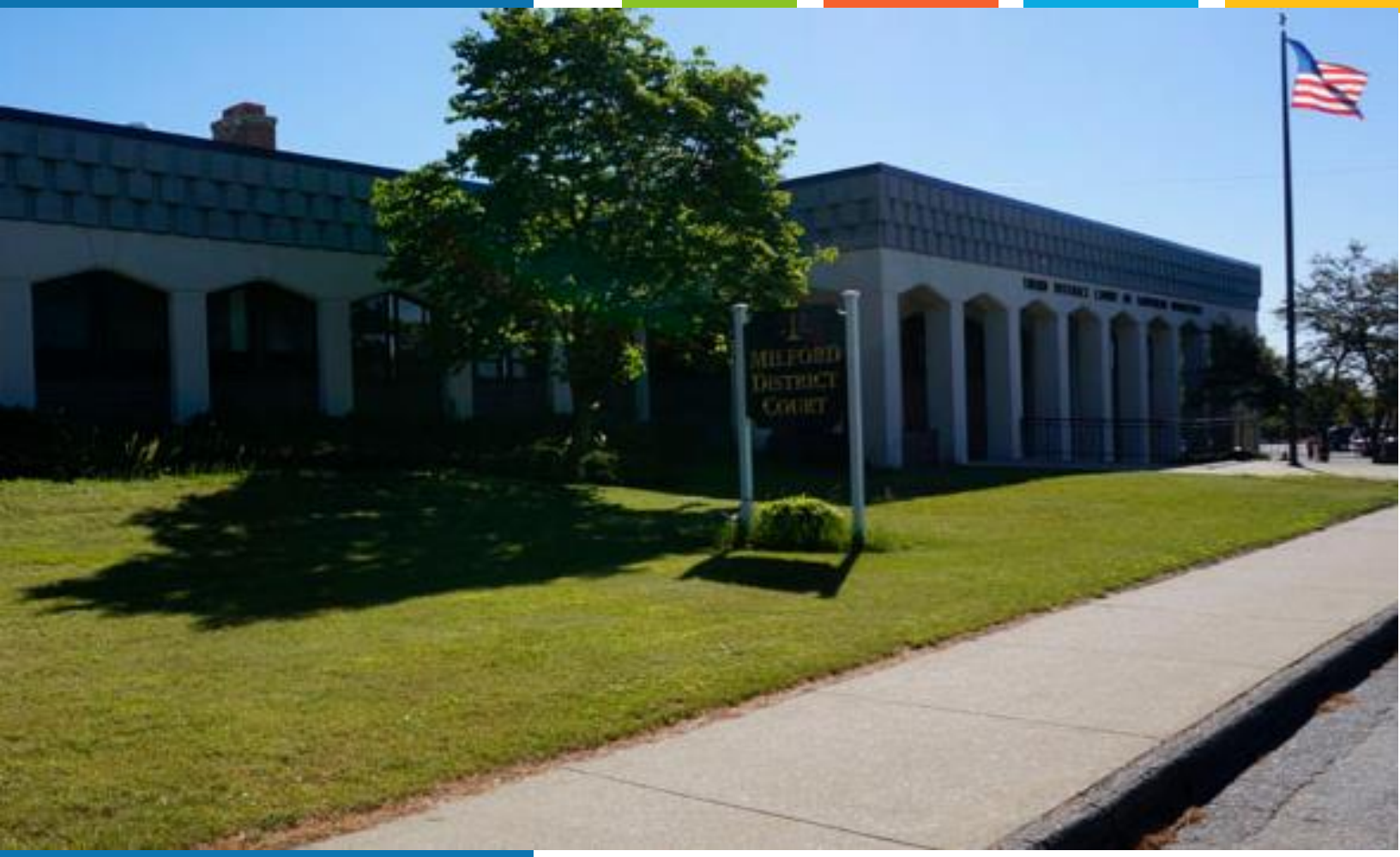

Milford District Court
Milford, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

July 21, 2022

Tighe&Bond

100% Recyclable

Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the Milford Courthouse on June 9, 2021. While on site we inspected the air handling equipment located in the mechanical rooms and toured the facility to determine if the spaces generally matched usages noted on the architectural plans. Tighe and Bond was provided with mechanical design plans 2000. Our analysis is based on these drawings and our one day on site.

Site Visit Attendees:

- *Office of Court Management:*
  - Frank Levey, Courthouse Facilities Staff
- *Tighe & Bond*
  - Ryan Ablondi, PE, Senior Mechanical Engineer
  - Tim Bill, Staff Mechanical Engineer
  - Olivia Robillard, Mechanical Intern

1.1 Existing Ventilation System

The Milford District Courthouse was constructed in 1967 and is approximately 16,500 square feet in size. The building underwent a roof replacement renovation in 2000 at which time, all of the ventilation and exhaust air for the building was rebalanced. As part of the renovation all of the exhaust fans serving the building we replaced however, all of the air handling units (AHUs) and fan coil units (FCUs)_ remained.

Four air handling units and twenty-one fan coil units provide ventilation air to the building. Each AHU contains a supply fan, chilled water cooling coils, hot water heating coils, and 2" MERV 8 filters. The AHU's appear to be from the original construction in 1967 and are in poor condition. We were not able to access the inside of the units while onsite to see the condition of the coils. The outdoor air dampers and actuators were also not accessible.

The FCU's appear to be from the original construction in 1967 and are in poor condition. All of the FCU's are two-pipe with heating and cooling being switched seasonally. The units have a supply fan, chilled/hot water cooling coil, MERV 11 filters, and according to the drawings provide ventilation air to the building. The outdoor air dampers and actuators were not accessible during the visit.

The lockup area is served by an exhaust fan, EF-6 and FCU's. The exhaust fans draw air from the cells while the FCUs, located in the common area outside of the cells, provide comfort cooling, heating and ventilation air.

There are nine exhaust fans serving the building according to the drawings provided to Tighe & Bond. Two of the toilet exhaust fans, EF-2 & 7, and the fan serving Courtroom 115, EF-10, were not operational while on site.

A hot water boiler plant consists of a 900 MBH input, gas-fired, modular boiler with 3 heating modules. The boiler provides hot water to air handlers, radiation, and fan coil units and appears to be in good condition.

A 25 ton water cooled chiller with a scroll compressor is located in the basement mechanical room. Heat rejection for the chiller is provided by a cooling tower which is also located in the basement. Both the chiller and cooling tower appear to be original to the building and are in poor condition.

Table 1 summarizes the AHUs and FCUs designed airflow rates, the MERV rating of the installed filters, and the condition of the units. The original drawings do not have individual tag numbers for each FCU but rather tags numbers for each type of FCU. In order to facilitate the ventilation calculations, Tighe & Bond developed unique tags for each individual FCU. Where multiple FCUs serve a common space, they were given alpha numeric tags (e.g. FCU-2A and FCU-2B). The tags in parentheses (e.g. (5A)) are the equipment tags corresponding to the type of FCU from the original drawings.

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Filters	Condition
AC-1	1,500	500	2" MERV 11	Poor
AC-2	1,000	300	2" MERV 11	Poor
AC-3	1,000	300	2" MERV 8	Poor
AC-4	2,000	600	2" MERV 8	Poor
FCU-1 (8B)	400	60	Non-MERV	Poor
FCU-2A (5A)	500	75	Non-MERV	Poor
FCU-2B (5A)	500	75	Non-MERV	Poor
FCU-3 (5A)	500	75	Non-MERV	Poor
FCU-4A (8A)	800	200	Non-MERV	Poor
FCU-4B (8A)	800	200	Non-MERV	Poor
FCU-5 (4A)	400	80	Non-MERV	Poor
FCU-6A (5A)	500	75	Non-MERV	Poor
FCU-6B (5A)	500	75	Non-MERV	Poor
FCU-7 (5A)	500	75	Non-MERV	Poor
FCU-8 (6A)	600	75	Non-MERV	Poor
FCU-9A (5A)	500	75	Non-MERV	Poor
FCU-9B (5A)	500	75	Non-MERV	Poor
FCU-10 (6A)	600	100	Non-MERV	Poor
FCU-11 (4A)	400	80	Non-MERV	Poor
FCU-12 (6A)	600	100	Non-MERV	Poor

FCU-13 (8D)	800	150	Non-MERV	Poor
FCU-14 (8C)	800	80	Non-MERV	Poor
FCU-15A (4A)	400	80	Non-MERV	Poor
FCU-15B (4A)	400	80	Non-MERV	Poor
FCU-16 (4A)	400	80	Non-MERV	Poor

Photo 1 – Representative Air Handler

Photo 2 – Representative Fan Coil Unit

1.2 Existing Control System

A pneumatic system controls the existing HVAC air handling equipment. It is an old, obsolete system and appears to be original. We did not see any evidence or components of a Building Management System (BMS) during our site visit. We are not aware of any demand control ventilation sequences in use at this courthouse.

Section 2
Recommendations

Below is a list of recommendations for the Milford District Courthouse. Please refer to the "Overview of Recommendations" report for further explanation and requirements of the stated recommendations.

2.1 Filtration Efficiency Recommendations

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

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

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

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

RF-3a: *Connect the pressure sensor to a local alarm.*

Maximum differential pressure should be set per manufacturer's recommendation based on air velocity to ensure filters are within their service lives. Typically, this is not more than 1.0" w.g.

Alarm setpoints for each bank of filters should be reviewed, to ensure they are consistent with the filter manufacturer's recommendation.

2.2 Testing & Balancing Recommendations

The AHUs and FCUs are approximately 55 years old and it is unknown to Tighe & Bond when the last time the units were tested and balanced. Also, the code requirements to determine the outdoor air flow rates that were used to design the original system may be different than the 2015 International Mechanical Code (IMC) and current ASHRAE Standard 62.1 requirements.

We recommend the following testing and balancing measures be implemented:

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

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

TABLE 2
Recommended Air Handler O.A. Flow Rates

Unit	Original Supply Airflow (CFM)	Original Design Min. O.A. (CFM)	Current Code Min. O.A. Requirements (CFM)	Recommended Minimum O.A. (CFM)
AC-1	1,500	500	260	500
AC-2	1,000	300	80	300
AC-3	1,000	300	205	300
AC-4	2,000	600	460	600
FCU-1 (8B)	400	60	35	60
FCU-2A (5A)	500	75	50	75
FCU-2B (5A)	500	75	50	75
FCU-3 (5A)	500	75	41	75
FCU-4A (8A)	800	200	90	200
FCU-4B (8A)	800	200	90	200
FCU-5 (4A)	400	80	18	80
FCU-6A (5A)	500	75	47	75
FCU-6B (5A)	500	75	47	75
FCU-7 (5A)	500	75	29	75
FCU-8 (6A)	600	75	37	75
FCU-9A (5A)	500	75	27	75
FCU-9B (5A)	500	75	27	75
FCU-10 (6A)	600	100	30	100
FCU-11 (4A)	400	80	82	80
FCU-12 (6A)	600	100	45	100
FCU-13 (8D)	800	150	62	150
FCU-14 (8C)	800	80	19	80
FCU-15A (4A)	400	80	17	80
FCU-15B (4A)	400	80	17	80
FCU-16 (4A)	400	80	28	80

Note: Although the ASHRAE Position Document on Infectious Aerosols recommends using the latest published standards and codes as a baseline for minimum ventilation, the mechanical code in effect at the time the

HVAC systems were designed and constructed is what governs the required outdoor air flowrate for the HVAC equipment, if there have been no additions, renovations, alterations or changes in occupancy to the building. The 2015 International Mechanical Code does not prevent the continued use of existing systems.

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

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

TABLE 3
Average Airflow Rate per Person

	All Spaces	***Courtrooms***	***Non-Courtroom Spaces***
Total Occupancy (People)	160	78	82
Total Supply Air (CFM/Person)	105	45	164
Outdoor Air (CFM/Person)	23	8	38

The airflow rate per person for each Courtroom and the Jury Pool Room is shown below in Table 4. These values are based on full occupancy without taking diversity into account, the original full design supply airflow rate, and the recommended outdoor airflow rate. The airflow rates per person assumes the full supply and code minimum outdoor airflows are 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)***	***Outdoor Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Pool Room	42	1,500	36	500	12
Courtroom 109	70	2,000	29	600	9

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)***	***Outdoor Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Pool Room	15	1,500	100	500	33
Courtroom 109	19	2,000	105	600	32

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

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

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

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

RTB-6: *Test and balance all air handler and fan coil unit chilled and hot water coils.*

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

2.3 Equipment Maintenance & Upgrades

We recommend the following equipment maintenance and upgrades:

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

Replace dampers and actuators that are not functioning properly.

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

As mentioned above, we were not able to access the coil section of the AHUs but due to their age, we would recommend cleaning if it has not been done recently.

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

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

2.4 Control System Recommendations

We recommend the following for the control system:

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

This sequence should start all air handlers, fan coil units and exhaust fans before the building is occupied, with the start time calculated to provide three air changes per hour (ACH) of ventilation air, or for two hours before people arrive.

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 and any multi-occupant areas served by FCUs that do not run continuously. 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. Refer to the "Overview of Recommendations" document for further guidance on installing portable HEPA filters.

2.6 Humidity Control

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

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

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

2.6 Other Recommendations

2.6.1 Replace Air Handling Units

Indoor air handling units have a life expectancy of 35-45 years. The air handlers serving the courthouse are approximately 54 years old and are in poor condition. These units

could fail at any time. While immediate replacement may not be necessary at this time, we recommend developing a capital plan to replace these units in 2-5 years.

2.6.2 Replace Fan Coil Units

The existing FCUs serving the main and lower levels are approximately 54 years old and are past the end of their useful life. The average life expectancy for FCUs is 25-30 years. As far as we know all the FCUs are functional, but in poor condition and could fail at any time. While immediate replacement may not be necessary at this time, we recommend developing a capital plan to replace these units in 2-5 years.

2.6.3 Repair or Replace Holding Cell and Toilet Exhaust Fans

We recommend repairing or replacing the holding cell and toilet exhaust fans that are not working or are not exhausting the proper airflow rate.

2.6.4 Run Supply Fans Continuously During Occupied Hours

All ACs and FCUs were set to run the fan in "auto" mode, which runs the supply fan only when the unit is actively heating or cooling. This should be changed on each of the systems to run the supply fans continuously in occupied mode, to supply ventilation air to the spaces. Note that this may cause comfort issues because supply air temperature can fluctuate as the heating and cooling is staged on and off, and the systems may not have been designed to operate like this originally.

2.7 Milford District Court Recommendations Checklist

Recommended Immediate Actions

1. ☐ RTB-1: Test and balance air handling unit airflow rates
2. ☐ RE-1: Test air handling system dampers and actuators for proper operation
3. ☐ RC-1: Implement a pre-occupancy flush sequence.

Recommended Actions

4. ☐ RF-3: Install a differential pressure sensor with a display across the air handling units' filter bank.
5. ☐ RF-3a: Connect the pressure sensor to a local alarm.
6. ☐ RTB-6: Test and balance all air handler chilled and hot water coils.
7. ☐ RE-2: Clean air handler coils
8. ☐ RE-5: Install freeze stat on existing air handlers or confirm the existing freeze stat is working correctly on each air handling unit.
9. ☐ RE-7: Test air handler coil control valves for proper operation
10. ☐ RFC-1: Install portable HEPA filters
11. ☐ Create capital improvement plan for AC's and FCU's.
12. ☐ Repair or Replace Holding Cell and Toilet Exhaust Fans
13. ☐ Run Supply Fans Continuously During Occupied Hours

Optional Actions

14. ☐ RF-3: Install a differential pressure sensor with a display across the filter bank.
15. ☐ RTB-5: Test and balance air inlets and outlets

Section 3
Testing & Balancing Results

Milharmer Associates visited the Milford District Courthouse on April 20th, 2022 to test the airflow rates of the air handling units and the exhaust fans. A summary of the tested airflow rates versus the design airflow rates are shown below in Tables 5 and 6. The full testing and balancing report is attached.

TABLE 5
Air Handler Airflow Testing & Balancing Results

	Design			Actual		
Unit	Total Supply Fan Airflow (CFM)	Recommended Outdoor Airflow (CFM)	Return Airflow (CFM)	Supply Fan Airflow (CFM)	Outdoor Airflow (CFM)	Return Airflow (CFM)
AC-1	1,500	500	1,000	1,610	541	1,069
AC-2	1,000	300	700	1,094	323	771
AC-3	1,000	300	700	919	274	645
AC-4	2,000	600	1,400	992	492	500
FCU-1 (8B)	400	60	340	280	144	136
FCU-2A (5A)	500	75	425	205	79	126
FCU-2B (5A)	500	75	425	159	21	138
FCU-3 (5A)	500	75	425	279	92	187
FCU-4A (8A)	800	200	600	305	83	222
FCU-4B (8A)	800	200	600	240	0	240
FCU-5 (4A)	400	80	320	378	151	227
FCU-6A (5A)	500	75	425	237	38	275
FCU-6B (5A)	500	75	425	249	53	272
FCU-7 (5A)	500	75	425	251	53	292
FCU-8 (6A)	600	75	525	261	38	267
FCU-9A (5A)	500	75	525	230	66	178
FCU-9B (5A)	500	75	525	376	41	154
FCU-10 (6A)	600	100	500	216	122	158

FCU-11 (4A)	400	80	320	153	52	98
FCU-12 (6A)	600	100	500	244	43	201
FCU-13 (8D)	800	150	650	336	121	215
FCU-14 (8C)	800	80	720	369	124	245
FCU-15A (4A)	400	80	320	273	55	144
FCU-15B (4A)	400	80	320	224	93	169
FCU-16 (4A)	400	80	320	289	103	186

TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow (CFM)	Actual Return/Exhaust Airflow (CFM)
EF-1	Break Room	200	35
EF-2	Restroom	320	319
EF-3	Boiler Room	300	376
EF-4	Restroom	400	380
EF-5	Courtroom	600	549
EF-6	Holding Cells	710	308
EF-7	Restroom	240	Not Operational
EF-8	Lobby	300	272
EF-10	Courtroom	500	Not Operational

The typical balancing tolerance for air systems is ±10% of the design airflow.

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

1. AC-4 is operating at 49% of the design airflow. The unit is running at the nameplate amperage. The unit cannot be sped up and further investigation is needed to find out what is causing the low airflow. AC-4 is not delivering the original design supply or code required outdoor air airflow. This unit is well beyond it's useful life and, at 49% of design airflow, it is likely not able to meet heating and cooling demands for the space. This unit should be considered for replacement.

2. All of the tested FCU's are not supplying a sufficient amount of supply air to meet the design airflow and the majority of the tested FCUs are not providing the recommended amount of outdoor air. As noted in section 2.7, these FCUs are all well beyond their useful life and should be considered for replacement in order to restore proper ventilation and heating and cooling comfort.
3. EF-1, serving the breakroom, is operating at 18% of the design airflow. The TAB contractor reported that there is no excessive duct leakage or open ends. The fan should be investigated to determine the cause of the low airflow and repaired / replaced as necessary.
4. EF-6, serving the lockup area, is operating at 44% of the design airflow. The TAB contractor noted that a sheave change could restore the EF to it's design airflow. We recommend the TAB contractor return to provide the sheave change.
5. The TAB contractor noted that EF-7 and EF-10, serving bathrooms and Courtroom 115 respectively, were not operational at the time of the site visit. The reason for these units not being operational should be investigated and the EFs should be repaired / replaced as necessary.
6. The TAB contractor noted that the chiller was not operational at the time of the site visit as the building was operating in heating mode. We recommend the TAB contractor return to perform TAB work on the CHW system during the summer cooling season.
7. Hot water systems were not tested. We recommend the TAB contractor return to perform TAB work on the hot water system during the winter heating season.

Disclaimer

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

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: **Milford District Court**
161 West St. Milford, MA

Project No.: **22-182** **Project Date:** **4/20/2022**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	Milford District Court		
Address:	161 West St. Milford, MA		
Date:	4/20/2022	**Project No.**	22-182

CERTIFICATION

Submitted & Certified by:

Milharmer Associates, Inc.

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

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

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

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

Certification

SCOTT F. MILLER

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

Testing, Adjusting and Balancing of Environmental Systems

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

CP-23541

NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

Firm Certification

MILHARMER ASSOCIATES, INC.

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

Testing, Adjusting and Balancing of Environmental Systems

3384

NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

Project:	Milford District Court		
Address:	161 West St. Milford, MA		
Date:	4/20/2022	**Project No.**	22-182

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D. Instrument Sheet
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SECTION 2 **TAB Building Systems**

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

INSTRUMENT SHEET

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

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

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

Technician:

SYMBOL SHEET

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

SYMBOL SHEET CONTINUED

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

Project:	Milford District Court		
Address:	161 West St. Milford, MA		
Date:	4/20/2022	**Project No.**	22-182

REPORT SUMMARY

The following is the report for the Milford District Court with the following comments:

1. AC-4 is running at 71% of design airflow. The unit is running at nameplate amps and subsequently cannot be sped up any further.

2. EF-1 serving the Employee Room is designed for 200 CFM and is only exhausting 25 CFM. There doesn't appear to be any duct leakage or open ends so the fan needs to be inspected by a mechanical contractor to determine the reason for low airflow.

3. EF-6 serving the Cells is at approximately 50% of design airflow and would require a sheave change to increase the flow to design.

Chilled water was not running at the time of testing.

Project:	Milford District Court		
Address:	161 West St. Milford, MA		
Date:	4/20/2022	**Project No.**	22-182

REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
AC-1	1,610 CFM	1,069 CFM	541 CFM
AC-2	1,094 CFM	771 CFM	323 CFM
AC-3	919 CFM	645 CFM	274 CFM
AC-4	992 CFM	500 CFM	492 CFM

UNIT	EXHAUST
EF-1	35 CFM
EF-2	319 CFM
EF-3	376 CFM
EF-4	380 CFM
EF-5	549 CFM
EF-6	308 CFM
EF-7	*
EF-8	272 CFM
EF-9	Deleted
EF-10	*

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

FAN DATA SHEET

	FAN NO. AC-1		FAN NO. AC-2	
Serves / Location:	Courtroom 115	Ceiling	Corridor 114	Ceiling
Manufacturer:	Trane Fan Coil Unit		Trane Fan Coil Unit	
Model Number:	*1		*1	
Size:	NL		NL	
Serial Number:	*1		*1	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	*1	NL	*1
Frame Number:	NL	*1	NL	*1
Horsepower:	NL	*1	NL	*1
Brake Horsepower:	NL	*1	NL	*1
Safety Factor:	NL	*1	NL	*1
Volts/Phase:	NL	*1	NL	*1
Motor Amperage:	NL	*1	NL	*1
Motor RPM:	NL	*1	NL	*1
Speeds:	NL	*1	NL	*1
Heater Size:	NL	*1	NL	*1
Heater Amps.:	NL	*1	NL	*1
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1500	1610	1000	1094
Return Air CFM:	1000	1069	700	771
Exhaust Air CFM:				
Outside Air CFM:	500	541	300	323
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	*1	NL	*1
Motor Drive:	NL	*1	NL	*1
Motor Size/Bore:	NL	*1	NL	*1
Fan Drive:	NL	*1	NL	*1
Fan Size/Bore:	NL	*1	NL	*1
Belt Size / Number:	NL	*1	NL	*1
Shafts C-C:	NL	*1	NL	*1
Turns Open:	NL	*1	NL	*1

Comments: ***1 Cannot access fan coil unit in the ceiling.**

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: AC-1 & AC-2
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
	AC-1						
Courtroom 115	1	9X18	FH	125	NA	375	412
Courtroom 115	2	9X18	FH	125	NA	375	410
Courtroom 115	3	9X18	FH	125	NA	375	393
Courtroom 115	4	9X18	FH	125	NA	375	395
					TOTAL:	1500	1610
	RETURN						
Courtroom 115	1	16X3 Slot	LD	NA	NA	1000	1069
	O.A.						
	1	NA	NA	NA	NA	500	541
	AC-2						
Corridor 114	1	48X8	2.67	375	409	1000	1094
	RETURN						
Corridor 114	1	36X12	FH	NA	NA	1000	771
	O.A.						
	1	NA	NA	NA	NA	300	323

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

FAN DATA SHEET

	FAN NO. AC-3		FAN NO. AC-4	
Serves / Location:	Juvenal Probation Depa	Mechanical	Court Room 109	Mechanical
Manufacturer:	Trane		Trane	
Model Number:	TYPE L3		TYPE M8	
Size:	NL		NL	
Serial Number:	K124902		K124903	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	Daton	NL	Allis/ Chalmers
Frame Number:	NL	57	NL	NL
Horsepower:	NL	1/2	NL	1 1/2
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.25	NL	1.2
Volts/Phase:	208-230/460	204/205/206	208-220/ 440	209/212/215
Motor Amperage:	1.8-1.9/0.95	1.7/1.6/1.8	5.0-.5.0/2.5	5.01/5.0.4.9
Motor RPM:	1725	1738	1730	1741
Speeds:	Single Speed	Single Speed	Single Speed	Single Speed
Heater Size:	NL	FUSED	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1000	919	1398	992
Return Air CFM:	700	645	798	500
Exhaust Air CFM:				
Outside Air CFM:	300	274	600	492
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	1477	NL	1479
Motor Drive:	NL	1VL44	NL	1VP50
Motor Size/Bore:	NL	5/8	NL	7/8
Fan Drive:	NL	15/16"	NL	15/16"
Fan Size/Bore:	NL	4" OD	NL	5 3/4"
Belt Size / Number:	NL	A38	NL	B45
Shafts C-C:	NL	14 1/2"	NL	16 1/2"
Turns Open:	NL	5	NL	5

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: AC-3, Basement
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
	SUPPLY						
Juvenile Probation	1	24X24	FH	NA	NA	320	196
Juvenile Probation	2	24X24	FH	NA	NA	320	199
Office	3	24X24	FH	NA	NA	120	205
Office	4	24X24	FH	NA	NA	120	116
Office	5	24X24	FH	NA	NA	120	140
Office	6	10X10	FH	NA	NA	NL	63
					TOTAL:	1000	919
	RETURN						
Juvenile Probation	1	24X24	FH	NA	NA	400	339
Office	2	24X24	FH	NA	NA	100	94
Office	3	24X24	FH	NA	NA	100	106
Office	4	24X24	FH	NA	NA	100	106
					TOTAL:	700	645
	O.A.						
	1	NA	NA	NA	NA	300	274

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: AC-4
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
Courtroom 109	1	74X 2 Slot	FH	NA	NA	466	96
Courtroom 109	2	74X 2 Slot	FH	NA	NA	466	480
Courtroom 109	3	74X 2 Slot	FH	NA	NA	466	416
					TOTAL:	1398	992
	RETURN						
Courtroom 109	1	30X18	FH	NA	NA	798	500
	O.A.						
	1	NA	NA	NA	NA	600	492

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, Basement
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-NL	Speed @ HI					
G14	1	44X4	1.04	72	268	75	279
	FC-NL	Speed @ HI					
G18	1	32X4	0.76	99	270	75	205
	FC-NL	Speed @ HI					
G18	1	32X4	0.76	99	209	75	159
	FC-NL	Speed @ HI					
Corridor Entrance	1	20X6	0.71	0	243	NL	173
	FC-NL	Speed @ HI					
G20	1	60X4	1.42	0	197	NL	280
	FC-NL	Speed @ HI					
G03	1	30X4	0.71	0	266	NL	378
	FC-NL	Speed @ HI					
Corridor Exit	1	41x6	1.45	0	317	NL	460
	FC-NL	Speed @ HI					
G27 Stairs	1	30X4	0.71	0	154	NL	109
	FC-NL						
Lock-up	1	60X4	1.42	0	215	NL	305
	FC-NL						
Lock-up	1	60X4	1.42	0	169	NL	240

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, Basement

SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-NL	Speed @ HI					
G14	1	44X4	1.04	0	180	NL	187
	FC-NL	Speed @ HI					
G18	1	32X4	0.76	0	166	NL	126
	FC-NL	Speed @ HI					
G18	1	32X4	0.76	0	182	NL	138
	FC-NL	Speed @ HI					
Corridor Entrance	1	20X6	0.71	0	70	NL	50
	FC-NL	Speed @ HI					
G20	1	60X4	1.42	0	96	NL	136
	FC-NL	Speed @ HI					
G03	1	30X4	0.71	0	160	NL	227
	FC-NL	Speed @ HI					
Cooridor Exit	1	41x6	1.45	0	367	NL	532
	FC-NL	Speed @ HI					
G27 Stairs	1	30X4	0.71	0	62	NL	44
	FC-NL						
Lock-up	1	60X4	1.42	0	157	NL	222
	FC-NL						
Lock-up	1	60X4	1.42	0	169	NL	240

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, Basement
SUPPLY [ ] RETURN [ ] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-NL	Speed @ HI					
G14	1	NA	NA	NA	NA	NL	92
	FC-NL	Speed @ HI					
G18	1	NA	NA	NA	NA	NL	79
	FC-NL	Speed @ HI					
G18	1	NA	NA	NA	NA	NL	21
	FC-NL	Speed @ HI					
Corridor Entrance	1	NA	NA	NA	NA	NL	0
	FC-NL	Speed @ HI					
G20	1	NA	NA	NA	NA	NL	144
	FC-NL	Speed @ HI					
G03	1	NA	NA	NA	NA	NL	151
	FC-NL						
Cooridor Exit	1	NA	NA	NA	NA	NL	0
	FC-NL	Speed @ HI					
G27 Stairs	1	NA	NA	NA	NA	NL	0
	FC-NL						
Lock-Up	1	NA	NA	NA	NA	NL	83
	FC-NL						
Lock-Up	1	NA	NA	NA	NA	NL	0

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, 1st Fl.
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-4A (F)	Speed @ HI					
Employees 102	1	30X4	0.71	563	215	400	153
	FC-6A (F)	Speed @ HI					
Clerks Office 105	1	44X4	1.04	576	208	600	216
	FC-5A (F)	Speed @ HI					
Clerks Office 107	1	34X4	0.94	529	245	500	230
	FC-5A (F)	Speed @ HI					
Clerks Office 107	1	34X4	0.94	529	400	500	376
	FC-6A (R)	Speed @ HI					
Judges Office 111	1	42X4	0.99	606	264	600	261
	FC-5A (R)	Speed @ HI					
Judges Lobby 112	1	36X4	1	500	251	500	251
	FC-5A (R)	Speed @ HI					
Library Conf. 113	1	36X4	1	500	237	500	237
	FC-5A (R)	Speed @ HI					
Library Conf. 113	1	36X4	1	500	249	500	249
	FC-2A (F)	Speed @ HI					
Corridor 114	1	15X4	0.35	571	229	200	80
	FC-4A (R)	Speed @ HI					
Judges Chamber 116	1	28X4	0.78	513	371	400	289

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, 1st Fl.
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-5B (F)	Speed @ HI					
Vest. 115	1	34X4	0.94	532	252	500	237
	FC-4A (F)	Speed @ HI					
Gen. P.O. Office 120	1	34X4	0.94	424	290	400	273
	FC-4A (F)	Speed @ HI					
Gen. P.O. Office 120	1	30X4	0.94	424	238	400	224
	FC-8C (F)	Speed @ HI					
P.O. Office 122	1	62X4	1.46	548	253	800	369
	FC-8D (F)	Speed @ HI					
Conference 125	1	60X4	1.67	479	201	800	336
	FC-6A (F)	Speed @ HI					
Conference 126	1	44X4	1.04	576	235	600	244
	FC-4B (F)	Speed @ HI					
Vest. NL	1	30X4	0.71	563	300	400	213

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, 1st Fl.
SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-4A (F)	Speed @ HI					
Employees 102	1	30X4	0.71	113	138	80	98
	FC-6A (F)	Speed @ HI					
Clerks Office 105	1	44X4	1.04	96	152	100	158
	FC-5A (F)	Speed @ HI					
Clerks Office 107	1	34X4	0.94	80	189	75	178
	FC-5A (F)	Speed @ HI					
Clerks Office 107	1	34X4	0.94	80	164	75	154
	FC-6A (R)	Speed @ HI					
Judges Office 111	1	42X4	0.99	101	270	100	267
	FC-5A (R)	Speed @ HI					
Judges Lobby 112	1	36X4	1	75	292	75	292
	FC-5A (R)	Speed @ HI					
Library Conf. 113	1	36X4	1	75	275	75	275
	FC-5A (R)	Speed @ HI					
Library Conf. 113	1	36X4	1	75	272	75	272
	FC-2A (F)	Speed @ HI					
Corridor 114	1	15X4	0.35	0	146	0	51
	FC-4A (R)	Speed @ HI					
Judges Chamber 116	1	28X4	0.78	103	239	80	186

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, 1st Fl.
SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-5B (F)	Speed @ HI					
Vest. 115	1	34X4	0.94	0	177	0	166
	FC-4A (F)	Speed @ HI					
Gen. P.O. Office 120	1	34X4	0.94	85	153	80	144
	FC-4A (F)	Speed @ HI					
Gen. P.O. Office 120	1	30X4	0.94	85	180	80	169
	FC-8C (F)	Speed @ HI					
P.O. Office 122	1	62X4	1.46	55	168	80	245
	FC-8D (F)	Speed @ HI					
Conference 125	1	60X4	1.67	90	129	150	215
	FC-6A (F)	Speed @ HI					
Conference 126	1	44X4	1.04	96	193	100	201
	FC-4B (F)	Speed @ HI					
Vest. NL	1	30X4	0.71	0	172	0	122

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, 1st Fl.
SUPPLY [ ] RETURN [ ] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-4A (F)	Speed @ HI					
Employees 102	1	NA	NA	NA	NA	80	55
	FC-6A (F)	Speed @ HI					
Clerks Office 105	1	NA	NA	NA	NA	100	58
	FC-5A (F)	Speed @ HI					
Clerks Office 107	1	NA	NA	NA	NA	75	52
	FC-5A (F)	Speed @ HI					
Clerks Office 107	1	NA	NA	NA	NA	75	122
	FC-6A (R)	Speed @ HI					
Judges Office 111	1	NA	NA	NA	NA	100	66
	FC-5A (R)	Speed @ HI					
Judges Lobby 112	1	NA	NA	NA	NA	75	41
	FC-5A (R)	Speed @ HI					
Library Conf. 113	1	NA	NA	NA	NA	75	38
	FC-5A (R)	Speed @ HI					
Library Conf. 113	1	NA	NA	NA	NA	75	53
	FC-2A (F)	Speed @ HI					
Corridor 114	1	NA	NA	NA	NA	0	23
	FC-4A (R)	Speed @ HI					
Judges Chamber 116	1	NA	NA	NA	NA	80	103

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: FC's, 1st Fl.
SUPPLY [ ] RETURN [ ] OUTSIDE AIR [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	FC-5B (F)	Speed @ HI					
Vest. 115	1	34X4	0.94	NA	NA	0	71
	FC-4A (F)	Speed @ HI					
Gen. P.O. Office 120	1	NA	NA	NA	NA	80	93
	FC-4A (F)	Speed @ HI					
Gen. P.O. Office 120	1	NA	NA	NA	NA	80	55
	FC-8C (F)	Speed @ HI					
P.O. Office 122	1	NA	NA	NA	NA	89	124
	FC-8D (F)	Speed @ HI					
Conference 125	1	NA	NA	NA	NA	150	121
	FC-6A (F)	Speed @ HI					
Conference 126	1	NA	NA	NA	NA	100	43
	FC-4B (F)	Speed @ HI					
Vest. NL	1	NA	NA	NA	NA	0	91

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

FAN DATA SHEET

	FAN NO. EF-1		FAN NO. EF-2	
Serves / Location:	Employee Room	Roof	Toilets	Roof
Manufacturer:	Greenheck		Greenheck	
Model Number:	G-75 (2RB53)		G-075-DGEX-QD	
Size:	NL		NL	
Serial Number:	12951646 1207		01D04377	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	FASCO	NL	FASCO
Frame Number:	NL	NL	NL	NL
Horsepower:	1/25	1/25	1/12	1/25
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	115/1	120	115/1	120
Motor Amperage:	NL	1	1.3	1
Motor RPM:	1050	DIRECT DRIVE	1050	DIRECT DRIVE
Speeds:	60HZ	DIRECT DRIVE	60HZ	DIRECT DRIVE
Heater Size:	NA	NA	NA	NA
Heater Amps.:	NA	NA	NA	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	200	35	320	319
Outside Air CFM:				
Suction Pressure:	0.375	-0.12	0.5	-0.2
Discharge Pressure:		0.11		0.11
Fan Static Pressure:		NA		NA
External Pressure:		0.23		0.31
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE
Motor Drive:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE
Motor Size/Bore:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE
Fan Drive:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE
Fan Size/Bore:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE
Belt Size / Number:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE
Shafts C-C:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE
Turns Open:	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE	DIRECT DRIVE

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: EF-1 & EF-2

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-1						
Employees 102	1	8X8	FH	NA	NA	200	35
	EF-2						
Mens 103	1	12X6	FH	NA	NA	130	137
Mens 103	2	12X6	FH	NA	NA	130	117
Toilet	3	8X8	FH	NA	NA	60	65
					TOTAL:	320	319

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

FAN DATA SHEET

	FAN NO. EF-3		FAN NO. EF-4	
Serves / Location:	Mechanical	Roof	Toilets	Roof
Manufacturer:	Greenheck		Greenheck	
Model Number:	G-85 (G-090-DGEX-QD)		GB-080-4X-QD-R2	
Size:	NL		NL	
Serial Number:	12951646 1207		01D04377	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	DAYTON	NL	FASCO
Frame Number:	NL	NL	NL	NL
Horsepower:	1/12	1/20	1/4	1/4
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	NL
Volts/Phase:	115/1	113	115/1	120
Motor Amperage:	3	2.7	4.1	3.6
Motor RPM:	1550	NA	1725	1697
Speeds:	60HZ	DIRECT DRIVE	60HZ	BELT
Heater Size:	NA	NA	NA	NA
Heater Amps.:	NA	NA	NA	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	300	376	400	380
Outside Air CFM:				
Suction Pressure:	0.5	-0.24	0.5	-0.25
Discharge Pressure:		0.14		0.11
Fan Static Pressure:		NA		NA
External Pressure:		0.28		0.36
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	DIRECT DRIVE	DIRECT DRIVE	NL	1442
Motor Drive:	DIRECT DRIVE	DIRECT DRIVE	NL	VP25
Motor Size/Bore:	DIRECT DRIVE	DIRECT DRIVE	NL	1/2
Fan Drive:	DIRECT DRIVE	DIRECT DRIVE	NL	4" OD
Fan Size/Bore:	DIRECT DRIVE	DIRECT DRIVE	NL	3/4
Belt Size / Number:	DIRECT DRIVE	DIRECT DRIVE	NL	3L190
Shafts C-C:	DIRECT DRIVE	DIRECT DRIVE	NL	4 1/2
Turns Open:	DIRECT DRIVE	DIRECT DRIVE	NL	3

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: EF-3 & EF-4

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-3						
Mechanical (GRD)	1	10X10	0.59	508	638	300	376
	EF-4						
Womens 124	1	12X56	FH	NA	NA	170	151
Womens 124	2	12X56	FH	NA	NA	170	102
Toilet	3	8X8	FH	NA	NA	60	127
					TOTAL:	400	380

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

FAN DATA SHEET

	FAN NO. EF-5		FAN NO. EF-6	
Serves / Location:	Courtroom 109	Roof	Cells	Roof
Manufacturer:	Greenheck		Greenheck	
Model Number:	GB-90-4XQD-R2		GB-101-4X-QD-R3	
Size:	NL		NL	
Serial Number:	01I17137		01H18435	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	FASCO	NL	FASCO
Frame Number:	NL	NL	NL	NL
Horsepower:	1/4	1/4	1/4	1/4
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	115/1	120	115/1	120
Motor Amperage:	4.1	3.2	4.1	3.5
Motor RPM:	1725	1702	1725	1712
Speeds:	60HZ	BELT	60HZ	BELT
Heater Size:	NA	NA	NA	NA
Heater Amps.:	NA	NA	NA	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	600	549	710	308
Outside Air CFM:				
Suction Pressure:	0.5	-0.28	0.5	-0.17
Discharge Pressure:		0.16		0.1
Fan Static Pressure:		NA		NA
External Pressure:		0.34		0.27
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	1709	NL	1555
Motor Drive:	NL	VP25	NL	VP25
Motor Size/Bore:	NL	1/2	NL	1/2
Fan Drive:	NL	4" OD	NL	4" OD
Fan Size/Bore:	NL	3/4	NL	3/4
Belt Size / Number:	NL	3L190	NL	3L190
Shafts C-C:	NL	4 1/2	NL	4 1/2
Turns Open:	NL	3	NL	3

Comments:

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

AIR DISTRIBUTION

SYSTEM: EF's

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-5						
Courthouse 109	1	30X18	2.98	201	172	600	549
Toilet	EF-6						
Toilet	1	8x8	FH	NA	NA	60	83
Lock-Up	2	20x14	FH	NA	NA	180	17
Lock-Up	3	10x6	FH	NA	NA	100	42
Lock-Up	4	10x16	FH	NA	NA	100	62
Lock-Up	5	10x16	FH	NA	NA	100	76
Lock-Up	6	10x16	FH	NA	NA	150	18
Lock-Up	7	10x16	FH	NA	NA	150	10
					TOTAL:	840	308 *1

Comments: *1 **Schedule Design 710 CFM.**

Project: Milford District Court
Address: 161 West St. Milford, MA
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FAN DATA SHEET

	FAN NO. EF-7		FAN NO. EF-8	
Serves / Location:	Toilets	Roof	Lobby	Roof
Manufacturer:	Greenheck		Greenheck	
Model Number:	GB-080-4X-QD-R2		GB-080-4X-QD-R2	
Size:	NL		NL	
Serial Number:	01I13391		01I13391	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	FASCO	NL	FASCO
Frame Number:	NL	NL	NL	NL
Horsepower:	1/4	1/4	1/4	1/4
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	115/1	*1	115/1	120
Motor Amperage:	4.1	*1	4.1	3.8
Motor RPM:	1725	*1	1725	1733
Speeds:	Single Speed	*1	Single Speed	
Heater Size:	NA	NA	NA	NA
Heater Amps.:	NA	NA	NA	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	240	*1	300	272
Outside Air CFM:				
Suction Pressure:	0.5		0.5	-0.12
Discharge Pressure:				0.12
Fan Static Pressure:				NA
External Pressure:				0.24
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	*1	NL	1573
Motor Drive:	NL	VP25	NL	VP25
Motor Size/Bore:	NL	1/2	NL	1/2
Fan Drive:	NL	4" OD	NL	4" OD
Fan Size/Bore:	NL	3/4	NL	3/4
Belt Size / Number:	NL	3L190	NL	3L190
Shafts C-C:	NL	4 1/2	NL	4 1/2
Turns Open:	NL	3	NL	3

Comments: ***1 Unit not operating.**

Project: Milford District Court
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AIR DISTRIBUTION

SYSTEM: EF-7 & EF-8

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-7						
Toilet 110	1	8x8	FH	NA	NA	75	*1
Toilet 117	2	8x8	FH	NA	NA	75	*1
					TOTAL:	150	*2
	EF-8						
Waiting 118	1	35x2	FH	NA	NA	75	67
Waiting 118	2	35x3	FH	NA	NA	75	67
Waiting 118	3	35x4	FH	NA	NA	75	70
Waiting 118	4	35x5	FH	NA	NA	75	68
					TOTAL:	300	272 *3

Comments: *1 **Not operating.**

*2 **Schedule Design 240 CFM.**

*3 **Schedule Design 300 CFM.**

Project: Milford District Court
Address: 161 West St. Milford, MA
Date: 4/20/2022 **Project No.** 22-182

FAN DATA SHEET

	FAN NO. EF-9		FAN NO. EF-10	
Serves / Location:			Courtroom 119	Roof
Manufacturer:	*1		Greenheck	
Model Number:	*1		GB-090-4X-QD-R2	
Size:	*1		NL	
Serial Number:	*1		01I17141	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:			NL	FASCO
Frame Number:			NL	NL
Horsepower:			1/4	1/4
Brake Horsepower:			NL	NA
Safety Factor:			NL	NL
Volts/Phase:			115/1	*2
Motor Amperage:			4.1	*2
Motor RPM:			1725	*2
Speeds:			Single Speed	
Heater Size:			NA	NA
Heater Amps.:			NA	NA
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	NL	*1	500	*2
Outside Air CFM:				
Suction Pressure:			0.5	
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:			NL	*1
Motor Drive:			NL	VP25
Motor Size/Bore:			NL	1/2
Fan Drive:			NL	4" OD
Fan Size/Bore:			NL	3/4
Belt Size / Number:			NL	3L190
Shafts C-C:			NL	4 1/2
Turns Open:			NL	3

Comments: ***1 Deleted.**

***2 Not operating.**

Project: Milford District Court
Address: 161 West St. Milford, MA
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AIR DISTRIBUTION

SYSTEM: EF-10

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
Courtroom 115	1	X *2				500	*1

Comments: *1 **Not operating, No access to diffuser above the ceiling.**

*2 **Can not access diffuser size**