FITCHBURG DISTRICT COURT
HVAC SYSTEM EVALUATION SUMMARY

Visited September 3, 2020. While on site 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.

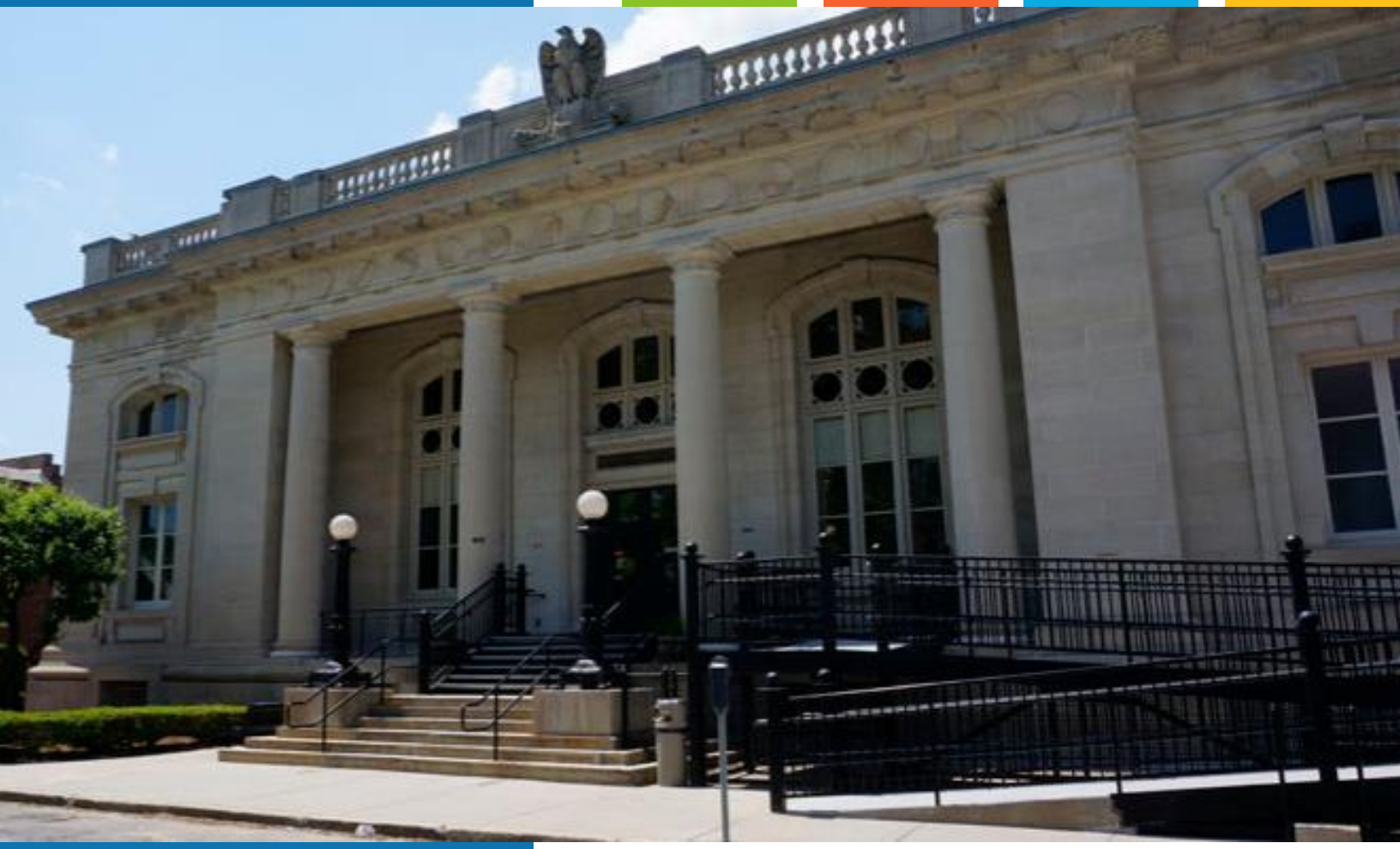
1.0 Airflow Rate per Person (Reduced Occupancy)

