Dudley District Court
Dudley, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

April 26, 2022

Tighe&Bond

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Section 1
Existing Conditions and Site Observations

Tighe & Bond visited the Dudley District Courthouse on June 24, 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 from 1970 and 2004. The 2004 mechanical drawings did not show supply and outdoor airflows for the equipment designed in 2004.

Site Visit Attendees:

- *Office of Court Management:*
  - Jason Stone, Courthouse Facilities Staff
- *Tighe & Bond*
  - Jason Urso, PE, Senior Mechanical Engineer
  - Timothy Bill, Staff Mechanical Engineer

1.1 Existing Ventilation System

The Dudley District Courthouse was constructed in 1972 and is approximately 16,800 square feet in size. The courthouse is served by three air handling units (AHU) and wall mounted packaged terminal air conditioning units (PTACs) located in perimeter spaces. Each AHU contains a supply fan, refrigerant (DX) cooling coils, and a 2" MERV 8 filter. Duct mounted electric reheat coils provide heat.

AHU-1, AHU-2, and AHU-3 appear to be from the original 1972 construction and are in poor condition. According to the original drawings, AHU-1 serves the main lobby, AHU-2 serves the main courtroom, and AHU-3 serves the holding cells. The dampers were not accessible while on site and the units were not accessible to open the access doors. The units contained 2", MERV 8 filters, which were accessible through a separate door. The rooftop condensing units serving the refrigerant cooling coils in AHU-1 and AHU-2 were replaced as part of a project completed in 2004.

The PTAC units were replaced in approximately 2004 and appear to be in good to fair condition. Some units contain ¼" metal screen filter, which possesses no MERV rating while others contain 1" filters, also without a MERV rating. The filters that were examined were very dirty, as well as the coils. There are outdoor air louvers on the perimeter walls, however the outdoor air dampers were not accessible. The 2004 design drawings do not list the quantity of outdoor air these units were designed for. According to facilities staff, the PTAC units only operate when there is a call for space heating or cooling. Ventilation air is only provided when the units are running. Facility personnel indicted some units have been replaced since 2004. There is a mix of McQuay, Islandaire, and Carrier PTAC units installed in the courthouse. We sent Islandaire one of the unit model numbers and they confirmed that the unit was equipped with a motorized outdoor air damper.

According to the drawings provided to Tighe & Bond, there are 13 exhaust fans serving the building. Roof mounted exhaust fan EF-2 serves the main public restrooms on the ground and first floor and appears to have been replaced during the 2004 project. The remaining single occupancy restrooms are served by ceiling mounted fans operated by a

light switch. According to the existing drawings, there are six ceiling mounted toilet exhaust fans. Some single occupancy restrooms contained a drop ceiling. The toilet exhaust fans were located above this ceiling, but the fan was not ducted to a grille in the toilet room. Exhaust fan EF-12, located in the ground floor mechanical room serves the holding cells.

Roof mounted exhaust fans (EF-11 and EF-13) exhaust the first floor conference rooms, and were replaced in 2004, according to existing design drawings. While on site, EF-11 was running however EF-13 was not. Exhaust fan EF-1, located on the roof, serves the courtroom and was also replaced in 2004.

Table 1 summarizes the air handling units' designed airflow rates, the MERV rating of the installed filters, and the condition of the units.

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Pre/Final Filters	Condition
AHU-1	1,400	210	2" MERV 8	Poor
AHU-2	2,000	1,000	2" MERV 8	Poor
AHU-3	600	600	2" MERV 8	Poor
PTAC Units	Unknown	Unknown	¼" Metal	Good to Fair

Photo 1 – Typical Air Handler

Photo 2 – Typical PTAC Unit

1.2 Existing Control System

According to staff, local thermostats operate the air handling equipment. 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 Dudley District Courthouse. Please refer to the "Overview of Recommendations" report for further explanation and requirements of the stated recommendations.

Building areas without adequate ventilation and filtration significantly increase the risk of spreading viruses like Coronavirus (SARS-CoV-2), especially areas with high occupant density and where people occupy the same space for relatively long periods of time. Consider significantly reducing occupancy or relocating occupants to other areas with adequate ventilation.

2.1 Filtration Efficiency Recommendations

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

RF-1: *Replace AHU 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. We also recommend that the PTAC unit filters be cleaned or replaced.

The PTAC units with 1" filters may be able to accommodate a 1" MERV 13 filter. We recommend having a TAB Contractor determine if there is a significant drop in airflow using MERV 13 filters.

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

This recommendation applies to the air handling units, not the PTAC units.

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.

2.2 Testing & Balancing Recommendations

Air handlers AHU-1, 2, and 3 are approximately 50 years old. 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.

The 2004 design drawings do not indicate the supply or outdoor airflow for the PTAC units. We recommend verifying what the total supply airflow is for all PTAC units, verify if all units provide outdoor air, and balancing them to the appropriate outdoor air flow rates. We can provide specific outdoor airflow rates for each space containing PTAC units when the units are balanced.

TABLE 2
Recommended Air Handler O.A. Flow Rates

Unit	Original Supply Airflow (CFM)	Original Design Min. O.A. (CFM)	Current Code Min. O.A. Requirements (CFM)	Recommended Minimum O.A. (CFM)
AHU-1	1,400	210	119	**210**
AHU-2	2,000	1,000	739	**1,000**
AHU-3	600	600	163 (600 for exhaust air make-up)	**600**
PTAC	Unknown	Unknown	Varies	**Varies**

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 for space served by AHU-1, 2, and 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)	87	71	16
Total Supply Air (CFM/Person)	46	28	122
Outdoor Air (CFM/Person)	21	14	48

*Table only represents ventilated spaces.

The airflow rate per person for each Courtroom 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. Courtroom 114 is served by two PTAC units, where the designed airflow rate is unknown.

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)***
Courtroom 114	49	Unknown	Unknown	Unknown	Unknown
Courtroom 116	101	2,000	20	1,000	10

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, 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)***
Courtroom 114	11	Unknown	Unknown	Unknown	Unknown
Courtroom 116	20	2,000	100	1,000	50

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 delivered to each space by the three air handlers has not been recently tested, we recommend testing the airflow rates in each room. These systems are very old and the airflow rate delivered to and returned from these spaces may no longer match the original design intent.

RTB-6: *Ensure refrigerant coils are fully charged with refrigerant.*

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

2.3 Equipment Maintenance & Upgrades

We recommend the following equipment maintenance and upgrades:

RE-1: *Test existing air handling system, including the PTAC dampers and actuators for proper operation*.

Replace dampers and actuators that are not functioning properly.

RE-2: *Clean air handler and PTAC coils and drain pans.*

2.4 Control System Recommendations

We recommend the following for the control system:

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

We recommend providing controls to add a flush sequence for all air handlers. We also recommend this for the PTAC units if they have OA dampers.

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. Refer to the "Overview of Recommendations" document for further guidance on installing portable HEPA filters.

Due to the lack of ventilation in the areas listed below, we recommend the use of portable HEPA filters or similar air purification approaches if these areas are to be occupied in the near term, until adequate ventilation is added to these areas. While all spaces benefit from additional air filtration, this measure is likely not necessary for single occupant offices.

- Interior Conference Rooms
- Holding Cell Common Area
- Juvenile Dept. - Basement

If it's discovered that some of the PTAC units are not equipped with outdoor air dampers, or are otherwise unable to provide the code-required OA volumes, we recommend adding HEPA filters to the following areas:

- Courtroom 114
- Adult Probation Officers Office - Basement
- Library
- Clerk's General Office

2.6 Humidity Control

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

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

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

2.7 Other Recommendations

2.7.1 Replace Air Handling Units

Indoor air handling units have a life expectancy of 35-45 years. Air handlers AHU-1, 2, and 3 are approximately 50 years old and are in poor condition. Consider replacing these units in the next 2-5 years. Adding unventilated spaces to the new air handling equipment should be considered. Other than adding unventilated spaces to the air handling equipment, this recommendation is an equipment maintenance measure and does not increase the indoor air quality of the building.

2.7.2 Add Ventilation to Interior Occupied Areas

Several interior rooms are not mechanically ventilated. We recommend adding a ventilation system to serve these areas or connecting them to the existing systems when the air handlers are replaced, as described in recommendation 2.7.1. The existing ductwork distribution systems may require modifications to accommodate the increased airflow.

2.7.3 Add Controls to Operate PTAC Unit Fans At All Times

If it's discovered that the PTAC units do provide outdoor air, we recommend investigating the feasibility of adding controls to these units to run the supply fan at all times during occupied hours. This will allow ventilation air to be supplied while there is no call for heating or cooling. PTAC units are typically not designed to run without heating or cooling the air, so this may cause comfort control issues.

Another option is to design an overhead dedicated outdoor air ventilation air system serving the perimeter spaces in order to provide ventilation air to these spaces.

2.7.4 Toilet Room Exhaust Fans

We recommend relocating the toilet exhaust fans isolated above the ceilings in the toilet rooms, to the lay-in ceiling. This will allow the fans to exhaust directly from the toilet room.

Disclaimer

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

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Section 3
Testing & Balancing Results

Wing's Testing & Balancing visited the Dudley District Courthouse on March 3, 2022 through March 7, 2022 to test the airflow rates of the air handling units and the toilet exhaust fans. A summary of the tested airflow and water flow rates versus the design airflow rates are shown below in Tables 5 and 6. The full testing and balancing report is attached.

TABLE 5
Air Handler Airflow Testing & Balancing Results

	Design			Actual		
Unit	**Total Supply Fan Airflow (CFM)**	**Recommended Outdoor Airflow (CFM)**	**Return Airflow (CFM)**	**Supply Fan Airflow (CFM)**	**Outdoor Airflow (CFM)**	**Return Airflow (CFM)**
AHU-1	1,400	210	1,190	1,292	220	1,072
AHU-2	2,000	1,000	1,000	2,180	988	1,192
AHU-3	600	600	0	578	578	0
AHU-4	Unknown	250	Unknown	805	0	805
PTAC (Rear Lobby)	Unknown	Unknown	Unknown	330	0	330
PTAC (Judge's Lobby)	Unknown	Unknown	Unknown	377	0	377
PTAC (Courtroom 2)	Unknown	Unknown	Unknown	626	45	571
PTAC (Assistant Clerk)	Unknown	Unknown	Unknown	368	0	368

TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	**Serving**	**Design Return/ Exhaust Airflow (CFM)**	**Actual Return/ Exhaust Airflow (CFM)**
EF-1	Court Room 1	2,000	Not Tested
EF-2	Restrooms	660	814
EF-3	Lobby	Unknown	711
EF-11	Conf. Rm	450*	488
EF-12	Lock-Up	570*	382

*Airflow information is not legible on the original design plans. This value may not be accurate.

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. AHU-1, 2 and 3 are performing within the acceptable airflow range.
2. The outside air damper actuator serving AHU-2 and AHU-3 is damaged and has been disconnected. Although the outdoor air flow rate is acceptable, we recommend replacing the actuator so the damper can close during unoccupied hours.
3. AHU-4 was discovered during the testing exercise.
    a. This unit does not appear on the original design plans provided to Tighe & Bond, therefore the design airflow rates are unknown. The unit is not providing any outdoor air to the Juvenile Courtroom due to the actuator being disconnected from the OA damper. We recommend replacing the actuator.
    b. The balancer identified the AHU-4 serves employee lunchroom, Clerk Office, Storage, General Storage, two offices, and the Juvenile Department located in the central area of the ground floor. Based on what this AHU serves, we recommend balancing the outdoor air to 250 CFM. Tighe & Bond has not field-verified the areas served by AHU-4.
4. Most PTAC units are not providing any outdoor air. We recommend investigating if these units can be connected to the outdoors and if they units can accommodate the added load of conditioning the outdoor air.
5. Exhaust fan EF-1 was not tested. The exhaust ductwork is located above sheetrock ceilings and is not accessible. The exhaust grilles are located in the ceiling, which are over 30 feet in the air and could not be tested. A lift would be required to test these grilles. We recommend installing an access door in the ceiling in order to gain access to the main exhaust duct in order to test the airflow rate. This is not an immediate action that is required.
6. The design plans that were provided to Tighe & Bond do not show an exhaust fan serving the Lobby, therefore the design airflow rate is unknown.
7. Exhaust fan EF-11 is operating within acceptable range.
8. Exhaust fan EF-12 appears to be operating above the designed airflow rate.
9. The balancer indicated that the toilet exhaust fans serving the single toilet rooms have been removed. Courthouse staff reported to the balancer that these fans are scheduled to be replaced.

WING'S TESTING & BALANCING CO., INC.

Dudley District Court
HVAC Survey

* * * *

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

March 7th, 2022

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WING'S TESTING & BALANCING CO., INC.

March 7th, 2022

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

Re: Dudley District Court / HVAC Ventilation Study

Dear Jason,

Wing's has completed the HVAC / Fresh Air Survey for the above referenced location. The results are as follows:

Initial Observations:

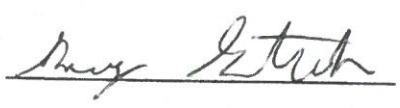
- Most PTAC units have had their inner parts replaced leaving them with no outside air ventilation.
- No water readings to take because the chilled is DX and the heat is electric reheat.
- A fourth AHU was discovered located in the basement and was tested.

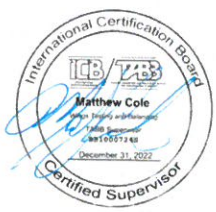
Testing Observations:

- The outside air actuator for AHU-2 has been disconnected and is set in a fixed position.
- The outside air actuator for AHU-3 has been disconnected and set open.
- The outside air actuator for AHU-4 is disconnected from the damper and is not functional.
- There is no access to the grilles or the ductwork for EF-1.
  - The grilles are located 30+ft up in the main courtroom and the duct is buried behind sheetrock ceilings.
  - The fan is operating with a good amount of air flow being discharged on the roof.
  - EF-1 is operating at full load amperage.

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

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





Barry Stratos
Certified TABB Technician
CT SM-2 License 6386
MA SM-2 13595

SUPPLY FAN REPORT

PROJECT: Dudley District Court **DATE:** 3/4/22

AREA SERVED: AHUs **TECH:** BS

FAN DATA

FAN NUMBER	AHU-1		AHU-2		AHU-3		AHU-4	
LOCATION	1st Floor Ceiling		Mechanical Room		Mechanical Room		Mechanical Room	
AREA SERVED	Main Lobby		Main Court Room		Lock-Up		Juvenille Court	
MANUFACTURER	NA		Trane		Trane		Carrier	
MODEL OR SIZE	NA		L-6		T-3		FB4ANF036	
	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL	DESIGN	ACTUAL
TOTAL CFM	1400	1292	2000	2180	600	578	ND	805
RETURN AIR	1190	1072	1000	1192	0	0	ND	805
OUTSIDE AIR	210	220	1000	988 (1)	600	578 (1)	ND	0 (2)
DISCH. STATIC	---	+0.14"	---	+0.28"	---	+0.05"	---	+0.16"
SUCTION STATIC	---	-0.34"	---	-1.19"	---	-0.30"	---	-0.58"
TOTAL STATIC	---	0.48"	---	1.47"	---	0.35"	0.35	0.72"
FAN RPM	NA	755	NA	1186	NA	734	DD	DD
PULLEY O.D.	12.0" x 1"		6.0" x 7/8"		2.25" x 1/2"		DD	
ESP	0.15		0.57		0.25		0.21	
VFD SPEED	No VFD		No VFD		No VFD		No VFD	
O.A.D.MIN POS	20%		40%		100%		100%	

MOTOR DATA

MANUFACTURER	GE		Marathon		Century		GE	
MODEL OR FR.	48Z		145T		FR48		NA	
HORSEPOWER	1/2	1/2	1 1/2	1 1/2	1/6	1/6	1/3	1/6
MOTOR RPM	3450	3450	1745	1745	1725	1725	1075	1725
VOLTAGE / PH.	115/1	115/1	208/3	208/3	115/1	115/1	208/1	115/1
AMPS LEG 1	7.4	7.4	5.5	5.5	4.0	4.5	3.1	1.9
AMPS LEG 2	---	---	---	5.5	---	---	---	---
AMPS LEG 3	---	---	---	5.5	---	---	---	---
SHEAVE O.D.	3.0" x 1/2"		4.75" x 7/8"		4.0" x 7/8"		DD	
BELTS - QUANTITY / SIZE	1/4L530		1/A46		1/3L380		DD	
SHEAVE POSITION	1/2 Open		1/2 Open		1/2 Open		DD	
C to C	14.5		16.0		14.0		---	

REMARKS

(1) Outside air damper is disconnected from the actuator and in a fixed position. The actuator is burnt out and needs replacing.

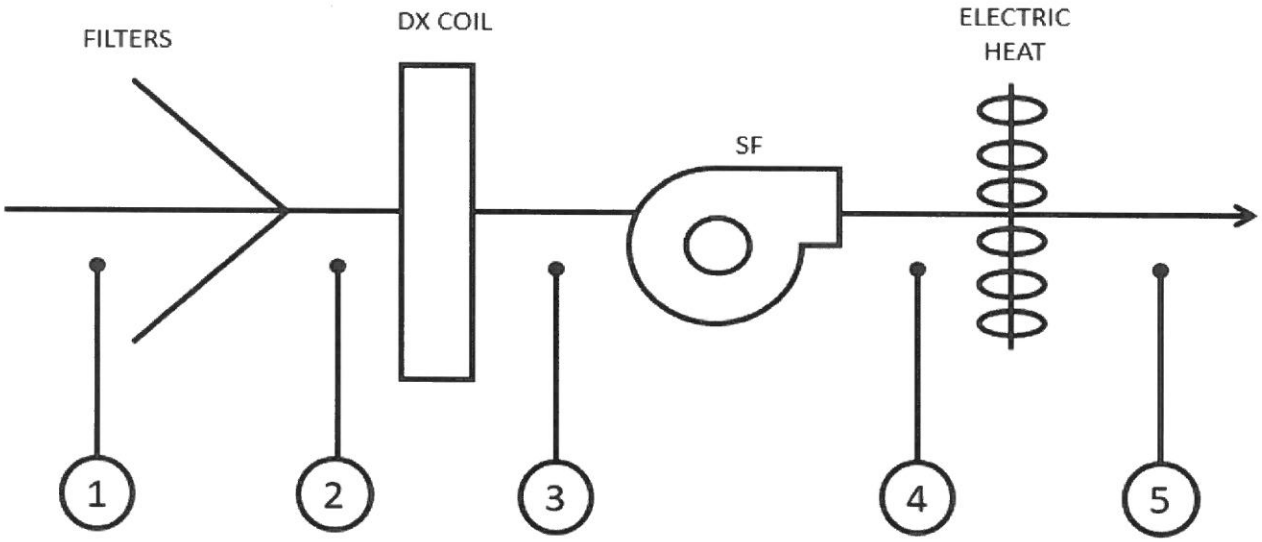
(2) O.A. actuator disconnected and not fucntional. Needs replacing.

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement

SYSTEM STATIC PRESSURE PROFILE

PROJECT: Dudley District Court **DATE:** 3/4/22

SYSTEM/AREA: AHUs **TECH:** BS



UNIT	1	2	3	4	5	6	7	8	NOTES
AHU-1	-0.03"	-0.11"	-0.34"	+0.14"	+0.12"				
AHU-2	-0.31"	-0.51"	-1.19"	+0.28"	+0.26"				
AHU-3	-0.17"	-0.19"	-0.58"	+0.16"	+0.14"				

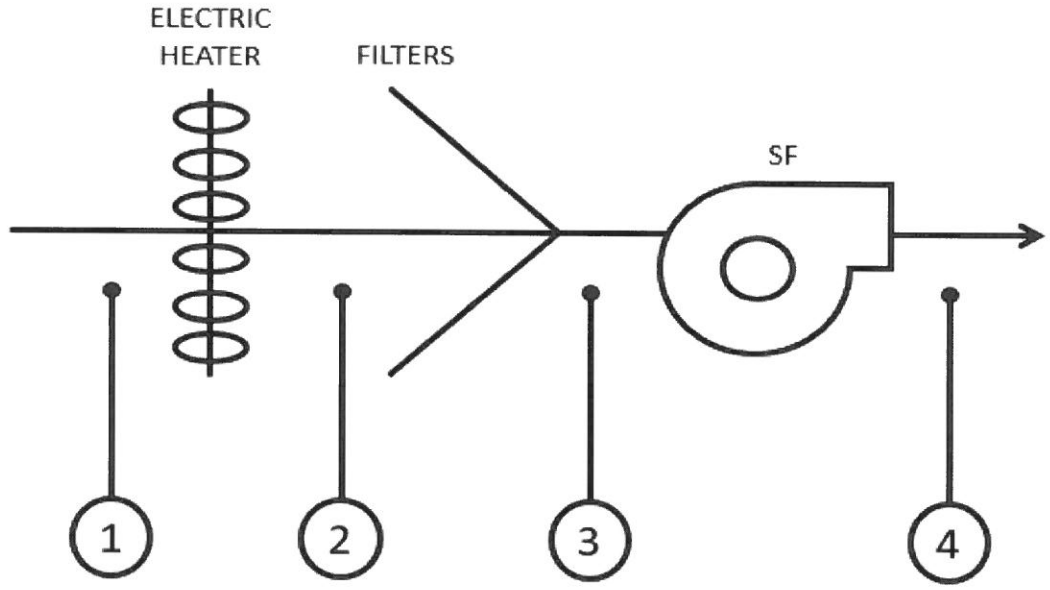
REMARKS

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement

SYSTEM STATIC PRESSURE PROFILE

PROJECT: Dudley District Court **DATE:** 3/3/22

SYSTEM/AREA: AHU-3 **TECH:** BS



UNIT	1	2	3	4	5	6	7	8	NOTES
AHU-3	-0.20"	-0.25"	-0.30"	+0.05"					

REMARKS

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement

AIR DEVICE REPORT

PROJECT: Dudley District Court **DATE:** 3/7/22

SYSTEM / AREA: AHUs and EFs **TECH:** BS

LOCATION	NO.	SIZE	A K	DESIGN		TEST		FINAL		NOTES
				FPM	CFM	FPM	CFM	FPM	CFM	
AHU-1										
Supply										
Lobby	1	9" x 9"	FH	---	ND	---	223			
Lobby	2	9" x 9"	FH	---	ND	---	188			
Lobby	3	48" x 4"	FH	---	ND	---	200			
Lobby	4	48" x 4"	FH	---	ND	---	214			
Lobby	5	48" x 4"	FH	---	ND	---	234			
Lobby	6	48" x 4"	FH	---	ND	---	231			
							1292			
Return										
Lobby	1	36" x 16"	4.0	298	1190	268	1072			
AHU-3										
Supply										
Cell 1	1	7" x 5"	0.21	---	ND	261	55			
Cell 2	2	7" x 5"	0.21	---	ND	259	54			
Cell 3	3	7" x 5"	0.21	---	ND	100	21			
Cell 4	4	24" x 6"	0.85	---	ND	413	351			
Cell 5	5	11" x 5"	0.32	---	ND	300	97			
							578			
EF-11										
112	1	12" x 6"	0.43	---	ND	363	156			
113	2	12" x 6"	0.43	---	ND	470	202			
DA's Office	3	12" x 6"	0.43	---	ND	302	130			
							488			
EF-12										
Cell 1	1	7" x 5"	0.21	---	ND	134	28			
Cell 2	2	7" x 5"	0.21	---	ND	139	29			
Cell 3	3	7" x 5"	0.21	---	ND	253	53			
Cell 4	4	24" x 6"	0.85	---	ND	236	201			
Cell 5	5	11" x 5"	0.32	---	ND	222	71			
							382			

REMARKS

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement

VELOCITY PRESSURE READINGS

PROJECT: Dudley District Court **DATE:** 3/7/22

AREA SERVED: AHUs **TECH:** BS

TRAVERSE LOCATIONS	DUCT SIZE "	AREA SQ.FT.	DESIGN		CENT. STAT. PRESS."	TEST		NOTES
			FPM	CFM		FPM	CFM	
AHU-2								
Total	32" x 14"	3.11	643	2000	+0.28"	701	2180	
Return	22" x 16"	2.44	410	1000	-0.21"	488	1192	
O.A.				1000	Calculated		988	
AHU-4								
Total	18" x 10"	1.25	---	ND	-0.17"	644	805	

REMARKS

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement

SUPPLY FAN REPORT

PROJECT: Dudley District Court **DATE:** 3/7/22

AREA SERVED: PTACs **TECH:** BS

FAN DATA								
FAN NUMBER	PTAC		PTAC		PTAC		PTAC	
LOCATION	Rear Lobby		Judge's Lobby		Courtroom #2		Assistant Clerk	
AREA SERVED	Rear Lobby		Judge's Lobby		Courtroom #2		Assistant Clerk	
MANUFACTURER	Island Air		McQuay		Adarondac Aire		Island Aire	
MODEL OR SIZE	EZ15A2KFA		PKAHS.1.0.12		CEC125BOC		EZ15A2KAIS	
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	ND	330	ND	377	ND	626	ND	368
RETURN AIR	ND	330	ND	377	ND	571	ND	368
OUTSIDE AIR	ND	0 (1)	ND	0 (1)	ND	45 (2)	ND	0 (1)
DISCH. STATIC	---	+0.05"	---	+0.04"	---	+0.04"	---	+0.05"
SUCTION STATIC	---	-0.04"	---	-0.04"	---	-0.04"	---	-0.04"
TOTAL STATIC	---	0.09"	---	0.08"	---	0.08"	---	0.09"
FAN RPM	DD	DD	DD	DD	DD	DD	DD	DD
PULLEY O.D.	DD		DD		DD		DD	
ESP	---		---		---		---	
VFD SPEED	No VFD		No VFD		No VFD		No VFD	
O.A.D.MIN POS	(1)		(1)		(2)		(1)	

MOTOR DATA								
MANUFACTURER	NA		NA		NA		NA	
MODEL OR FR.	NA		NA		NA		NA	
HORSEPOWER	1/5	1/5	0.16	0.16	1/2	1/2	1/5	1/5
MOTOR RPM	1075	1075	175	175	1075	1075	1075	1075
VOLTAGE / PH.	230/1	230/1	230/1	230/1	230/1	230/1	208/1	208/1
AMPS LEG 1	0.73	0.5	0.43	0.4	3.6	2.2	0.73	0.5
AMPS LEG 2	---	---	---	---	---	---	---	---
AMPS LEG 3	---	---	---	---	---	---	---	---
SHEAVE O.D.	DD		DD		DD		DD	
BELTS - QUANTITY / SIZE	DD		DD		DD		DD	
SHEAVE POSITION	DD		DD		DD		DD	
SPEED	NA		High		NA		High	

REMARKS

(1) Unit does not have outside air to it.

(2) O.A. is a fctory setpoint and it's not adjustable.

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement

EXHAUST FAN REPORT

PROJECT: Dudley District Court **DATE:** 3/3/22

AREA SERVED: Exhaust Fans **TECH:** BS

FAN DATA

FAN NUMBER		EF-1	EF-02	EF-3	EF-11	EF-12
LOCATION		Roof	Roof	Roof	Roof	Mechanic Rm
AREA SERVED		Court Room 1	Restrooms	Lobby	Conference Room	Lock-Up
MANUFACTURER		Greenheck	Greenheck	Greenheck	Greenheck	Trane
MODEL OR SIZE		GB-091-4	GB-081-6	GB-071-6	GB-081-6	UIOF2-FC
TOTAL CFM	DESIGN	ND	ND	ND	ND	ND
	ACTUAL	(1)	814	711	488	382
FAN RPM	DESIGN	NA	NA	NA	NA	NA
	ACTUAL	1488	1367	1333	1118	607
PULLEY	O.D.	3.75" x 3/4"	3.25" x 3/4"	3.0" x 3/4"	3.75" x 3/4"	6.5" x 1"
SERVICE		NA	1.15	1.15	1.15	1.25

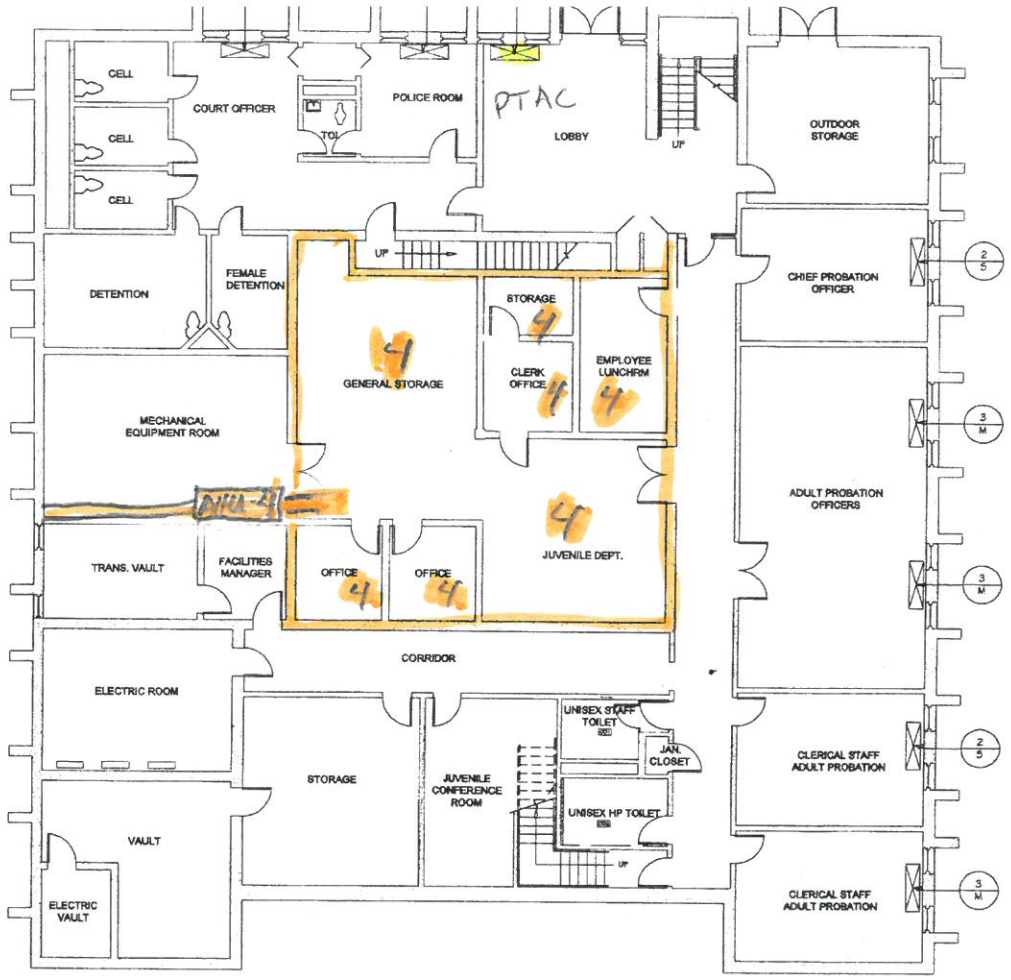
MOTOR DATA

MANUFACTURER		Fasco	Marathon	Marathon	Marathon	GE
MODEL NUMBER		NA	48Z	48Z	48Z	FR48
MOTOR HP	DESIGN	Y4	1/6	1/6	1/6	1/5
	ACTUAL	1/4	1/6	1/6	1/6	1/5
MOTOR RPM		1725	1725	1725	1725	1725
VOLTAGE/PHASE		115/1	115/1	115/1	115/1	115/1
MOTOR AMPS	DESIGN	4.1	3.9	3.9	3.9	3.9
	ACT. LEG 1	4.2	3.7	3.6	3.2	3.1
	ACT. LEG 2	---	---	---	---	---
	ACT. LEG 3	---	---	---	---	---
SHEAVE		2.75" x 1/2"	2.75" x 1/2"	2.5" x 1/2"	2.5" x 1/2"	3.25" x 1/2"
BELTS - QUANTITY/SIZE		1/4L220	1/4L200	1/4L200	1/3480	1/4L320
SHEAVE POSITION		Fully closed	Fully closed	3/4 Closed	1/2 Open	1/2 Open
C to C		5.5	4.75	5.5	4.5	9.0

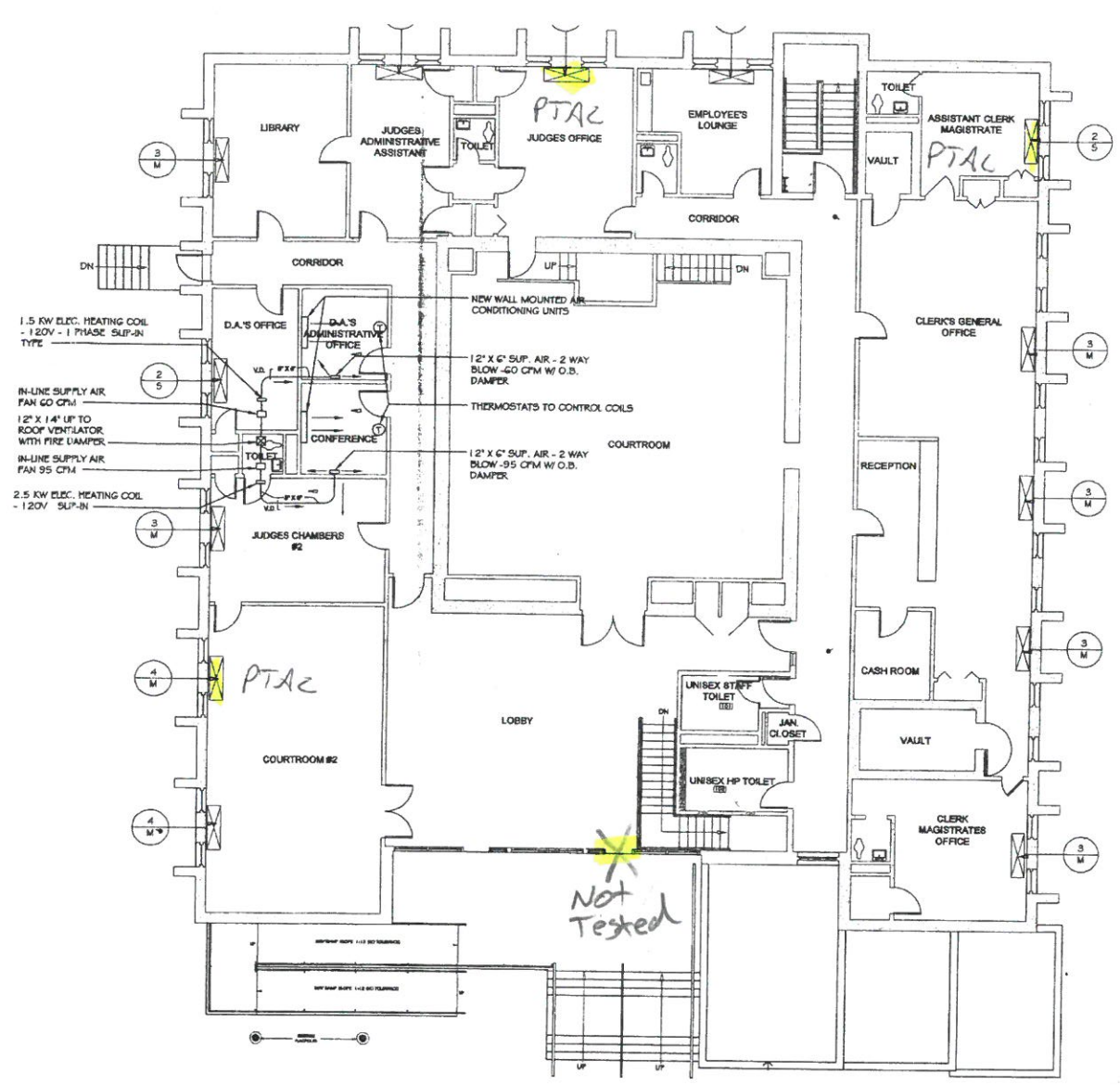
REMARKS

(1) There is no access to either the ductwork orthe grilles to this fan. The grilles are 30+ ft up in the main courtroom and the ductwork is burried behind sheetrocked celings.

NA Not Available | **ND** No Design | **DD** Direct Drive | **N/R** No Requirement



RENOVATED HVAC GROUND FLOOR PLAN
SCALE: 1/8" = 1'-0"



RENOVATED HVAC FIRST FLOOR PLAN
SCALE: 1/8" = 1'-0"

SCHEDULE OF ELECTRIC HEATING & AIR CONDITIONING UNITS

MARK	MANUFACTURER & CATALOG NUMBER	HEATING WATTS	MOTORS (COOLING)	VOLTS & PHASE	BTUH HEATING	BTUH COOLING	MOUNTING	REMARKS	NOTES
1/S	REMINGTON - EK09F5	2460 W	1 HP - 60 W & 304 W	208V - 1 PHASE	8,400	9,000	SAME AS EXISTING	SAME CONTROL AS EXISTING UNIT	
2/S	REMINGTON - EK11F5	2460 W	1 1/4 HP - 80 W & 304 W	〃	8,470	11,700	〃	〃	SEE NOTE #1
3/M	REMINGTON - EK14F5	3360 W	1 1/2 HP 90 W & 347 W	〃	11,470	14,100	〃	〃	〃
3/L	REMINGTON - EK14L5	4500 W	1 1/2 HP 90 W & 347 W	〃	15,370	14,100	〃	〃	〃
4/M	REMINGTON - EC25	7200 W	2 HP 215 W & 458 W	〃	24,600	21,000	〃	〃	〃

NOTES:
#1. FURNISHED WITH POSITIVE PRESSURE VENTILATION
#2. ALL NEW UNITS SHALL HAVE THE SAME CONTROL SEQUENCE AS THE EXISTING UNITS
#3. S= SMALL HEATING COIL, M= MEDIUM & L= LARGE COIL

HEATING & VENTILATING LEGEND

SYMBOLS USED ARE INDICATED BY A CHECK ☑

	HEATING SUPPLY LINE
	HEATING RETURN LINE
✓	THERMOSTAT
	BALANCE VALVE
	GATE VALVE
	GLOBE VALVE
	CONTROL VALVE
	AIR VENT VALVE
	MIXING VALVE
	CHECK VALVE
	AQUASTAT
	TRAP
✓	SUP. SUPPLY
	RET. RETURN
✓	F.A. FRESH AIR
	B.R. BOTTOM REGISTER
	C.R. CEILING REGISTER
	H.R.R. HIGH WALL REGISTER
✓	V.D. VOLUME DAMPER
✓	F.D. FIRE DAMPER
	C.U.H. CABINET UNIT HEATER
	U.H. UNIT HEATER
	U.V. UNIT VENTILATOR
	CIRCULATOR

CALED NORTH

NOTE:
1. THE CONTRACTOR IS RESPONSIBLE FOR VERIFYING ALL DIMENSIONS, AND NOTIFYING THE ARCHITECT OF ANY AND ALL DISCREPANCIES OF SAME PRIOR TO THE COMMENCEMENT OF CONSTRUCTION.
2. ALL DRAWINGS ARE DIAGRAMMATIC, AND ARE NOT TO BE SCALED FOR MEASUREMENTS.

REVISIONS

NO.	DESCRIPTION	DATE

PROJECT TRC0013 CONTRACT NO. HC1
ROOF, AC UNITS, AND PARKING IMPROVEMENTS - DUDLEY DISTRICT COURTHOUSE

THE COMMONWEALTH OF MASSACHUSETTS
DIVISION OF CAPITAL ASSET MANAGEMENT
ADMINISTRATIVE OFFICE OF TRIAL COURT

H.V.A.C. RENOVATED FLOOR PLANS

THE OFFICE OF ALLEN M. LIEB ARCHITECTS, P.C. LTD. ARCHITECTS
45 GLEN STREET, BUILDING B LYNNFIELD, MA 01940
N.P. LAURENCE ASSOCIATES, INC.
113 WEST MAIN STREET, NORTHBOROUGH, MA 01532-1995

DRAWING NO.

DRAWN: