Haverhill District Court
Haverhill, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

November 30, 2021

Tighe&Bond

100% Recyclable

Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the Haverhill District Courthouse on August 17, 2020. 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:*
  - Greg McMahan, Courthouse Facilities Staff
- *Tighe & Bond*
  - Jason Urso PE, Senior Mechanical Engineer
  - Timothy Bill, Mechanical Staff Engineer

1.1 Existing Ventilation System

Haverhill District Court was constructed in 1962, upgraded in 2018, and is approximately 19,000 square feet in size. One York air handling unit (AHU) and two York energy recovery ventilators (ERV) provide ventilation air to the building, and fan coil units provide heating and cooling to most spaces. Air handler AHU-1 serves Courtroom 117 and the ERVs supply ventilation air to the fan coil units. AHU-1 contains a supply fan, return fan, a chilled water cooling coil, a hot water heating coil and a 2" filter. We could not determine the MERV rating in the field, but the 2016 design drawings specified a MERV 8 filter. The coils are slightly dusty, but overall in good, clean condition. The two ERVs contain a supply fan, exhaust fan, an energy recovery wheel, supply and exhaust air filters, DX cooling coils, and indirect fired natural gas furnace. The MERV rating of the filters could not be determined and they are not listed in the design drawings.

The AHU and ERVs are approximately 2 years old and are in excellent condition. The dampers and actuators are also in excellent condition. We presume all three units run as constant volume systems. All restrooms are exhausted via the ERV units.

Two 399 million BTU/hr boilers provide hot water to AHU-1 and fan coil units. A 38 ton, air cooled, roof mounted chiller provides chilled water to all air handlers and the fan coil units.

Table 1 summarizes the air handling units' designed airflow rates, the MERV rating of the installed filters, and the condition. The design drawings do not indicate an outdoor airflow rate for AHU-1.

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Filters	Condition
AHU-1	4,000	Unknown	MERV 8	Excellent
ERV-1	1,750	1,750	Unknown	Excellent
ERV-2	1,750	1,750	Unknown	Excellent

Photo 1 – AHU-1

Photo 1 – ERV-1

1.2 Existing Control System

The mechanical equipment is controlled by a new Delta Controls enteliWEB building management system (BMS) that was installed with the recent HVAC system upgrade. The hot water boiler plant, chilled water plant, all three air handlers, fan coil units, the attic ventilation system, dampers, and valves are all tied into the system. The air handler and two energy recovery units operate on an occupied and unoccupied schedule and AHU-1 contains a freeze stat, which protects the unit from freezing the coils. According to the BMS documents, filter pressure drop is communicated to the control system and there is no demand control ventilation (DCV) sequence.

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Section 2
Recommendations

Below is a list of recommendations that we propose for Haverhill 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 the existing air handling units:

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

We recommend replacing the supply air filters for AHU-1, ERV-1, and ERV-2 with MERV 13 filters. The TAB Contractor and Engineer shall verify that the air handlers can accommodate a MERV-13 filter.

2.2 Testing & Balancing Recommendations

The air handling units are approximately two years old and were tested and balanced in 2018. Table 2 lists the code required and the recommended minimum outdoor air flow rates. According to the 2018 air balance report, the designed outdoor airflow rate for AHU-1 was 850 CFM and the unit was balanced to 918 CFM. Typical balancing tolerances for air systems is ±10% of the design airflow. The outdoor air volume indicated in the 2018 report for AHU-1 is extremely close to falling within the low end of the tolerance range of the recommended outdoor air of 1,025 CFM. Both ERVs are supplying more ventilation air than is required by code.

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)
AHU-1	4,000	Unknown	1,025	**1,025**
ERV-1	1,750	1,750	1,425	**1,750**
ERV-2	1,750	1,750	900	**1,750**

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 air flow rates shown in Table 2 above. 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)	240	172	68
Total Supply Air[1] (CFM/Person)	70	37	155
Outdoor Air (CFM/Person)	14	11	21

Note 1: Total supply air used in calculation includes supply air provided by fan coil units.