		Total Air		*Outdoor Air*	
Courtroom	*Total People*	*Supply Airflow (CFM)*	*Airflow Rate (CFM/Person)*	*Outside Airflow (CFM)*	*Airflow Rate (CFM/Person)*
Jury Pool Room	9	490	54	130	14
Juvenile Probation Court	16	Unknown	TBD	Unknown	TBD
Civil Court (C122)	21	1,900	90	500	24
Jury Courtroom A	19	1,790	93	462	24
Juvenile Courtroom B	11	1,090	99	287	26

2.0 Recommendations

Section	Recommendation/Finding	Action
2.1	**Filtration Efficiency**	
RF-1	Replace filters with MERV 13	Complete
RF-3	Install a differential pressure sensor across the filter banks	In-progress
RF-3a	Connect the pressure sensor to the BMS system and/or local alarm	In-progress
2.2	**Testing and Balancing**	
RTB-1	Test and rebalance air handling unit supply air and minimum outside air flow rates	In-progress
RTB-4	Test and balance VAV box airflow rates	In-progress
RTB-5	Test and balance all air inlets and outlets	In-progress
RTB-6	Test and balance VAV reheat coils	In-progress
2.3	**Equipment Maintenance and Upgrades**	
RE-1	Test existing air handling system dampers and actuators for proper operation	In-progress
RE-4	Implement a pre-occupancy flush sequence	In-progress
2.5	**Additional Filtration and Air Cleaning**	
RFC-1	Install portable HEPA filters in high traffic areas – *if courthouse is to operate at a high occupancy (i.e. 50-75% or greater), install portable HEPA filters in high traffic areas.*	In-progress
2.6	**Humidity Control**	
	No actionable items listed – continuous monitoring for seasonal changes	In-progress

2.7	Other Recommendations	
2.7.1	Provide proper ventilation air to holding cells	In-progress
2.7.2	Replace rooftop air handling unit	In-progress
2.7.3	Provide reheat coil(s) to first floor	In-progress
2.7.4	Repair duct liner where samples were taken	In-progress
2.7.5	Replace VAV boxes	In-progress
2.7.6	Expand and enhance building management system	In-progress



Fitchburg District Court
Fitchburg, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

August 4, 2021

Tighe&Bond

100% Recyclable

Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the Fitchburg District Courthouse on September 3, 2020. While on site, we inspected the rooftop air handling unit and toured the building to determine if the spaces generally matched usage noted on the architectural plans.

Site Visit Attendees:

- Office of Court Management:
  - Michael Norman, Manager of Court Facilities
  - Jay Quinn, Fitchburg District Court
- Tighe & Bond:
  - Todd Holland, PE, Senior Mechanical Engineer
  - Timothy Bill, Staff Engineer

1.1 Existing Ventilation System

A single York rooftop unit with 65 tons of electric cooling and 300 MBH gas heat, provides ventilation air to the Fitchburg Courthouse. The unit contains a mixing box with outdoor air (OA) and return air (RA) dampers, 10-hp power exhaust fan, filter section, DX cooling coil, 30-hp supply fan, two-stage gas furnace, scroll compressors, and condenser coils. This unit was installed in 2005 and uses R-22 refrigerant which has been phased out of production. The supply fan is controlled by a variable frequency drive (VFD), with speed modulated to maintain static pressure (1" w.g.) in the discharge duct.

The unit contains a set of 2" pleated MERV-8 filters in a v-bank arrangement. This is favorable because more filter area is presented to the airflow, which lowers velocity, reduces pressure drop, and increases holding capacity. The upstream face of the adjacent heating coil appears to be clean. Facilities personnel confirmed that the coil and its drain pan are cleaned regularly. We noted the presence of suspect visible mold (SVM) on the painted steel frame of the fan assembly.

The rooftop unit is in fair condition, and at 15 years old is right at the end of its expected life. Facilities personnel noted that many repairs were made to the unit, both shortly after the initial installation and periodically while in service. Reliability has been poor. Recent repairs and upgrades include new controls, supply fan VFD, and motor. The OA and RA dampers and their electronic actuators appear to be in good condition.

There is a 5-ton split system that serves the Juvenile Probation Court on the basement floor, with an air-cooled condensing unit located on grade outside the southwest corner of the building. We were unable to access the air handler to assess its condition or filtration. We were also unable to locate an outdoor air intake for this unit.

Photo 1 – Suspect visual mold on RTU fan assembly

According to the design drawings, single-duct variable air volume (VAV) boxes control the airflow to each space. VAV boxes serving the second floor contain hot water reheat coils, while those serving the first floor do not. Facilities personnel report that the capacity of gas heat in the rooftop unit is marginal on cold days, barely enough to temper incoming air while the perimeter radiation maintains setpoint temperature.

VAV boxes typically operate between a maximum and minimum position. The minimum position prevents the VAV box damper from fully closing, which allows constant airflow to the space when occupied, which is a code requirement. The design drawings that we were able to reference on site do not list a minimum supply airflow, so it is unknown if supply air is being provided at all times. The working condition of these boxes is unknown.

The distribution ductwork is sheet metal and externally insulated with fiberglass wrap for the runs between the RTU and the VAV boxes. Aft of the VAV boxes, the ducts are lined with fiberglass insulation. This was done for acoustical reasons but can adversely affect indoor air quality (IAQ) even when the liner is fully intact. The fiberglass liner was tested for mold or hazardous materials recently, as was evident from sheet metal patches in all visible ducts. It is assumed that these tests came back negative, although we did not have access to the test results to confirm this assumption. However, the sampling method left exposed loose edges of insulation in the air stream, which is not good for IAQ.

Photos 2 and 3 – Fiberglass duct liner and loose edges at test panel

TABLE 1
Existing Air Handling Units

Unit	*Original Design Airflow (CFM)*	*Original Design Min. O.A. (CFM)*	*Filters*	*Condition*
RTU-1	24,000	3,200	2" MERV-8	Fair
AHU-1	Unknown	Unknown	Unknown	Fair

Each holding cell has an exhaust grille near the toilet/sink fixture. The original metal grilles have been replaced with tamper-proof units made by drilling holes in plywood, and given the small size and quantity of holes, it is likely that the holding cells are receiving less airflow than intended.

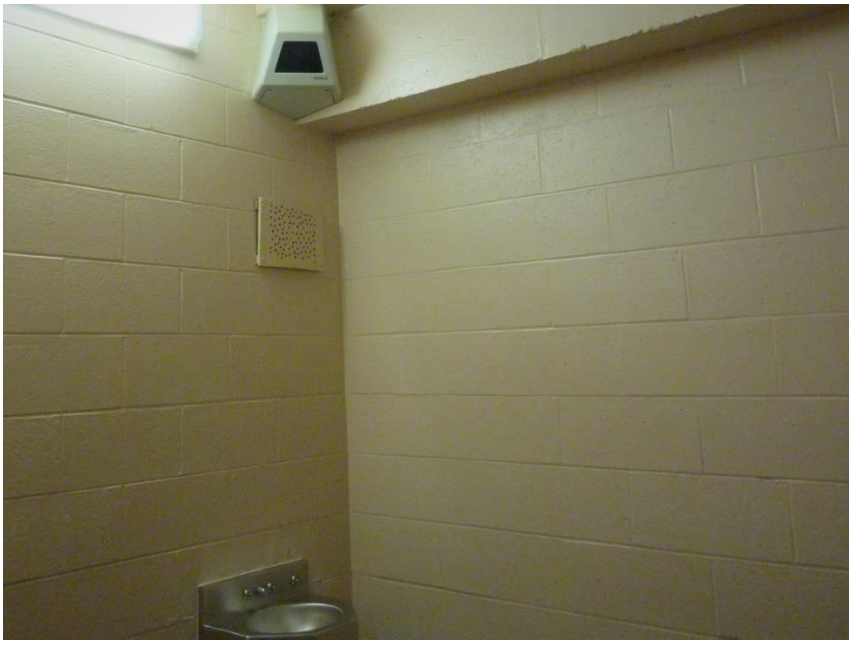


Photo 4 – Holding cell with modified exhaust grille

Ventilation air is provided to the holding cell area through supply diffusers in the corridors. Air fresheners zip-tied to these diffusers are an indication that ventilation may be inadequate. At the time of our visit, each cell had a solid door, with two openings that can be secured from the outside. It is unlikely that the undercut was adequate to provide required ventilation to the individual cells. Trial Court Facilities Management & Capital Planning informs us that these doors are being replaced.

