Newton District Court
West Newton, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

March 30, 2022

Tighe&Bond

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Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the Newton District Courthouse on March 10, 2021. While on site we inspected the air handling equipment located in the mechanical rooms and toured the facility to determine if the spaces generally matched usages noted on the architectural plans.

Site Visit Attendees:

- *Office of Court Management:*
  - Ray Nardone - FSII
  - Scott Morse - Senior HVAC Tech

- *Tighe & Bond*
  - Ryan Ablondi, Mechanical Engineer
  - Tim Bill, Staff Mechanical Engineer

1.1 Existing Ventilation System

The Newton District Courthouse was constructed in 1930 and is approximately 19,000 square feet in size. Three variable air volume (VAV) rooftop air handling units (RTU) provide ventilation air to the building. Each unit contains a supply fan, refrigerant (DX) cooling coils with remote air cooled condensers, hot water heating coils, and 2" MERV 8 filters. Integral return fans are contained within each air handling unit. Each air handler is a variable air volume (VAV) unit, where VAV boxes regulate the airflow into zones throughout the building.

The units are from a renovation in 2000 and are in fair condition. The outdoor and return air dampers are in good condition. The actuators were not able to be observed during the site visit. The heating and cooling coils are in fair condition.

RTU-1 did not match the reading that was shown on the BMS system. The system said that the outdoor air damper was 90% open, however when the unit was observed, the outdoor air damper was almost totally shut. There also appeared to be a leak in the heating coil in RTU-1.

According to the drawings provided to Tighe & Bond, there are six exhaust fans serving the building. Two of the six fans serve toilet rooms and the lockup area. The toilet exhaust and lockup exhaust fans were running at the time of our site visit.

Ventilation air is provided to the lockup area via RTU-1. Each cell has a supply and exhaust register. The exhaust registers are served by EF-1.

A 2.6 million BTU/hr hot water boiler plant provides hot water to air handlers, radiation, and VAV reheat coils. The pumps in the boiler room were making an abnormal noise during our site visit. The cause of the noise should be investigated.

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	8,460	3,380	2" MERV 8	Fair
RTU-2	11,835	2,820	2" MERV 8	Fair
RTU-3	9,825	3,930	2" MERV 8	Fair

Photo 1 – Representative Air Handler

1.2 Existing Control System

The existing control system is a rudimentary BMS system. There is a computer that can be used to view the status of the equipment in the system and space temperatures. It is our understanding that operating parameters cannot be modified via the BMS and that the BMS does not have any alarm capability. The outside air damper positions for the AHUs did not match the read-outs on the BMS. The dampers and actuators should be investigated to provide an accurate reading.

Section 2
Recommendations

Below is a list of recommendations for the Newton 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

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 20 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.

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	8,460	3,380	995	**3,380**
RTU-2	11,835	2,820	1,120	**2,820**
RTU-3	9,825	3,930	966	**3,930**

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.

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.

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)	208	117	91
Total Supply Air (CFM/Person)	145	77	232
Outdoor Air (CFM/Person)	49	31	72

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. At times when the supply airflow is reduced due to the space temperature being satisfied, the airflow rate per person will also be reduced.

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	20	1,200	60	286	14
Courtroom 1	95	6,000	63	2,400	25
Courtroom 2	72	3,000	42	1,200	17

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. At times when the supply airflow is reduced due to the space temperature being satisfied, the airflow rate per person will also be reduced.

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	7	1,200	171	286	41
Courtroom 1	23	6,000	261	2,400	104
Courtroom 2	17	3,000	176	1,200	71

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

RTB-2: *Rebalance system return air flow rate.*

We recommend testing and balancing the return fan airflow rate to ensure the correct quantity of return air is being delivered to the air handler.

RTB-4: *Test and balance VAV box flow rates.*

We recommend testing and balancing the VAV boxes to ensure each space is being supplied the proper quantity of air.

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

If the airflow to each space has not been recently tested, we are recommending testing the airflow rates in the holding cells, control room, 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.

RTB-6: *Test and balance all air handler hot water and dx coils.*

Testing and balancing the air handler hot water and dx coils will help ensure the coils are receiving the proper water flow rates. Due to the age of the coils, the coils may not perform as required to properly temper the supply air. Coils become fouled over time, which degrades the performance.

Confirm that the air handler's refrigerant system is operating correctly to ensure the DX coil is receiving full refrigerant flow.