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 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)*
Courtroom Session 1	140	4,000	29	1,025	7
Courtroom Session 2	56	1,278	23	600	11
Courtroom Session 3	50	1,138	23	365	7

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)*
Courtroom Session 1	31	4,000	129	1,025	33
Courtroom Session 2	14	1,278	91	600	43
Courtroom Session 3	13	1,138	88	365	28

We recommend the following testing and balancing measures be implemented:

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

We recommend increasing the outdoor air flow rate by 10% beyond the recommended outdoor air flow rates under non-peak conditions. We do not believe this would result in an increased risk of coil freezing 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.

2.3 Equipment Maintenance & Upgrades

We do not recommend any equipment maintenance or upgrades. The systems are two years old, are in excellent condition, the coils are clean, and we assume all equipment is functioning properly.

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.

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.

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 manufacturer.

2.6 Humidity Control

Installing duct mounted or portable humidifiers can help maintain the relative humidity levels recommended by ASHRAE. The feasibility of using duct mounted humidification or portable humidifiers 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. We are not aware if this building was constructed to accommodate a humidification system.

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

We do not have any other recommendations at this time.

Section 3
Testing & Balancing Results

Milharmer Associates, Inc. visited the Haverhill District Courthouse on January 4, 2021 to test the airflow rates of the air handling units. A summary of the tested airflow rates and water flow rates versus the design airflow rates are shown below in Table 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 Fan Airflow (CFM)**	**Supply Fan Airflow (CFM)**	**Outdoor Airflow (CFM)**	**Return Fan Airflow (CFM)**
AHU-1	4,000	1,025	2,975	4,189	1,018	3,171
ERV-1	1,750	1,750	1,750	1,735	1,735	2,334
ERV-2	1,750	1,750	1,750	1,677	1,677	2,363

TABLE 6
Air Handler Waterflow Testing & Balancing Results

	Design		Actual	
Unit	**Chilled Water Flow Rate (GPM)**	**Hot Water Flow Rate (GPM)**	**Chilled Water Flow Rate (GPM)**	**Hot Water Flow Rate (GPM)**
AHU-1	32.6	15.5	Not tested	14.9

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

1. AHU-1 supply and return fan are performing within acceptable range. The outdoor airflow of the unit has been balanced to Tighe and Bond's recommended airflow. Based on the tested brake horsepower vs. the motor horsepower and the designed total static pressure vs. the actual static pressure, it appears AHU-1 can accommodate a MERV 13 filter.
2. The hot water coil flow rate in AHU-1 is within acceptable range. The chilled water system was not operational at the time of the visit, therefore the chilled water coil could not be tested.
3. ERV-1 and ERV-2 supply fans are operating within acceptable range. The return fans are operating above design conditions. The return fans are direct drive and controlled by VFDs. The airflows can be reduced to the original designed flows by an ATC Contractor. Since the exhaust fans are operating above the designed

airflow rates, we recommend adding MERV 13 filters to the exhaust. The exhaust air is filtered before it comes in contact with the energy recovery wheel.

4. The VFD controlling the supply fan in ERV-1 is operating at 60 Hz, which is the maximum setting. Adding a MERV 13 filter to the supply may slightly reduce airflow, but the fan may still be supplying air within the 10% acceptable range.
5. The VFD controlling the supply fan in ERV-2 is operating at 60 Hz, which is the maximum setting. Adding a MERV 13 filter to the supply may slightly reduce airflow, but the fan may still be supplying air within the 10% acceptable range.
6. Fan coil units were tested, however several could not be tested due to access issues. Most of the fan coil units that were tested are performing within acceptable range. FCU-8 serving room B33 is providing 70 CFM of outdoor air, which is double the design.
7. Fan coil unit FCU-18 serving holding cell B14 was designed to provide almost 100% outdoor air, 222 CFM, per the 2016 design drawings. The tested outdoor airflow rate was 28 CFM. Per the 2018 TAB report when this unit was first installed, it was providing 30 CFM of outdoor air. We cannot conclude why this unit was designed with such a high outdoor air flow rate based on the information in the design drawings. The code required outdoor air flow rate for this space is approximately 70 CFM, based on an occupancy of 6 people. We recommend this unit be balanced to provide 70 CFM of outdoor air.
8. FCU-17, FCU-19, and FCU-20 were also designed with a high quantity of outdoor air.
    a. FCU-17 serving Holding Cell B13 is required to provide 40 CFM of outdoor air per code. According to the 2018 TAB report, it is providing 64 CFM of outdoor air.
    b. FCU-19 serving Holding Cell B17 is required to provide 45 CFM of outdoor air per code. According to the 2018 TAB report, it is providing 89 CFM of outdoor air.
    c. FCU-20 serving Holding Tank B15 is required to provide 70 CFM of outdoor air per code. According to the 2018 TAB report, it is providing 122 CFM of outdoor air.

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.

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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: **Haverhill District Court**
45 Ginty Blvd., Haverhill, MA

Project No.: **21-013** **Project Date:** **1/4/2021**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	Haverhill District Court		
Address:	45 Ginty Blvd., Haverhill, MA		
Date:	1/4/2021	**Project No.**	21-013

CERTIFICATION

Submitted & Certified by:

Milharmer Associates, Inc.

Certification No.: ***3384*** Certification Expiration Date: **3-31-21**

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

THIS IS TO CERTIFY THAT

Milharmer Associates, Inc.

HAS MET ALL REQUIREMENTS FOR NEBB CERTIFICATION IN THE FOLLOWING DISCIPLINE

Testing, Adjusting and Balancing of Environmental Systems

FOR THE NEBB BOARD OF DIRECTORS

March 31, 2021

Expiration Date

NEBB President

3384

NEBB Certification Number

NEBB President-Elect

NEBB Certification Board

NEBB Certified Professional

Scott F. Miller

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

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.

March 31, 2021

Expiration Date

23541

NEBB Certificant Number

Richard Farr

NEBB Certification Board Chairman

Cynthia Heath

NEBB Certification Director

The NEBB Certification Board retains sole ownership of all certificates. The NEBB Certification Board Policy Manual governs use of this certificate.

Project:	Haverhill District Court		
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SECTION 2 **TAB Building Systems**

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

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	8-20-20	8-20-21
2	Shortridge Flow Hood	8-20-20	8-20-21
3	Ampmeter	8-20-20	8-20-21
4	Tachometer	8-20-20	8-20-21
5	Airflow Anemometer	8-20-20	8-20-21
6	Digital Thermometers	8-20-20	8-20-21
7	Shortridge Water Meter	8-20-20	8-20-21
8	Sound Meter	8-20-20	8-20-21
9	Vibration Meter	8-20-20	8-20-21

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

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

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REPORT SUMMARY

The following is the report for the Haverhill District Court. A survey was performed on AHU-1, ERV-1 & 2, and the majority of the FCU's. Not all FCU's could be tested due to access issues.

1. AHU-1 was tested and is operating at design airflow, the minimum outside air was increased to the setting recommended by Tighe & Bond.

2. ERV-1 & 2 are both running at design airflow on the supply side and are running above design on the exhaust side. These units are direct drive units with VFD's to control fan speed so the Exhaust VFD's could be lowered if the Court House wishes to decrease airflow to design.

The chilled water was not running while we were on site.

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REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
AHU-1	4,189 CFM	3,171 CFM	1,018 CFM
ERV-1	1,735 CFM	2,334 CFM	1,735 CFM
ERV-2	1,677 CFM	2,363 CFM	1,677 CFM

Project: Haverhill District Court
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FAN DATA SHEET

	FAN NO. AHU-1		FAN NO.	
Serves / Location:	Courtroom 117 / Roof			
Manufacturer:	YORK			
Model Number:	XTO-36 x 57			
Size:	NL			
Serial Number:	CLEM XT 0248			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	WEG		
Frame Number:	184	182/4T		
Horsepower:	5	5		
Brake Horsepower:	3.21	3.78		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	202/3		
Motor Amperage:	14	10.73		
Motor RPM:	1760	1767		
Speeds:	1	1		
Heater Size:	NL	NA		
Heater Amps.:	NL	NA		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	4000	4189		
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	1025	1018		
Suction Pressure:	NL	-1.15		
Discharge Pressure:	NL	0.33		
Fan Static Pressure:	2.89	1.48		
External Pressure:	1.25	NA		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	2732	2782		
Motor Drive:	NL	AK64		
Motor Size/Bore:	NL	1 1/8"		
Fan Drive:	NL	AK41h		
Fan Size/Bore:	NL	1 3/16"		
Belt Size / Number:	NL	AX46/1		
Shafts C-C:	NL	16		
Turns Open:	NL	FIXED		

Comments: **The OA volume is measured by using a rotating vane manometer at the intake W.M.S.**
Size 28x27 with AK=4.94 sq.ft.

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TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 24 " WIDTH x 24 " DEPTH Sq Ft = 4.00

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	4187
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**4189**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	1321	1303	1109	992			
B	1512	1229	912	812			
C	1311	1011	908	702			
D	1329	1092	712	691			
E	1109	1209	1001	668			
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 1047

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Brian Murphy

Project: Haverhill District Court
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FAN DATA SHEET

	FAN NO.	ERV-1 SUPPLY	FAN NO.	ERV-1 EXHAUST
Serves / Location:	Courthouse	Roof		
Manufacturer:	YORK			
Model Number:	JR0A072B1A2AACMCM3A30AHB			
Size:	NL			
Serial Number:	170805102			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	ROSENBERG	NL	ROSENBERG
Frame Number:	NL	No access	NL	No access
Horsepower:	NL	No access	NL	No access
Brake Horsepower:	NL	No access	NL	No access
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	208/3	208	208/3	208
Motor Amperage:	NL	1.3	NL	2.2
Motor RPM:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Speeds:	NL	60HZ	NL	55HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	NL	1735		
Return Air CFM:				
Exhaust Air CFM:			NL	2334
Outside Air CFM:		1735		
Suction Pressure:	NL	-0.72	NL	NA
Discharge Pressure:	NL	0.25	NL	NA
Fan Static Pressure:	NL	0.97	NL	NA
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Belt Size / Number:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open:	NL	DIRECT DRIVE	NL	DIRECT DRIVE

Comments:

Project:	Haverhill District Court		
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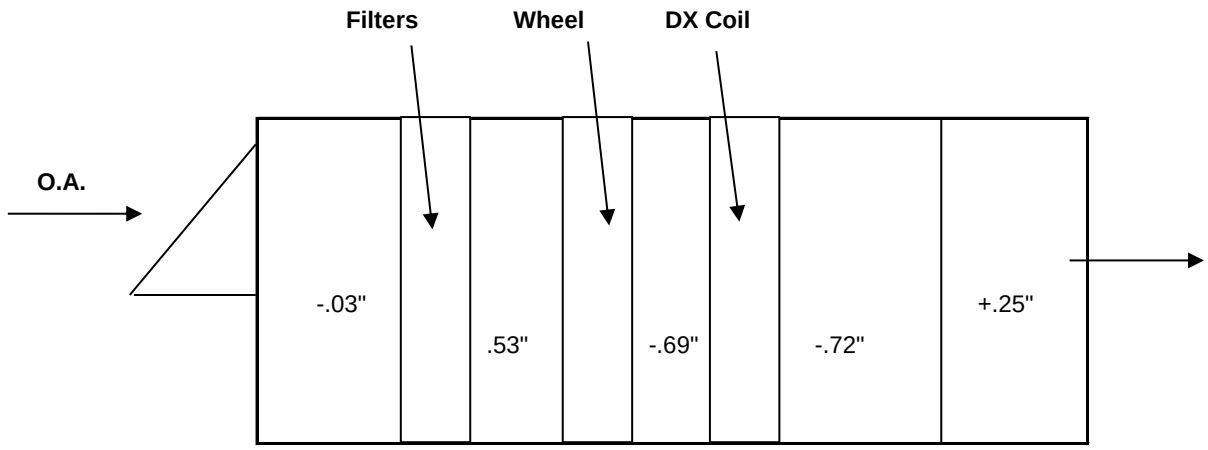
ERV-1



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Date: 1/4/2021 **Project No.** 21-013

TRAVERSE DATA

SYSTEM: ERV-1 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 46 " WIDTH x 17 " DEPTH Sq Ft = 5.43

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1734
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1735**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	329	341	288				
B							
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 3 AVERAGE FPM = 319

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Brian Murphy

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

TRAVERSE DATA

SYSTEM: ERV-1 TRAVERSE NUMBER : T1
Exhaust TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 46 " WIDTH x 6 " DEPTH Sq Ft = 1.92

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2332
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2334**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	1166	1283	1312	1136	1243		
B	1263	1216	1194	1302	1053		
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 10 AVERAGE FPM = 1217

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Brian Murphy

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

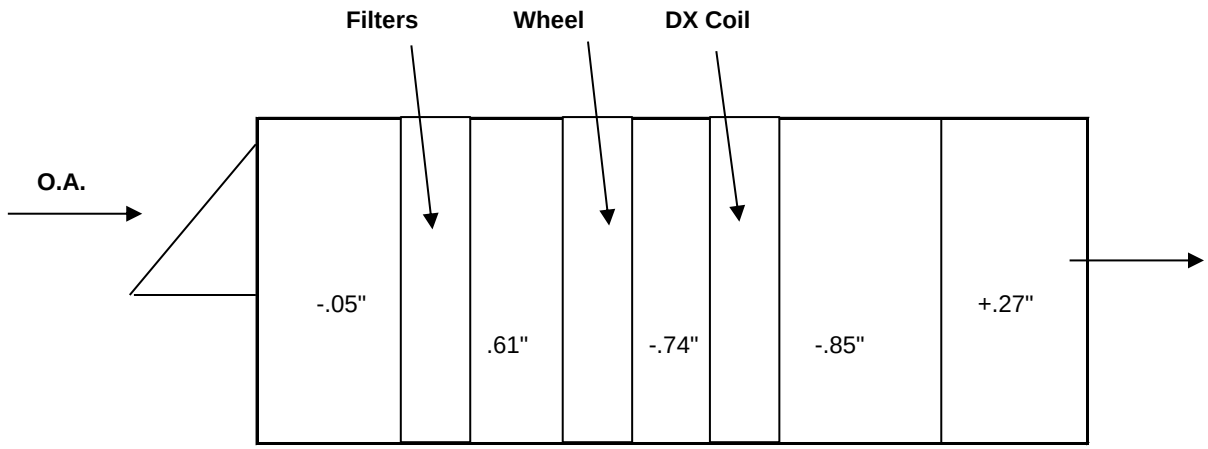
FAN DATA SHEET

	FAN NO.	ERV-2 SUPPLY	FAN NO.	ERV-2 EXHAUST
Serves / Location:	Courthouse	Roof		
Manufacturer:	YORK			
Model Number:	JR0A072B1A2AACMCM3A30AHB			
Size:	NL			
Serial Number:	170805101			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	ROSENBERG	NL	ROSENBERG
Frame Number:	NL	No access	NL	No access
Horsepower:	NL	No access	NL	No access
Brake Horsepower:	NL	No access	NL	No access
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	208/3	208	208/3	208
Motor Amperage:	NL	1.1	NL	2.1
Motor RPM:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Speeds:	NL	60HZ	NL	54HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	NL	1677		
Return Air CFM:				
Exhaust Air CFM:			NL	2363
Outside Air CFM:		1677		
Suction Pressure:	NL	-0.85	NL	NA
Discharge Pressure:	NL	0.27	NL	NA
Fan Static Pressure:	NL	1.12	NL	NA
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Belt Size / Number:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open:	NL	DIRECT DRIVE	NL	DIRECT DRIVE

Comments:

Project:	Haverhill District Court		
Address:	45 Ginty Blvd., Haverhill, MA		
Date:	1/4/2021	**Project No.**	21-013

ERV-2



Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

TRAVERSE DATA

SYSTEM: ERV-2 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 46 " WIDTH x 17 " DEPTH Sq Ft = 5.43

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1676
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1677**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	309	319	298				
B							
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 3 AVERAGE FPM = 309

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Brian Murphy

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

TRAVERSE DATA

SYSTEM: ERV-2 TRAVERSE NUMBER : T1
Exhaust TRAVERSE LOCATION: Roof

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 46 " WIDTH x 6 " DEPTH Sq Ft = 1.92

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2360
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2361**

AIR DENSITY RATIO CORRECTION = 1.00
SCFM CORRECTION FACTOR 1.00
ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	1119	1219	1299	1209	1271		
B	1302	1248	1202	1333	1109		
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 10 AVERAGE FPM = 1231

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Brian Murphy

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-1	Fan SPD = Low					
B05A	1	9x9	FH	NA	NA	180	163
B05A	2	9x9	FH	NA	NA	180	168
					TOTAL:	360	331
	RETURN						
	1	12x12	FH	NA	NA	330	295
	OUTSIDE AIR	NA	NA	NA	NA	30	36
	FCU-2A	Fan SPD = Med.					
B05	1	12x12	FH	NA	NA	285	272
B05	2	12x12	FH	NA	NA	285	268
					TOTAL:	570	540
	RETURN						
	1	12x12	FH	NA	NA	420	403
	OUTSIDE AIR	NA	NA	NA	NA	150	137
	FCU-2B	Fan SPD = Med.					
B05	1	12x12	FH	NA	NA	285	280
B05	2	12x12	FH	NA	NA	285	278
					TOTAL:	570	558
	RETURN						
	1	12x12	FH	NA	NA	420	402
	OUTSIDE AIR	NA	NA	NA	NA	150	156

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-3	Fan SPD=high					
B07A	1	6x6	FH	NA	NA	50	54
B07A	2	6x6	FH	NA	NA	50	50
B01	3	6x6	FH	NA	NA	60	61
B01	4	6x6	FH	NA	NA	60	61
B04	5	9x9	FH	NA	NA	200	180
B02	6	9x9	FH	NA	NA	150	144
					TOTAL:	570	550
	RETURN						
	1	12x6	FH	NA	NA	145	162
	OUTSIDE AIR	NA	NA	NA	NA	425	388
	FCU-4	Fan SPD =Low					
B06	1	9x9	FH	NA	NA	157	160
B06	2	9x9	FH	NA	NA	157	154
B06	3	9x9	FH	NA	NA	157	167
B06	4	9x9	FH	NA	NA	157	158
					TOTAL:	628	639
	RETURN						
	1	24x24	FH	NA	NA	585	599
	OUTSIDE AIR	NA	NA	NA	NA	43	40

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-5	Fan SPD = Low					
B07	1	9x9	FH	NA	NA	198	204
	RETURN						
B07	1	12x6	FH	NA	NA	173	180
	OUTSIDE AIR	NA	NA	NA	NA	25	24
	FCU-6	Fan SPD =Low					
B07B	1	6x6	FH	NA	NA	115	106
	RETURN						
	1	12x6	FH	NA	NA	100	92
B07B	OUTSIDE AIR	NA	NA	NA	NA	15	14
	FCU-7	Fan SPD =Low					
B08	1	6x6	FH	NA	NA	115	113
	RETURN						
B08	1	12x6	FH	NA	NA	100	96
	OUTSIDE AIR	NA	NA	NA	NA	15	17
	FCU-8	Fan SPD = Low					
B33	1	9x9	FH	NA	NA	180	175
B33	2	9x9	FH	NA	NA	180	170
					TOTAL:	360	345
	RETURN						
B33	1	12x12	FH	NA	NA	328	275
	OUTSIDE AIR	NA	NA	NA	NA	75	70

Comments:

Project: Haverhill District Court
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Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-9	Fan SPD = Low					
B32	1	12x12	FH	NA	NA	240	246
B32A	2	6x6	FH	NA	NA	50	46
					TOTAL:	290	292
	RETURN						
B32	1	12x6	FH	NA	NA	162	164
Corr. Closet	2	6x6	FH	NA	NA	50	53
					TOTAL:	212	217
	OUTSIDE AIR	NA	NA	NA	NA	78	75
	FCU-10	Fan SPD = Med.					
B31	1	9x9	FH	NA	NA	125	130
	RETURN						
B31	1	6x6	FH	NA	NA	50	56
	OUTSIDE AIR	NA	NA	NA	NA	75	74
	FCU-11	Fan SPD =Low					
B20	1	6x6	FH	NA	NA	70	70
B20	2	6x6	FH	NA	NA	70	71
					TOTAL:	140	141
	RETURN						
B20	1	6x6	FH	NA	NA	115	118
	OUTSIDE AIR	NA	NA	NA	NA	25	23

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-12	Fan SPD = Low					
B26	1	6x6	FH	NA	NA	55	58
B26	2	6x6	FH	NA	NA	58	54
					TOTAL:	113	112
	RETURN						
B26	1	12x6	FH	NA	NA	83	77
	OUTSIDE AIR	NA	NA	NA	NA	30	35
	FCU-13	Fan SPD = Low					
B29	1	6x6	FH	NA	NA	50	45
B29	2	6x6	FH	NA	NA	50	48
B25	3	6x6	FH	NA	NA	30	33
B00	4	6x6	FH	NA	NA	60	55
B00	5	6x6	FH	NA	NA	60	56
B09	6	6x6	FH	NA	NA	45	47
B09	7	6x6	FH	NA	NA	45	46
					TOTAL:	340	330
	RETURN						
B00	1	12x6	FH	NA	NA	124	128
	OUTSIDE AIR	NA	NA	NA	NA	216	202
	FCU-14	Fan SPD = Med.					
B24	1	9x9	FH	NA	NA	135	140
	RETURN						
B24	1	12x6	FH	NA	NA	112	119
	OUTSIDE AIR	NA	NA	NA	NA	23	21

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
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AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-15	Fan SPD = Med.					
B20	1	6x6	FH	NA	NA	75	70
B21	2	6x6	FH	NA	NA	84	85
B21	3	6x6	FH	NA	NA	90	88
					TOTAL:	249	243
	RETURN						
B21	1	6x6	FH	NA	NA	75	79
B20	2	12x6	NA	NA	NA	137	130
					TOTAL:	212	209
	OUTSIDE AIR	NA	NA	NA	NA	37	34
	FCU-16	Fan SPD = Low					
B10	1	6x6	FH	NA	NA	56	50
B11	2	6x6	FH	NA	NA	56	55
					TOTAL:	112	105
	RETURN						
B10	1	6x6	FH	NA	NA	43	40
B11	2	6x6	FH	NA	NA	43	38
					TOTAL:	86	78
	OUTSIDE AIR	NA	NA	NA	NA	26	27

Comments:

Project: Haverhill District Court
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AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-18	Fan SPD = Med.					
B14	1	12x12	FH	NA	NA	249	252
	RETURN						
B14	1	12x12	FH	NA	NA	222	224
	OUTSIDE AIR	NA	NA	NA	NA	27	28

Comments:

Project: Haverhill District Court
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Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-22A	Fan SPD = Low					
108	1	SD-3	FH	NA	NA	213	220
108	2	SD-3	FH	NA	NA	213	216
108	3	SD-3	FH	NA	NA	213	219
					TOTAL:	639	655
	RETURN						
108	1	RR-3	FH	NA	NA	339	351
	OUTSIDE AIR	NA	NA	NA	NA	300	304
	FCU-22B	Fan SPD = Low					
108	1	SD-3	FH	NA	NA	213	215
108	2	SD-3	FH	NA	NA	213	212
108	3	SD-3	FH	NA	NA	213	216
					TOTAL:	639	643
	RETURN						
108	1	RR-3	FH	NA	NA	339	336
	OUTSIDE AIR	NA	NA	NA	NA	300	307
	FCU-23	Fan SPD = Low					
107	1	SD-2	FH	NA	NA	180	177
107	2	SD-2	FH	NA	NA	180	184
					TOTAL:	360	361
	RETURN						
107	1	RR-3	FH	NA	NA	330	330
	OUTSIDE AIR	NA	NA	NA	NA	30	31

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-24	Fan SPD = Low					
106	1	SD-3	FH	NA	NA	289	277
	RETURN						
106	1	RG-3	FH	NA	NA	275	257
	OUTSIDE AIR	NA	NA	NA	NA	14	20
	FCU-25	Fan SPD = Med.					
104	1	SD-2	FH	NA	NA	123	116
	RETURN						
104	1	RG-2	FH	NA	NA	108	99
	OUTSIDE AIR	NA	NA	NA	NA	15	17

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-27	Fan SPD = Low					
109	1	SD-2	FH	NA	NA	188	190
109	2	SD-2	FH	NA	NA	188	181
109	3	SD-2	FH	NA	NA	188	182
					TOTAL:	564	553
	RETURN						
109	1	RR-3	FH	NA	NA	492	483
	OUTSIDE AIR	NA	NA	NA	NA	72	70
	FCU-28	Fan SPD = Med.					
112A	1	SD-2	FH	NA	NA	169	177
	RETURN						
112A	1	RR-2	FH	NA	NA	155	159
	OUTSIDE AIR	NA	NA	NA	NA	14	18

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units
SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-31	Fan SPD = Low					
124	1	SD-2	FH	NA	NA	107	109
123	2	SD-2	FH	NA	NA	107	114
					TOTAL:	214	223
	RETURN						
124	1	RR-2	FH	NA	NA	90	93
123	2	RR-2	FH	NA	NA	90	84
					TOTAL:	180	177
	OUTSIDE AIR	NA	NA	NA	NA	34	36

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** 21-013

AIR DISTRIBUTION

SYSTEM: Fan Coil Units

SUPPLY [X] RETURN [X] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FCU-37	Fan SPD = Low					
122	1	SD-3	FH	NA	NA	240	233
122	2	SD-3	FH	NA	NA	240	240
122E	3	SD-3	FH	NA	NA	240	239
122E	4	SD-3	FH	NA	NA	240	236
122D	5	SD-1	FH	NA	NA	50	53
					TOTAL:	1010	1001
	RETURN						
122E	1	RR-4	FH	NA	NA	847	831
	OUTSIDE AIR	NA	NA	NA	NA	163	170

Comments:

Project: Haverhill District Court
Address: 45 Ginty Blvd., Haverhill, MA
Date: 1/4/2021 **Project No.** **21-013**

FLOW METERING DATA

SYSTEM: Hot Water

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	GAUGE Pd	SET Pd	DESIGN GPM	SET GPM	BALANCING VLV SET @
AHU-1	AHU-1	4A 1 1/2"	24.49	24.49	16	14.9	100%

Comments: