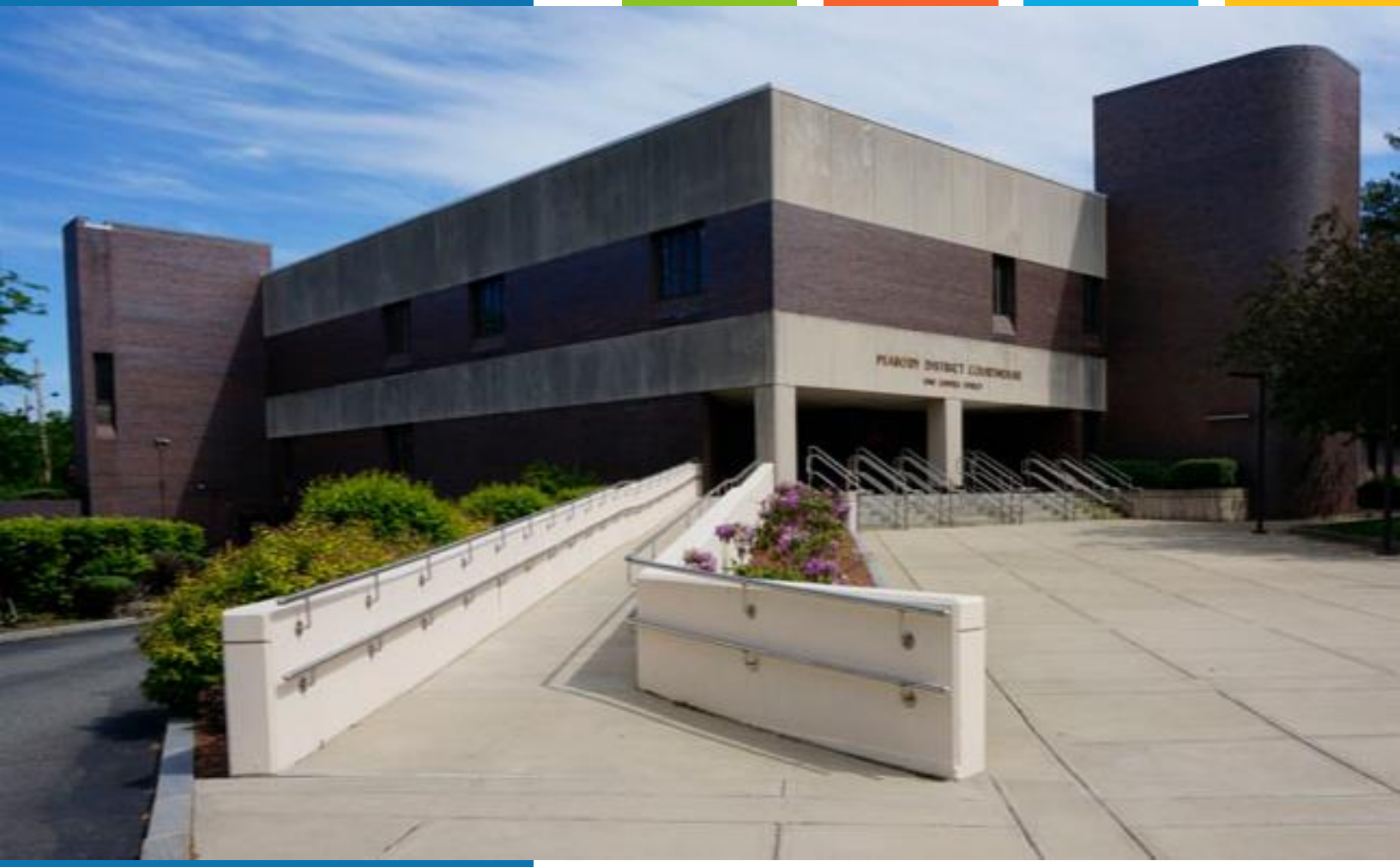

Peabody District Court
Peabody, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

November 9, 2021

Tighe&Bond

100% Recyclable

Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the Peabody District Courthouse on March 2, 2021. While on site we inspected the air handling equipment located in the mechanical rooms and on the roof and toured the facility to determine if the spaces generally matched usages noted on the architectural plans.

Site Visit Attendees:

- *Office of Court Management:*
  - Dawn Tape, Courthouse Facilities Staff
- *Tighe & Bond*
  - Ryan Ablondi, Sr. Mechanical Engineer
  - Matt Mancini, Staff Mechanical Engineer

1.1 Existing Ventilation System

The Peabody District Courthouse was constructed in 1976 and is approximately 40,000 square feet in size. The building core is served by a constant volume system consisting (2) roof top air handling units with DX cooling only and no heat, which were installed in 2006. Each interior zone served by these RTUs has a duct mounted hot water heating coil with a pneumatic 3-way control valve which are original to the building. The perimeter spaces are served by fan coil units which appear to be original to the building and well beyond their useful life. Each fan coil unit has a single, dual temp coil that is served with hot water in heating season and switched over to chilled water in cooling season.

Hot water is provided by a 2,695 MBH, oil fired modular boiler with 7 modules installed in 2006. Chilled water is provided by a 30-ton air-cooled chiller installed on the roof in 2006. During the site visit facilities personnel mentioned that two of the seven modules are currently not operating due to mechanical deficiencies. Until recently only three modules had been operating but they were able to get two more back up and running. While this does not impact the COVID readiness of the building, this boiler is the only source of heat for the building and as such, is a critical piece of mechanical infrastructure. Tighe & Bond recommends investigating and addressing the deficiencies with the boiler system prior to the next heating season in Fall 2021.

HW & CHW is pumped throughout the building by a set of (3) end suction pumps which are headered together. One pump distributes hot water to the heating system for reheat coils and fin tube radiation while the other serves the dual temp system for the fan coil units around the building perimeter. The pump in the middle is a standby pump which can serve either system as needed. These pumps are original to the building and well beyond their useful life.

According to staff the dual temp system which serves all the FCUs throughout the perimeter of the building has been isolated and shut off due to leaking pipes which would cause flooding throughout the building. These fan coil units are the main source of heating, cooling and ventilation for the perimeter offices, conference rooms and open work areas which are regularly occupied by the staff in the building. Building facilities has placed portable heat pumps throughout these spaces which provide some heating and

cooling but do not provide any ventilation air. These units have a heating capacity of 11 MBH and are in spaces where the original fan coil units had heating capacities ranging from 20-35 MBH. It is noticeably cold in many of these spaces and it was reported that building staff often wear jackets in order to stay warm throughout the workday. In order to restore basic comfort as well as recommend ventilation to these normally occupied areas, we recommend addressing this issue as soon as possible. See the Other Recommendations section below for more information.

The jury pool room on the second floor has a dedicated unit ventilator (UV-1) which draws outside air directly from a hood on the roof above. It has a single dual temp coil which runs hot water in heating season and chilled water in cooling season from the dual temp system serving all the fan coil units.

Heating and ventilating unit (HV-1) is a mixed air unit with a HW coil with face & bypass dampers which serves the holding cells and maintenance office area in the basement. The holding cell area is negatively pressurized with exhaust from each cell. Each cell is also provided with ventilation air from HV-1. This unit provides no cooling to these spaces.

Table 1 summarizes the air handling units' designed airflow rates, the MERV rating of the installed filters, and the condition of the units.

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Filters	Condition
RTU-1	12,000	3,000	MERV 8	Good
RTU-2	10,500	2,250	MERV 8	Good
UV-1	1,600	400	Unknown	Good
HV-1	1,600	400	MERV 8	Good
FCUs (Combined)	11,450	2,863	Unknown	Poor

Photo 1 – Boiler

Photo 2 – Pumps

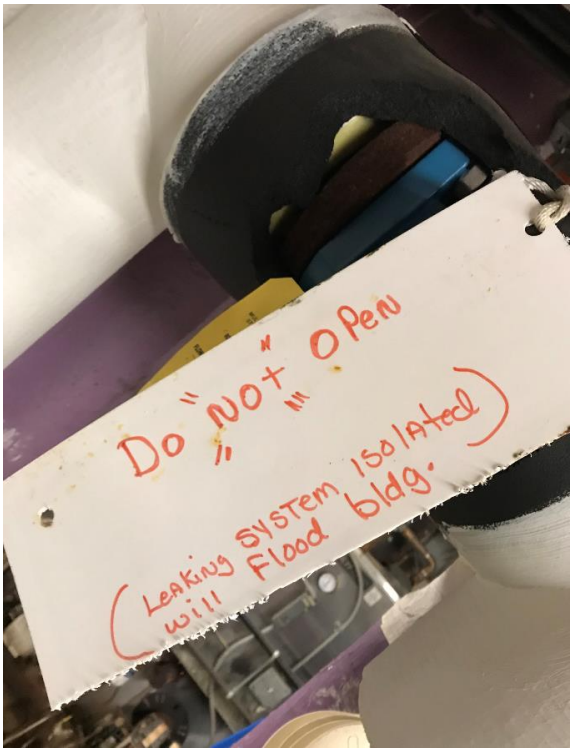

Photo 3 – Sign in MER

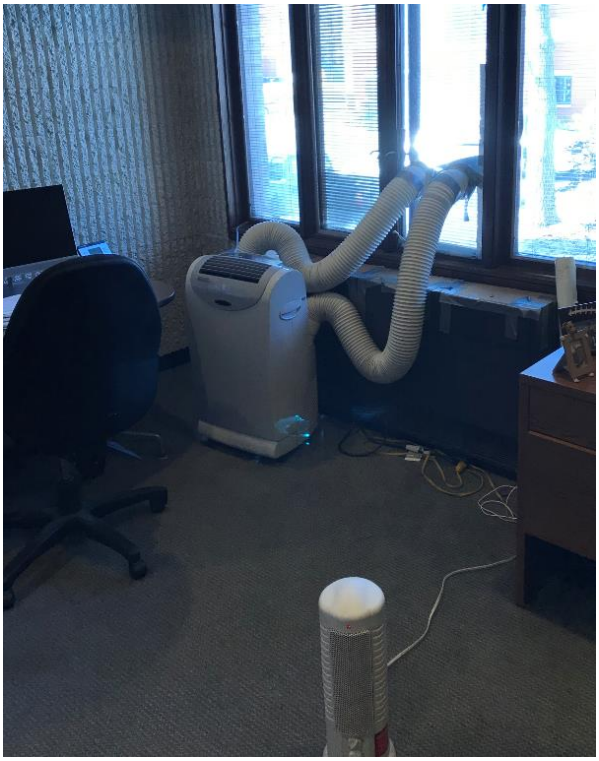

Photo 4 – Typical FCU / Portable Heat Pump

1.2 Existing Control System

The Peabody District Courthouse does not have a Building Management System (BMS) for controlling the mechanical systems. All the mechanical equipment is controlled using local controls. A large amount of the controls, including control valves, damper actuators, thermostats, etc. are pneumatic. These pneumatic controls are original to the building and beyond their useful life to the point of becoming obsolete. The air compressor serving the pneumatic system is original to the building and well beyond its useful life.

As renovations have happened over the years, particularly the 2006 HVAC renovation, electric valves, damper actuators and thermostats have replaced some of thew pneumatics, however, a large portion of the systems still use pneumatic controls.

Photo 5 – Pneumatic Control Panel

Photo 6 – Air Compressor

Section 2
Recommendations

Below is a list of recommendations for the Peabody District Courthouse. Please refer to the "Master Recommendation List" for further explanation and requirements of the stated recommendations.

Building areas without adequate ventilation and filtration significantly increase the risk of spreading viruses like COVID-19, especially areas with high occupant density and where people occupy the same space for relatively long periods of time. Consider significantly reducing occupancy or relocating occupants to other areas with adequate ventilation.

2.1 Filtration Efficiency Recommendations

Currently, MERV 8 filters are installed in the main air handling units and smaller units serving the Holding area and Jury Pool Room. Facilities staff has purchased 2" MERV 13 filters and has a plan to replace the existing MERV 8 filters.

The use of 2" MERV 13 meets the minimum ASHRAE recommendations for filtration during the pandemic. We recommend that a testing and balancing contractor test and document the airflow and static pressure profile of all air handlers, as outlined in recommendation RF-1 in the Overview of Recommendations document. This will help determine if the equipment can accommodate the increase in system static pressure associated with the addition of the MERV 13 filters.

We recommend the following measures be implemented for the existing air handling units:

RF-1: *Replace filters with MERV-13 filters.*

The TAB Contractor and/or Engineer shall verify that the air handlers can accommodate a MERV-13 filter per Appendix A in the overview of recommendations report. Filter racks should be inspected and adjusted to ensure that filters fit tightly and that end spacers are in place to minimize filter bypass.

RF-3: *Install a differential pressure sensor with a display across the filter bank.*

2.2 Testing & Balancing Recommendations

The air handling units are approximately 15 years old and it is unknown to Tighe & Bond when the last time the units were tested and balanced. Also, the code requirements to determine the outside air flow rates that were used to design the original system may be different than the 2015 International Mechanical Code (IMC) and current ASHRAE Standard 62.1 requirements.

We recommend the following testing and balancing measures be implemented:

RTB-1: *Test and balance air handling unit supply air and minimum outside air flow rates.*

We recommend testing and balancing the outdoor air flow rates for all air handling units to the recommended minimum O.A. rates listed in Table 2.

Please note, there are 23 FCUs throughout the building with varying capacities and OA requirements. We simply show a range in Table 2 below because none of these units are currently operational and cannot be balanced until they are made operational or replaced. See Section 2.6: Other Recommendations for more information.

TABLE 2
Recommended Air Handler O.A. Flow Rates

Unit	Original Supply Airflow (CFM)	Original Design Min. O.A. (CFM)	Current Code Min. O.A. Requirements (CFM)	Recommended Minimum O.A. (CFM)
RTU-1	12,000	3,000	1,909	**3,000**
RTU-2	10,500	2,250	1,910	**2,250**
UV-1	1,600	400	173	**400**
HV-1	1,600	400	256	**400**
FC-1 thru FC-23	300-1000	75-250	15-175	**75-250**

Note: Although the ASHRAE Position Document on Infectious Aerosols recommends using the latest published standards and codes as a baseline for minimum ventilation, the mechanical code in effect at the time the HVAC systems were designed and constructed is what governs the required outdoor air flowrate for the HVAC equipment, if there have been no additions, renovations, alterations or changes in occupancy to the building. The 2015 International Mechanical Code does not prevent the continued use of existing systems.

As mentioned in section 1 above, during our site visit it was discovered that none of the fan coil units are currently in operation due to a leaking piping system serving all of the fan coils. As a result, the areas with fan coil units are not receiving any ventilation air at all. Many of these areas are regularly occupied by courthouse employees. We highly recommend addressing this issue as soon as possible. See the Other Recommendations section below for more information.

During the pandemic, we recommend maintaining the outdoor airflows at the original designed values where they exceed the code minimums calculated by Tighe & Bond. Supplying more outdoor than required by code will provide better indoor air quality.

Where we recommend increasing the outdoor air beyond the original design, it appears the cooling and heating coils should be able to provide leaving air conditions similar to the original design under peak outdoor air conditions, assuming the coils are clean and their performance has not degraded significantly over time. Supply air temperatures during the heating and cooling season should be monitored to ensure they are not dropping below design values. If the supply air temperature does drop below design values, the outdoor airflow rate should be reduced, but not below the originally designed outdoor air flow rates.

Where we do not recommend increasing outdoor air to the current code requirements, it appears the cooling and/or heating coils cannot maintain the proper leaving air temperature under peak outdoor air conditions.

The average airflow rate per person is shown below in Table 3. These values are based on the original full design supply airflow rate and the recommended outdoor airflow rates shown in Table 2. The airflow rate per person assumes a diversity factor of 70%, meaning the maximum number of occupants assumed to be in all zones at all times equates to 70% of the code required occupancy.

TABLE 3
Average Airflow Rate per Person

	All spaces	***Courtrooms***	***Non-Courtroom Spaces***
Total Occupancy (People)	425	330	96
Total Supply Air (CFM/Person)	87	18	329
Outdoor Air (CFM/Person)	21	4	79

The airflow rate per person for each Courtroom and the Jury Pool Room is shown below in Table 4. These values are based on full occupancy without taking diversity into account, the original full design supply airflow rate, and the recommended outdoor airflow rate. The airflow rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4
Airflow Rate per Person (Full Occupancy)

		Total Air		***Outdoor Air***	
Courtroom	***Total People***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outside Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Pool Room	28	1,600	57	400	14
Court Session 1	181	3,080	17	770	4
Court Session 2	72	980	14	210	3
Court Session 3	77	1,860	24	399	5

Note: Courtroom occupant density is based on 70 people/1,000 square feet, per the 2015 International Mechanical Code

The airflow rate per person for each Courtroom and the Jury Pool Room, based on a reduced occupancy schedule determined by the Office of Court Management, is shown below in Table 4a. The airflow rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4a
Airflow Rate per Person (Reduced Occupancy)

		Total Air		*Outdoor Air*	
Courtroom	***Total People***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outside Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Pool Room	6	1,600	267	400	67
Court Session 1	40	3,080	77	770	10
Court Session 2	22	980	45	210	10
Court Session 3	35	1,860	53	399	11

Note: If occupancy is further reduced, the airflow rate per person will increase, assuming full airflow is being delivered to the space.

RTB-3: *Increase outside air flow rate beyond minimum under non-peak conditions.*

Due to the age of the units, the ability for the coils to maintain the supply air temperature is uncertain. We recommend increasing the outdoor air flow rate to the values in Table 5 during non-peak outdoor air conditions during the pandemic only. This may require additional controls to implement. We do not believe this would cause a threat of a potential coil to freeze given the amount of outside air as a percentage of total supply air, however cold spots on the coil may develop due to poor mixing. This may cause nuisance freeze stat trips via the existing freeze stat. If there is no existing freeze stat, we recommend installing one.

TABLE 5
Recommended Air Handler O.A. Flow Rates During Non-peak Conditions

Unit	**Original Supply Airflow (CFM)**	**Recommended Min. O.A. (CFM)**	**Recommended Min. O.A. Under Non-Peak O.A. Conditions (CFM)**
RTU-1	12,000	**3,000**	4,000
RTU-2	10,500	**2,250**	3,500

The return air to each air handler will also have to be adjusted to accommodate the additional outdoor air during the operation of this sequence.

RTB-5: *Test and balance all air inlets and outlets.*

If the airflow to each space has not been recently tested, we recommend testing the airflow rates in the holding cells, Courtrooms, Jury Pool room, and other densely occupied areas as a minimum. These systems are very old and the airflow rate delivered to and returned from these spaces may not match the original design intent.

If specific areas within the Courthouse experiences regular cooling and heating comfort complaints this may be an indication of a lack of airflow to the space. We recommend testing and balancing the air inlets and outlets serving those spaces to the designed values. Prior to rebalancing the building, we recommend verifying the boiler plant is maintaining the correct supply water temperature. Incorrect supply water temperature may be contributing to the temperature control complaints instead of a lack of airflow.

2.3 Equipment Maintenance & Upgrades

We recommend the following equipment maintenance and upgrades:

RE-1: *Test existing air handling system dampers and actuators for proper operation*.

Replace dampers and actuators that are not functioning properly.

RE-2: *Clean air handler coils and drain pans.*

2.4 Control System Recommendations

We recommend the following for the control system:

RC-1: *Implement a pre and post-occupancy flush sequence.*

RC-2: *Install controls required to introduce outside air beyond the minimum requirements.*

The existing control system does not appear to be sophisticated enough to implement this type of sequence. Additional controls and sensors will be required.

Prior to implementing this control strategy, the TAB Contractor should verify the quantity of outside air the outdoor air louvers can accommodate without exceeding an intake air velocity of 450 feet/minute (FPM). Exceeding this air velocity through an intake air louver may result in rain or snow entering the louver.

RC-4: *Confirm the economizer control sequence is operational.*

Replace control components, such as outdoor and return air temperature and/or humidity sensors, as required.

2.5 Additional Filtration and Air Cleaning

We recommend the installation of the following air cleaning devices:

RFC-1: *Install portable HEPA filters.*

Due to the fact that the perimeter offices and conference room do not currently have proper ventilation, we recommend installing portable HEPA filters in these areas. During our site visit, it appeared some spaces were shared by multiple people. Below is a list of these specific areas where we would recommend HEPA filters if those spaces are regularly occupied by multiple people. If any of these spaces have only a single occupant, a HEPA filter is not needed.

- Security Office 122B
- Clerk of Courts Secretarial Pool 129
- Asst. Clerk 136
- Asst. Clerk 137
- Asst. Clerk 135
- Clerk of Courts 131
- Juvenile Hearing 120
- Juvenile Probation 114
- Adult Male Probation 112
- Adult Male Probation 109
- Adult Female Probation 107
- Chief Probation 105
- Assistant Chief Probation 104
- Break Room 102
- Jury Deliberation Room 201
- Jury Pool Room 208
- Judges Lobby 212
- Judges Lobby 216
- Judges Lobby 218
- Judges Lobby 220
- Office Space 221
- Peabody Police 226

Additionally, if the Courthouse is to operate at a high capacity (i.e. 50% occupancy or greater), we recommend installing portable HEPA filters in high traffic areas, such as entrance lobbies. They should also be considered for Courtrooms, depending on the occupancy of the room and how much noise is generated from the filters. The noise levels will vary depending on the manufacturer.

2.6 Other Recommendations

2.6.1 Repair the Dual Temp Piping System

As mentioned in Section 1.1, the dual temp system which serves all of the fan coil units around the perimeter of the building as well as the unit ventilator in the Jury Pool Room has been shut off due to leaking which causes flooding in the building. These FCUs serve offices, conference rooms and open work areas which are regularly occupied by the staff in the building. This leaking issue should be investigated and repaired as soon as possible in order to restore basic comfort and ventilation to these areas of the courthouse.

2.6.1 Replace Fan Coil Units

As mentioned in Section 1.1, the fan coil units are well beyond their useful life at 45 years old. These units should be considered for replacement either with similar window mounted fan coil units or with a new overhead system. We recommend performing a study to determine a feasible, cost effective and efficient system to replace these fan coil units and restore basic comfort and ventilation to these areas.

2.6.3 Install a Building Management System

We recommend replacing the pneumatic control system with a Building Management System to control and monitor HVAC equipment. Pneumatic air systems are antiquated and do not offer the same benefits as a BMS. This recommendation is an energy saving and maintenance measure and does not affect the indoor air quality of the building.

2.6.4 Convert Hot and Chilled Water System to Variable Flow

The hot and chilled water pumps are constant flow systems. Constant flow pumps circulate the same volume of water to air handling units regardless of whether the water is required or not. If air handlers do not require this water, the three-way valves serving the air handler coils bypass the coil, which allows the water to return back to the chiller or boiler plant. We recommend investigating the possibility of converting these systems to variable flow. The three-way reheat and chilled water valves would have to be replaced with two-way valves, as well as any other three-way valves that are in the system. As noted above, the HW and CHW pumps are beyond their useful life and should be considered for replacement with new pumps including Variable frequency drives (VFD). VFDs allow the pumps to vary the flow rate to match the demand. This recommendation is an energy saving measure and does not affect the indoor air quality of the building.

2.6.5 Replace Pneumatic Damper and Valve Actuators with Electronic Actuators

We recommend replacing pneumatic damper and valve actuators with electronic actuators and tying them into the Building Management System. Pneumatic controls is an old and obsolete technology. These systems tend to leak air, may result in poor control of the HVAC equipment, cause the air compressor to run more frequently and increase energy usage. A BMS can monitor the position of electronic valves, trend valve position data, and report alarms.

If the existing pneumatic system can cycle damper and valve actuators and position the valves and dampers in their correct position repeatedly, then immediate replacement is not necessary. If the system cannot cycle the actuators to correct damper or valve positions, this may cause too little or too much outdoor air flow and water flow through the units, affecting the quantity of ventilation air and heating and cooling capacity of the coils.

Disclaimer

Tighe and Bond cannot in anyway guarantee the effectiveness of the proposed recommendations to reduce the presence or transmission of viral infection. Our scope of work is intended to inform the Office of Court Management on recommendations for best practices based on the guidelines published by ASHRAE and the CDC. Please note that these recommendations are measures that may help reduce the risk of airborne exposure to COVID-19 but cannot eliminate the exposure or the threat of the virus. Implementing the proposed recommendations will not guarantee the safety of building occupants. Tighe & Bond will not be held responsible should building occupants contract the virus. The Office of Court Management should refer to other guidelines, published by the CDC and other governing entities, such as social distancing, wearing face masks, cleaning and disinfecting surfaces, etc. to help reduce the risk of exposure of COVID-19 to building occupants.

Section 3
Testing & Balancing Results

Milharmer Associates visited the Peabody District Courthouse on September 22nd, 2021 to test the airflow rates of the air handling units and the airflow rates within the rooms. A summary of the tested airflow rates versus the design airflow rates are shown below in Table 6. The full testing and balancing report is attached, which includes the flow rates measured in each space.

TABLE 6
Air Handler Testing & Balancing Results

	Design			Actual		
Unit	Total Supply Fan Airflow (CFM)	Recommended Outdoor Airflow (CFM)	Return Airflow (CFM)	Supply Fan Airflow (CFM)	Outdoor Airflow (CFM)	Return Airflow (CFM)
RTU-1	12,000	3,000	9,000	10,988	2,698	8,690
RTU-2	10,500	2,250	8,250	9,264	2,065	7,199
UV-1	1,600	400	1,200	N/A	N/A	N/A
HV-1	1,600	400	1,200	N/A	N/A	N/A

The typical balancing tolerance for air systems is ±10% of the design airflow. In reviewing the airflow report data, the following should be noted:

1. Hot water re-heat coils serving RTU-1 and RTU-2 were not tested by the TAB contractor because the hot water system was not operating during the time of their visit. We recommend having the TAB contractor return when the system is operating to test and balance the flow to these coils.
2. There are six exhaust fans serving the building. Four of them (RF-1, RF-2, RF-3 & RF-5) serve occupied areas including bathrooms and holding cells. These fans were not tested and balanced by the TAB contractor. We recommend the TAB contractor test and balance the airflow for these fans.
3. RTU-1 supply fan is performing within acceptable range, however the outside air flow rate is slightly below the 10% tolerance. Also, many of the individual spaces, particularly at the end of duct runs, are well below the 10% tolerance for airflow.
4. RTU-2 supply fan is performing below the typical 10% tolerance. The return fan is returning approximately 1,050 CFM less air than specified, creating a large positive pressure in the spaces this air handler serves. We recommend the operation of the return fan be further investigated by the ATC contractor and corrected to provide a return airflow rate of 8,250 CFM.
5. None of the FCUs serving the perimeter spaces were running. As noted in the report above, the FCUs are not operating due to the dual temp piping system throughout the building being in a state of disrepair which leads to leaks throughout the building. We recommend addressing this issue as soon as

possible to restore basic comfort cooling and heating to the building as well as proper ventilation.

6. UV-1 was not tested because it was reported to the TAB contractor that the units does not operate. This is likely due to the fact that it is served by the same dual temp system that serves the FCU's and cannot be operated.
7. TAB report notes that HV-1 was not tested and that it reportedly has not been operational for a long time. The reason HV-1 has not been operational is not clear at this point. HV-1 it provides ventilation air for the maintenance office and the holding cell area. We recommend investigating and repairing any issues as soon as possible to restore proper ventilation to these areas.

MILHARMER ASSOCIATES, INC.
534 New State Highway, Route 44, Suite 3
Raynham, MA 02767
Tel.: 508-823-8500; Facsimile: 508-823-8600

TEST AND BALANCE REPORT

Project: **Peabody District Court**
Peabody , MA

Project No.: **21-536** **Project Date:** **9/22/2021**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	Peabody District Court		
Address:	Peabody , MA		
Date:	9/22/2021	**Project No.**	21-536

CERTIFICATION

Submitted & Certified by:

Milharmer Associates, Inc.

Certification No.: ***3384*** Certification Expiration Date: **3-31-23**

The data presented in this Report is a record of system measurements and final adjustments that have been obtained in accordance with the current edition of the ***N.E.B.B. Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems.*** Any variances from design quantities which exceed N.E.B.B. tolerances, are noted in the Test-Adjust-Balance Report Project Summary.

N.E.B.B. Qualified TAB Supervisor Name: **Scott F. Miller**

N.E.B.B. Qualified TAB Supervisor Signature:_____

Certification

SCOTT F. MILLER

HAS MET ALL REQUIREMENTS FOR NEBB CERTIFIED PROFESSIONAL STATUS IN THE FOLLOWING DISCIPLINE

Testing, Adjusting and Balancing of Environmental Systems

This Certificate, as well as individual affiliation with a NEBB Certified Firm and associated NEBB Certification Stamp are REQUIRED to provide a NEBB Certified Report. Participation in the NEBB Quality Assurance Program requires the Certificant be affiliated with a NEBB Certified Firm

CP-23541

NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

Firm Certification

MILHARMER ASSOCIATES, INC.

HAS MET ALL REQUIREMENTS FOR NEBB CERTIFIED STATUS IN THE FOLLOWING DISCIPLINE

Testing, Adjusting and Balancing of Environmental Systems

3384

NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

Project:	Peabody District Court		
Address:	Peabody , MA		
Date:	9/22/2021	**Project No.**	21-536

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Address: Peabody , MA
Date: 9/22/2021 **Project No.** 21-536

INSTRUMENT SHEET

The following is a list of Instruments owned and operated by Milharmer Associates, Inc. and used on this project.

Instrument ID Number	Instrument	Calibration Date	Calibration Due Date
1	ADM-870 Digital Multimeter	8-20-21	8-20-22
2	Shortridge Flow Hood	8-20-21	8-20-22
3	Ampmeter	8-20-21	8-20-22
4	Tachometer	8-20-21	8-20-22
5	Airflow Anemometer	8-20-21	8-20-22
6	Digital Thermometers	8-20-21	8-20-22
7	Shortridge Water Meter	8-20-21	8-20-22
8	Sound Meter	8-20-21	8-20-22
9	Vibration Meter	8-20-21	8-20-22

Please Note: Instruments are tested annually at the M.A.I. Lab. and sent back to the factory if deviation exceeds manufacturing tolerance.

Technician:

SYMBOL SHEET

AHU	Air Handling Unit	HEATER O.L.	Thermal Overload
AC or ACU	Air Conditioner Unit		Protection For Motors
ACCU	Air Cooled Condensing Unit		Located at Starter Motor
ADJ P.D.	Adjusted Pitch Diameter		
AMP	Amperage	HEPA	High Efficiency Particulate
AVG	Average		Arrestance
A.D.	Air Density	HOA	Hand/Off/Auto Switch
		H.P.	Horsepower
B.H.P.	Brake Horsepower	HPS	High Pressure Steam
		HRC	Heat (Recovery or Recliam) Coil
CFM	Cubic Feet Per Minute	HVAC	Heating, Ventilation and
CH	Chiller		Air Conditioning
CHWR	Chilled Water Return	HWR	Hot Water Return or
CHW or CHWS	Chilled Water Supply		Heating Water Return
CT	Cooling Tower	HWS	Hot Water Supply or
CWR	Condenser Water Return		Heating Water Supply
CW or CWS	Condenser Water Supply	HX	Heat Exchanger
DB	Dry Bulb	I.D.	Inside Diameter
D.D.	Direct Drive		
DIA	Diameter	LAT	Leaving Air Temperature
		L.D.	Linear Supply Diffuser
EAT	Entering Air Temperature	LPS	Low Pressure Steam
EDC	Electric Duct Coil	L.T.	Light Troffer
EDH	Electric Duct Heater	LWT	Leaving Water Temperature
EF	Exhaust Fan		
EMS	Energy Mgt System	MAU/MUA	Make Up Air Unit
EWT	Entering Water Temperature	MBH	1,000 BTU's per Hour
FCU	Fan Coil Unit	N.A.	Not Accessible
FH	Fume Hood	N/A	Not Applicable
F.L.A.	Full Load Amperage	N.I.	Not Installed
FPB	Fan Powered Box	N.L.	Not Listed
FPM	Feet Per Minute		
FT. HD.	Feet of Head		
GPM	Gallons Per Minute		

SYMBOL SHEET CONTINUED

O.D.	Outside Diameter	TAB	Testing, Adjusting, and Balancing
OA Min	Outside Air Minimum	TSP	Total Static Pressure
OAT	Outside Air Total	TP	Thermally Protected
PF	Power Factor	UH	Unit Heater
PHC	Preheat Coil		
PH	Phase(s)	V	Volts
PSI	Pounds Per Square Inch	VAV	Variable Air Volume
P.T.	Pitot Traverse	VD	Volume Damper
		VFD	Variable Frequency Drive
RA	Return Air	VP	Velocity Pressure
RF	Return Air Fan		
R.G.	Return Grille	W	Watts
RHC	Reheat Coil	WB	Wet Bulb
RPM	Revolutions per Minute	W.D.	Water Density
		W.G.	Water Guage
SA	Supply Air		
SAT	Supply Air Temperature	F	Degrees Fahrenheit
S.D.	Supply Diffuser		
SEF	Smoke Exhaust Fan	ΔP	Differential (Delta) Pressure or Pressure Drop
SF (AIR)	Supply Fan		
S.F.(Elect)	Service Factors		
SHC	Steam Heating Coil	ΔT	Differential (Delta) Temperature, Net Temperature Decrease or Increase
S.P. "W.C."	Static Pressure Measured in Inches of Water Column	#	PSI or Pounds Per Square Inch Decrease or Increase

Project:	Peabody District Court		
Address:	Peabody , MA		
Date:	9/22/2021	**Project No.**	21-536

REPORT SUMMARY

Attached is the report for Peabody District Court with the following comments:

1. HV-1 serving the holding cells was not running and we were told that it has not run in a long time.

2. The FCU's were not running and we were told they also have not run in a long time.

Project:	Peabody District Court		
Address:	Peabody , MA		
Date:	9/22/2021	**Project No.**	21-536

REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
RTU-1	10,988 CFM	8,690 CFM	2,698 CFM
RTU-2	9,264 CFM	7,199 CFM	2,065 CFM
HV-1	*1	*1	*1

*1 Unit does not run.

FANS

UNIT	EXHAUST

Project: Peabody District Court
Address: Peabody , MA
Date: 9/22/2021 **Project No.** 21-536

FAN DATA SHEET

	FAN NO. RTU-1 (AC-1)		FAN NO. RETURN	
Serves / Location:	1st & 2nd Fl.	Roof	1st & 2nd Fl.	Roof
Manufacturer:	YORK		YORK	
Model Number:	Y23AC02A30ABAH		Y23AC02A30ABAH	
Size:	NL		NL	
Serial Number:	N0H7208755		N0H7208755	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	BALDOR	NL	BALDOR
Frame Number:	NL	256T	NL	213T
Horsepower:	NL	20	NL	7.5
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	230/460		208-230/460	
Motor Amperage:	48/24		21.7-20/10	
Motor RPM:	1760		1750	
Speeds:	NL		NL	
Heater Size:	NL		NL	
Heater Amps.:	NL		NL	
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	11985 (12060) *1	10988		
Return Air CFM:			10780 (10840) *1	8690
Exhaust Air CFM:				
Outside Air CFM:	3000	2698		
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:	2.38		0.5	
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	1229		1050	
Motor Drive:	NL	6 1/2" OD	NL	5 1/2" OD
Motor Size/Bore:	NL	1 1/2"	NL	1 1/2"
Fan Drive:	NL	15 3/4" OD	NL	11 1/4" OD
Fan Size/Bore:	NL	2 1/8"	NL	1 5/8"
Belt Size / Number:	NL	5VX610/2	NL	BX62/2
Shafts C-C:	NL	12	NL	19
Turns Open:	NL	FIXED	NL	FIXED

Comments: ***1 Connected load.**

Project: Peabody District Court
Address: Peabody , MA
Date: 9/22/2021 **Project No.** 21-536

AIR DISTRIBUTION

SYSTEM: RTU-1 (AC-1)
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
208	1	24X24	FH	NA	NA	525	475
208	2	24X24	FH	NA	NA	525	461
208	3	24X24	FH	NA	NA	525	481
208	4	24X24	FH	NA	NA	525	404
208	5	18X12	FH	NA	NA	525	*1
208	6	18X12	FH	NA	NA	525	*1
208	7	18X12	FH	NA	NA	525	*1
208	8	18X12	FH	NA	NA	525	*1
208	9	18X12	FH	NA	NA	525	*1
208	10	18X12	FH	NA	NA	525	*1
208	11	18X12	FH	NA	NA	525	*1
208	12	18X12	FH	NA	NA	525	*1
C213	13	24X24	FH	NA	NA	490	384
C213	14	24X24	FH	NA	NA	490	397
C207	15	24X24	FH	NA	NA	180	146
C206	16	24X24	FH	NA	NA	180	90
215	17	24X24	FH	NA	NA	465	326
215	18	24X24	FH	NA	NA	465	542
215	19	24X24	FH	NA	NA	465	630
215	20	24X24	FH	NA	NA	465	483
C119	21	12X12	FH	NA	NA	95	188
C119	22	24X24	FH	NA	NA	220	181
C119	23	24X24	FH	NA	NA	220	168
112	24	24X24	FH	NA	NA	325	240
112	25	24X24	FH	NA	NA	325	264
112	26	24X24	FH	NA	NA	325	250
112	27	24X24	FH	NA	NA	325	238
C124	28	12X12	FH	NA	NA	75	60
					TOTALS:	11410	10240

Comments: *1 Traversed 36x18 duct, Total for 5 - 12 = 3832
Unable to access at skylights.

Project: Peabody District Court
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AIR DISTRIBUTION

SYSTEM: RTU-1 (AC-1)

SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
C113	29	12X12	FH	NA	NA	125	140
C115	30	12X12	FH	NA	NA	105	129
C125	31	24X24	FH	NA	NA	115	134
C125	32	24X24	FH	NA	NA	130	141
C118	33	24X24	FH	NA	NA	175	204
					TOTALS:	650	748
					UNIT TOTALS:	12060	10988

Comments:

Project: Peabody District Court
Address: Peabody , MA
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AIR DISTRIBUTION

SYSTEM: RTU-1 (AC-1)
SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
C206	1	24X24	FH	NA	NA	160	151
C207	2	24X24	FH	NA	NA	160	173
215	3	20X20	FH	NA	NA	1675	1181
208	4	48X48	15.5	366	327	5670	5069
C118	5	24X24	FH	NA	NA	155	146
C119	6	24X24	FH	NA	NA	395	378
C119	7	12X12	FH	NA	NA	85	68
C125	8	24X24	FH	NA	NA	115	49
C125	9	24X24	FH	NA	NA	105	75
C116	10	24X24	FH	NA	NA	1170	855
C115	11	12X12	FH	NA	NA	95	56
C113	12	12X12	FH	NA	NA	110	52
C124	13	12X12	FH	NA	NA	65	37
C213	14	20X20	FH	NA	NA	880	400
Comments:					TOTALS:	10840	8690

Project: Peabody District Court
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FAN DATA SHEET

	FAN NO. RTU-2 (AC-2)		FAN NO. RETURN	
Serves / Location:	bsmt, 1st & 2nd Fl.	Roof	bsmt, 1st & 2nd Fl.	Roof
Manufacturer:	YORK		YORK	
Model Number:	Y23AC02A30ABAH		Y23AC02A30ABAH	
Size:	NL		NL	
Serial Number:	N0H7202827		N0H7202827	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	BALDOR	NL	BALDOR
Frame Number:	NL	256T	NL	213T
Horsepower:	NL	20	NL	7.5
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	230/460		208-230/460	
Motor Amperage:	48/24		21.7-20/10	
Motor RPM:	1760		1750	
Speeds:	NL		NL	
Heater Size:	NL		NL	
Heater Amps.:	NL		NL	
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	10290 (10295) *1	9264		
Return Air CFM:			9261 (9015) *1	7199
Exhaust Air CFM:				
Outside Air CFM:	2250	2065		
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	1096		915	
Motor Drive:	NL	6 1/2" OD	NL	5 1/2" OD
Motor Size/Bore:	NL	1 1/2"	NL	1 1/2"
Fan Drive:	NL	15 3/4" OD	NL	11 1/4" OD
Fan Size/Bore:	NL	2 1/8"	NL	1 5/8"
Belt Size / Number:	NL	5VX610/2	NL	BX62/2
Shafts C-C:	NL	12	NL	19
Turns Open:	NL	FIXED	NL	FIXED

Comments: ***1 Connected load.**

Project: Peabody District Court
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AIR DISTRIBUTION

SYSTEM: RTU-2 (AC-2)
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
C215	1	24X24	FH	NA	NA	165	92
C205	2	24X24	FH	NA	NA	165	237
C204	3	24X24	FH	NA	NA	190	297
204	4	24X24	FH	NA	NA	770	235 *1
204	5	24X24	FH	NA	NA	770	798
204	6	24X24	FH	NA	NA	770	517
204	7	24X24	FH	NA	NA	770	813
C202	8	24X24	FH	NA	NA	250	164
C202	9	24X24	FH	NA	NA	250	70
C107	10	24X24	FH	NA	NA	180	435
110	11	24X24	FH	NA	NA	875	742
110	12	24X24	FH	NA	NA	875	705
110	13	24X24	FH	NA	NA	875	800
110	14	24X24	FH	NA	NA	875	686
C122	15	12X12	FH	NA	NA	130	85
C129	16	24X24	FH	NA	NA	390	574
C122	17	24X24	FH	NA	NA	390	295
126	18	24X24	FH	NA	NA	535	659
126	19	24X24	FH	NA	NA	535	460
G108	20	24X24	FH	NA	NA	260	297
G108	21	24X24	FH	NA	NA	275	303
Comments: *1 Cardboard in diffuser face.					TOTALS:	10295	9264

Project: Peabody District Court
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AIR DISTRIBUTION

SYSTEM: RTU-2 (AC-2)
SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
C202	1	24X24	FH	NA	NA	375	697
C215	2	24X24	FH	NA	NA	150	90
C205	3	24X24	FH	NA	NA	150	144
C204	4	36X36	8.63	321	300	2770	2289
C119	5	36X48	11.57	357	132	4115	3027
C122	6	12X12	FH	NA	NA	115	79
C122	7	24X24	FH	NA	NA	700	461
C107	8	24X24	FH	NA	NA	160	135
G108	9	24X24	FH	NA	NA	480	277
					TOTALS:	9015	7199

Comments:

Project: Peabody District Court
Address: Peabody , MA
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AIR DISTRIBUTION

SYSTEM: HV-1
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
Jail Cell	1		FH	NA	NA	140	
Jail Cell	2		FH	NA	NA	210	
Jail Cell	3		FH	NA	NA	210	
Jail Cell	4		FH	NA	NA	360	
Jail Cell	5		FH	NA	NA	200	
Jail Cell	6		FH	NA	NA	120	
Jail Cell	7		FH	NA	NA	120	
Jail Cell	8		FH	NA	NA	90	
Jail Cell	9		FH	NA	NA	120	
					TOTALS:	1570	*1

Comments: *1 Not running.

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Address: Peabody , MA
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AIR DISTRIBUTION

SYSTEM: UV-1
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
213	1	24X24	FH	NA	NA	NL	
213	2	24X24	FH	NA	NA	NL	
213	3	24X24	FH	NA	NA	NL	
213	4	24X24	FH	NA	NA	NL	
					TOTAL:	NL	*1
	RETURN						
213	1	24X24	FH	NA	NA	NL	
213	2	24X24	FH	NA	NA	NL	
					TOTAL:	NL	*1

Comments: *1 Not running.