

Haverhill District Court Haverhill, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management September 18, 2024

Tighe&Bond



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.

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 $\pm 10\%$ 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

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

Recommended Air Handler O.A. Flow Rates

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.

	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

TABLE 3

Average Airflow Rate per Person

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 Occupanc	y)

		Tota	Total Air		oor 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)						
		Tota	nl Air	Outdo	or 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.

On December 6, 2022, Milharmer returned to the Courthouse to test the airflow rate of the return fans for ERV-1 and ERV-2. These fans were previously operating well above the specified design airflow and have been rebalanced. Milharmer also attempted to test the chiller flowrate while on site but were unable to do so due to a blockage at the balance/ test valve port.

On January 18, 2024 Milharmer returned to the courthouse to balance FCU-18. This unit was previously not providing enough outdoor air. The unit has been rebalanced to the design airflow.

		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	1,667
ERV-2	1,750	1,750	1,750	1,677	1,677	1,732

TABLE 5Air Handler Testing & Balancing Results

TABLE 6

Air Handler Waterflow Testing & Balancing Results

	Desi	gn	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 $\pm 10\%$ 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 and return fans are operating within acceptable range.
- 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. FCU-18 is performing within the acceptable airflow range.
- 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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Tighe&Bond

Milharmer Associates, Inc. TAB Report January 4, 2021

MILHARMER ASSOCIATES, INC.
534 New State Highway, Route 44, Suite 3
Ravnham, 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



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
	CE	RTIFICATION	
	Subm	itted & Certified by:	
	Milhan	mer Associates, Ir	NC.
Certification N	lo.: 3384	(Certification Expiration Date: 3-31-21
The data p have been obt Testing, Adju exceed N.E.B	resented in this Report is a record of sy tained in accordance with the current ec isting and Balancing of Environment .B. tolerances, are noted in the Test-Ad	rstem measurements a dition of the N.E.B.B. P t al Systems. Any varia just-Balance Report Pr	nd final adjustments that Procedural Standards for ances from design quantities which oject Summary.
N.E.B.B. Qual	ified TAB Supervisor Name: Scott F. M	Ailler	
N.E.B.B. Qual	ified TAB Supervisor Signature:		
		NEBB	

FOR THE NEBB BOARD OF DIRECTORS Testing, Adjusting and Balancing of Environmental Systems A-ALCC gyfury Schoole NEBB President-Elect **NEBB** President HAS MET ALL REQUIREMENTS FOR NEBB CERTIFICATION IN THE FOLLOWING DISCIPLINE Milharmer Associates, Inc. THIS IS TO CERTIFY THAT Certification **NEBB** Certification Number March 31, 2021 **Expiration Date** 3384

n Board sional	0Y	EMENTS FOR L STATUS IN	rvíronmental Systems	Firm and associated NEBB Certification ation in the NEBB Quality Assurance NEBB Certified Firm.	Ruchard Fant	V NEBB Certification Board Chairman	lymenia device	NEBB Certification Director	tion Board Policy Manual governs use of this certificate.
NEBB Certification NEBB Certified Profession	Scott F. Miller	HAS MET ALL THE NEBB REQUIREN NEBB CERTIFIED PROFESSIONAL	Testing, Adjusting and Balancing of Env	This Certificate, as well as individual affiliation with a NEBB Certified Firm Stamp are REQUIRED to provide a NEBB Certified Report. Participatio Program requires the Certificant be affiliated with a NEB	March 31, 2021	Expiration Date	23541	NEBB Certificant Number	The NEBB Certification Board retains sole ownership of all certificates. The NEBB Certification l

Project: Address:	Haverhill District Court 45 Ginty Blvd., Haverhill, MA		
Date:	1/4/2021	Project No.	21-013
	ТА	BLE OF CONTENTS	
SECTION 1	TAB Qualific	ations	
	A. N.E.B.B. (B. N.E.B.B. (C. N.E.B.B. S D. Instrumen E. Symbol S	Certification Company Certificate Supervisor Certificate It Sheet heet	
SECTION 2	TAB Building	g Systems	

Project:	Haverhill District Court		
Address:	45 Ginty Blvd., Haverhill, MA		
Date:	1/4/2021	Project No.	21-013
	INSTRUM	IENT SHEET	
The following is this project.	a list of Instruments owned and operated by	Milharmer Associates, Inc. and used	d on
Instrument	Instrument	Calibration Date	Calibration
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	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
СН	Chiller		Air Conditioning
CHWR	Chilled Water Return	HWR	Hot Water Return or
CHW or CHWS	Chilled Water Supply		Heating Water Return
СТ	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		6
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		
	Feet of Head		
FT. HD.			

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
РНС	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
SF (AIR)	Supply Fan		Pressure Drop
S.F.(Elect)	Service Factors		-
SHC	Steam Heating Coil	ΔT	Differential (Delta) Temperature,
S.P. "W.C."	Static Pressure		Net Temperature
	Measured in Inches of		Decrease or Increase
	Water Column	#	PSI or Pounds Per Square Inch
			Decrease or Increase

Project:	Haverhill District Court		
Address:	45 Ginty Blvd., Haverhill, MA		
Date:	1/4/2021	Project No.	21-013
	REPORT SUM	IMARY	
	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 du	e
	to access issues.		
	1 AHI I-1 was tested and is operating at design at	rflow the minimum outside air was	
	increased to the setting recommended by Tighe &	Bond.	
	2. ERV-1 & 2 are both running at design airflow or	the supply side and are running	
	control fan speed so the Exhaust VFD's could be lo	owered if the Court House wishes	
	to decrease airflow to design.		
	The chilled water was not running while we were o	n site.	

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 D	istrict Court			
Address:	45 Ginty Bl	vd., Haverhill, MA			
Date:	1/4/2021			Project No.	21-013
		F	AN DATA SHEET	ſ	
		FAN	NO. AHU-1	FAN NC).
Serves / Locat	tion:	Courtroom 117 / Ro	of		
Manufacturer:		YORK			
Model Numbe	r:	XTO-36 x 57			
Size:		NL			
Serial Number	r:	CLEM XT 0248			
M	OTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:		NL	WEG		
Frame Numbe	er:	184	182/4T		
Horsepower:		5	5		
Brake Horsepo	ower:	3.21	3.78		
Safety Factor:		NL	1.15		
Volts/Phase:		208/3	202/3		
Motor Ampera	ige:	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 CF	M:	4000	4189		
Return Air CFI	M:				
Exhaust Air Cl	FM:				
Outside Air CF	-M:	1025	1018		
Suction Press	ure:	NL	-1.15		
Discharge Pre	ssure:	NL	0.33		
Fan Static Pre	ssure:	2.89	1.48	<u> </u>	
External Press	sure:	1.25	NA		
I	RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:		2732	2782		
Motor Drive:		NL	AK64		
Motor Size/Bo	re:	NL	1 1/8"		
Fan Drive:		NL	AK41h		
Fan Size/Bore	:	NL	1 3/16"		
Belt Size / Nur	mber:	NL	AX46/1		
Shafts C-C:		NL	16		
Turns Open:		NL	FIXED		
Comments:		me is measured by using	a rotating vane manome	ater at the intake W M S	

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Size 28x27 with AK=4.94 sq.ft.

Project: H	averhill District C	Court					
Address: 4	5 Ginty Blvd., Ha	verhill, MA					
Date: 1	/4/2021				Project No.	21-0)13
		-	RAVERSE	DATA			
SYSTEM: A	HU-1			TRAVERSE	NUMBER :	T1	
S	upply			TRAVERSE	LOCATION:	Roof	
DUCT SIZE (ROU	JND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (REC	CT.)	24	" WIDTH x	24"	DEPTH	Sq Ft =	4.00
AIR DENSITY DA	ATA						
STATIC PRESS	@ CL:	NA In	Ng.		DESIGN	CFM =	NL
DUCT AIR TEMP	':	70 De	eg F		ACTUAL	CFM =	4187
BAROMETRIC P	RESS :	29.92 In	Hg.		S	CFM=	4189
AIR DENSITY RA	TIO CORRECT	ION =	1.00				
SCFM CORREC	TION FACTOR		1.00				
ACTUAL DENSIT	Υ		0.075				
TEST HOLE	1	2	3	4	5	6	7
А	1321	1303	1109	992			
В	1512	1229	912	812			
С	1311	1011	908	702			
D	1329	1092	712	691			
E	1109	1209	1001	668			
F							
G							
Н							
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NO. OF READIN	GS =	20	AVERAGE FF	PM =	1047		
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TECHNICIAN:	Brian Murphy						

Project:	Haverhill Dis	strict Court			
Address:	45 Ginty Blv	/d., Haverhill, MA			
Date:	1/4/2021			Project No.	21-013
		FA	N DATA SHEET	-	
		FAN NO.	ERV-1 SUPPLY	FAN NO	. ERV-1 EXHAUST
Serves / Loca	tion:	Courthouse	Roof		
Manufacturer:		YORK			
Model Numbe	r:	JR0A072B1A2AACMC	M3A30AHB		
Size:		NL			
Serial Number	r:	170805102			
M	OTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:		NL	ROSENBERG	NL	ROSENBERG
Frame Numbe	ər:	NL	No access	NL	No access
Horsepower:		NL	No access	NL	No access
Brake Horsep	ower:	NL	No access	NL	No access
Safety Factor:		NL	NL	NL	NL
Volts/Phase:		208/3	208	208/3	208
Motor Ampera	ige:	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 CF	M:	NL	1735		
Return Air CFI	M:				
Exhaust Air Cl	FM:			NL	2334
Outside Air CF	FM:		1735		
Suction Press	ure:	NL	-0.72	NL	NA
Discharge Pre	ssure:	NL	0.25	NL	NA
Fan Static Pre	ssure:	NL	0.97	NL	NA
External Press	sure:	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/Bo	re:	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 / Nur	mber:	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: ŀ	Haverhill District C	Court					
Address: 4	15 Ginty Blvd., Ha	verhill, MA					
Date: 1	1/4/2021				Project No.	21-	013
		-					
SYSTEM: F	-RV-1					T1	
						Roof	
	Juppiy			HUWERO			
DUCT SIZE (RO	UND)		" DIAMETER	ł		Sa Ft =	0.00
	CT)	46	" WIDTH x	. 17 '	DEPTH	Sa Ft =	5 43
		-10	WIDTHX			0411-	0.40
AIR DENSITY D	АТА						
STATIC PRESS	@ CL:	NA In'	Wg.		DESIGN	CFM =	NL
DUCT AIR TEM	⊃ :	70 De	eg F		ACTUAL	CFM =	1734
BAROMETRIC F	PRESS :	29.92 In	Hg.		S	CFM=	1735
AIR DENSITY R	ATIO CORRECT	ION =	1.00				
SCFM CORREC	TION FACTOR		1.00				
ACTUAL DENSI	ΤY		0.075				
TEST HOLE	1	2	3	4	5	6	7
А	329	341	288				
В							
С							
D							
E							
F							
G							
Н							
I							
NO. OF READIN	IGS =	3	AVERAGE FF	PM =	319		
J							
к							
L							
М							
N							
0							
Р							
Q							
R							
TECHNICIAN:	Brian Murphy		-				

Project:	Haverhill District C	Court					
Address: 4	15 Ginty Blvd., Ha	verhill, MA					
Date:	1/4/2021				Project No.	21-0)13
		-	TRAVERSE	DATA			
SYSTEM:	ERV-1			TRAVERSE	NUMBER :	T1	
I	Exhaust			TRAVERSE	LOCATION:	Roof	
						Sa Et -	0.00
		46		6 "		Sy Fi =	0.00
DUCT SIZE (RE	GT.)	40		0	DEFIN	3y Fi =	1.92
AIR DENSITY D	ATA						
STATIC PRESS	@ CL:	NA In'	Wg.		DESIGN	CFM =	NL
DUCT AIR TEM	P :	70 De	eg F		ACTUAL	CFM =	2332
BAROMETRIC F	PRESS :	29.92 In	Hg.		S	CFM=	2334
AIR DENSITY R	ATIO CORRECT	ION =	1.00				
SCFM CORREC	TION FACTOR		1.00				
ACTUAL DENSI	ТҮ		0.075				
TEST HOLE	1	2	3	4	5	6	7
А	1166	1283	1312	1136	1243		
В	1263	1216	1194	1302	1053		
С							
D							
Е							
F							
G							
н							
I							
NO. OF READIN	IGS =	10	AVERAGE FF	PM =	1217		
J							
к							
L							
М							
N							
0							
Р					ļ		
Q							
R							
TECHNICIAN:	Brian Murphy						

Address: 45 Ginty Blvd., Haverhill, MA Date: 1/4/2021 Project No. 21-013 FAN DATA SHEET FAN DATA SHEET Serves / Location: Courthouse Roof FAN NO. ERV-2 EXHAUST Manufacturer: YORK Image State St	Project:	Haverhill Di	strict Court			
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	Address:	45 Ginty Blv	√d., Haverhill, MA			
FAN DATA SHEET FAN NO. ERV-2 SUPPLY FAN NO. ERV-2 EXHAUST Serves / Location: Courthouse Roof	Date:	1/4/2021			Project No.	21-013
FAN NO. ERV-2 SUPPLY FAN NO. ERV-2 EXHAUST Serves / Location: Courthouse Roof			FA	N DATA SHEET	-	
Serves / Location: Courthouse Roof Image: Courthouse Roof Manufacturer: YORK Image: Courthouse			FAN NO.	ERV-2 SUPPLY	FAN NC). ERV-2 EXHAUST
Manufacturer: YORK Model Number: JR0A07281A2AACMCM3A30AHB Size: NL Serial Number: 170805101 MOTOR DESIGN TESTED DESIGN Manufacturer: NL ROSENBERG NL ROSENBERG Manufacturer: NL No access NL No access Frame Number: NL No access NL No access Brake Horsepower: NL No access NL No access Safety Factor: NL Na access NL No access Safety Factor: NL NL NL No access Motor Amperage: NL 1.1 NL 2.1 Motor RPM: NL 0IRECT DRIVE NL 54HZ Speeds: NL VFD Protected NL VFD Protected Heater Amps: NL VFD Protected NL VFD Protected Supply Air CFM: NL 1677 E Extemation CFM: Sutoin Pressure:	Serves / Locat	tion:	Courthouse	Roof		
Model Number: JR0A072B1A2AACMCM3A30AHB Size: NL Serial Number: 170805101 MOTOR DESIGN TESTED Manufacturer: NL Rain Number: NL ROSENBERG NL Rosenberg NL Rosenberg NL No access NL No access NL No access NL No access NL Safety Factor: NL NL No access Safety Factor: NL NL Na access Motor Amperage: NL NL NL Motor Amperage: NL NL DIRECT DRIVE NL OBEX Speeds: NL OLS OHZ Heater Size: NL VFD Protected NL Supply Air CFM: NL Sution Pressure: <	Manufacturer:		YORK			
Size: NL Serial Number: 170805101 MOTOR DESIGN TESTED Manufacturer: NL ROSENBERG Frame Number: NL No access NL No access Horsepower: NL No access NL No access Brake Horsepower: NL Na No access NL No access Safety Factor: NL NL Na access NL Nu Nu Volts/Phase: 208/3 208 208/3 208 Motor Amperage: NL 1.1 NL 2.1 Motor ArPM: NL DIRECT DRIVE NL DIRECT DRIVE Speeds: NL VFD Protected NL VFD Protected Heater Size: NL VFD Protected NL VFD Protected Supply Air CFM: NL 1677 Estaust Air CFM: NL 0.82 Suction Pressure: NL 0.27 NL NA Discharge Pressure: NL 0.27 NL NA Fan Static Pressure: NL NA NA NA Fan Static Pressure: NL NA NA NA Fan RPM: DESIGN TE	Model Number	r:	JR0A072B1A2AACMC	M3A30AHB		
Serial Number: 170805101 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 Na access NL No access Safety Factor: NL Na access NL No access Motor Amperage: NL 1.1 NL 208 208/3 208 Motor RPM: NL DIRECT DRIVE NL DIRECT DRIVE S44Z Heater Size: NL 60HZ NL VFD Protected Heater Amps.: NL VFD Protected NL VFD Protected Supply Air CFM: NL 1677 Z Z Sution Pressure: NL 0.27 NL NA Outside Air CFM: 0.21 NA NA N	Size:		NL			
MOTORDESIGNTESTEDDESIGNTESTEDManufacturer:NLROSENBERGNLROSENBERGFrame Number:NLNo accessNLNo accessHorsepower:NLNo accessNLNo accessSafety Factor:NLNo accessNLNo accessSafety Factor:NLNLNLNLNLVolts/Phase:208/3208208/3208Motor Amperage:NL1.1NL2.1Motor Amperage:NL1.1NL2.1Motor Amperage:NL0 IRECT DRIVENLDIRECT DRIVESpeeds:NL60HZNL54HZHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedSupply Air CFM:NL1677EESupply Air CFM:NL1677IISuction Pressure:NL0.27NLNASuction Pressure:NL0.27NLNAFan RPM:NLNANLNARPMDESIGNTESTEDDESIGNTESTEDAnd CFM:NLNANLNANLNANLNANLRPMDESIGNTESTEDDESIGNTESTEDSuction Pressure:NLNLNANLAna Static Pressure:NLNLNABichard Pressure:NLNLNANL <td>Serial Number</td> <td>r:</td> <td>170805101</td> <td></td> <td></td> <td></td>	Serial Number	r:	170805101			
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 NL Safety Factor: NL NL NL NL NL Volts/Phase: 208/3 208 208/3 208 Motor Amperage: NL 1.1 NL 2.1 Motor Amperage: NL 1.1 NL 2.1 Motor Amperage: NL 0IRECT 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 Supply Air CFM: NL 1677 Exhaust Air CFM: Exhaust Air CFM: Image: Second Access Suction Pressure: NL 0.35 NL NA NA Fan Static Pressure: NL 0.45 NL NA Fan RPM: NL NA NL	M	OTOR	DESIGN	TESTED	DESIGN	TESTED
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 NL Volts/Phase: 208/3 208 208/3 208 Motor Amperage: NL 1.1 NL 2.1 Motor Amperage: NL 1.1 NL 2.1 Motor Amperage: NL 0IRECT 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 Supply Air CFM: NL 1677 Extensit CFM: Extensit Air CFM: Suction Pressure: NL 0.27 NL NA Discharge Pressure: NL 0.27 NL NA Fan Static Pressure: NL NA NL NA Fan RPM: DESIGN TESTED DESIGN TESTED Fan RPM: NL NA NL NA Motor Jrive: NL <td>Manufacturer:</td> <td></td> <td>NL</td> <td>ROSENBERG</td> <td>NL</td> <td>ROSENBERG</td>	Manufacturer:		NL	ROSENBERG	NL	ROSENBERG
Horsepower:NLNo accessNLNo accessBrake Horsepower:NLNo accessNLNo accessSafety Factor:NLNLNLNLNLVolts/Phase:208/3208208/3208Motor Amperage:NL1.1NL2.1Motor Amperage:NL1.1NL2.1Motor Amperage:NLDIRECT DRIVENLDIRECT DRIVESpeeds:NL60HZNLVFD ProtectedHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedSupply Air CFM:NL1677EESupply Air CFM:NL1677CCSuction Pressure:NL0.85NLNADischarge Pressure:NL0.27NLNAExternal Pressure:NL1.12NLNAExternal Pressure:NLDIRECT DRIVENAMotor Drive:NLDIRECT DRIVENAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Static Pressure:NLDIRECT DRIVENLDIRECT DRIVEFan RPM:NLDIRECT DRIVENLDIRECT DRIVEFan RPM:NLDIRECT DRIVENLDIRECT DRIVEFan State/Bore:NLDIRECT DRIVENL<	Frame Numbe	ər:	NL	No access	NL	No access
Brake Horsepower: NL No access NL No access Safety Factor: NL NL NL NL NL Volts/Phase: 208/3 208 208/3 208 Motor Amperage: NL 1.1 NL 2.1 Motor Amperage: NL 1.1 NL 2.1 Motor Amperage: 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 Supply Air CFM: NL 1677 E Extanust Air CFM: Extanust Air CFM: I Suction Pressure: NL -0.85 NL NA Discharge Pressure: NL 0.27 NL NA Fan Static Pressure: NL NA NA NA Retmail Pressure: NL NA NA NA F	Horsepower:		NL	No access	NL	No access
Safety Factor:NLNLNLNLVolts/Phase:208/3208208/3208Motor Amperage:NL1.1NL2.1Motor Amperage:NL1.1NL2.1Motor RPM:NLDIRECT DRIVENLDIRECT DRIVESpeeds:NL60HZNL54HZHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedFANDESIGNTESTEDDESIGNTESTEDSupply Air CFM:NL1677Image: Comparison of the system of th	Brake Horsepo	ower:	NL	No access	NL	No access
Volts/Phase:208/3208208/3208Motor Amperage:NL1.1NL2.1Motor Amperage:NLDIRECT DRIVENLDIRECT DRIVESpeeds:NL60HZNL54HZHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedFANDESIGNTESTEDDESIGNTESTEDSupply Air CFM:NL1677Image: Comparison of the system o	Safety Factor:		NL	NL	NL	NL
Motor Amperage:NL1.1NL2.1Motor RPM:NLDIRECT DRIVENLDIRECT DRIVESpeeds:NL60HZNL54HZHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedSupply Air CFM:NL1677Image: CFM:Image: CFM:Supply Air CFM:NL1677Image: CFM:Image: CFM:Suction Pressure:NL0.27NLNADischarge Pressure:NL0.27NLNAFan Static Pressure:NL1.12NLNAFan Static Pressure:NLNANLNAFan RPMDESIGNTESTEDDESIGNTESTEDFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVE	Volts/Phase:		208/3	208	208/3	208
Motor RPM:NLDIRECT DRIVENLDIRECT DRIVESpeeds:NL60HZNL54HZHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedFANDESIGNTESTEDDESIGNTESTEDSupply Air CFM:NL1677.Return Air CFM:Suction Pressure:NL1677.Suction Pressure:NL0.27NLNADischarge Pressure:NL0.27NLNAFan Static Pressure:NL1.12NLNAExternal Pressure:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEFan RPM:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Motor Ampera	ige:	NL	1.1	NL	2.1
Speeds:NL60HZNL54HZHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedFANDESIGNTESTEDDESIGNTESTEDSupply Air CFM:NL1677Image: Comparison of the state of th	Motor RPM:		NL	DIRECT DRIVE	NL	DIRECT DRIVE
Heater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedFANDESIGNTESTEDDESIGNTESTEDSupply Air CFM:NL1677Image: Comparison of the street of the str	Speeds:		NL	60HZ	NL	54HZ
Heater Amps.:NLVFD ProtectedNLVFD ProtectedFANDESIGNTESTEDDESIGNTESTEDSupply Air CFM:NL1677Image: Comparison of the test of tes	Heater Size:		NL	VFD Protected	NL	VFD Protected
FANDESIGNTESTEDDESIGNTESTEDSupply Air CFM:NL1677	Heater Amps.:	:	NL	VFD Protected	NL	VFD Protected
Supply Air CFM:NL1677Image: Constraint of the system of t	!	FAN	DESIGN	TESTED	DESIGN	TESTED
Return Air CFM:Image: Constraint of the systemExhaust Air CFM:Image: Constraint of the systemOutside Air CFM:1677Suction Pressure:NLNL-0.85NLNADischarge Pressure:NLNL0.27NLNAFan Static Pressure:NLNL1.12NLNAExternal Pressure:NLNLNARPMDESIGNTESTEDDESIGNFan RPM:NLNLNAMotor Drive:NLNLDIRECT DRIVEMotor Size/Bore:NLNLDIRECT DRIVEFan Size/Bore:NLNLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVENLDIRECT DRIVEDIRECT DRIVENLDIRECT DRIVEDIRECT DRIVENLDIRECT DRIVEDIRECT DRI	Supply Air CFI	M:	NL	1677		
Exhaust Air CFM:NL2363Outside Air CFM:16771Suction Pressure:NL-0.85NLNADischarge Pressure:NL0.27NLNAFan Static Pressure:NL1.12NLNAExternal Pressure:NLNANLNAFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Fore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Fore:NLDIRECT DRIVENLDIRECT DRI	Return Air CF	M:				
Outside Air CFM:16771677Suction Pressure:NL-0.85NLNADischarge Pressure:NL0.27NLNAFan Static Pressure:NL1.12NLNAExternal Pressure:NLNANLNAExternal Pressure:NLNANLNAFan RPMDESIGNTESTEDDESIGNTESTEDFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Fore:NLDIRECT DRIVENL	Exhaust Air CF	FM:	<u> </u>		NL	2363
Suction Pressure:NL-0.85NLNADischarge Pressure:NL0.27NLNAFan Static Pressure:NL1.12NLNAExternal Pressure:NLNANLNARPMDESIGNTESTEDDESIGNTESTEDFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Outside Air CF	FM:		1677		
Discharge Pressure:NL0.27NLNAFan Static Pressure:NL1.12NLNAExternal Pressure:NLNANLNARPMDESIGNTESTEDDESIGNTESTEDFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Suction Press	ure:	NL	-0.85	NL	NA
Fan Static Pressure:NL1.12NLNAExternal Pressure:NLNANLNARPMDESIGNTESTEDDESIGNTESTEDFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Discharge Pre	ssure:	NL	0.27	NL	NA
External Pressure:NLNANLNARPMDESIGNTESTEDDESIGNTESTEDFan RPM:NLNLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Fan Static Pre	ssure:	NL	1.12	NL	NA
RPMDESIGNTESTEDDESIGNTESTEDFan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	External Press	sure:	NL	NA	NL	NA
Fan RPM:NLNANLNAMotor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	F	RPM	DESIGN	TESTED	DESIGN	TESTED
Motor Drive:NLDIRECT DRIVENLDIRECT DRIVEMotor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Fan RPM:		NL	NA	NL	NA
Motor Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEFan Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Motor Drive:		NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Drive:NLDIRECT DRIVENLDIRECT DRIVEFan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Motor Size/Bor	re:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Size/Bore:NLDIRECT DRIVENLDIRECT DRIVEBelt Size / Number:NLDIRECT DRIVENLDIRECT DRIVEShafts C-C:NLDIRECT DRIVENLDIRECT DRIVETurns Open:NLDIRECT DRIVENLDIRECT DRIVE	Fan Drive:		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	Fan Size/Bore	2	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C: NL DIRECT DRIVE NL DIRECT DRIVE Turns Open: NL DIRECT DRIVE NL DIRECT DRIVE	Belt Size / Nur	mber:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open: 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: H	laverhill District C	Court					
Address: 4	5 Ginty Blvd., Ha	verhill, MA					
Date: 1	/4/2021				Project No.	21-	013
			TRAVERSE				
SYSTEM [.] E	RV-2				NUMBER ·	T1	
S	vlaqu			TRAVERSE	E LOCATION:	Roof	
DUCT SIZE (ROI	JND)		" DIAMETER	R		Sq Ft =	0.00
	CT.)	46	" WIDTH x	17 '	' DEPTH	Sq Ft =	5.43
, , , , , , , , , , , , , , , , , , ,	,					•	
AIR DENSITY DA	ТА						
STATIC PRESS	@ CL:	NA In	Wg.		DESIGN	CFM =	NL
DUCT AIR TEMF	2 :	70 De	eg F		ACTUAL	CFM =	1676
BAROMETRIC P	RESS :	29.92 In	Hg.		S	CFM=	1677
AIR DENSITY RA	TIO CORRECT	ON =	1.00				
SCFM CORREC ⁻	TION FACTOR		1.00				
ACTUAL DENSIT	٦Y		0.075				
TEST HOLE	1	2	3	4	5	6	7
А	309	319	298				
В							
С							
D							
E							
F							
G							
Н							
I							
NO. OF READIN	GS =	3	AVERAGE F	PM =	309		
J							
К							
L							
М							
N							
0							
Р						 	
Q							
R							
TECHNICIAN:	Brian Murphy		-				

Project: H	Haverhill District C	Court					
Address: 4	l5 Ginty Blvd., Ha	verhill, MA					
Date:	/4/2021				Project No.	21-0	013
		-	TRAVERSE	DATA			
SYSTEM: E	ERV-2			TRAVERSE	NUMBER :	T1	
E	Exhaust			TRAVERSE	LOCATION:	Roof	
	(סואו					Sa Et -	0.00
		46				Sq Ft =	1.02
DUCT SIZE (RE		40	WIDTITX	0	DEFIN	Sy Ft =	1.92
AIR DENSITY D	ATA						
STATIC PRESS	@ CL:	NA In'	Wg.		DESIGN	CFM =	NL
DUCT AIR TEM	D :	70 De	eg F		ACTUAL	CFM =	2360
BAROMETRIC F	PRESS :	29.92 In	Hg.		S	CFM=	2361
AIR DENSITY R	ATIO CORRECT	ION =	1.00				
SCFM CORREC	TION FACTOR		1.00				
ACTUAL DENSI	ΤY		0.075				
TEST HOLE	1	2	3	4	5	6	7
А	1119	1219	1299	1209	1271		
В	1302	1248	1202	1333	1109		
С							
D							
E							
F							
G							
Н							
I							
NO. OF READIN	IGS =	10	AVERAGE F	PM =	1231		
J							
К							
L							
М							
N							
0							
Р					ļ		
Q							
R							
TECHNICIAN:	Brian Murphy						

Project:	Haverhill District C	ourt					
Address:	45 Ginty Blvd., Ha	verhill, MA					
Date:	1/4/2021				Project No.	21-07	13
				BUTION			
SYSTEM:	Fan Coil Units						
SUPPLY	x		RETURN X	1	OL		
			I				
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-1	Fan SPD = Lo	ow				
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
							_
		<u> </u>					
_	FCU-2A	Fan SPD = M	led.				
B05	1	12x12	FH	NA	NA	285	272
B05	2	12x12	FH	NA	NA	285	268
					TOTAL:	570	540
	RETURN					4	
	1	12x12	FH	NA	NA	420	403
	OUTSIDE AIR	NA	NA	NA	NA	150	137
						41	
						4	
	FCU-2B	Fan SPD = M	led.			4	
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
					/	 	
					/	 	
		<u> </u>			!	lł	

Project:	Haverhill District C	Court					
Address:	45 Ginty Blvd., Ha	verhill, MA					
Date:	1/4/2021				Project No.	21-01	13
QVQTFM∙	Fan Coil Units						
				1	OI		
001121				l			
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-3	Fan SPD=hig	jh				
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 =Lo	w				
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
		<u> </u>			TOTAL:	628	639
	RETURN	<u> </u>					
	1	24x24	FH	NA	NA	585	599
	OUTSIDE AIR	NA	NA	NA	NA	43	40

Project:	Haverhill District C	Jourt					
Address:	45 Ginty Blvd., Ha	verhill, MA					
Date:	1/4/2021				Project No.	21-01	13
				BUTION			
SYSTEM:	Fan Coil Units						
SUPPLY	X		RETURN X	1	OL	JTSIDE AIR X	
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-5	Fan SPD = Le	ow		T/		
B07	1	9x9	FH	NA	NA	198	204
	RETURN				<u> </u>		
B07	1	12x6	FH	NA	NA	173	180
	OUTSIDE AIR	NA	NA	NA	NA	25	24
			!		<u> </u>		
	_				<u> </u> !		
	FCU-6		w		<u> </u> !		
B07B	1	6x6	FH	NA	NA	115	106
	RETURN				<u> </u>		
	1	12x6	FH	NA	NA	100	92
B07B	OUTSIDE AIR	NA	NA	NA	NA	15	14
		_			!		
		_			!		
	FCU-7	Fan SPD =Lo	W		/		
B08	1	6x6	FH	NA	NA	115	113
<u> </u>	RETURN	_	!		<u>ا</u> ـــــــــــا		
B08	1	12x6	FH	NA	NA	100	96
	OUTSIDE AIR	NA	NA	NA	NA	15	17
		┥───	_ _ ′	 	ب ا	\vdash	
		_		 	ļ!	\vdash	
	FCU-8	Fan SPD = Lo	WC		↓ ′	\vdash	
B33	1	9x9	FH	NA	NA	180	175
B33	2	9x9	FH	NA	NA	180	170
		_	<u> </u>	 	TOTAL:	360	345
	RETURN		<u> </u>	 	ب ا	└─── ┤	
B33	1	12x12	FH	NA	NA	328	275
	OUTSIDE AIR	NA	NA	NA	NA	75	70

Project:	Haverhill District C	ourt					
Address:	45 Ginty Blvd., Ha	verhill, MA					
Date:	1/4/2021				21-01	13	
			AIR DISTRI	3UTION			
SYSTEM:	Fan Coil Units						
SUPPLY	Х		RETURN X		Οι	JTSIDE AIR X	
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
ļ	FCU-9	Fan SPD = Lo	wc		P		
B32	1	12x12	FH	NA	NA	240	246
B32A	2	6x6	FH	NA	NA	50	46
		_	_ _ '	 	TOTAL:	290	292
ļ	RETURN	_			P		
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
		_			P		
		┫		 	_	 	
	FCU-10	Fan SPD = M	ed.	 	 /	 	
B31	1	9x9	FH	NA	NA	125	130
	RETURN		- '	 	 /	Jł	
B31	1	6x6	FH	NA	NA	50	56
 	OUTSIDE AIR	NA	NA	NA	NA	75	74
				 		 	
				 	 /	↓	
	FCU-11	Fan SPD =Lo	W	 	 /	↓	
B20	1	6x6	FH	NA	NA	70	70
B20	2	6x6	FH	NA	NA	70	71
		───	- '	 	TOTAL:	140	141
	RETURN		'	 	 7	↓	
B20	1	6x6	FH	NA	NA	115	118
L	OUTSIDE AIR	NA	NA	NA	NA	25	23
			- '	 	 /	Jł	
ļ		_	- '		 /	↓	
			- '	 	 /	┟─────╂	

·roject:	Haverhill District C	Jourt					
Address:	45 Ginty Blvd., Ha [.]	verhill, MA					
)ate:	1/4/2021				Project No.	21-01	13
				JUTION			
SYSTEM:	Fan Coil Units						
SUPPLY	x		RETURN X		OL		
						· · · · · · · · · · · · · · · · · · ·	
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-12	Fan SPD = Lo	ow				
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 = Lo	ow				
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 = M	led.				
B24	1	9x9	FH	NA	NA	135	140
	RETURN		Τ		<u> </u>		
B24	1	12x6	FH	NA	NA	112	119
	OUTSIDE AIR	NA	NA	NA	NA	23	21
			· /		· ·	I	

Project:	Haverhill District C	ourt					
Address:	45 Ginty Blvd., Ha	verhill, MA					
Date:	1/4/2021				Project No.	21-01	13
				BUTION			
SYSTEM:	Fan Coil Units						
SUPPLY	x		RETURN X		Ol		
				·			
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-15	Fan SPD = M	led.				
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	Τ	<u> </u>				
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
		T	<u> </u>				
		T	<u> </u>				
	FCU-16	Fan SPD = Lo	ow				
B10	1	6x6	FH	NA	NA	56	50
B11	2	6x6	FH	NA	NA	56	55
	_		<u> </u>		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
		_	_ _ ′		<u> </u>		
		∔	_ _ ′		<u> </u>		
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Project:	Haverhill District C	ourt						
Address:	45 Ginty Blvd., Hav	verhill, MA						
Date:	1/4/2021				Project No.	21-0	13	
			AIR DISTRII	BUTION				
SYSTEM:	Fan Coil Units							
SUPPLY X RETURN X OUTSIDE AIR X								
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED	
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM	
	FCU-18	Fan SPD = M	ed.					
B14	1	12x12	FH	NA	NA	249	252	
	RETURN	40-40	E U	NIA	NIA	000	004	
В14						222	224	
	OUTSIDE AIR	N/A	INA	IN/A	NA .	21	20	
	_							
		1	1		1			
			1					
Comments:								

Project: Address:	Haverhill District C 45 Ginty Blvd., Ha	ourt verhill, MA					
Date:	1/4/2021	, crim, 100 .	Project No			21-0 ⁻	13
		7	AIR DISTRIF	3UTION			
SYSTEM:	Fan Coil Units						
SUPPLY	X		RETURN X		OL	JTSIDE AIR X	
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-22A	Fan SPD = Lo	wc	 	ļļ	 	
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
			!	L	TOTAL:	639	655
	RETURN		!		/	L	
108	1	RR-3	FH	NA	NA	339	351
	OUTSIDE AIR	NA	NA	NA	NA	300	304
			!				
					!		
	FCU-22B	Fan SPD = Lo	wc		!		
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
					<u> </u>		
	FCU-23	Fan SPD = Lo	oww				
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
			1 7				
			· · · · ·				

Project:	Haverhill District C	ourt					
Address:	45 Ginty Blvd., Ha	verhill, MA			Project No.	21.0	10
Dale.	1/4/2021				Project No.	21-0	15
			AIR DISTRI	BUTION			
SYSTEM:	Fan Coil Units			_			
SUPPLY	х		RETURN X		Ol	JTSIDE AIR X	
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-24	Fan SPD = Lo					
106	1	SD-3	FH	NA	NA	289	277
400	RETURN	DO 0		N1.0		075	0.57
106		RG-3			NA	275	257
	OUTSIDE AIR	NA	NA	INA	NA	14	20
	FCU-25	Fan SPD = M	led.				
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:							
I							

Project:	Haverhill District C	ourt					
Address:	45 Ginty Blvd., Hav	verhill, MA					
Date:	1/4/2021				Project No.	21-0	13
OVOTEM.	Fon Coil Unito						
				1	0		
GOLLET	X		RETORN		00		
ROOM OR	UNIT	UNIT	ARFAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-27	Fan SPD = Lo)W				
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 = M	ed.				
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
			_				
l							
							
Comments							
Comments:							
1							

Project:	Haverhill District C	ourt						
Address:	45 Ginty Blvd., Ha	verhill, MA						
Date:	1/4/2021				Project No.	21-0	13	
	For Call Unite			BUTION				
SUPPLY	x		RETURN X	1	OL			
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED	
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	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	
	_							
	_							
 								
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Comments.			8		1			

Project:	Haverhill District C	ourt					
Address:	45 Ginty Blvd., Hav	/erhill, MA			Due is at No	04.0	40
Date:	1/4/2021				Project No.	21-0	13
			AIR DISTRI	BUTION			
SYSTEM:	Fan Coil Units						
SUPPLY	X		RETURN X		OL	JTSIDE AIR X	
ROOM OR	UNIT	UNIT	AREAxK	DESIGN	TEST	DESIGN	TESTED
LOCATION	NUMBER	SIZE	FACTOR	FT/MIN	FT/MIN	CFM	CFM
	FCU-37	Fan SPD = Lo	w				
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
		I	 		 		
Comments:							

Project:	Haverhill Distr	ict Court					
Address:	45 Ginty Blvd.	, Haverhill, M	4				
Date:	1/4/2021			Project No	o. 2 [°]	1-013	
		FLO		RING DATA			
SYSTEM: Hot Wa	ater				_		
ROOM OR	UNIT	UNIT	GAUGE	SET	DESIGN	SET	BALANCING
LOCATION	NUMBER	SIZE	Pd	Pd	GPM	GPM	VLV SET @
AHU-1	AHU-1	4A 1 1/2"	24.49	24.49	16	14.9	100%
	+						
Comments:	<u> </u>						

Tighe&Bond

Milharmer Associates, Inc. TAB Report December 6, 2022

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.:

22-638

Project Date:

12/6/2022

MECHANICAL CONTRACTOR

Tighe & Bond



A N.E.B.B. Certified Company







Project:	Haverhill District Court		
Address: Date:	45 Ginty Blvd., Haverhill, MA 12/6/2022	Project No.	22-638
	TAE	BLE OF CONTENTS	000
SECTION 1	TAB Qualifica	ations	
	A. N.E.B.B. C B. N.E.B.B. C C. N.E.B.B. S D. Instrument E. Symbol Sh	Certification Company Certificate Supervisor Certificate t Sheet neet	
SECTION 2	TAB Building	Systems	

Project:	Haverhill District Court		
Address:	45 Ginty Blvd., Haverhill, MA		
Date:	12/6/2022	Project No.	22-638
	INSTRUM	IENT SHEET	
The following is	s a list of Instruments owned and operated by	Milharmer Associates, Inc. and used	lon
this project.			
Instrument	Instrument	Calibration	Calibration
ID Number		Date	Due Date
1	ADM-870 Digital Multimeter	8-20-22	8-20-23
2	Shortridge Flow Hood	8-20-22	8-20-23
3	Ampmeter	8-20-22	8-20-23
4	Tachometer	8-20-22	8-20-23
5	Airflow Anemometer	8-20-22	8-20-23
6	Digital Thermometers	8-20-22	8-20-23
7	Shortridge Water Meter	8-20-22	8-20-23
8	Sound Meter	8-20-22	8-20-23
9	Vibration Meter	8-20-22	8-20-23

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
СН	Chiller		Air Conditioning
CHWR	Chilled Water Return	HWR	Hot Water Return or
CHW or CHWS	Chilled Water Supply		Heating Water Return
СТ	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		6
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		
	Feet of Head		
FT. HD.			

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
РНС	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
SF (AIR)	Supply Fan		Pressure Drop
S.F.(Elect)	Service Factors		-
SHC	Steam Heating Coil	ΔT	Differential (Delta) Temperature,
S.P. "W.C."	Static Pressure		Net Temperature
	Measured in Inches of		Decrease or Increase
	Water Column	#	PSI or Pounds Per Square Inch
			Decrease or Increase



Address: 45 Ginty Blvd., Haverhill, M2 Dre: 12/6/202 Project No. 22-638 FAN NO.< ERV-1 SUPPLY	Project:	Haverhill Distr	rict Court			
Project No. 22-638 FAN No. EX-I SUPPLY FAN No. EX-I SUPPLY Serves / Location: Courthouse Roof Serves / Location: Courthouse Roof Manufacturer: YORK Model Number: JRA072B1A2AACMCM3A30AHB Size: NL Sorial Number: 1708072B1A2AACMCM3A30AHB TESTED Sorial Number: NL TESTED Mordon Mordon DESIGN TESTED Munfacturer: NL ROSENBERG NL ROSENBERG Munfacturer: NL No access NL No access Safety Factor: NL No access NL No access Safety Factor: NL NL NL NL NL Volts/Phase: 208/3 208 208/3 208 Safety Factor: NL OBTECT DRIVE NL VED Protected	Address:	45 Ginty Blvd	., Haverhill, MA			
FAN DATA SHEET FAN NO. ERV-1 SUPPLY FAN NO. ERV-1 EXHAUST Serves / Location: Courthouse Roof	Date:	12/6/2022			Project No.	22-638
FAN NO. ERV-1 SUPPLY FAN NO. ERV-1 EXHAUST Serves / Location: Courthouse Roof			FAI	N DATA SHEET		
Serves / Location: Courthouse Roof Imanufacturer: Manufacturer: YORK Imanufacturer: JR0A072B1A2AACMCM3A30AHB Size: NL Imanufacturer: Imanufacturer: Serial Number: 170805102 Imanufacturer: Imanufacturer: Motor DESIGN TESTED DESIGN TESTED Manufacturer: NL ROSENBERG NL ROSENBERG Frame Number: NL No access NL No access Brake Horsepower: NL No access NL No access Brake Horsepower: NL NL NL No access Motor Amperage: NL NL NL NL Volts/Phase: 208/3 208 208/3 208 Motor Amperage: NL DIRECT DRIVE NL DIRECT DRIVE Meter Amps: NL VFD Protected NL VFD Protected Heater Amps: NL VFD Protected NL VFD Protected Supply Air CFM: 1			FAN NO.	ERV-1 SUPPLY	FAN NO.	ERV-1 EXHAUST
Manufacturer:YORKInternational Content of C	Serves / Locat	tion:	Courthouse	Roof		
Model Number:JR0A072B1A2AACMCM3A30AHBSize:NLISerial Number:17005102MOTORDESIGNTESTEDDESIGNTESTEDManufacturer:NLROSENBERGNLROSENBERGFrame Number:NLNo accessNLNo accessHorsepower:NLNo accessNLNo accessBrake Horsepower:NLNo accessNLNo accessBrake Horsepower:NLNLNLNLVolts/Phase:208/3208206/3208Safety Factor:NLNLNLNLVolts/Phase:208/3208208/3208Motor Amperage:NL1.3NL2.2Motor Amperage:NL0IRECT DRIVENLDIRECT DRIVESpeeds:NL60 HZNL47 HZHeater Size:NLVFD ProtectedNLVFD ProtectedHeater Amps.:NLVFD ProtectedNLVFD ProtectedSupply Air CFM:17501735CCSuction Pressure:NL0.25NLNASuction Pressure:NL0.25NLNASuction Pressure:NLDIRECT DRIVENLNARPMDESIGNTESTEDDESIGNTESTEDSuction Pressure:NL0.25NLNASuction Pressure:NL0.25NLNASuction Pressure:NL0.26NLNAFan Static Pres	Manufacturer:		YORK			
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	Turns Open:		NL	DIRECT DRIVE	NL	DIRECT DRIVE

Comments:

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Project:	Haverhill Distr	ict Court			
Address:	45 Ginty Blvd.	, Haverhill, MA			
Date:	12/6/2022			Project No.	22-638
		FAI	N DATA SHEET	1	
		FAN NO.	ERV-2 SUPPLY	FAN NO.	ERV-2 EXHAUST
Serves / Locat	tion:	Courthouse	Roof		
Manufacturer:		YORK	•		
Model Numbe	r:	JR0A072B1A2AACMC	МЗАЗОАНВ		
Size:		NL			
Serial Number	r:	170805101			
M	OTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:		NL	ROSENBERG	NL	ROSENBERG
Frame Numbe	er:	NL	No access	NL	No access
Horsepower:		NL	No access	NL	No access
Brake Horsepo	ower:	NL	No access	NL	No access
Safety Factor:		NL	NL	NL	NL
Volts/Phase:		208/3	208	208/3	208
Motor Ampera	ige:	NL	1.1	NL	2.1
Motor RPM:		NL	DIRECT DRIVE	NL	DIRECT DRIVE
Speeds:		NL	60 HZ	NL	45 HZ
Heater Size:		NL	VFD Protected	NL	VFD Protected
Heater Amps.:	:	NL	VFD Protected	NL	VFD Protected
	FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CF	M:	1750	1677		
Return Air CFI	M:				
Exhaust Air Cl	FM:			1750	1732
Outside Air CF	FM:		1677		
Suction Press	ure:	NL	-0.85	NL	NA
Discharge Pre	essure:	NL	0.27	NL	NA
Fan Static Pre	essure:	NL	1.12	NL	NA
External Press	sure:	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/Bo	re:	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 / Nur	mber:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C:		NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open:		NL	DIRECT DRIVE	NL	DIRECT DRIVE
Commenter					

omments:

Tighe&Bond

Milharmer Associates, Inc. TAB Report January 12, 2024

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.:

24-028

Project Date:

1/12/2024

MECHANICAL CONTRACTOR

Tighe & Bond



A N.E.B.B. Certified Company

Project:	Haverhill District Court			
Address:	45 Ginty Blvd., Haverhill, MA			
Date:	1/12/2024	Project No.	24-028	
		CERTIFICATION		
	S	ubmitted & Certified by:		
	Mill	harmer Associates, Inc.		
Certification N	lo.: 3384	Certific	ation Expiration Date:	12/31/2024
The data p have been ob Testing, Adji exceed N.E.B	presented in this Report is a record of s tained in accordance with the current e usting and Balancing of Environmer B.B. tolerances, are noted in the Test-A	system measurements and fina edition of the N.E.B.B. Proced ntal Systems. Any variances djust-Balance Report Project S	al adjustments that Jural Standards for from design quantities w Summary.	rhich
N.E.B.B. Qua	lified TAB Supervisor Name: Scott F.	Miller		
N.E.B.B. Qua	lified TAB Supervisor Signature:			
		NEBB		



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

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NEBB President

mallas

NEBB President-Elect

CP-23541

NEBB Certification Number

December 31, 2024

Expiration Date

Project:	Haverhill District Court	
Address: Date:	45 Ginty Blvd., Haverhill, MA 1/12/2024 Project No.	24-028
	TABLE OF CONTENTS	
SECTION 1	TAB Qualifications	
	 A. N.E.B.B. Certification B. N.E.B.B. Company Certificate C. N.E.B.B. Supervisor Certificate D. Instrument Sheet E. Symbol Sheet 	
SECTION 2	TAB Building Systems	

Project:	Haverhill District Court							
Address:	45 Ginty Blvd., Haverhill, MA							
Date:	1/12/2024	Project No.	24-028					
	INSTRUMENT SHEET							
The following is a list of Instruments owned and operated by Milharmer Associates, Inc. and used on this project.								
Instrument	Instrument	Calibration	Calibration					
		Date	Due Date					
1	ADM-870 Digital Multimeter	8-20-23	8-20-24					
2		8-20-23	8 20 24					
3	Tachometer	8-20-23	8-20-24					
5		8-20-23	8-20-24					
6	Digital Thermometers	8-20-23	8-20-24					
0		0 20 20	0 20 24					
7	Shortridge Water Meter	8-20-23	8-20-24					
8	Sound Meter	8-20-23	8-20-24					
9	Vibration Meter	8-20-23	8-20-24					

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
СН	Chiller		Air Conditioning
CHWR	Chilled Water Return	HWR	Hot Water Return or
CHW or CHWS	Chilled Water Supply		Heating Water Return
СТ	Cooling Tower	HWS	Hot Water Supply or
CWR	Condenser Water Return		Heating Water Supply
CW or CWS	Condenser Water Supply	НХ	Heat Exchanger
DB	Drv 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		Leaving water remperature
EMS	Energy Mot System	MAU/MUA	Make Un Air Unit
EWT	Entering Water Temperature	МВН	1,000 BTU's per Hour
FCU	Fan Coil Unit	N/A	Not Accessible
FH	Fume Hood	NA	Not Applicable
F.L.A.	Full Load Amperage	NI	Not Installed
FPB	Fan Powered Box	NL	Not Listed
FPM	Feet Per Minute		
11 1 171	Foot of Hood		
FT. HD.	reet of fiead		

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
РНС	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
SF (AIR)	Supply Fan		Pressure Drop
S.F.(Elect)	Service Factors		-
SHC	Steam Heating Coil	ΔT	Differential (Delta) Temperature,
S.P. "W.C."	Static Pressure		Net Temperature
	Measured in Inches of		Decrease or Increase
	Water Column	#	PSI or Pounds Per Square Inch
			Decrease or Increase

Project:	Haverhill District C	Court					
Address:	45 Ginty Blvd., Ha	verhill, MA					
Date:	1/12/2024				Project No.	24-0	28
AIR DISTRIBUTION							
SYSTEM:	SYSTEM: FCU-18						
SUPPLY	X		RETURN X		OL	JTSIDE AIR X	
			AREAxK		TEST	DESIGN	TESTED
LOCATION		SIZE	FACTOR	F I/MIIN	F I/IVIIN	CFIM	CFM
Cell 2	1	12X12	FH	NA	NA	249	252
		12/(12			101	210	202
	RETURN						
Cell 2	1	12X12	FH	NA	NA	179	181
		NΑ	ΝΔ	ΝΔ	ΝΔ	70	71
	,		14/ (14/ (10	, ,
Comments:							