Photo 5 – Supply diffuser in corridor outside holding cells

1.2 Existing Control System

The Courthouse has two HVAC control systems, a newer Johnson Metasys DDC system, and a very basic system that provides a list of points and has no graphics, layered on top of the original pneumatic controls. The Metasys system is tied to the existing rooftop unit and provides supervisory controls. We understand that the system provides the following for the rooftop unit:

1. Start/stop based on an occupancy schedule
2. Economizer mode – 100% outdoor air when conditions permit
3. Modulation of fan speed via a VFD and duct static pressure sensor
4. Supply air temperature control, supply temperature reset, night setback
5. Start/stop/staging of cooling and heating
6. Other: statuses, safeties, and alarms

It is our understanding that the existing VAV boxes and space thermostats are not connected to Metasys and are controlled by the original pneumatics. There are two pneumatic thermostats in each zone, a cooling stat that controls the VAV box, and a heating stat that controls perimeter radiation and reheat coils (second floor only) to satisfy space temperature requirements.

There are no demand-controlled ventilation sequences or CO_2 sensors in the building.

Photo 6 – Dual Pneumatic Thermostats Serving a Typical Zone

Section 2
Recommendations

Below is list of recommendations that we propose for the Fitchburg District Court. Please refer to the "Master Recommendation List" for further explanation and requirements of the stated recommendations.

2.1 Filtration Efficiency Recommendations

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

RF-1: *Replace 2" MERV-8 filters with MERV-13 filters.*

The TAB Contractor and/or Engineer shall verify that the air handlers can accommodate a MERV-13 filter.

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

RF-3a: *Connect the pressure sensor to the BMS system and/or a local alarm.*

2.2 Testing & Balancing Recommendations

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

Tighe & Bond does not have detailed technical specifications for this RTU. Although our preliminary analysis indicates the unit has adequate cooling and heating capacities, we will need more data in order to determine if the unit can accommodate the 2015 code required ventilation air under peak conditions. Prior to rebalancing efforts, dampers and actuators should be tested to ensure they are operating correctly.

We recommend the following testing and balancing measures be implemented:

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

We recommend rebalancing the rooftop unit's outside airflow rates to the values shown in Table 2. Our preliminary analysis indicates the unit has adequate cooling capacity, assuming the refrigeration circuit is fully charged, and its performance has not degraded over time.

However, the gas furnace may not have adequate capacity to provide proper supply air temperature to the first floor under peak outdoor air conditions, because the first floor VAV boxes do not have reheat coils. In order to provide this volume of outdoor air, it is likely that additional heating capacity must be installed. One option is to replace the RTU. Another option is to install a reheat coil in the drop that serves the first floor, or replace the VAV boxes with units that have reheat coils.

TABLE 2
Recommended Air Handler O.A. Flow Rates

Unit	***Original Design Airflow (CFM)***	***Original Design Min. O.A. (CFM)***	***Current Code Min. O.A. Requirements (CFM)***	**Recommended Minimum O.A. (CFM)**
RTU-1	24,000	3,200	5,441	**5,500**
AHU-1	Unknown	Unknown	848	**850**

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.

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

TABLE 3
Average Airflow Rate per Person

	All Spaces	***Courtrooms***	***Non-Courtroom Spaces***
Total Occupancy (People)	424	284	141
Total Supply Air (CFM/Person)	57	20	130
Outdoor Air (CFM/Person)	15	5	34

The airflow rate per person for each Courtroom is shown below in Table 4. The VAV box or separate system serving the Juvenile Probation Court, located in the basement, was not shown on the mechanical drawings or observed during the visit. Tighe & Bond will need additional information to more precisely calculate those airflows.