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.*

RE-4: *Inspect VAV boxes and controllers.*

VAV boxes regulate the supply air delivered to each space. At a minimum, we recommend cycling the damper positions and testing the airflow to verify the maximum and minimum airflow rates are being delivered as designed. Consider cleaning the airflow stations and reheat coils and changing dirty filters in the fan powered VAV boxes. Any boxes not delivering the expected airflow rates should be rebalanced or replaced.

RE-5: *Install freeze stat or confirm the existing freeze stat is working correctly on each air handling unit.*

RE-7: *Test the existing air handler control valves and actuators for proper operation.*

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 BMS appears to be sophisticated enough to implement this type of sequence, however new control sequences must be defined.

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.*

RC-5: *Disable demand control ventilation sequences.*

2.5 Additional Filtration and Air Cleaning

We recommend the installation of the following air cleaning devices:

RFC-1: *Install portable HEPA filters.*

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 size of the HEPA filter unit and the manufacturer.

2.6 Humidity Control

Installing duct mounted or portable humidifiers can help maintain the relative humidity levels recommended by ASHRAE. The feasibility of adding active humidification is determined by the building envelope. Buildings that were not designed to operate with active humidification can potentially be damaged due to a lack of a vapor barrier, adequate insulation, and air tightness.

Duct mounted humidifiers must be engineered, integrated into the building control system, tested, and commissioned. They are available in many configurations but require substantial maintenance and additional controls. They also run the risk of adversely affecting IAQ from growing microorganisms, or leaking water through poorly sealed ductwork damaging insulation and ceilings. Portable humidifiers are easier to install and require less maintenance, but still have the potential to damage the building envelope.

While active humidification is not recommended as a whole building solution due to high installation costs, operational costs, potential to damage the building envelope and adversely affect poor IAQ, it may be warranted as a temporary solution in some areas.

2.7 Other Recommendations

2.7.1 Capital Planning for Replacement of RTUs

The existing RTUs are approx. 21 years old and are approaching the end of their useful life. These units are in fair condition and likely have approximately 5-8 years of useful life remaining. While immediate replacement is not necessary at this time, we would recommend developing a capital plan to replace these units ~5years.

2.7.2 Replace existing BMS

We recommend replacing the existing BMS with a more modern BMS capable of more than simply monitoring the mechanical equipment. The existing system does not offer the same benefits as a modern BMS such as read/write access and alarm capabilities. This recommendation is an energy saving and maintenance measure and does not affect the indoor air quality of the building.

2.7.1 Convert Hot Water Systems to Variable Flow

The hot 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 boiler plant. We recommend investigating the possibility of converting these systems to variable flow. The three-way air handler valves would have to be replaced with two-way valves, as well as any other three-way valves that are in the system. Variable frequency drives (VFD) may be able to be connected to the existing hot water pumps, allowing 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.

2.7.2 Repair RTU-1 HW Leak

There was a significant leak in the hot water heating coil for RTU-1 at the time of our site visit. We recommend repairing this leak immediately to prevent further wasted water, water treatment chemicals and to prevent any water damage to the building.

2.7.3 Investigate & Repair HW pump

At the time of our site visit, Tighe & Bond noted an unusually loud noise from the operating HW pump. We recommend investigating the noise to determine if the pump is in a dead head condition, or perhaps the bearings are damaged and repairs to the pump are required.

Section 3
Testing & Balancing Results

Milharmer Associates visited the Newton District Courthouse on January 21, 2022 to test the airflow rates of the air handling units and the exhaust fans. A summary of the tested airflow and water flow rates versus the design airflow rates are shown below in Tables 5 and 6. The full testing and balancing report is attached.

TABLE 5
Air Handler Airflow 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	8,460	3,380	5,080	6,845	3,212	3,633
RTU-2	11,835	2,820	9,015	Not Tested	Not Tested	Not Tested
RTU-3	9,825	3,930	5,895	6,977	3,457	3,520

TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow (CFM)	Actual Return/Exhaust Airflow (CFM)
EF-1	Restrooms	1,450	1,334
EF-2	Restrooms	1,380	1,320
EF-3	Kitchenette	250	316

The typical balancing tolerance for air systems is ±10% of the design airflow. In VAV systems, airflow issues may reside in downstream VAV boxes resulting in a total supply airflow reading at the air handler less than the designed value. Further investigation is required to determine the cause of a low airflow reading at the air handling unit.

In reviewing the airflow report data, the following should be noted:

1. RTU-1 is operating at 80% of the design airflow. The outdoor air damper serving RTU-1 is set at 50% and would not change positions when commanded by the control system. We recommend investigating the issue with the OA damper actuator and repairing / replacing the damper and/or actuator as necessary. Additionally, we recommend rebalancing the entire system per comment 4 below.
2. RTU-2 was not operational during the visit. The unit should be serviced and made operational. We recommend retesting once the unit is running.

3. RTU-3 is operating at 71% of the design airflow. The outdoor air damper serving the unit is set at 75% and would not change positions when commanded by the control system. We recommend investigating the issue with the OA damper actuator and repairing / replacing the damper and/or actuator as necessary. Additionally, we recommend rebalancing the entire system per comment 4 below.
4. The VAV boxes serving RTU-1 and RTU-3 were tested during the visit. Many of the VAV boxes had overridden set points and were tested in these positions. We recommend rebalancing all rooftop units and VAV boxes to return the system to the design airflow.
5. The TAB report notes that VAV boxes served by RTU-1 and RTU-3 have supply airflows that are significantly less than the airflow tested for each VAV. We recommend calibrating all VAV airflow sensors as part of the rebalancing effort described in note 4 above.
6. The hot water coils in the RTUs should be tested.
7. The exhaust fans are operating with accepted tolerances.

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.

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: **Newton District Courthouse**
Newton, MA

Project No.: **21-540** **Project Date:** **1/21/2022**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	Newton District Courthouse		
Address:	Newton, MA		
Date:	1/21/2022	**Project No.**	21-540

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

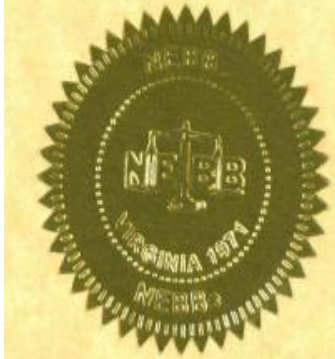
NEBB Certification Number

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:	Newton District Courthouse		
Address:	Newton, MA		
Date:	1/21/2022	**Project No.**	21-540

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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:	Newton District Courthouse		
Address:	Newton, MA		
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REPORT SUMMARY

Attached is the report for Newton District Courthouse with the following comments:

The systems at this Courthouse are VAV boxes served by three Roof Top Units. We were on site with controls and performed testing of the VAV boxes for RTU-1 and RTU-3. RTU-2 would not run and needs to be serviced by McQuay and tested when the unit is running. During the testing, it was discovered that many of the VAV boxes had set points that had been overridden to satisfy many areas of the Courthouse. We took readings in the as found condition but based on the amount of changes made, the only way to get the systems back to design would be to do a complete re-balance of all 3 Roof Top Units and the associated VAV boxes.

1. RTU-1 - the Out Side Air damper is presently at 50% and would not control to any other position.

2. RTU-2 - The unit would not run and needs to be serviced by McQuay.

3. RTU-3 - the Out Side Air damper is presently at 75% and would not control to any other position.

Project:	Newton District Courthouse		
Address:	Newton, MA		
Date:	1/21/2022	**Project No.**	21-540

REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
RTU-1	6,845 CFM	6,088 CFM	3,212 CFM
RTU-2	Not Running	Not Running	Not Running
RTU-3	6,977 CFM	4,982 CFM	3,457 CFM

Project:	Newton District Courthouse		
Address:	Newton, MA		
Date:	1/21/2022	**Project No.**	21-540

REPORT SUMMARY

FANS

UNIT	EXHAUST
EF-1	1,334 CFM
EF-2	1,320 CFM
EF-3	316 CFM

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

FAN DATA SHEET

	FAN NO. RTU-1 SUPPLY		FAN NO. RTU-1 RETURN	
Serves / Location:	1ST, 2ND & 3RD Fl.	Roof	1ST, 2ND & 3RD Fl.	Roof
Manufacturer:	McQuay		McQuay	
Model Number:	RFS030CLY		RFS030CLY	
Size:	NL		NL	
Serial Number:	FBOU02120084600		FBOU02120084600	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	CENTURY	NL	BALDOR
Frame Number:	NL	S254T	NL	184T
Horsepower:	NL	15	NL	5
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	200/3	208/3	200	208/3
Motor Amperage:	43.4	27/26/26	15	7.5/8/8
Motor RPM:	1770	NA	1750	NA
Speeds:	NL	NA	HOA	NA
Heater Size:	NL	CB Protected	NL	NA
Heater Amps.:	NL	CB Protected	NL	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	8460	6845 *1		
Return Air CFM:			7350	6088
Exhaust Air CFM:				
Outside Air CFM:	3380	3212		
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	7	NL	5
Motor Size/Bore:	NL	3/4	NL	1 1/8
Fan Drive:	NL	5 1/2	NL	NA
Fan Size/Bore:	NL	1 15/16	NL	NA
Belt Size / Number:	NL	BX44/2	NL	A70/1
Shafts C-C:	NL	13 1/2	NL	24
Turns Open:	NL	FIXED	NL	FIXED

Comments: ***1 Supply cfm total of all VAV's on BMS = 4145 CFM.**

***2 OA damper is at 50%, unable to control.**

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

AIR DISTRIBUTION

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

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
3008	1	10X10	FH	NA	NA	225	197
3032	2	12X12	FH	NA	NA	400	393
3023	3	10X10	FH	NA	NA	380	318
3022	4	22X24	FH	NA	NA	750	989
2028	5	10X10	FH	NA	NA	250	177
2029	6	14X14	FH	NA	NA	480	331
2021	7	12X12	FH	NA	NA	545	392
2018	8	8X8	FH	NA	NA	120	97
2022	9	8X8	FH	NA	NA	150	144
2023	10	6X6	FH	NA	NA	100	65
1038	11	10X10	FH	NA	NA	200	97
1048	12	6X6	FH	NA	NA	75	44
1048	13	8X8	FH	NA	NA	75	50
1049	14	14X14	FH	NA	NA	500	215
1011	15	10X10	FH	NA	NA	250	118
1061	16	10X10	RV	NA	NA	400	242
3022	17	30X18	FH	NA	NA	750	900
3022	18	38X14	FH	NA	NA	750	587
3022	19	30X18	FH	NA	NA	750	659
1018	20	8X8	FH	NA	NA	200	73

Comments: ** Supply cfm total of all VAV's on BMS = 4145. TOTALS: 7350 6088

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

FAN DATA SHEET

	FAN NO. RTU-2 SUPPLY		FAN NO. RTU-2 RETURN	
Serves / Location:		Roof		Roof
Manufacturer:	McQuay		McQuay	
Model Number:	RFS0U02120085200		RFS0U02120085200	
Size:	NL		NL	
Serial Number:	FBOU02120085200		FBOU02120085200	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:				
Frame Number:				
Horsepower:				
Brake Horsepower:				
Safety Factor:				
Volts/Phase:				
Motor Amperage:				
Motor RPM:				
Speeds:				
Heater Size:				
Heater Amps.:				
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	11835			
Return Air CFM:			8570	
Exhaust Air CFM:				
Outside Air CFM:	2820			
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:				
Motor Drive:				
Motor Size/Bore:				
Fan Drive:				
Fan Size/Bore:				
Belt Size / Number:				
Shafts C-C:				
Turns Open:				

Comments: ***** Not running, need McQuay to service.**

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

AIR DISTRIBUTION

SYSTEM: RTU-2

SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
3018	1	12x12	FH	NA	NA	450	
3018	2	12x12	FH	NA	NA	450	
3018	3	10X10	FH	NA	NA	220	
3004	4	8X8	FH	NA	NA	100	
3006	5	10X10	FH	NA	NA	200	
3014	6	14X14	FH	NA	NA	600	
3014	7	14X14	FH	NA	NA	600	
2030	8	14X14	FH	NA	NA	500	
2030	9	10X10	FH	NA	NA	285	
2031	10	10X10	FH	NA	NA	280	
2034	11	16x16	FH	NA	NA	700	
2016	12	10X10	FH	NA	NA	200	
2034	13	16X16	FH	NA	NA	700	
1024	14	8X8	FH	NA	NA	160	
1023	15	10X10	FH	NA	NA	270	
1025	16	8X8	FH	NA	NA	190	
1026	17	8x8	FH	NA	NA	190	
1008	18	14X14	FH	NA	NA	600	
1031	19	10X10	FH	NA	NA	230	
1027	20	10X10	FH	NA	NA	220	
1019	21	10X10	FH	NA	NA	200	
1022	22	10X10	FH	NA	NA	150	
1016	23	6X6	FH	NA	NA	75	
1032	24	12x12	FH	NA	NA	400	
1037	25	14X14	FH	NA	NA	600	
Comments: ** Not running, need McQuay to service.					TOTALS:	8570	0

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

FAN DATA SHEET

	FAN NO. RTU-3 SUPPLY		FAN NO. RTU-3 RETURN	
Serves / Location:				
Manufacturer:	McQuay		McQuay	
Model Number:	RFS036CLY		RFS036CLY	
Size:	NL		NL	
Serial Number:	FBOU02120084000		FBOU02120084000	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	CENTURY	NL	BALDOR
Frame Number:	NL	S284T	NL	213T
Horsepower:	NL	15	NL	7 1/2
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	200/3	208/3	200/3	208/3
Motor Amperage:	43.4		22.5	
Motor RPM:	1770		1760	
Speeds:	NL		NL	
Heater Size:	NL		NL	
Heater Amps.:	NL		NL	
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	9825	6977 *1		
Return Air CFM:			8495	4982
Exhaust Air CFM:				
Outside Air CFM:	3930	3457 *2		
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	5 1/2	NL	AK60H
Motor Size/Bore:	NL	1 1/2	NL	1 3/8
Fan Drive:	NL	2B5V52	NL	NA
Fan Size/Bore:	NL	1 15/16	NL	NA
Belt Size / Number:	NL	BX54/2	NL	A77/2
Shafts C-C:	NL	20 1/2	NL	25
Turns Open:	NL	FIXED	NL	FIXED

Comments: ***1 Supply cfm total of all VAV's on BMS = 3867 CFM**

***2 OA damper is at 75%, unable to control.**

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

AIR DISTRIBUTION

SYSTEM: RTU-3

SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
3003	1	8X8	FH	NA	NA	480	NI
3012	2	8X8	FH	NA	NA	NL	153
2008	3	14X14	FH	NA	NA	500	342
2013	4	10X10	FH	NA	NA	200	72
2010	5	6X6	FH	NA	NA	100	51
2013	6	8X8	FH	NA	NA	100	58
1015	7	10X10	RV	NA	NA	200	103
1059	8	8X8	RV	NA	NA	150	60
1034	9	10X10	FH	NA	NA	215	92
1035	10	10X10	FH	NA	NA	200	80
1036	11	10X10	FH	NA	NA	200	84
2017	12	33.5 X 18.5	4.31	348	223	1500	961
2017	13	33.5 X 18.5	4.31	348	79	1500	940
2017	14	36.25 X 30.25	7.62	197	119	1500	907
2017	15	36.25 X 30.25	7.62	197	24	1500	963
2015	16	8X8	FH	NA	NA	150	116
					TOTALS:	8495	4982

Comments: ** Supply cfm total of all VAV's on BMS = 3867
There are 3 VAV's that show) on BMS.

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

AIR DISTRIBUTION

SYSTEM: EF-1

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
3031	1	8X8	FH	NA	NA	130	140
3029	2	6X6	FH	NA	NA	50	45
3024	3	6X6	FH	NA	NA	75	87
3028	4	6X6	FH	NA	NA	75	81
2020	5	6X6	FH	NA	NA	100	131
2026	6	6X6	FH	NA	NA	75	75
2027	7	6X6	FH	NA	NA	75	33
1051	8	6X6	FH	NA	NA	50	15
1052	9	11X11	FH	NA	NA	110	90
1053	10	11X11	FH	NA	NA	110	84
1055	11	13X13	FH	NA	NA	200	140
1046	12	10X10	FH	NA	NA	NL	188
1046	13	10X10	FH	NA	NA	200	93
1029	14	6X6	FH	NA	NA	100	69
1029	15	6X6	FH	NA	NA	100	63
Comments:					TOTALS:	1450	1334

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

AIR DISTRIBUTION

SYSTEM: EF-2
SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
3016	1	6X6	FH	NA	NA	75	88
3017	2	6X6	FH	NA	NA	75	85
3011	3	8X8	FH	NA	NA	130	223
3011	4	8X8	FH	NA	NA	130	221
2007	5	8X8	FH	NA	NA	150	+197 *1
1017	6	8X8	FH	NA	NA	120	154
1017	7	8X8	FH	NA	NA	120	104
1017	8	8X8	FH	NA	NA	120	81
1021	9	8X8	FH	NA	NA	120	148
1021	10	8X8	FH	NA	NA	120	108
1021	11	8X8	FH	NA	NA	120	70
1041	12	6X6	FH	NA	NA	100	38
					TOTALS:	1380	1320

Comments: Positive airflow, may be tied into wrong duct.

Project: Newton District Courthouse
Address: Newton, MA
Date: 1/21/2022 **Project No.** 21-540

AIR DISTRIBUTION

SYSTEM: EF-3

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
3032	1	10X10	FH	NA	NA	250	316
					TOTALS:	250	316

Comments: