWR Temperature	✓	
g. Reset HWS Temperature Setpoint	✓	
h. Boiler Temperature High/Low Limit Alarm	✓	

Functional Performance Test
Record Sheets



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i. HWS Temperature Setpoint Alarm	✓		
j. Graphic Display	✓		

Remarks:

Notes:



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date: *2/15/12*

Heating Hot Water System

Primary Pumps:
P-1, P-2

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

- Hydronic Balancing Report *Received, 12/20/11*

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

- Pump Identification:

P-1	Weinman 309 S ^S CV-75P54
P-2	Weinman 309 S ^S CV-75P54

- Pump Capacity:
(data per Original Design documents)

	Flow Rate (gpm)	Pump Head (ft)	Impeller (in)
P-1	190	80	-
P-2	190	80	-

- Pump Motor Performance (nameplate):

	Horsepower (hp)	Voltage (volts)	Phase	FLA (amps)
P-1	7.5	208	3	22
P-2	7.5	208	3	22

C. Functional Performance Tests

- Verify pump status through BAS (via current transducer/differential pressure sensor).

Compliance:
Non-compliance:



Remarks:



2. Verify operation of Starter HOA switch.

Compliance: ✓
Non-compliance: _____

Remarks:

3. Verify that the pumps are enabled when the heating system is indexed to operate through the BAS.
➤ Record parameters.

Compliance: ✓
Non-compliance: _____

Remarks:

4. Verify that the pumps and heating system are enabled when the outdoor air temperature drops below/rises above setpoint.
➤ Record outdoor air 'enable' setpoint. < 55°F

Compliance: ✓
Non-compliance: _____

Remarks:

5. Verify automated failure recovery routine during lead pump failure. Verify that the lag pump is energized and alarm generated.
➤ Record failure recovery parameters.

Compliance: ✓
Non-compliance: _____

HWP-2 put in OFF.

Remarks: 30 SEC. DELAY ;

6. Verify lead/lag pump arrangement is duty cycled based on runtime equalization.
➤ Record lead pump changeover schedule.

Compliance: ✓
Non-compliance: _____

DAILY DUTY CYCLE.

Remarks:

Alarms and Safeties

7. Verify pump status alarm is generated at the operator workstation during pump failure condition.

Compliance: ✓
Non-compliance: _____

Remarks:



8. Verify the following information is available and accurate at the operator's workstation			
	Yes		No
a. P-1 S/S	✓		
b. P-1 Status	✓		
c. P-2-S/S	✓		
d. P-2 Status	✓		
e. Pump lead/lag status (runtime)	✓		
f. Graphic Display	✓		

Remarks:

Notes:



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date: 2/15/12

Split System Air Handling Unit
AHU-1/CCU-1
(Children's Library)

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET


A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
2. Operations and Maintenance Data (*for new VFDs*)
3. Verification of Warranty Periods on new Equipment (*for new VFDs*)
4. Verify Owner Training is Complete - *Training Conducted on 12/21/11*

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification	Trane MCCA017	
2. Unit Voltage	Evaporator fan: 208V/3PH Return fan 208V/3PH Condenser: 208V/3PH	
3. Unit Full Load Amps (Nameplate)	Evaporator fan: 44.4 Return fan: 3.6 Condensing unit: -	
4. Verify new control equipment and field devices have been installed per the approved Controls shop drawing, and in accordance with RFP.	Compliance: _____ Non-compliance: _____	

Remarks:



5. Verify installation of variable speed drives.

Compliance: ✓
Non-compliance: _____

Remarks: **NEW RF-1 ONLY. SF-1 VFD IS EXISTING**

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.
Record times.

Compliance: ✓
Non-compliance: _____

Remarks:

2. Verify air handler override at starter when in hand position.

Compliance: ✓
Non-compliance: _____

Remarks:

3. Measure and record unit static pressure and total airflow (via BMS sensor and airflow via balancing report).

Compliance: ✓
Non-compliance: _____

1" SP SET PT.

Remarks: **Refer to balancing report**

4. Verify calibration of supply and return and mixed air temperature sensors.

Compliance: ✓
Non-compliance: _____

BMS: 74.3

IR: 73.8

Remarks:

5. Verify installation and calibration of O.A. sensor.

Compliance: ✓
Non-compliance: _____

(Colobal pt.)

Remarks:

Functional Performance Test
Record Sheets



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6. Verify calibration and placement of RH sensor.

Compliance: ✓
Non-compliance: _____

Remarks: (SENSOR NOT USED BY SEQUENCE)

7. Verify return static pressure sensors and record settings.

> Record locations

0.03" w.c setpoint.

Compliance: ✓
Non-compliance: _____

Remarks:

8. Verify operation of morning warm-up mode. Verify outdoor air damper is closed.

> Verify Supply temperature resets to 85 F.

Remarks: Forced schedule to UNOCC. + change Avg temps to put unit into WARMUP

Compliance: ✓
Non-compliance: _____

9. Verify morning warm-up terminates when average space temperatures (or return air temperature) reaches setpoint.

Compliance: ✓
Non-compliance: _____

Remarks:

10. Verify operation of cool-down mode. Verify outdoor air damper is closed and exhaust fans are off in that zone.

Remarks: Forced schedule + Avg space temp to go into cool down mode.

Compliance: ✓
Non-compliance: _____

11. Verify unit transitions to normal operation upon reaching occupied space temperatures per sequence of operation.

Compliance: ✓
Non-compliance: _____

Remarks:

12. Verify when unit becomes occupied that O.A. damper goes to minimum O.A. setting. Record Outdoor air reading at minimum.

Compliance: ✓
Non-compliance: _____



Remarks: *per TAB Report / O+M MANUAL*

13. Verify fan status at both the supply and return fans through the current sensor switches.
 > Verify return fans interlocked with supply fans

Compliance: ✓
 Non-compliance: _____

Remarks:

14. Verify supply fan modulates to maintain static pressure sensor setpoint. Record setpoint of sensor.
1" WC setpoint

Compliance: ✓
 Non-compliance: _____

Remarks:

15. Verify return fan modulates to maintain static pressure sensor setpoint. Record setpoint of sensor.
0.03" WC setpoint

Compliance: ✓
 Non-compliance: _____

Remarks:

16. Verify exhaust damper modulates to maintain building static pressure sensor setpoint. Record setpoint of sensor.
 > Record sensor location

Compliance: ✓
 Non-compliance: _____

Remarks:

17. Verify unit will maintain discharge air temperature. Record discharge air reset schedule.

Compliance: ✓
 Non-compliance: _____

SAT RESETS UP TO 55°F → RAT.

Remarks: *(SOME OVERHEATING observed due to Attic heat.) - Left ONE Unit OFF*

18. Verify economizer control is installed to maintain discharge air temperature setpoint per the sequence of operation.

Compliance: ✓
 Non-compliance: _____

Remarks: *DRYBULB ECONOMIZER IN PLACE.
 ACTIVATES ON CALL FOR COOLING.*

Functional Performance Test
Record Sheets



O'DEA
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CONSULTING ENGINEERS

19. Verify installation of ~~enthalpy~~ ^{DRYbulb} control system for economizer operation. Compliance: ✓
 Non-compliance: _____
 > Verify economizer disabled above 75 F and below 45 F. ✓

Remarks: DIFFERENTIAL dry-bulb being used (7F MIN. DIFFERENTIAL) OBSERVED ON GRAPHIC.

20. Verify de-activation of economizer mode. Verify that O.A. damper returns to minimum O.A. and relief air damper closes. Compliance: ✓
 Non-compliance: _____

Remarks:

21. Verify DX cooling operation. Compliance: ✓
 Non-compliance: _____
 > Verify hot water valve closed during DX cooling ✓
 > Verify DX stages enabled on call for cooling based on average space temperature differentials.

Remarks: ✓ COOLING cycle VERIFIED DURING COOLING SEASON July - August 2011.

22. Verify compressor cooling stages and record. Verify BAS monitoring of cooling stages. Compliance: ✓
 Non-compliance: _____
 2 - Stages

Remarks: VERIFIED DURING COOLING SEASON August 2011

23. Verify operation of heating hot water control valve. Valve shall operate off of discharge air sensor. Record discharge air temperature off of coil at full heating. Compliance: ✓
 Non-compliance: _____

Remarks:

24. Verify cooling is locked out during the heating mode. Compliance: ✓
 Non-compliance: _____

Remarks: VERIFIED BY Design of Root schedule. (SOFTWARE DEADBANDS IN PLACE).



25. Verify fan failure alarm at BAS. Verify fan stops and O.A. damper closes.

Compliance: ✓
Non-compliance:

Remarks:

26. Verify operation of low limit thermostat. When activated, the HW valve shall full open, O.A. damper shall close, and fan shall be disabled. Verify alarm at OWS.

Compliance: ✓
Non-compliance:

Remarks:

27. Verify DCV sequence.

- CO2 setpoint is maintained. ✓
- Dampers modulate to maintain setpoint ✓
- Min. damper position is maintained in occupied mode.
- Verify damper positions modulate with fan speed.
- Record Min/Max damper positions *PER DATA IN OJM MANUAL*

Compliance: ✓
Non-compliance:

Remarks:

28. Verify unoccupied mode of operation. Verify fans are off, O.A. damper is 100% closed.
➤ Verify low-limit temperature is maintained by HW valve

Compliance: ✓
Non-compliance:

Remarks: *VERIFIED ON GRAPHICS*

Alarms and Safeties

1. Verify the existing smoke detector shutdown relay is interlocked with new VFDs and is functional.

Compliance:
Non-compliance: X

Remarks: *NOT CONNECTED, EXISTING CONDITION. - OWNER TO ADDRESS. (N.I.C.)*

2. Verify the following alarms are generated:

- Freezestat Alarm ✓
- High duct static pressure

Compliance: ✓
Non-compliance:

Functional Performance Test Record Sheets



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- CCU condenser fan run status failure ✓
- Supply fan run status failure ✓
- Return fan run status failure ✓

Remarks:

Notes:

Split System AHU-1, CCU-1.doc



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date: 2/15/12

Split System Air Handling Unit
AHU-2/CCU-2
(Adult Library Unit)

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
2. Operations and Maintenance Data (*for new VFDs*)
3. Verification of Warranty Periods on new Equipment (*for new VFDs*)
4. Verify Owner Training is Complete - *Training Conducted on 12/21/11*

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

- | | | |
|---|---|--|
| 1. Unit Identification | Trane MCCA030UB | |
| 2. Unit Voltage | Evaporator fan: 208V/3Ph
Return fan: 208V/3Ph
Condenser: 208V/3Ph | |
| 3. Unit Full Load Amps (Nameplate) | Evaporator fan: 57
Return fan: 3.6
Condensing unit: - | |
| 4. Verify new control equipment and field devices have been installed per the approved Controls shop drawing, and in accordance with RFP. | Compliance: <input checked="" type="checkbox"/>
Non-compliance: <input type="checkbox"/> | |

Remarks:



5. Verify installation of variable speed drives.

Compliance: ✓
Non-compliance: _____

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.
Record times.

Compliance: ✓
Non-compliance: _____

Remarks:

2. Verify air handler override at starter when in hand position.

Compliance: ✓
Non-compliance: _____

Remarks:

3. Measure and record unit static pressure and total airflow. (via BMS sensor and airflow via balancing report).

Compliance: ✓
Non-compliance: _____

1" SP SETPOINT

Remarks: **Refer to balancing report**

4. Verify calibration of supply and return and mixed air temperature sensors.

Compliance: ✓
Non-compliance: _____

CHECKED WITH IR

Remarks:

5. Verify installation and calibration of O.A. sensor.

Compliance: ✓
Non-compliance: _____

Remarks:

**Functional Performance Test
Record Sheets**



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6. Verify calibration and placement of RH sensor.

Compliance: ✓
Non-compliance: _____

Remarks: **RH SENSOR NOT USED by SEQUENCE**

7. Verify return static pressure sensors and record settings.

➤ Record locations **RETURN DUCT PRIOR TO AHU**

Compliance: ✓
Non-compliance: _____

Remarks: **0.03" WC SETPOINT**

8. Verify operation of morning warm-up mode. Verify outdoor air damper is closed.

➤ Verify Supply temperature resets to 85 F.

Compliance: ✓
Non-compliance: _____

Remarks:

9. Verify morning warm-up terminates when average space temperatures (or return air temperature) reaches setpoint.

Compliance: ✓
Non-compliance: _____

Remarks:

10. Verify operation of cool-down mode. Verify outdoor air damper is closed and exhaust fans are off in that zone.

Compliance: ✓
Non-compliance: _____

Remarks:

11. Verify unit transitions to normal operation upon reaching occupied space temperatures per sequence of operation.

Compliance: ✓
Non-compliance: _____

Remarks:

12. Verify when unit becomes occupied that O.A. damper goes to minimum O.A. setting. Record Outdoor air reading at minimum.

Compliance: ✓
Non-compliance: _____

PER TAB REPORT DATA PROVIDED



Remarks:

13. Verify fan status at both the supply and return fans through the current sensor switches.
 > Verify return fans interlocked with supply fans

Compliance: ✓
 Non-compliance: _____

Remarks:

14. Verify supply fan modulates to maintain static pressure sensor setpoint. Record setpoint of sensor.

Compliance: ✓
 Non-compliance: _____

Remarks:

15. Verify return fan modulates to maintain static pressure sensor setpoint. Record setpoint of sensor.

Compliance: ✓
 Non-compliance: _____

Remarks:

16. Verify exhaust damper modulates to maintain building static pressure sensor setpoint. Record setpoint of sensor.
 > Record sensor location *S.P. = 0.05" WC.*

Compliance: _____
 Non-compliance: ✓

*EXHAUST DAMPER MECHANICALLY FROZEN AT TIME OF TEST.
 DAMPER IN NEEDED OF REPAIR. N.I.S.*

Remarks:

17. Verify unit will maintain discharge air temperature. Record discharge air reset schedule.

Compliance: ✓
 Non-compliance: _____

Remarks:

18. Verify economizer control is installed to maintain discharge air temperature setpoint per the sequence of operation.

Compliance: ✓
 Non-compliance: _____

FORCED ^{SPACE} Avg Temp to 74°F TO ENGAGE cooling.

Remarks:

Functional Performance Test
Record Sheets



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19. Verify installation of ~~enthalpy~~ control system for economizer operation. Compliance: ✓
 Non-compliance: _____
 ➤ Verify economizer disabled above 75 F and below 45 F. ✓

Remarks: DIFFERENTIAL DRY BULB being used. (7 F MIN. DIFFERENTIAL)

20. Verify de-activation of economizer mode. Verify that O.A. damper returns to minimum O.A. and relief air damper closes. Compliance: ✓
 Non-compliance: _____

Remarks:

21. Verify DX cooling operation. Compliance: ✓
 Non-compliance: _____
 ➤ Verify hot water valve closed during DX cooling ✓
 ➤ Verify DX stages enabled on call for cooling based on average space temperature differentials.

Remarks: Cooling cycle VERIFIED DURING cooling season July-August 2011. (Remote + site visit)

22. Verify compressor cooling stages and record. Verify BAS monitoring of cooling stages. Compliance: ✓
 Non-compliance: _____
 4 STAGES

Remarks: VERIFIED DURING cooling season August 2011

23. Verify operation of heating hot water control valve. Valve shall operate off of discharge air sensor. Record discharge air temperature off of coil at full heating. Compliance: ✓
 Non-compliance: _____

Remarks:

24. Verify cooling is locked out during the heating mode. Compliance: ✓
 Non-compliance: _____

Remarks: VERIFIED BY SOFTWARE DEAD BANDS

**Functional Performance Test
Record Sheets**



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25. Verify fan failure alarm at BAS. Verify fan stops and O.A. damper closes. Compliance: ✓
Non-compliance: _____

Remarks:

26. Verify operation of low limit thermostat. When activated, the HW valve shall full open, O.A. damper shall close, and fan shall be disabled. Verify alarm at OWS. Compliance: ✓
Non-compliance: _____

Remarks:

27. Verify DCV sequence. Compliance: ✓
 > CO2 setpoint is maintained. Non-compliance: _____
 > Dampers modulate to maintain setpoint
 > Min. damper position is maintained in occupied mode. ✓
 > Verify damper positions modulate with fan speed. ✓
 > Record Min/Max damper positions
 SEE PARAMETERS IN TAB RE/O+M REPORT

Remarks:

28. Verify unoccupied mode of operation. Verify fans are off, O.A. damper is 100% closed. Compliance: ✓
 > Verify low-limit temperature is maintained by HW valve Non-compliance: _____

Remarks:

Alarms and Safeties

1. Verify the existing smoke detector shutdown relay is interlocked with new VFDs and is functional. Compliance: _____
Non-compliance: X

NOT CONNECTED, EXISTING CONDITION (NIC.)

Remarks:

- OWNER TO ADDRESS.

2. Verify the following alarms are generated: Compliance: ✓
 > Freezestat Alarm ✓ Non-compliance: _____
 > High duct static pressure

Functional Performance Test Record Sheets



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- CCU condenser fan run status failure ✓
- Supply fan run status failure ✓
- Return fan run status failure ✓

Remarks:

Notes:

Split System AHU-2, CCU-2.doc



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY

Date: 2/15/12

Series Fan Powered Boxes
FP Boxes - VAV-2-1/2-2

FUNCTIONAL PERFORMANCE TEST - RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

~4:30 PM

1. Unit Identification

VAV-2-1 - Community Rm / VAV-2-2 LOBBY
ELEVATOR
VAV-2-1 VAV-2-2

2. Verify installation of plenum inlet filter.

N/A - EXISTING, NIC

Compliance:	_____	_____
Non-compliance:	_____	_____

Remarks:

3. Verify unit is labeled.

Compliance:	_____ ✓	_____ ✓
Non-compliance:	_____	_____

Remarks: PE Added LABELS TO T-STAT DISPLAY

4. Verify installation of local disconnect switch.

N/A - EXISTING, NIC

Compliance:	_____
Non-compliance:	_____



2-1 2-2

Remarks:

5. Verify installation of thermostat.

Compliance:
Non-compliance:

Remarks:

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance:
Non-compliance:

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

Compliance:
Non-compliance:

Remarks: VERIFIED globally For All VAVs

2. Verify calibration of thermostat. Record actual setpoints.

	VAV-21	VAV-22
BMS	72.6 F	72.7 F
IR:	71.5 F	72.5 F

Compliance:
Non-compliance:

Remarks:

Occupied Mode:

3. Verify unit fan operates continuously in occupied mode.

Compliance:
Non-compliance:

PE TO provide FAN STATUS

Remarks: VERIFIED acoustically.

Functional Performance Test
Record Sheets



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4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.

Compliance: ✓ ✓
Non-compliance: _____

REMARKS: HEAT T-STAT TO 72°F, VALVE OPENS, RH CLOSED

VAV-2-1 VAV-2-2

5. Measure and record supply air volume and compare to design volume. (cfm) 2-1 2-2

Compliance: ✓ ✓
Non-compliance: _____

VAV-2-1 MAX 2200 CFM S.P. SATISFIED. | VAV-2-2 200 CFM 187 CFM

REMARKS: Refer to balancing report

6. Set space temperature setpoint up to 85 deg. F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open.

Compliance: ✓ ✓
Non-compliance: _____

REMARKS: VAV-2-1, CUM STARTED PER SEQUENCE. VAV-2-2, NO REHEAT AVAIL. SENSOR COOLED WITH ICE TO TEST HEATING.

7. Verify thermostat operates both reheat and ~~perimeter radiation~~ in sequence (where applicable). perimeter CUM

Compliance: ✓ N/A
Non-compliance: _____

REMARKS:

8. Verify if thermostat are adjustable with fixed deadband of 5 F.

Compliance: ✓ ✓
Non-compliance: _____

REMARKS:

9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.

Compliance: ✓ ✓
Non-compliance: _____

REMARKS: Reduced to 15% during testing. (DIRECTED PE TO change to 15% for all VAV's)

**Functional Performance Test
Record Sheets**



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VAV-2-1 2-2

Unoccupied Mode:

10. Verify that the unit fan is not running and the air valve is closed.

*TESTED globally
VERIFIED Acoustically - PE TO PROVIDE FAN STATUS.*

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: *VERIFIED globally For All VAV's*

12. Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

Compliance: ✓ ✓
Non-compliance: _____

Unoccupied sequence verified globally

Remarks:

Alarms and Safeties

13. Verify the following alarms are generated:

- Fan Failure - *PE TO PROVIDE*
- High zone temp ✓
- Low zone temp ✓

Compliance: _____
Non-compliance: X X

Remarks:

14. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature
- b. Space Temperature Setpoint
- c. Airflow Volume
- d. Airflow Minimum Setpoint
- e. Airflow Maximum Setpoint
- g. Hot Water Control Valve
- h. VAV Air valve position
- i. Fan status
- j. Fan Start/Stop
- k. Heating/Cooling Mode
- l. Fan failure alarm

	Yes	No
a.	✓	
b.	✓	
c.	✓	
d.		=
e.		
g.	✓	
h.	✓	
i.		✓ ← PE TO provide
j.	✓	
k.	✓	

**Functional Performance Test
Record Sheets**



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CONSULTING ENGINEERS

Series FP VAVs.doc



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date: 2/15/12

Series Fan Powered Boxes
FP Boxes –

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

~ 5:30 P.M.

1. Unit Identification

VAV -2-3 (New Books) / VAV-2-5 (Conference Room)
2-3 2-5

2. Verify installation of plenum inlet filter.

N/A - EXISTING, NIL

Compliance: _____
Non-compliance: _____

Remarks:

3. Verify unit is labeled.

Remarks: PE Added LABELS TO T-STAT Display

Compliance: ✓ ✓
Non-compliance: _____

4. Verify installation of local disconnect switch.

N/A - EXISTING, NIL

Compliance: _____
Non-compliance: _____



VAV-2-3 2-5

Remarks:

5. Verify installation of thermostat.

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

*OPERATES OF Bldg. Schedule,
VERIFIED globally*

Remarks:

Compliance: ✓ ✓
Non-compliance: _____

2. Verify calibration of thermostat. Record actual setpoints.

<i>2-4</i>	<i>2-5</i>
<i>RMS: 72.7 °F</i>	<i>73.4 °F</i>
<i>IR: 72.5 °F</i>	<i>73.1 °F</i>

Remarks:

Compliance: ✓ ✓
Non-compliance: _____

Occupied Mode:

3. Verify unit fan operates continuously in occupied mode.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: *PE TO Provide FAN STATUS
VERIFIED Acoustically*

**Functional Performance Test
Record Sheets**



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4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.

Compliance: ✓
Non-compliance: ✓

Remarks: HEATED T-STAT with HAIR DRYER.

VAV-23 2-5

5. Measure and record supply air volume and compare to design volume. (cfm)

2-3 2-5
MAX: SP: 750 cfm | 750 cfm
BMS: 760 Reading | 763

Compliance: ✓
Non-compliance: ✓

Remarks: Refer to balancing report

6. Set space temperature setpoint up to 85 deg. F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open.

Compliance: ✓
Non-compliance: ✓

Remarks: SENSOR COOLED with ICE PACK TO TEST HEATING.

7. Verify thermostat operates both reheat and perimeter radiation in sequence (where applicable).

Compliance: ✓ N/A N/A
Non-compliance: ✓

Remarks:

8. Verify if thermostat are adjustable with fixed deadband of 5 F.

Compliance: ✓
Non-compliance: ✓

Remarks:

9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.

Compliance: ✓
Non-compliance: ✓

Remarks: Reduced to 15% during testing.
(Directed PE to change to 15%)

**Functional Performance Test
Record Sheets**



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CONSULTING ENGINEERS

Unoccupied Mode:

2-3 2-5

10. Verify that the unit fan is not running and the air valve is closed.

TESTED globally

Compliance: ✓ ✓
Non-compliance: _____

Remarks: *VERIFIED ACUOSTICALLY - PE TO PROVIDE FAN STATUS*

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

VERIFIED globally for all VAVs

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

12. Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

Remarks: *UNOCCUPIED SEQUENCE VERIFIED globally*

Compliance: ✓ ✓
Non-compliance: _____

Alarms and Safeties

13. Verify the following alarms are generated:

- Fan Failure *← PE TO PROVIDE*
- High zone temp ✓
- Low zone temp ✓

Compliance: _____
Non-compliance: X X

Remarks:

14. Verify the following information is available and accurate at the operator's workstation:

- | | Yes | No |
|-------------------------------------|-----|----|
| a. Space Temperature | ✓ | |
| b. Space Temperature Setpoint | ✓ | |
| c. Airflow Volume | ✓ | |
| d. Airflow Minimum Setpoint | | = |
| e. Airflow Maximum Setpoint | | = |
| g. Hot Water Control Valve | ✓ | |
| h. VAV Air valve position | ✓ | |
| i. Fan status | | ✓ |
| j. Fan Start/Stop | ✓ | |
| k. Heating/Cooling Mode | ✓ | |
| l. Fan failure alarm | | ✓ |

PE TO PROVIDE.

**Functional Performance Test
Record Sheets**



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CONSULTING ENGINEERS

Series FP VAVs.doc



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date: 2/15/12

Series Fan Powered Boxes
FP Boxes -

FUNCTIONAL PERFORMANCE TEST - RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

~ 5:45 PM

1. Unit Identification	VAV-2-4 (CIRCULATION)	/ VAV-2-6 * (CIRC.)	2-4	2-6
2. Verify installation of plenum inlet filter.	N/A - EXISTING, NIL		Compliance: _____	Non-compliance: _____
Remarks:				
3. Verify unit is labeled.			Compliance: <input checked="" type="checkbox"/>	Non-compliance: <input checked="" type="checkbox"/>
Remarks: PE Added LABELS TO T-STAT Display				
4. Verify installation of local disconnect switch.	N/A - EXISTING, NIL		Compliance: _____	Non-compliance: _____

* VAV-2-4 / 2-6 OPERATE OFF OF COMMON Thermostat.

Functional Performance Test
Record Sheets



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VAV-2-4/2-6

Remarks:

5. Verify installation of thermostat.

Compliance: ✓
Non-compliance: _____

Remarks:

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: VERIFIED globally FOR all VAV'S

2. Verify calibration of thermostat. Record actual setpoints.

Compliance: ✓
Non-compliance: _____

BMS: 71.7°F
IR: 70.9

Remarks:

COMMON T-STAT

Occupied Mode:

3. Verify unit fan operates continuously in occupied mode.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: PE TO PROVIDE FAN STATUS

**Functional Performance Test
Record Sheets**



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CONSULTING ENGINEERS**

4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.

Compliance: ✓
Non-compliance: ✓

Remarks: HEATED T-STAT with HAIR DRYER

5. Measure and record supply air volume and compare to design volume. (cfm)

MAX: 1280 / 300
BMS: 1295 / 330

Compliance: ✓
Non-compliance: ✓

Remarks: Refer to balancing report

6. Set space temperature setpoint up to 85 deg. F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open.

Compliance: ✓
Non-compliance: ✓

Remarks: VAV-2-4 & 2-6 ON COMMON T-STAT.
OPERATE IN TANDEM

7. Verify thermostat operates both reheat and perimeter radiation in sequence (where applicable).

Compliance: N/A
Non-compliance: _____

Remarks:

8. Verify if thermostat are adjustable with fixed deadband of 5 F.

Compliance: ✓
Non-compliance: ✓

Remarks:

9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.

Compliance: ✓
Non-compliance: ✓

Remarks: Reduced to 15%.
(DIRECTED PE to change to 15%)



Unoccupied Mode:

10. Verify that the unit fan is not running and the air valve is closed.

Compliance:
Non-compliance:

TESTED globally

Remarks: VERIFIED Acoustically - PE TO PROVIDE FAN STATUS

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

Compliance:
Non-compliance:

Remarks: VERIFIED globally for all VAV's

12. Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

Compliance:
Non-compliance:

Remarks: UNOCCUPIED sequence VERIFIED globally

Alarms and Safeties

13. Verify the following alarms are generated:

- Fan Failure PE TO PROVIDE
- High zone temp ✓
- Low zone temp ✓

Compliance:
Non-compliance:

Remarks:

14. Verify the following information is available and accurate at the operator's workstation:

	Yes	No
a. Space Temperature	<input checked="" type="checkbox"/>	
b. Space Temperature Setpoint	<input checked="" type="checkbox"/>	
c. Airflow Volume	<input checked="" type="checkbox"/>	
d. Airflow Minimum Setpoint		<input checked="" type="checkbox"/>
e. Airflow Maximum Setpoint		<input checked="" type="checkbox"/>
g. Hot Water Control Valve	<input checked="" type="checkbox"/>	
h. VAV Air valve position	<input checked="" type="checkbox"/>	
i. Fan status		<input checked="" type="checkbox"/>
j. Fan Start/Stop	<input checked="" type="checkbox"/>	
k. Heating/Cooling Mode	<input checked="" type="checkbox"/>	
l. Fan failure alarm		<input checked="" type="checkbox"/>

**Functional Performance Test
Record Sheets**



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Series FP VAVs.doc

**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date: 2/15/12**

Series Fan Powered Boxes
FP Boxes –

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified: ~ 6:00 PM

1. Unit Identification VAV-2-5 / VAV-2-7 (DIRECTOR OFFICE)
(CONF. RM.) 2-5 2-7

2. Verify installation of plenum inlet filter. Compliance: _____
N/A - EXISTING, NIL Non-compliance: _____

- Remarks:

3. Verify unit is labeled. Compliance: ✓
Non-compliance: _____

- Remarks: PE LABELED T-STAT Displays

4. Verify installation of local disconnect switch. Compliance: _____
N/A - EXISTING, NIL Non-compliance: _____



Remarks:

5. Verify installation of thermostat.

Compliance: ✓ ✓
Non-compliance: _____

2-5 2-7

Remarks:

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

OPERATES OFF Bldg. Schedule

Compliance: ✓ ✓
Non-compliance: _____

Remarks: *VERIFIED globally*

2. Verify calibration of thermostat. Record actual setpoints.

	<i>VAV-25</i>	<i>VAV-29</i>
<i>BMS:</i>	<i>73.4 °F</i>	<i>71.2 °F</i>
<i>IR:</i>	<i>73.1 °F</i>	<i>70.8 °F</i>

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

Occupied Mode:

3. Verify unit fan operates continuously in occupied mode.

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

*FAN ON. - VERIFIED Acoustically
PE TO PROVIDE FAN STATUS.*

Functional Performance Test
Record Sheets



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- | | | | | |
|--|--|--|-------------------------------------|--------------------------------|
| <p>4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.</p> <p>HEATED FSTAT WITH HAIR DRYER</p> <p>Remarks:</p> | <p>VAV-2-7</p> <p>* DAMPER goes to 100%.</p> <p>CFM SETPOINT NOT REACHED</p> | <p>Compliance: <u>✓</u></p> <p>Non-compliance: _____</p> | <p><u>2-5</u></p> <p><u>2-7</u></p> | <p><u>✓*</u></p> <p>_____</p> |
| <p>5. Measure and record supply air volume and compare to design volume. (cfm)</p> <p>Remarks: Refer to balancing report</p> | <p>2-5</p> <p>set point: 750 cfm</p> <p>BMS: 763</p> | <p>Compliance: <u>✓</u></p> <p>Non-compliance: _____</p> | <p>2-7</p> <p>500</p> <p>330</p> | <p>_____</p> <p><u>✓</u></p> |
| <p>6. Set space temperature setpoint up to 85 deg. F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open.</p> <p>Remarks: SENSOR coated with ICE PACK TO TEST HEATING</p> | <p>N/A</p> | <p>Compliance: <u>✓</u></p> <p>Non-compliance: _____</p> | <p>_____</p> | <p><u>✓</u></p> <p>_____</p> |
| <p>7. Verify thermostat operates both reheat and perimeter radiation in sequence (where applicable).</p> <p>Remarks:</p> | <p>N/A</p> | <p>Compliance: <u>N/A</u></p> <p>Non-compliance: _____</p> | <p>N/A</p> | <p><u>N/A</u></p> <p>_____</p> |
| <p>8. Verify if thermostat are adjustable with fixed deadband of 5 F.</p> <p>Remarks:</p> | <p>_____</p> | <p>Compliance: <u>✓</u></p> <p>Non-compliance: _____</p> | <p>_____</p> | <p><u>✓</u></p> <p>_____</p> |
| <p>9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.</p> <p>Remarks:</p> | <p>REDUCED to 15%.</p> <p>(DIRECTED PE TO change to 15%)</p> | <p>Compliance: <u>✓</u></p> <p>Non-compliance: _____</p> | <p>_____</p> | <p><u>✓</u></p> <p>_____</p> |

**Functional Performance Test
Record Sheets**



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Unoccupied Mode:

2-5 2-7

10. Verify that the unit fan is not running and the air valve is closed.

TESTED GLOBALLY

Compliance: ✓ ✓
Non-compliance: _____

Remarks: VERIFIED ACOUSTICALLY - PE TO PROVIDE FAN STATUS

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: VERIFIED GLOBALLY FOR ALL VAV'S

12. Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: UNOCCUPIED SEQUENCE VERIFIED GLOBALLY

Alarms and Safeties

13. Verify the following alarms are generated:

- Fan Failure PE TO PROVIDE
- High zone temp ✓
- Low zone temp ✓

Compliance: _____
Non-compliance: X X

Remarks:

14. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature ✓
- b. Space Temperature Setpoint ✓
- c. Airflow Volume ✓
- d. Airflow Minimum Setpoint ✓
- e. Airflow Maximum Setpoint ✓
- g. Hot Water Control Valve ✓
- h. VAV Air valve position ✓
- i. Fan status ✓
- j. Fan Start/Stop ✓
- k. Heating/Cooling Mode ✓
- l. Fan failure alarm ✓

Yes	No
✓	
✓	
✓	
✓	✓
✓	✓
✓	✓
✓	✓
✓	✓
✓	✓

**Functional Performance Test
Record Sheets**



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Series FP VAVs.doc



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date: 2/15/12

Series Fan Powered Boxes

FP Boxes - 2-8/9

FUNCTIONAL PERFORMANCE TEST - RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification

VAV-2-8/2-9

8

2:09

9

2. Verify installation of plenum inlet filter.

N/A - EXISTING, N.I.C.

Compliance: _____

Non-

compliance: _____

Remarks:

3. Verify unit is labeled.

Compliance: _____

Non-

compliance: _____

Remarks: PE ADDED LABELS TO T-STAT DISPLAY.

4. Verify installation of local disconnect switch.

N/A - EXISTING, N.I.C.

Compliance: _____

Non-

compliance: _____



Remarks:

5. Verify installation of thermostat.

Compliance:
Non-compliance:

8 9
✓ ✓
_____ _____
_____ _____

Remarks:

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance:
Non-compliance:

✓ ✓
_____ _____
_____ _____

Remarks:

→ C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

PER SENSAL Schedule

Compliance:
Non-compliance:

✓ ✓
_____ _____
_____ _____

Remarks:

2. Verify calibration of thermostat. Record actual setpoints.

Compliance:
Non-compliance:

72.5 73.4 ✓
72.4 73.3 ✓
✓ ✓
_____ _____
_____ _____

Remarks:

Occupied Mode:

JTB

3. Verify unit fan operates continuously in occupied mode.

Compliance:
Non-compliance:

_____ _____
✓ ✓
_____ _____

Remarks:

C.D. P.E. to ADDRESS FOR ALL

Functional Performance Test
Record Sheets



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9

4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.

Remarks:

Design used to heat up sensor

Compliance:
Non-compliance:

8

5. Measure and record supply air volume and compare to design volume. (cfm)

Remarks:

✓

*1900 cfm 51%
1982*

Compliance:
Non-compliance:

Remarks: Refer to balancing report

6. Set space temperature setpoint up to 85 deg F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open. (When Unit in HTG Mode)

Remarks:

Cooling Check

*65
65
Custom
Closed*

Compliance:
Non-compliance:

7. Verify thermostat operates both reheat and perimeter radiation in sequence (where applicable).

Remarks:

@ 0% w/heat

Compliance:
Non-compliance:

8. Verify if thermostat are adjustable with fixed deadband of 5 F.

Remarks:

*62 74°F
69°F @ T-Stat*

Compliance:
Non-compliance:

9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.

Remarks:

(15%) →

Compliance:
Non-compliance:

2750 cfm



Unoccupied Mode:

10. Verify that the unit fan is not running and the air valve is closed.

Compliance: _____
Non-compliance: ✓

⑧ ⑨

Remarks: PE TO ADDRESS FAN STATUS (annotated Check Confirmed Program.)

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

Compliance: ✓
Non-compliance: _____

Remarks:

⑫ Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

Compliance: ✓
Non-compliance: _____

TBD

Remarks:

UNOCCUPIED SEQUENCE VERIFIED globally, VAV-211.

Alarms and Safeties

13. Verify the following alarms are generated:

- Fan Failure ← PE TO PROVIDE
- High zone temp
- Low zone temp AHU LEVEL ALARM

Compliance: _____
Non-compliance: X

Remarks:

14. Verify the following information is available and accurate at the operator's workstation:

- | | Yes | No |
|--------------------------------------|----------|--------------------|
| a. Space Temperature | <u>✓</u> | <u>✓</u> |
| b. Space Temperature Setpoint | <u>✓</u> | <u>✓</u> |
| c. Airflow Volume | <u>✓</u> | <u>✓</u> |
| d. Airflow Minimum Setpoint | <u>✓</u> | <u>✓</u> Refer RPT |
| e. Airflow Maximum Setpoint | <u>✓</u> | <u>✓</u> |
| g. Hot Water Control Valve | <u>✓</u> | <u>✓</u> |
| h. VAV Air valve position | <u>✓</u> | <u>✓</u> |
| i. <u>Fan status</u> | <u>✓</u> | <u>✓</u> |
| j. <u>Fan Start/Stop</u> | <u>✓</u> | <u>✓</u> |
| k. <u>Heating/Cooling Mode</u> | <u>✓</u> | <u>✓</u> |
| l. Fan failure alarm | <u>✓</u> | <u>✓</u> |

* Status / PE ADDRESS



Series FP VAVs.doc



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date: 2/15/12

Series Fan Powered Boxes
FP Boxes - 2-11/10

FUNCTIONAL PERFORMANCE TEST - RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

15 FEB 2012
12:44 PM

1. Unit Identification

VAV 2-11/10

11

10

2. Verify installation of plenum inlet filter.

N/A - EXISTING, N.I.C.

Compliance: _____

Non-

compliance: _____

Remarks:

3. Verify unit is labeled.

Compliance: ✓

Non-

compliance: _____

Remarks: PE ADDED LABEL TO T-STAT DISPLAY

4. Verify installation of local disconnect switch.

N/A - EXISTING, N.I.C.

Compliance: _____

Non-

compliance: _____



Remarks:

5. Verify installation of thermostat.

Compliance: ✓
Non-compliance: ✓

Remarks:

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance: ✓
Non-compliance: ✓

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

OPERATING OFF BLDG Schedule (ALL)

Compliance: ✓
Non-compliance: ✓

Remarks:

2. Verify calibration of thermostat. Record actual setpoints.

T-STAT LOCAL READING 74 CLS
69 HRQ
TEMP @ SENSOR 72

Compliance: ✓
Non-compliance: ✓

Remarks:

Occupied Mode:

3. Verify unit fan operates continuously in occupied mode.

✓ in "START" VIA BMS

Compliance: ✓
Non-compliance: ✓

Remarks:

Functional Performance Test
Record Sheets



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(11) (12)

HEATING TEST

4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.

76°F

Remarks:

Compliance:
Non-compliance:

5. Measure and record supply air volume and compare to design volume. (cfm)

Record Effective space temp to 76.6°F

2319 CFM SP
1396 CFM →

Remarks: Refer to balancing report

Compliance:
Non-compliance:

CHANGED TEST
COOLING TEST

6. Set space temperature setpoint up to 85 deg. F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open. (When unit in HTG mode.)

6 / MAX
OPD

Remarks:

Compliance:
Non-compliance:

920 CFM

No REHEAT RAV Hdr

7. Verify thermostat operates both reheat and perimeter radiation in sequence (where applicable).

WITH HEAT ON T-STAT
RH VALVE CLOSED

Remarks:

Compliance:
Non-compliance:

8. Verify if thermostat are adjustable with fixed deadband of 5 F.

Remarks:

Compliance:
Non-compliance:

9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.

(15%)

Remarks:

Compliance:
Non-compliance:

→ DIRECTED RE. TO CHANGE
AS WE GO Tdy

132 CFM

**Functional Performance Test
Record Sheets**



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Unoccupied Mode:

10. Verify that the unit fan is not running and the air valve is closed.

TEST V.A. AMD 2 OCC/UNOCC - Part in UNOCC

Verified - Accurately + on BMS.

Remarks:

Confirmed for all FAN'S

Compliance:

(11) (10)
✓ *✓*

Non-compliance:

_____ *—*

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

Remarks: SETBACK TEMPS ADDED TO GRAPHICS
ON 2/15/2011

Compliance:

90°F - } Programmed 15°Fob Zone
55°F - }
✓ ✓

Non-compliance:

_____ *—*

12. Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

FAN STARTS, REHEAT VALVES DRIVE TO 100%

Remarks: *PE TO ADD FAN STATUS*

Compliance:

✓ ✓

Non-compliance:

_____ *—*

Alarms and Safeties

13. Verify the following alarms are generated:

- Fan Failure
- High zone temp
- Low zone temp

AMD LEVEL ALARM

Remarks:

PE TO ADD FAN STATUS

Compliance:

_____ *—*

Non-compliance:

x x

14. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature
- b. Space Temperature Setpoint
- c. Airflow Volume
- d. Airflow Minimum Setpoint
- e. Airflow Maximum Setpoint
- g. Hot Water Control Valve
- h. VAV Air valve position
- i. Fan status
- j. Fan Start/Stop
- k. Heating/Cooling Mode
- l. Fan failure alarm

Yes

No

✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓ ✓
() ✓

**Functional Performance Test
Record Sheets**



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Series FP VAVs.doc



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date: 2/15/12

Series Fan Powered Boxes
FP Boxes -

FUNCTIONAL PERFORMANCE TEST - RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification

VAV-1-1 / VAV-1-2 childrens*
Library

2. Verify installation of plenum inlet filter.

N/A - EXISTING, NIC

Compliance: _____

Non-

compliance: _____

Remarks:

3. Verify unit is labeled.

Compliance: _____

Non-

compliance: _____

Remarks: PE ADDED LABELS TO T-STAT DISPLAY

4. Verify installation of local disconnect switch.

N/A - EXISTING, NIC

Compliance: _____

Non-

compliance: _____

* VAV-1-1 / 1-2 OPERATE OFF OF COMMON THERMOSTAT.



VAV-1-1

VAV-1-2

Remarks:

5. Verify installation of thermostat.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: COMMON

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance: ✓ ✓
Non-compliance: _____

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: VERIFIED GLOBALLY FOR ALL VAVS

2. Verify calibration of thermostat. Record actual setpoints.

Compliance: ✓ ✓
Non-compliance: _____

BMS: 68.4 (VAV-1-1/1-2 USE SAME SENSU)
IRS: 70.2

Remarks:

Occupied Mode:

3. Verify unit fan operates continuously in occupied mode.

Compliance: ✓ ✓
Non-compliance: _____

VERIFIED ACOUSTICALLY

Remarks:

PE TO PROVIDE FAN STATUS

Functional Performance Test
Record Sheets



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4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: HEATED-STAT WITH HAIR DRYER

VAV-1-1 VAV-1-2

5. Measure and record supply air volume and compare to design volume. (cfm)

SEPT.	1300	1-2	1300
BMV:	1289		1450

Compliance: ✓ ✓
Non-compliance: _____

Remarks: Refer to balancing report

6. Set space temperature setpoint up to 85 deg. F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open. ✓

Compliance: ✓ ✓
Non-compliance: _____

Remarks: SENSOR COOLED WITH ICE TO TEST HEATING. + HEATING SETPOINT RAISED.

7. Verify thermostat operates both reheat and perimeter radiation in sequence (where applicable).

Compliance: _____
Non-compliance: _____

N/A

Remarks:

8. Verify if thermostat are adjustable with fixed deadband of 5 F.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: COMMON T-STAT

9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.

Compliance: ✓
Non-compliance: _____

Remarks: REDUCED TO 15% MIN.

(DIRECTED PE to change to 15% for all VAV's)

**Functional Performance Test
Record Sheets**



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Unoccupied Mode:

VAU-1-1 VAU-1-2

10. Verify that the unit fan is not running and the air valve is closed.

Compliance: ✓ ✓
Non-compliance: _____

REMARKS: TESTED GLOBALLY
VERIFIED ACOUSTICALLY
PE TO PROVIDE FAN STATUS

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

Compliance: ✓ ✓
Non-compliance: _____

REMARKS: VERIFIED GLOBALLY FOR ALL VAV'S

12. Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

Compliance: ✓ ✓
Non-compliance: _____

REMARKS: UNOCCUPIED SEQUENCE VERIFIED GLOBALLY

Alarms and Safeties

13. Verify the following alarms are generated:
 ➢ Fan Failure - PE TO PROVIDE
 ➢ High zone temp ✓
 ➢ Low zone temp ✓

Compliance: _____
Non-compliance: X X

REMARKS:

14. Verify the following information is available and accurate at the operator's workstation:

	Yes	No
a. Space Temperature	<u>✓</u>	
b. Space Temperature Setpoint	<u>✓</u>	
c. Airflow Volume	<u>✓</u>	
d. Airflow Minimum Setpoint		<u>✓</u>
e. Airflow Maximum Setpoint		<u>✓</u>
g. Hot Water Control Valve	<u>✓</u>	
h. VAV Air valve position	<u>✓</u>	
i. Fan status		<u>✓</u>
j. Fan Start/Stop	<u>✓</u>	
k. Heating/Cooling Mode	<u>✓</u>	
l. Fan failure alarm		<u>✓</u>

**Functional Performance Test
Record Sheets**



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Series FP VAVs.doc



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY

Date: 2/15/12

Series Fan Powered Boxes
FP Boxes -

FUNCTIONAL PERFORMANCE TEST - RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification

VAV-1-3/4/5* / VAV-1-6

~6:15 PM

VAV-1-3/4/5

VAV-1-6

2. Verify installation of plenum inlet filter.

N/A - EXISTING, N.I.C.

Compliance: _____

Non-

compliance: _____

Remarks:

3. Verify unit is labeled.

PE ADDED LABELS TO T-STAT DISPLAY

Compliance: _____

Non-

compliance: _____

✓

✓

Remarks:

4. Verify installation of local disconnect switch.

N/A - EXISTING, N.I.C.

Compliance: _____

Non-

compliance: _____

*VAV-1-3, 4 & 5 ALL OPERATE OFF OF A COMMON Thermostat.

**Functional Performance Test
Record Sheets**



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VAV-1-3/4/5

VAV-1-6

Remarks:

5. Verify installation of thermostat.

Compliance: _____
Non-compliance: _____

✓✓✓ ✓

Remarks: **COMMON VAV-1-3/4/5**

6. Verify installation of hot water reheat coil control valve and actuator.

Compliance: _____
Non-compliance: _____

✓✓✓ ✓

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

^{VAV-1-3/4/5} BMS: 70.9	^{VAV-1-6} 71.8
IR: 70.3	71.6

Compliance: _____
Non-compliance: _____

✓ ✓

Remarks:

VERIFIED globally For ALL VAV'S

2. Verify calibration of thermostat. Record actual setpoints.

Compliance: _____
Non-compliance: _____

✓ ✓

Remarks:

Occupied Mode:

3. Verify unit fan operates continuously in occupied mode.

FANS OPERATE when commanded on.

Compliance: _____
Non-compliance: _____

✓✓✓ ✓

Remarks:

FANS OVERRIDEN OFF FOR NOISE REDUCTION in Lobby / PERIODICALS in current mode.

- MAY REQUIRE STAGING ON FOR COOLING Mode.

Functional Performance Test
Record Sheets



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4. Verify during a call for cooling the air valve modulates. Reduce space temperature setpoint and verify supply air terminal goes to maximum volume.

Compliance: ✓ ✓
Non-compliance: _____

(HEATED T-STAT with HAIR DRYER.)

VAV-1-6 CFM SET POINT NOT REACHED.

Remarks:

- NOTE: FAN SPEED REDUCED FOR NOISE CONSIDERATION *

5. Measure and record supply air volume and compare to design volume. (cfm)

Compliance: ✓ ✓
Non-compliance: _____

	VAV-1-3	1-4	1-5	VAV-1-6
SP	1300	1300	1240	1300
BMS	1240	950	1300	150

Remarks: Refer to balancing report

* - SETPOINT NOT REACHED, BUT SPACE TEMP IS CONTROLLED.

6. Set space temperature setpoint up to 85 deg. F. Verify supply air terminal goes to minimum primary airflow and reheat valve modulates open.

Compliance: ✓ ✓
Non-compliance: _____

Remarks: SENSOR COOLED WITH ICE TO TEST HEATING.

7. Verify thermostat operates both reheat and perimeter radiation in sequence (where applicable).

Compliance: ✓✓✓ N/A
Non-compliance: _____

Remarks: PTR ACTIVATES

8. Verify if thermostat are adjustable with fixed deadband of 5 F.

Compliance: ✓✓ ✓
Non-compliance: _____

Remarks: COMMON T-STAT

9. Set thermostat to room temperature and verify minimum setpoint of primary air of 30%.

Compliance: ✓✓✓ ✓
Non-compliance: _____

Remarks: Reduced to 15%.

(DIRECTED PE TO change to 15% for All VAV's)

**Functional Performance Test
Record Sheets**



O'DEA
LYNCH
ABBATTISTA
CONSULTING ENGINEERS

VAV-1-3/4/5

VAV
1-6

Unoccupied Mode:

10. Verify that the unit fan is not running and the air valve is closed.

Compliance: ✓✓✓
Non-compliance: _____

TESTED Globally (FANS OVERRIDDEN OFF FOR MODE CONTROL)

Remarks: PE TO PROVIDE FAN STATUS

11. Verify the unoccupied cooling and heating setpoints are used for temperature control.

Compliance: ✓✓✓
Non-compliance: _____

Remarks: VERIFIED globally FOR ALL VAV'S

12. Verify during a call for heat the unit fan is energized and the heating valve modulates to maintain setpoint.

Compliance: ✓
Non-compliance: _____

Remarks: UNOCCUPIED sequence verified globally

Alarms and Safeties

13. Verify the following alarms are generated:

- Fan Failure - PE TO PROVIDE
- High zone temp ✓
- Low zone temp ✓

Compliance: _____
Non-compliance: ✓ ✓

Remarks:

14. Verify the following information is available and accurate at the operator's workstation:

	Yes	No
a. Space Temperature	✓	
b. Space Temperature Setpoint	✓	
c. Airflow Volume	✓	
d. Airflow Minimum Setpoint		✓
e. Airflow Maximum Setpoint		✓
g. Hot Water Control Valve	✓	
h. VAV Air valve position	✓	
i. Fan status		✓
j. Fan Start/Stop	✓	
k. Heating/Cooling Mode	✓	
l. Fan failure alarm		✓

**Functional Performance Test
Record Sheets**



**O'DEA
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Series FP VAVs.doc



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date:

Exhaust Fan
TX-1
(Toilet Exhausts)

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Operations and Maintenance Data
3. Verification of Warranty Periods on Equipment
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

- | | |
|--|---|
| 1. Unit Identification | <u>Greenheck B3Q-90-4 / Childrens Library</u> |
| 2. Unit Voltage | <u>115V / 60 Hz</u> |
| 3. Unit Full Load Amps | <u>5.0 Amps.</u> |
| 4. Verify installation of new control components | Compliance: <u>✓</u> |
| | Non-compliance: _____ |

Remarks: **UNIT LOCATION: ATTIC**



C. Functional Performance Tests

1. Verify occupied/unoccupied schedule capability at BAS.

Compliance: ✓
Non-compliance: _____

Remarks:

2. Verify exhaust fan override at starter when in hand position.

Compliance: ✓
Non-compliance: _____

Remarks:

3. Verify CFM totals at registers.

Compliance: N/A
Non-compliance: _____

Cx Adjusted volume damper so that door will close unassisted

Remarks: *(PER TAB REPORT)*

4. Verify fan energizes when building is in occupied mode. Verify fan off when building is unoccupied mode.

Compliance: ✓
Non-compliance: _____

Remarks:

5. Verify exhaust damper closes 100% when fan is off and opens 100% when fan is on.

Compliance: ✓
Non-compliance: _____

Remarks:

Notes: *OLA ADJUSTED VOLUME DAMPER SO THAT DOOR WILL CLOSE.*



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:

Exhaust Fans
TX-2
(Toilet Exhausts)

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Operations and Maintenance Data
3. Verification of Warranty Periods on Equipment
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification

Greenheck BSC-90 / MAIN Library Toilets

2. Unit Voltage

115V/60 Hz

3. Unit Full Load Amps

5.0 Amps

4. Verify installation of new control components

Compliance: ✓

Non-

compliance: _____

Remarks: UNIT LOCATION: GROUND FL MER.



C. Functional Performance Tests

1. Verify occupied/unoccupied schedule capability at BAS.

Compliance: ✓
Non-compliance: _____

Remarks:

2. Verify exhaust fan override at starter when in hand position.

Compliance: ✓
Non-compliance: _____

Remarks:

3. Verify CFM totals at registers.

Compliance: N/A
Non-compliance: _____

Remarks: REFER TO TAB Report

4. Verify fan energizes when building is in occupied mode. Verify fan off when building is unoccupied mode.

Compliance: ✓
Non-compliance: _____

Remarks:

5. Verify exhaust damper closes 100% when fan is off and opens 100% when fan is on.

Compliance: ✓
Non-compliance: _____

Remarks:

Notes:

Exhaust Fan TX-2.doc

Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:

Exhaust Fans
KIT
(Pantry Exhaust)

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

- | | |
|--|---|
| 1. Unit Identification | <u>Greenheck BSR-70-4</u> |
| 2. Unit Voltage | <u>115 V/60 Hz</u> |
| 3. Unit Full Load Amps | <u>5.0</u> |
| 4. Verify installation of new control components | Compliance: <u>✓</u>
Non-compliance: _____ |

Remarks:

UNIT LOCATION: GROUND FL MER



C. Functional Performance Tests

1. Verify fan starts when local toggle switch is indexed on.

TESTED ON 2/9/12

Compliance: _____



Non-

compliance: _____

Remarks:

2. Verify exhaust damper closes 100% when fan is off and opens 100% when fan is on.

Compliance: _____



Non-

compliance: _____

Remarks:

Notes:

Exhaust Fan KIT.doc



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:

Exhaust Fans
EVEX-1
(Elevator machine room Exhaust)

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification Could NOT be READ
2. Unit Voltage _____
3. Unit Full Load Amps _____
4. Verify installation of new control components
Compliance: ✓
Non-compliance: _____

Remarks:



C. Functional Performance Tests

1. Verify fan energizes on call for cooling from local thermostat.

CONTROLS SEQUENCE IS IN COMPLIANCE.

Compliance: _____
Non-compliance: _____



Remarks: *FAN needs new BELT, wheel NOT ENGAGED*

2. Verify exhaust fan override at starter when in hand position.

Compliance: _____
Non-compliance: _____



Remarks:

3. Verify exhaust damper closes 100% when fan is off and opens 100% when fan is on.

Compliance: _____
Non-compliance: _____



Remarks:

Notes:

Exhaust Fans EV-EX-1.doc



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date: 2/15/12

Cabinet Unit Heaters
CUH- 1 (PARKING ENTRANCE)

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

~7:45 AM

1. Unit Identification / Area Served

PARKING ENTR. / CUH-1

2. Verify installation of thermostat.

Compliance: ✓
Non-compliance: _____

Remarks:

3. ~~Verify installation of hot water control valve and actuator.~~

N/A - NOT IN SCOPE
FAN ST/ST ONLY

Compliance: ✓
Non-compliance: _____

Remarks:

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

Compliance: ✓
Non-compliance: _____

(changed building occupied to 5 AM
from 4 AM)



Remarks:

2. Verify calibration of thermostat. Record actual setpoints.

Compliance: _____
Non-compliance: _____



Remarks:

Occupied Mode:

3. Verify unit fan operates ~~and hot water valve opens~~ on a call for heat in occupied mode.

Compliance: _____
Non-compliance: _____



Remarks:

4. Set thermostat to room temperature and verify unit fan cycles off.

Compliance: _____
Non-compliance: _____



Remarks:

Unoccupied Mode:

5. Verify the unoccupied heating setpoints are used for temperature control.

Compliance: _____
Non-compliance: _____



Remarks:

Alarms and Safeties

6. Verify the following alarms are generated:
- Fan Failure ✓
 - High zone temp
 - Low zone temp

Compliance: _____
Non-compliance: _____



Remarks:

**Functional Performance Test
Record Sheets**



**O'DEA
LYNCH
ABBATTISTA**
CONSULTING ENGINEERS

7. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature
- b. Space Temperature Setpoint
- g. ~~Hot Water Control Valve~~
- i. Fan status
- j. Fan Start/Stop
- l. Fan failure alarm

Yes	No
✓	
✓	
N/A	
✓	
✓	
✓	

CUHs.doc



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:

Cabinet Unit Heaters
CUH- 2

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification / Area Served

CUH-2 / REAR EXIT

2. Verify installation of thermostat.

Compliance: ✓

Non-compliance: _____

Remarks:

3. ~~Verify installation of hot water control valve and actuator.~~

FAN S7/ST INSTALLED

Compliance: ✓

Non-compliance: _____

Remarks: N/A - NOT IN scope.

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

Compliance: ✓

Non-compliance: _____



Remarks:

2. Verify calibration of thermostat. Record actual setpoints.

Compliance: ✓
Non-compliance: _____

Remarks: REDUCED SETPOINT TO 55°F.

Occupied Mode:

3. Verify unit fan operates ~~and hot water valve opens~~ on a call for heat in occupied mode.

Compliance: ✓
Non-compliance: _____

Remarks: NO HW VALVE (NIC)

4. Set thermostat to room temperature and verify unit fan cycles off.

Compliance: ✓
Non-compliance: _____

Remarks: CHANGED OCCUPIED SETPOINT TO 55°F.

Unoccupied Mode:

5. Verify the unoccupied heating setpoints are used for temperature control.

Compliance: ✓
Non-compliance: _____

Remarks:

Alarms and Safeties

6. Verify the following alarms are generated:
- Fan Failure ✓
 - High zone temp
 - Low zone temp

Compliance: ✓
Non-compliance: _____

Remarks:



7. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature
- b. Space Temperature Setpoint
- g. Hot Water Control Valve
- i. Fan status
- j. Fan Start/Stop
- l. Fan failure alarm

Yes

No

✓
✗ N/A
✓
✓
✓

CUHs.doc



Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:

Cabinet Unit Heaters
CUH- 4

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Authority requires the following documentation:

1. Air and Water Balancing Report
4. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Authority shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Unit Identification / Area Served

CUH- 4 / Vestibule

2. Verify installation of thermostat.

Compliance: ✓

Non-compliance: _____

Remarks:

3. Verify installation of ~~hot water control valve~~ and actuator.

N/A - ~~not~~

FAN ST/STOP only

Compliance: ✓

Non-compliance: _____

Remarks: NOT IN SCOPE

C. Functional Performance Tests

1. Verify occupied/unoccupied schedule at BAS.

Compliance: ✓

Non-compliance: _____



Remarks:

2. Verify calibration of thermostat. Record actual setpoints.

74°F
68°F

Compliance: _____
Non-compliance: _____



Remarks:

Occupied Mode:

3. Verify unit fan operates ~~and hot water valve opens~~ on a call for heat in occupied mode.

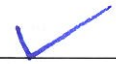
Compliance: _____
Non-compliance: _____



Remarks:

4. Set thermostat to room temperature and verify unit fan cycles off.

Compliance: _____
Non-compliance: _____



Remarks:

Unoccupied Mode:

5. Verify the unoccupied heating setpoints are used for temperature control.

Compliance: _____
Non-compliance: _____



Remarks:

Alarms and Safeties

6. Verify the following alarms are generated:
- Fan Failure ✓
 - High zone temp
 - Low zone temp

Compliance: _____
Non-compliance: _____



Remarks:

**Functional Performance Test
Record Sheets**



**O'DEA
LYNCH
ABBATTISTA**
CONSULTING ENGINEERS

7. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature
- b. Space Temperature Setpoint
- g. Hot Water Control Valve
- i. Fan status
- j. Fan Start/Stop
- l. Fan failure alarm

Yes

No

✓
✓
N/A
✓
✓
✓

✓

CUHs.doc



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:**

Fin Tube Radiation
(Area Served:) *GROUND PL. STORAGE*

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Fin Tube Length

/ Gnd PL Storage

2. Installation of new two-way control valve

Compliance: _____
Non-compliance: _____



Remarks:

3. Verify installation of new thermostat.

Compliance: _____
Non-compliance: _____



Remarks:



C. Functional Performance Tests

1. Verify operation of two-way control valve. Verify valve closes when room reaches set-point. Verify valve opens on a call for heat.

Compliance: ✓
Non-compliance: _____

Remarks:

2. Verify calibration of thermostat.

Compliance: ✓
Non-compliance: _____

Remarks:

3. In occupied mode, verify radiation operates in tandem with the VAV box reheat.

N/A

Compliance: _____
Non-compliance: _____

Remarks:

4. In unoccupied mode, verify radiation operates as first stage of heat. AHU remains off.

N/A

Compliance: _____
Non-compliance: _____

Remarks:

5. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature
- b. Space Temperature Setpoint
- g. Hot Water Control Valve

	Yes	No
a.	✓	
b.	✓	
g.	✓	



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY**

Date:

Fin Tube Radiation
(Area Served:) **ELECTRICAL ROOM**

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Fin Tube ~~Length~~ **Room SERVED: GROUND FL / ELECTRICAL ROOM**

2. Installation of new two-way control valve
Compliance: ✓
Non-compliance: _____

Remarks:

3. Verify installation of new thermostat.
Compliance: ✓
Non-compliance: _____

Remarks:



C. Functional Performance Tests

1. Verify operation of two-way control valve. Verify valve closes when room reaches set-point. Verify valve opens on a call for heat.

Compliance: ✓
Non-compliance: _____

Remarks:

2. Verify calibration of thermostat.

Compliance: ✓
Non-compliance: _____

Remarks:

3. In occupied mode, verify radiation operates in tandem with the VAV box reheat.

N/A

Compliance: _____
Non-compliance: _____

Remarks:

4. In unoccupied mode, verify radiation operates as first stage of heat. AHU remains off.

N/A

Compliance: _____
Non-compliance: _____

Remarks:

5. Verify the following information is available and accurate at the operator's workstation:

- a. Space Temperature
- b. Space Temperature Setpoint
- g. Hot Water Control Valve

Yes	No
<u>✓</u>	
<u>✓</u>	
<u>✓</u>	



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:**

Fin Tube Radiation
(Area Served:) **1ST FL TOILETS**

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Fin Tube Length ~~Area Served:~~ **1st FL Toilets - MEN** **WOMEN**

2. Installation of new two-way control valve	Compliance:	<u>✓</u>	<u>✓</u>
	Non-compliance:	_____	_____

Remarks:

3. Verify installation of new thermostat.	Compliance:	<u>✓</u>	<u>✓</u>
	Non-compliance:	_____	_____

Remarks:



C. Functional Performance Tests

1. Verify operation of two-way control valve. Verify valve closes when room reaches set-point. Verify valve opens on a call for heat.

Compliance: _____
Non-compliance: _____

MENS

WOMEN

Remarks: MENS RM VALVE NOT CLOSED. PE TO ADDRESS

2. Verify calibration of thermostat.
MENS. RM.
BAS : 75.4
IR : 75.7

Compliance: _____
Non-compliance: _____

Remarks:

3. In occupied mode, verify radiation operates in tandem with the VAV box reheat.

Compliance: _____
Non-compliance: _____

N/A

Remarks:

4. In unoccupied mode, verify radiation operates as first stage of heat. AHU remains off.

Compliance: _____
Non-compliance: _____

N/A

Remarks:

5. Verify the following information is available and accurate at the operator's workstation:

- | | | Yes | No |
|-------------------------------------|-------------------------------------|-------------------------------------|-----------|
| a. Space Temperature | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | |
| b. Space Temperature Setpoint | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | |
| g. Hot Water Control Valve | <input checked="" type="checkbox"/> | <input checked="" type="checkbox"/> | |



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:**

Fin Tube Radiation
(Area Served:) *2nd FL TOILET / REAR STAIRS.*

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Fin Tube ~~Length~~ *Area Served* 2nd FL Toilets

2. Installation of new two-way control valve

Compliance: ✓
Non-compliance: _____

BACK STAIRS
✓

Remarks:

3. Verify installation of new thermostat.

Compliance: ✓
Non-compliance: _____

✓

Remarks:



REAR
STAIRS

C. Functional Performance Tests

1. Verify operation of two-way control valve. Verify valve closes when room reaches set-point. Verify valve opens on a call for heat.

Compliance: _____
Non-compliance:

2ndnd Bathroom Valve heating, etc
BMS SAYS closed,
VALVE opened.

Remarks:

2. Verify calibration of thermostat.

Compliance:
Non-compliance: _____

BMS: 75.8
75.0

BMS: 67.2
IR: 66.2

Remarks:

3. In occupied mode, verify radiation operates in tandem with the VAV box reheat.

Compliance: _____
Non-compliance: _____

N/A

Remarks:

4. In unoccupied mode, verify radiation operates as first stage of heat. AHU remains off.

Compliance: _____
Non-compliance: _____

N/A

Remarks:

5. Verify the following information is available and accurate at the operator's workstation:

	Yes	No
a. Space Temperature	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
b. Space Temperature Setpoint	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>
g. Hot Water Control Valve	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>



**Dobbs Ferry Library, Retro-Commissioning
Dobbs Ferry, NY
Date:**

Fin Tube Radiation
(Area Served:) 1ST FL PANTRY / 1ST FL REAR STAIRS

FUNCTIONAL PERFORMANCE TEST – RECORD SHEET

A. Documentation Requirements

Prior to the functional performance test and verification process, the Commissioning Agent requires the following documentation:

1. Air and Water Balancing Report
2. Verify Owner Training is Complete

B. System Components

Prior to the functional performance and verification process, the Commissioning Agent shall verify all major system components, capacities, configurations and support functions are consistent with the design or documentation received. The following shall be verified:

1. Fin Tube ~~Length~~ Area Served: PANTRY / BACK STAIRS

2. Installation of new two-way control valve

Compliance: ✓
Non-compliance: _____

✓

Remarks:

3. Verify installation of new thermostat.

Compliance: ✓
Non-compliance: _____

✓

Remarks:

**Functional Performance Test
Record Sheets**



**O'DEA
LYNCH
ABBATTISTA**
CONSULTING ENGINEERS

C. Functional Performance Tests

1. Verify operation of two-way control valve. Verify valve closes when room reaches set-point. Verify valve opens on a call for heat.

Compliance: _____
Non-compliance: _____

PANTON REAR STAIRS
✓ ✓

Remarks: VERIFIED ON SHE VISIT 2/8/12

2. Verify calibration of thermostat.

Compliance: _____
Non-compliance: _____

✓ ✓

Remarks:

3. In occupied mode, verify radiation operates in tandem with the VAV box reheat.

Compliance: _____
Non-compliance: _____

N/A

Remarks:

4. In unoccupied mode, verify radiation operates as first stage of heat. AHU remains off.

Compliance: _____
Non-compliance: _____

N/A

Remarks:

5. Verify the following information is available and accurate at the operator's workstation:

- | | Yes | No |
|-------------------------------------|-----|----|
| a. Space Temperature | ✓ | ✓ |
| b. Space Temperature Setpoint | ✓ | ✓ |
| g. Hot Water Control Valve | ✓ | ✓ |

FTR.doc

APPENDIX E
Air and Water Balancing Report

METROPOLITAN TESTING AND BALANCING CORP.

22-14 124TH STREET

COLLEGE POINT, N.Y. 11356

OFFICE (718) 747-5545

FAX (718) 747-5547

DATE: 12/20/11

VENTILATION TEST REPORT

DOBBS FERRY LIBRARY

55 MAIN STREET

DOBBS FERRY, N.Y.

PREPARED FOR

PE CONTROL SERVICES, LTD

64 MAIN STREET

TUCKAHOE, N.Y. 10707

JOB NO. 3214

**METROPOLITAN TESTING AND
BALANCING CORP.**

Date 12/20/11

Page 1 of 14

Project DOBBS FERRY LIBRARY

System No AHU-1 Floor# MAIN

AIR DISTRIBUTION TEST SHEET

FAN MAKE	<u>TRANE</u>
SIZE	<u>MCCA017</u>
MOTOR HP	<u>16</u>
RPM	<u>1760</u>

	RATED	ACTUAL
LINE VOLTS	<u>200/3/60</u>	<u>208</u>
MOTOR AMPS	<u>44.4</u>	<u>33.1/33.2/32.8</u>

STATIC PRESSURE:	
SUCTION	<u>-2.2</u> IN. W.G.
DISCHARGE	<u>+ .72</u> IN. W.G.

	REQUIRED	ACTUAL
FAN RPM	<u>NA</u>	<u>NA*</u>
SYSTEM CFM	<u>7760</u>	<u>2920</u>

Terminal Number		Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
FPB-1-1	(1280)								
1		CD	12X12			320	320		
2		CD	12X12			320	320		
3		CD	12X12			320	320		
4		CD	12X12			320	320		
FPB-1-2	(1280)								
5		CD	12X12			320	320		
6		CD	12X12			320	330		
7		CD	12X12			320	320		
8		CD	12X12			320	320		

Remarks: * FAN SHUTS DOWN WHEN DOOR IS OPEN

**METROPOLITAN TESTING AND
BALANCING CORP.**

Date 12/20/11

Page 2 of 14

Project DOBBS FERRY LIBRARY

System No AHU-1 Floor # MAIN

AIR DISTRIBUTION TEST SHEET

Terminal Number		Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
FPB-1-3	(1300)								FAN ON MIN SPEED / NOISY
9		CD	18X18			650		360	
10		CD	18X18			650		360	
FPB-1-4	(1300)								FAN ON MIN SPEED / NOISY
11		CD	18X18			650		330	
12		CD	18X18			650		310	
FPB-1-5	(1300)								FAN ON MIN SPEED / NOISY
13		CD	18X18			650		350	
14		CD	18X18			650		330	
FPB-1-6	(1300)								
15		CD	18X18			650		560	
16		CD	18X18			650		320	

Remarks:

**METROPOLITAN TESTING AND
BALANCING CORP.**

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Project DOBBS FERRY LIBRARY

System No AHU-2 Floor# MAIN

AIR DISTRIBUTION TEST SHEET

FAN MAKE	<u>TRANE</u>
SIZE	<u>MCCA030UB</u>
MOTOR HP	<u>20</u>
RPM	<u>1745</u>

	RATED	ACTUAL
LINE VOLTS	<u>200/3/60</u>	<u>208</u>
MOTOR AMPS	<u>57</u>	<u>56.8/57.0/56.9</u>

STATIC PRESSURE:	
SUCTION	<u>-.32</u> IN. W.G.
DISCHARGE	<u>+.98</u> IN. W.G.

	REQUIRED	ACTUAL
FAN RPM	<u>NA</u>	<u>714</u>
SYSTEM CFM	<u>13121</u>	<u>13285</u>

Terminal Number		Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
FPB-2-2	(200)								
17		CD	12X12			100	110		
18		CD	12X12			100	110		
FPB-2-1	(2214)								
19		CD	12X12			369	370		
20		CD	12X12			369	370		
21		CD	12X12			369	360		
22		CD	12X12			369	370		
23		CD	12X12			369	350		
24		CD	12X12			369	360		

Remarks:

**METROPOLITAN TESTING AND
BALANCING CORP.**

Date 12/20/11

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Project DOBBS FERRY LIBRARY

System No AHU-2 Floor # MAIN

AIR DISTRIBUTION TEST SHEET

Terminal Number		Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
FPB-2-3	(736)								
25		CD	12X12			184		200	
26		CD	12X12			184		200	
27		CD	12X12			184		200	
28		CD	12X12			184		200	
FPB-2-7	(500)								FAN ON LOW SPEED
29		CD	14X14			250		330	
30		CD	14X14			250		350	
FPB-2-5	(754)								
31		CD	14X14			377		380	
32		CD	14X14			377		380	
FPB-2-6	(300)								
33		CD	12X12			150		160	
34		CD	12X12			150		160	
FPB-2-4	(1280)								
35		CD	18X18			640		580	
36		CD	18X18			640		580	

Remarks:

**METROPOLITAN TESTING AND
BALANCING CORP.**

Date 12/20/11

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Project DOBBS FERRY LIBRARY

System No AHU-2 Floor # UPPER

AIR DISTRIBUTION TEST SHEET

Terminal Number		Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
FPB-2-8	(2115)								
37		CD	12X12			235		250	
38		CD	12X12			235		240	
39		CD	12X12			235		240	
40		CD	12X12			235		250	
41		CD	12X12			235		240	
42		CD	12X12			235		250	
43		CD	12X12			235		240	
44		CD	12X12			235		250	
45		CD	12X12			235		240	
FPB-2-9	(1900)								
46		CD	12X12			450		450	
47		CD	12X12			450		450	
48		CD	12X12			450		440	
49		CD	12X12			100		100	
50		CD	12X12			450		440	
FPB-2-10	(920)								
51		CD	12X12			230		240	
52		CD	12X12			230		240	
53		CD	12X12			230		210	
54		CD	12X12			230		240	

Remarks:

**METROPOLITAN TESTING AND
BALANCING CORP.**

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Project DOBBS FERRY LIBRARY

System No AHU-2 Floor # UPPER

AIR DISTRIBUTION TEST SHEET

Terminal Number		Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
FPB-2-11	(2202)								
55		CD	14X14			367		360	
56		CD	14X14			367		360	
57		CD	14X14			367		355	
58		CD	14X14			367		360	
59		CD	14X14			367		360	
60		CD	14X14			367		360	

Remarks:

**METROPOLITAN TESTING AND
BALANCING CORP.**

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Project DOBBS FERRY LIBRARY

System No RF-1 Floor# CHILDRENS ATTIC- (MAIN)

AIR DISTRIBUTION TEST SHEET

FAN MAKE	<u>GREENHECK</u>
SIZE	<u>24-AFSW-41</u>
MOTOR HP	<u>5</u>
RPM	<u>1745</u>

	RATED	ACTUAL
LINE VOLTS	<u>208/3/60</u>	<u>208</u>
MOTOR AMPS	<u>3.6</u>	<u>2.1/2.1/2.2</u>

STATIC PRESSURE:	
SUCTION	<u>-.28</u> IN. W.G.
DISCHARGE	<u>+.20</u> IN. W.G.

	REQUIRED	ACTUAL
FAN RPM	<u>NA</u>	<u>1202</u>
SYSTEM CFM	<u>7060</u>	<u>6250</u>

Terminal Number	Room Number	Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
1		RR	24X24			280		250	
2		RR	24X24			1900		1800	
3		RR	24X24			280		200	
4		RR	24X24			4600		4000	

Remarks: FAN RUN UNDER DESIGN CFM TO MAINTAIN A POSITIVE PRESSURE.

**METROPOLITAN TESTING AND
BALANCING CORP.**

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Project DOBBS FERRY LIBRARY

System No RF-2 Floor# MAIN & UPPER

AIR DISTRIBUTION TEST SHEET

FAN MAKE	<u>GREENHECK</u>
SIZE	<u>40-AFSW-41</u>
MOTOR HP	<u>10</u>
RPM	<u>1755</u>

	RATED	ACTUAL
LINE VOLTS	<u>208/3/60</u>	<u>208</u>
MOTOR AMPS	<u>28.8</u>	<u>25.5/25.4/24.8</u>

STATIC PRESSURE:	
SUCTION	<u>-.30</u> IN. W.G.
DISCHARGE	<u>+.25</u> IN. W.G.

	REQUIRED	ACTUAL
FAN RPM	<u>NA</u>	<u>687</u>
SYSTEM CFM	<u>11880</u>	<u>8800</u>

Terminal Number	Floor Number	Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
5	-	-	-			180		-	DELETED
6	MAIN	RR	24X24			1000		600	
7	MAIN	RR	24X24			1100		800	
8	MAIN	RR	48X12			3100		2700	
9	-	-	-			200		-	DELETED
10	UPPER	RR	24X24			750		500	
11	UPPER	RR	24X24			750		500	
12	-	-	-			200		-	DELETED
13	UPPER	RR	24X24			2300		1900	
14	UPPER	RR	24X24			2300		1800	

Remarks: FAN RUN UNDER DESIGN CFM TO MAINTAIN A POSITIVE PRESSURE

**METROPOLITAN TESTING AND
BALANCING CORP.**

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Project DOBBS FERRY LIBRARY

System No TX-1 Floor# MAIN

AIR DISTRIBUTION TEST SHEET

FAN MAKE	<u>GREENHECK</u>
SIZE	<u>BSQ-90-4</u>
MOTOR HP	<u>1/4</u>
RPM	<u>1725</u>

	RATED	ACTUAL
LINE VOLTS	<u>115/1/60</u>	<u>120</u>
MOTOR AMPS	<u>5.0</u>	<u>4.9</u>

STATIC PRESSURE:	
SUCTION	<u>- .20</u> IN. W.G.
DISCHARGE	<u>+ .05</u> IN. W.G.

	REQUIRED	ACTUAL
FAN RPM	<u>NA</u>	<u>NA</u>
SYSTEM CFM	<u>400</u>	<u>390</u>

Terminal Number	Room Number	Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
1		ER				400		390	

Remarks:

**METROPOLITAN TESTING AND
BALANCING CORP.**

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Project DOBBS FERRY LIBRARY

System No TX-2 Floor# GROUND, MAIN & UPPER

AIR DISTRIBUTION TEST SHEET

FAN MAKE	<u>GREENHECK</u>
SIZE	<u>BSQ 90</u>
MOTOR HP	<u>1/4</u>
RPM	<u>1725</u>

	RATED	ACTUAL
LINE VOLTS	<u>115/1/60</u>	<u>120</u>
MOTOR AMPS	<u>5.0</u>	<u>5.0/5.0</u>

STATIC PRESSURE:	
SUCTION	<u>-.30</u> IN. W.G.
DISCHARGE	<u>+.10</u> IN. W.G.

	REQUIRED	ACTUAL
FAN RPM	<u>NA</u>	<u>NA</u>
SYSTEM CFM	<u>550</u>	<u>520</u>

Terminal Number	Floor Number	Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
2	GROUND	ER	6X6			100		100	
3	MAIN	ER	24X12			150		140	
4	MAIN	ER	24X12			150		140	
5	UPPER	ER	24X12			150		140	

Remarks:

**METROPOLITAN TESTING AND
BALANCING CORP.**

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Project DOBBS FERRY LIBRARY

System No KX-1 Floor# MAIN

AIR DISTRIBUTION TEST SHEET

FAN MAKE	<u>GREENHECK</u>
SIZE	<u>BSQ-70-4</u>
MOTOR HP	<u>¼</u>
RPM	<u>1725</u>

	RATED	ACTUAL
LINE VOLTS	<u>115/1/60</u>	<u>120</u>
MOTOR AMPS	<u>5.0</u>	<u>4.8/4.8</u>

STATIC PRESSURE:	
SUCTION	<u>- .20</u> IN. W.G.
DISCHARGE	<u>±.10</u> IN. W.G.

	REQUIRED	ACTUAL
FAN RPM	<u>NA</u>	<u>NA</u>
SYSTEM CFM	<u>150</u>	<u>150</u>

Terminal Number	Room Number	Terminal		Factor	Design		Final		Remarks
		Type	Size		FPM	CFM	FPM	CFM	
6		ER	10"Ø			150		150	

Remarks:

**METROPOLITAN TESTING AND
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Project DOBBS FERRY LIBRARY

PUMP DATA SHEET

PUMP NO.	P-1		
MANUFACTURER	WEINMAN		
SIZE	309SCV-75P54		
IMPELLER	-		
SERVICE	HOT WATER		
TEST DATA	GPM	FT. HD.	BHP
DESIGN	190	80	-
ACTUAL	**	92.40	5.70
DISCHARGE	52 PSI		
SUCTION	12 PSI		
ΔP	40 x 2.31 = 92.40 FT.HD.		
MOTOR MFG.	BALDOR		
FRAME	213JH		
H.P.	7 ½		
RPM	1725		
AMPS	22/11	ACT: 16.8 / 16.7 / 16.7	
VOLTS	230/460	ACT: 208 / 208 / 208	
REMARKS: ** BOTH PUMPS HAD TO BE RUN TOGETHER TO ACHIEVE 190 GPM AT THE 3" WATTS CIRCUIT SETTER ON COMMON PIPE.			

PUMP NO.	P-2		
MANUFACTURER	WEINMAN		
SIZE	309SCV-75P54		
IMPELLER	-		
SERVICE	HOT WATER		
TEST DATA	GPM	FT. HD.	BHP
DESIGN	190	80	-
ACTUAL	**	83.16	5.61
DISCHARGE	50 PSI		
SUCTION	14 PSI		
ΔP	36 x 2.31 = 83.16 FT.HD.		
MOTOR MFG.	BALDOR		
FRAME	213JH		
H.P.	7 ½		
RPM	1725		
AMPS	22/11	ACT: 16.4 / 16.5 / 16.5	
VOLTS	230/460	ACT: 208 / 208 / 208	
REMARKS: ** BOTH PUMPS HAD TO BE RUN TOGETHER TO ACHIEVE 190 GPM AT THE 3" WATTS CIRCUIT SETTER ON COMMON PIPE.			

**METROPOLITAN TESTING AND
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Project DOBBS FERRY LIBRARY

System No HOT WATER Floor# ALL FLOORS

WATER FLOW MEASURING STATION DATA

Terminal Number	Area Served	Measuring Station		Degree Setting	Design		(FT.) Final		Remarks
		Type	Size		Delta P	GPM	Delta P	GPM	
P-1 & P-2**		WATTS	3"	0	NA	191.3	1.9	190.0	
AHU-1		WATTS	2"	30	NA	18.8	9.1	19.0	
AHU-2		WATTS	2 1/2"	20	NA	44.0	4.7	44.0	
FPB-1-3		WATTS	3/4"	40	NA	9.0	4.0	4.0	
FPB-1-4		WATTS	3/4"	40	NA	9.0	4.0	4.0	
FPB-1-5		WATTS	3/4"	40	NA	9.0	4.0	4.0	
FPB-1-6		WATTS	3/4"	30	NA	4.0	4.0	4.0	
FPB-2-1						6.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-3						4.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-4						6.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-5						4.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-6						4.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-7						4.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-8						6.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-9						6.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-10						4.0			CIRCUIT BALANCING VALVE NOT INSTALLED
FPB-2-11						6.0			CIRCUIT BALANCING VALVE NOT INSTALLED
UH-1	PUMP ROOM	WATTS	1"	30	NA	3.5	1.7	3.5	
UH-1	BOILER ROOM	WATTS	1"	30	NA	3.5	1.8	3.5	
UH-1	CHILDREN'S ATTIC MER	WATTS	1"	20	NA	3.5	.75	3.5	
UH-1	CHILDREN'S ATTIC MER	WATTS	1"	20	NA	3.5	.77	3.5	
UH-1	CHILDREN'S ATTIC MER	WATTS	1"	20	NA	3.5	.74	3.5	

Remarks: ** P-1 & P-2 WERE RUNNING AT THE SAME TIME FOR COMMON CIRCUIT BALANCING VALVE READING.

**METROPOLITAN TESTING AND
BALANCING CORP.**

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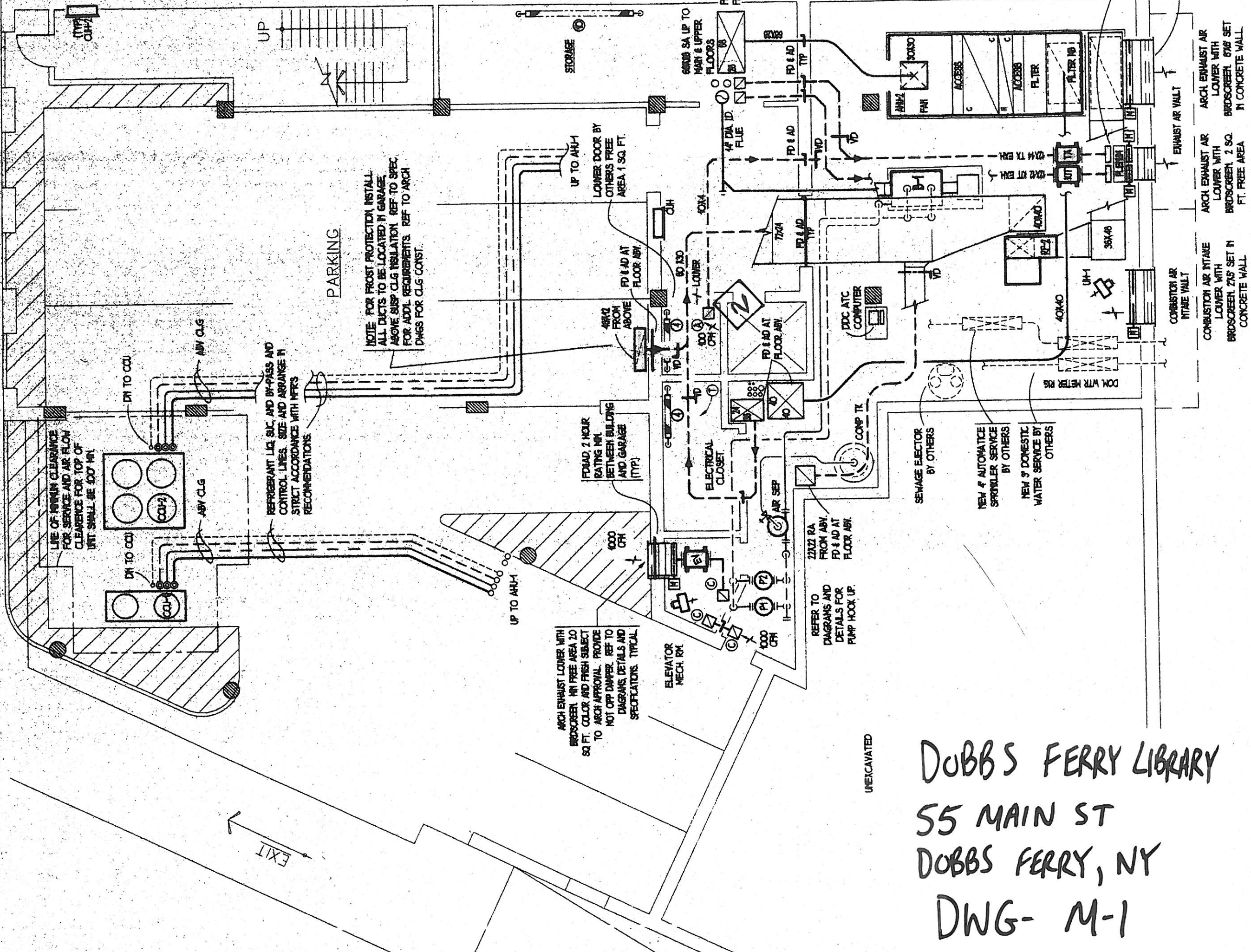
Project DOBBS FERRY LIBRARY

System No HOT WATER Floor# ALL FLOORS

WATER FLOW MEASURING STATION DATA

Terminal Number	Area Served	Measuring Station		Degree Setting	Design		Final		Remarks
		Type	Size		Delta P	GPM	Delta P	GPM	
CUH-2	GARAGE ELEVATOR LOBBY					4.0			CIRCUIT BALANCING VALVE NOT INSTALLED
CUH-2	GR. FL. NORTH EAST STAIRWAY					4.0			CIRCUIT BALANCING VALVE NOT INSTALLED
CUH-3	MAIN FL. FOYER					12.0			CIRCUIT BALANCING VALVE NOT INSTALLED
CUH-4	GR. FL. COMMUNITY ROOM					6.0			CIRCUIT BALANCING VALVE NOT INSTALLED
CUH-2	UPPER FL. ADULT LIBRARY STAIRWAY					4.0			CANNOT LOCATE BALANCING VALVE / SOLID CEILING
				TOTALS		191.3			

Remarks:



NOTE: FOR FROST PROTECTION, INSTALL ALL DUCTS TO BE LOCATED IN GARAGE ABOVE SUBP. CLG INSULATION. REF TO SPEC FOR ADDL REQUIREMENTS. REF TO ARCH DWGS FOR CLG CONST.

REFRIGERANT LIQ. SUC. AND BY-PASS AND CONTROL LINES, SIZE AND ARRANGE IN STRICT ACCORDANCE WITH MFR'S RECOMMENDATIONS.

LINE OF MINIMUM CLEARANCE FOR SERVICE AND AIR FLOW CLEARANCE FOR TOP OF UNIT SHALL BE 300 MIN.

ARCH EXHAUST LOWER WITH BRIDSCREEN. MIN FREE AREA 20 SQ. FT. COLOR AND FINISH SELECT TO ARCH APPROVAL. PROVIDE NOT OVP DAMPER. REF TO DIAGRAMS, DETAILS AND SPECIFICATIONS. TYPICAL.

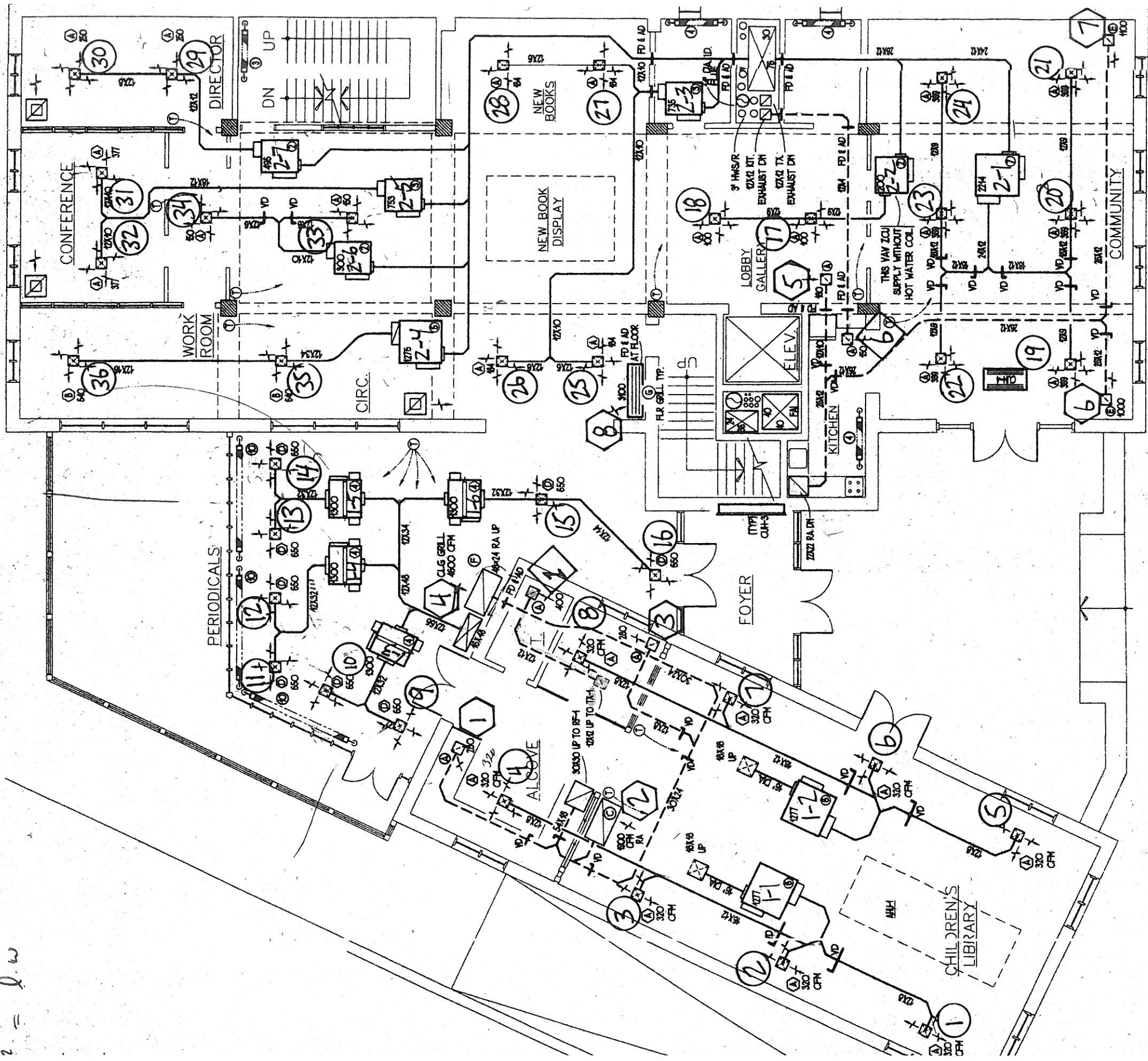
REFER TO DIAGRAMS AND DETAILS FOR PUMP HOOD UP.

DUBBS FERRY LIBRARY
 55 MAIN ST
 DOBBS FERRY, NY
 DWG- M-1

GROUND FLOOR MECHANICAL EQUIPMENT & DUCT PLAN

SCALE: 1/8" = 1'-0"

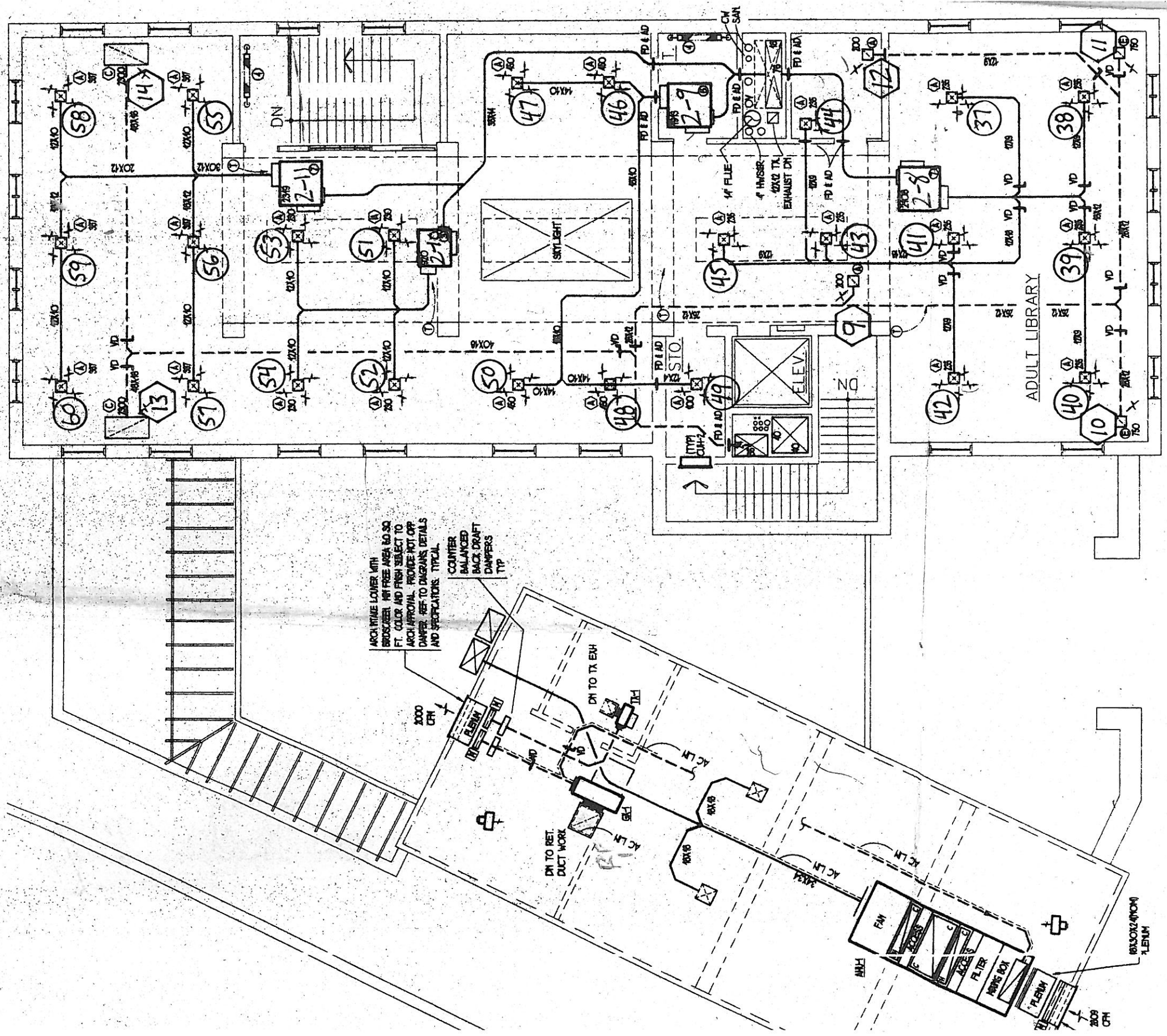
FOR BRANCH PIPING REFER TO 'GROUND FLOOR MECHANICAL PIPING PLAN, THIS SHEET



MAIN FLOOR MECHANICAL EQUIPMENT & DUCT PLAN

DOBBS FERRY LIBRARY
 55 MAIN ST.
 DOBBS FERRY, NY
 DWG- M-2

DOBBS FERRY
LIBRARY
55 MAIN ST.
DOBBS FERRY, NY



ARCHITIME LOWER WITH
BROSCREEN. MAY FREE SUBJECT TO
FT. COLLOR AND PRESH SUBJECT TO
ARCH APPROVAL. PROVIDE NOT OFF
DAMPERS. REF TO DIAGRAMS DETAILS
AND SPECIFICATIONS. TYPICAL

COUNTER
BALANCED
BACK DRAFT
DAMPERS
TYP

MECHANICAL EQUIPMENT & DUCT PLAN

UPPER FLOOR MECHANICAL EQUIPMENT & DUCT PLAN

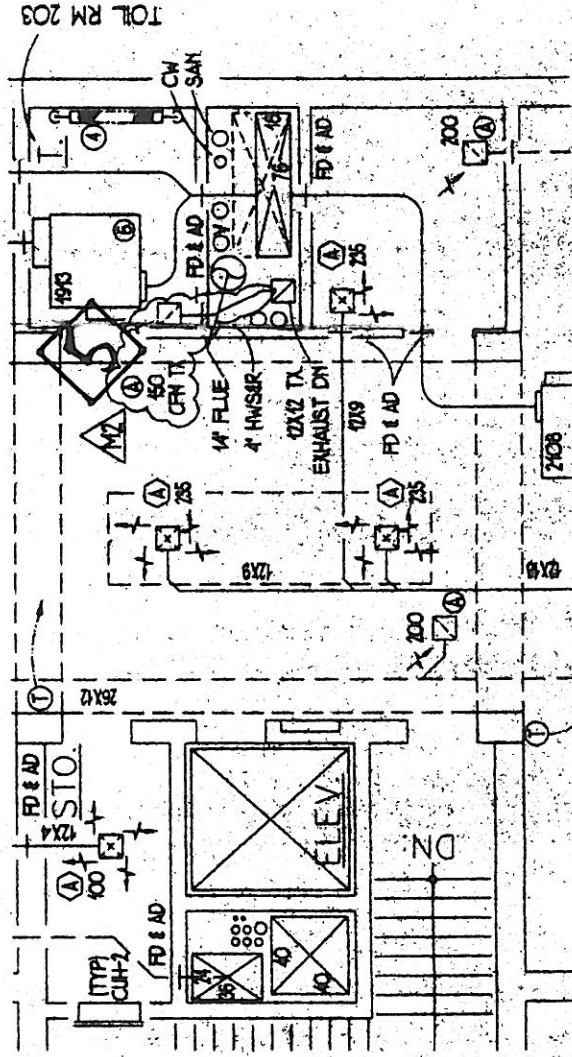
SCALE 1/8" = 1'-0"

DWG-M-3

REFER TO ADDENDUM NO. 4

REFER TO SKETCH SKM-3.1-11-08-00

REFER TO ATTACHED SKETCH SKM-3.1-11-08-00, UPPER FLOOR MECHANICAL EQUIPMENT AND DUCT PLAN WHICH MODIFIES TOILET EXHAUST DUCTWORK FOR TOILET ROOM 203



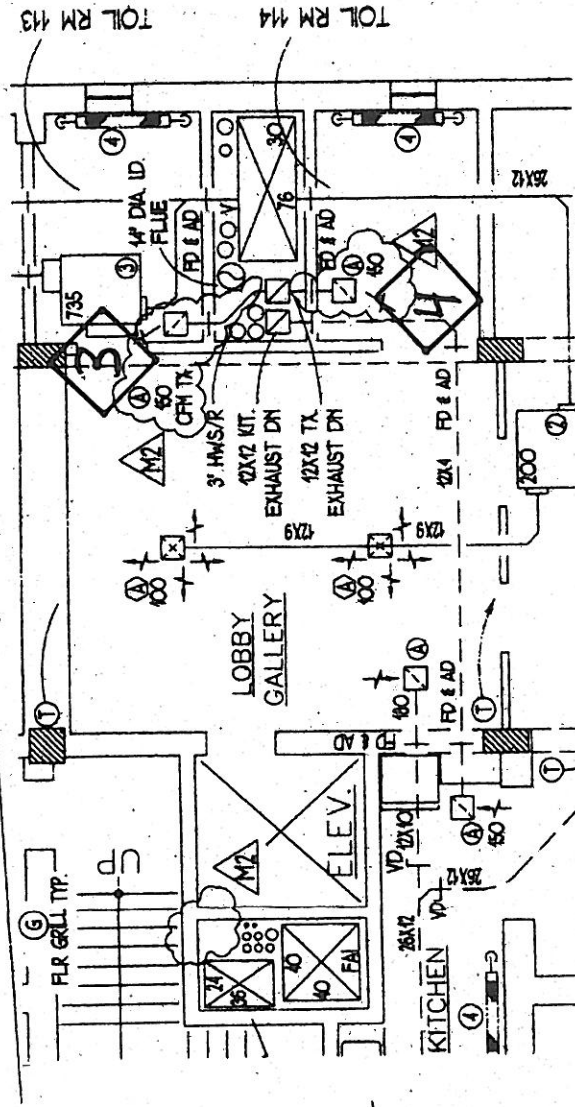
UPPER FLOOR MECHANICAL EQUIPMENT & DUCT PLAN

SCALE: HTS

REFER TO ADDENDUM NO. 4

SKETCH SKM-2.2-11-08-00

REFER TO ATTACHED SKETCH SKM-2.2-11-08-00, WHICH MODIFIES TOILET EXHAUST DUCTWORK FOR TOILET ROOMS 13 AND 14 AND IDENTIFIES RETURN AIR INLETS IN THE CONFERENCE ROOM, DIRECTOR'S OFFICE AND CIRCULATION ROOM



MAIN FLOOR MECHANICAL EQUIPMENT & DUCT PLAN

SCALE: HTS

DOBBS FERRY
55 MAIN ST.
DOBBS FERRY, NY
PART. DWG M-2 + M-3