These values are based on full occupancy, the original design supply airflow rate, and the code required outdoor airflow rate, without taking diversity into account. The airflow rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4
Airflow Rate per Person – Courtrooms (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	21	490	23	130	6
Juvenile Probation Court	116	Unknown		850	7
Civil Court (C122)	110	1,900	17	500	5
Jury Courtroom A	97	1,760	18	463	5
Juvenile Courtroom B	82	1,090	13	287	4

The airflow rate per person for each Courtroom, 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 (Reduced Occ.)***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outside Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Pool Room	9	490	54	130	14
Juvenile Probation Court	16	Unknown		850	53
Civil Court (C122)	21	1,900	90	500	24
Jury Courtroom A	19	1,760	93	463	24
Juvenile Courtroom B	11	1,090	99	287	26

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

If the Courthouse experiences regular cooling and heating comfort complaints, we recommend testing and rebalancing all air inlets and outlets in the spaces experiencing temperature control issues. Prior to rebalancing, we recommend verifying the RTU is maintaining the correct supply air temperatures. Incorrect supply air temperatures may be contributing to the temperature control complaints instead of a lack of airflow.

RTB-6: *Test and balance VAV reheat coils.*

Testing and balancing the reheat 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 condition the supply air. Coils can become fouled over time, which degrades performance.

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*.

Repair or replace the dampers and actuators that are not opening and closing fully, or not going to the position commanded by the controls.

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 airflow rates are being delivered as designed, and that they cycle to a reasonable minimum (40% for example). Any boxes not modulating properly or delivering the expected airflow rates should be rebalanced or replaced.

2.4 Control System

We recommend the following control system upgrades:

RC-1: *Implement a pre-occupancy flush sequence*

The RTU and exhaust fans are currently stopped and started manually. We recommend installing a 7-day programmable timeclock to provide automatic start and stop, with a start time to provide a pre-occupancy flush of ventilation air. A run time of three hours should provide the recommended three air changes of OA for the courtrooms.

2.5 Additional Filtration and Air Cleaning

RFC-1: *Install portable HEPA filters.*

If the Courthouse is to operate at a high capacity (i.e. 50%-75% occupancy or greater), we recommend installing portable HEPA filters in high traffic areas, such as entrance lobbies or places outside courtrooms where people may congregate. 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 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 Provide Proper Ventilation Air to Holding Cells

It is unlikely that the ventilation rates required by current code are currently provided to the holding cells. We recommend replacing the exhaust grilles, rebalancing or replacing the exhaust fans, and rebalancing or replacing the VAV boxes that serve this area in order to provide the proper volume of outdoor air to these important spaces.

2.7.2 Replace Packaged Rooftop Air Handling Unit

Replacement of the existing rooftop unit should be considered within 1-3 years. Rooftop units have life expectancies of approximately 15 years. This unit is 15 years old and has a history of poor reliability and could be subject to imminent failure, which will result in immediate interruption to Court activities. The heating capacity is also inadequate to provide the code-required amount of outdoor air to the first floor in peak winter conditions. A new RTU should be designed and installed that can accommodate the code-required ventilation rates, even during peak winter conditions

2.7.3 Provide Reheat Coil(s) for First Floor

It is likely that the existing RTU does not have adequate heating capacity to provide proper supply air conditions to the first floor under peak outdoor air conditions, because the VAV boxes do not have reheat coils. If the existing RTU is to remain, and in order to provide the code-required volume of outdoor air, additional heating capacity must be installed. Options include installing a reheat coil in the drop that serves the first floor, and replacing the VAV boxes with units that have electric or hydronic reheat coils. Additional engineering evaluation will be required to confirm there is adequate capacity in the heating hot water system to support additional heating coils.

2.7.4 Repair Duct Liner Where Samples Were Taken

The distribution ductwork aft of VAV boxes is lined with fiberglass insulation. In numerous locations these ducts were cut open to inspect and test the liner material. In the locations inspected by Tighe & Bond, the edges of the cutout portion were irregular, rough, and left exposed to the air stream. This is an IAQ concern, both for the ability of the loose edges to attract and hold debris, and for friable glass fibers to enter the air stream. We recommend reinstalling the patches in a manner that seals the loose edges and eliminates contact between fiberglass and the supply airstream, and also seals the duct against leakage.

2.7.5 Replace VAV Boxes

We also recommend the replacement of all VAV boxes. Assuming the existing VAV boxes are original, they are well past their normal life expectancy. The VAV box replacement should occur at the same time as the RTU replacement so the air handler can be properly sized. Reheat coils, either hydronic or electric, should be considered for VAV boxes on the first floor, per the recommendation above.

2.7.6 Expand and Enhance Building Management System

We recommend expanding a BMS to schedule, control, and monitor the VAV boxes, perimeter heating, and any other major HVAC equipment currently under local control. The pneumatic control systems are antiquated and do not offer the same benefits as a BMS.

Section 3
Testing & Balancing Results

Wing's Testing & Balancing Inc. visited the Fitchburg District Courthouse on June 15, 2021 to test the airflow rates of the air handling units and the exhaust fans. A summary of the tested airflow 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 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	24,000	5,500	17,700	22,140	**2,860**	19,280
AHU-1	Unknown	850	Unknown	1,288	**0**	1,288

TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	**Serving**	**Design Exhaust Airflow (CFM)**	**Actual Exhaust Airflow (CFM)**
EF-1	Restrooms	1,070	**561**
EF-2	Restrooms	1,070	**619**
EF-3	Restrooms	920	852

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 supply airflow is performing within an acceptable range. The outdoor airflow should be rebalanced and increased to the recommended level.
2. AHU-1 does not appear to have an outdoor air intake and the areas it serves do not appear to have any mechanical ventilation.
3. EF-1 & 2 are performing below the acceptable range. The restrooms vents are visibly clogged with dust which may be the cause of the low airflow.
4. Most VAV boxes have issues with the pneumatic controls, and were left as they were found, either fully open or fully closed.

Disclaimer

Tighe and Bond cannot in any way 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.

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WING'S TESTING & BALANCING CO., INC.

Fitchburg District Court
HVAC/Ventilation Survey

* * * *

Tighe & Bond
Attn: Jason Urso
53 Southampton Road
Westfield, MA 01085

June 15, 2021

94 North Branford Road • Suite One • Branford, CT 06405
(203) 481-4988 • Fax (203) 488-5634 • wings@wingstesting.com
SM-1 License #6803
www.wingstesting.com

WING'S TESTING & BALANCING CO., INC.

June 15, 2021

Tighe & Bond
Attn: Jason Urso
53 Southampton Road
Westfield, MA 01085

Re: Fitchburg District Court/HVAC Ventilation Survey

Dear Jason,

We have completed our HVAC/Fresh-Air survey for the above-mentioned project. Through our testing we found:

- Most VAV's have controls issues associated with their pneumatics. They have been left in an either fully open or fully closed position.
- Most of the restroom vents are at least partially clogged with dust.
- The filters for RTU-1 are (4) 16" x 25" x 2" and (16) 20" x 25" x 2" MERV-8

The following pages are your record of current operating conditions. If you have any questions, or if we can be of further service, please do not hesitate to call.

Very truly yours,
Wing's Testing & Balancing Co., Inc.
ICB Certified Contractor for:
TABB—Commissioning—Fire/Life Safety L1&L2—Sound & Vibration

Barry Stratos
Certified TABB Technician BB996928T

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SUPPLY FAN REPORT

PROJECT: Fitchburg District Court	**DATE:** 6/15/21
AREA SERVED: Various	**TECH:** BS

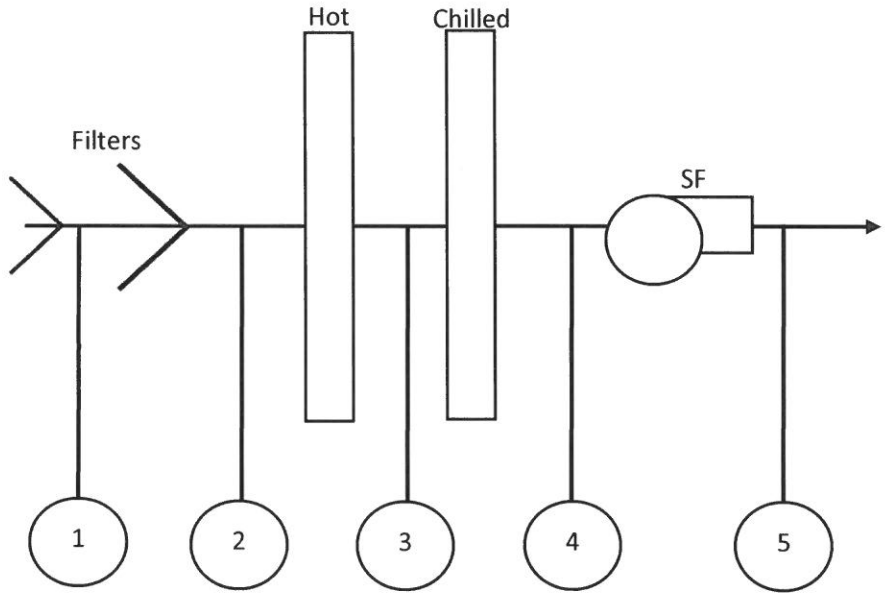
FAN DATA						
FAN NUMBER	RTU-1		RF-1		AHU-1	
LOCATION	Roof		Roof		Roof	
AREA SERVED	Whole Building		Whole Building		Basement & Lock Up	
MANUFACTURER	York		York		Carrier	
MODEL OR SIZE	YPAL065NVC		YPAL065NVC		FB4ANF060	
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	24,000	22,140	20,800	19,464	ND	1288
RETURN AIR	20,800	19,280	---	---	ND	1288
OUTSIDE AIR	3200	2860	---	---	0	0
DISCH. STATIC	---	+1.61"	---	+0.64"	---	+0.21"
SUCTION STATIC	---	-1.41"	---	-0.48"	---	-0.18"
TOTAL STATIC	---	3.02	---	1.12	---	0.39
FAN RPM	---	796	---	1540	---	---
PULLEY O.D.	19.0" x 2 7/16"		9 1/2" x 1 11/16"		DD	
ESP	2.22		---		---	
VFD SPEED	60 Hz		60 Hz		No VFD	
O.A.D.MIN POS	5%		---		---	
MOTOR DATA						
MANUFACTURER	US Motors		Baldor		NA	
MODEL OR FR.	286 T		215 T		NA	
HORSEPOWER	30	30	10	10	3/4	3/4
MOTOR RPM	1780	1780	1725	1725	1050	1050
VOLTAGE / PH.	200/3	200/3	460/3	460/3	230/1	211
AMPS LEG 1	87.0	84.1	33.0	21.3	5.4	---
AMPS LEG 2	---	82.8	---	22.4	---	4.9
AMPS LEG 3	---	83.3	---	22.5	---	
SHEAVE O.D.	8 1/2 x 1 7/8"		8 1/2 x 1 3/8"		DD	
BELTS - QTY / SIZE	3/Bx88		1/Bx7		DD	
SHEAVE POSITION	Fixed		Fixed		DD	
BHP	28.7		6.8		0.7	

REMARKS

NA-Not Available
ND-No Design DD-Direct Drive

SYSTEM STATIC PRESSURE PROFILE

PROJECT: Fitchburg District Court	**DATE:** 6/15/21
SYSTEM/AREA SERV: RTU-1	**TECH:** BS



STATIC PRESSURE READINGS "wc

POS. (+) / NEG.(-)	1	2	3	4	5	6	7	NOTES
RTU-1	-0.61"	-0.76"	-1.01"	-1.41"	+1.61"			

REMARKS

VELOCITY PRESSURE READINGS

PROJECT: Fitchburg District Court | **DATE:** 6/15/21

AREA SERVED: Various | **TECH:** BS

TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN		CENTERLINE STATIC PRES."	TEST		NOTES
			FPM	CFM		FPM	CFM	
RTU-1 Total	118" x 40"	32.8	---	24,000	w/velgrid	675	22,140	
RTU-1 OA	118" x 40"	32.8	---	3200	w/velgrid	88	2860	
RTU-1 Return	---	---	---	20,800	calc	---	19,280	
RF-1 Total	72" x 24"	12.0	---	20,800	w/velgrid	1622	19,464	
AHU-1 South Ret	16" x 12"	1.33	---	ND	-0.08	469	625	
AHU-1 North Ret	24" x 8"	1.33	---	ND	-0.08	497	663	
							1288	

REMARKS

EXHAUST FAN REPORT

PROJECT: Fitchburg District Court | **DATE:** 6/15/21

AREA SERVED: Various | **TECH:** BS

FAN DATA						
FAN NUMBER		EF-1	EF-2	EF-3		
LOCATION		Roof	Roof	Roof		
AREA SERVED		Restrooms	Bathroom	Restrooms		
MANUFACTURER		Greenheck	Greenheck	Greenheck		
MODEL OR SIZE		CUBE-141-4	CUBE-141-4	CUBE-121-4		
TOTAL CFM	DESIGN	1070	1070	920		
	ACTUAL	561	619	852		
FAN RPM	DESIGN	---	---	---		
	ACTUAL	1298	1386	1011		
PULLEY	O.D.	4 1/4" x 3/4"	4 1/4" x 3/4"	4 1/4" x 3/4"		
SERVICE		1.25	1.25	1.25		
MOTOR DATA						
MANUFACTURER		Fasco	Fasco	Fasco		
MODEL NUMBER		NA	NA	NA		
MOTOR HP	DESIGN	1/4	1/4	1/4		
	ACTUAL	1/4	1/4	1/4		
MOTOR RPM		1750	1750	1750		
VOLTAGE/PHASE		120/1	120/1	120/1		
MOTOR AMPS	DESIGN	4.1	4.1	4.1		
	ACT. LEG 1	---	---	---		
	ACT. LEG 2	3.0	3.1	3.6		
	ACT. LEG 3	---	---	---		
SHEAVE		3.0" x 1/2"	3.0" x 1/2"	2 1/2" x 1/2"		
BELTS-QTY/SIZE		1/4L220	1/4L220	1/3L190		
SHEAVE POSITION		100% Open	100% Open	100% Open		
BHP		0.2	0.2	0.2		

REMARKS

AIR DEVICE REPORT

PROJECT: Fitchburg District Court | **DATE:** 6/15/21

SYSTEM / AREA: Exhaust Fans | **TECH:** BS

LOCATION	NO.	SIZE	A K	DESIGN		TEST		FINAL		NOTES
				FPM	CFM	FPM	CFM	FPM	CFM	
EF-1										
C 218	1	8" x 9"	.36	---	ND	919	331			
C 219	2	10" x 10"	.90	---	ND	0	0			
C 202	3	6" x 6"	.18	---	ND	416	75			
C 223	4	6" x 6"	.18	---	ND	389	70			
C 103	5	6" x 6"	.18	---	ND	138	25			
C 104	6	6" x 6"	.18	---	ND	335	60			
					1070		561			
EF-2										
C 209	1	6" x 6"	.18	---	ND	612	110			
C207	2	6" x 6"	.18	---	ND	982	177			
C 208	3	6" x 6"	.18	---	ND	0	0			
C 103	4	6" x 6"	.18	---	ND	263	47			
C 111	5	6" x 6"	.18	---	ND	181	33			
C 114	6	6" x 6"	.18	---	ND	389	70			
C 115	7	6" x 6"	.18	---	ND	476	86			
C 116	8	6" x 6"	.18	---	ND	534	96			
					1079		619			
EF-3										
C 111	1	12" x 12"	.72	---	ND	343	250			
C 112	2	12" x 12"	.72	---	ND	395	284			
Basement Trav	3	11" x 4"	1.07	---	ND	920	297			
					920		852			

REMARKS