Orleans District Court
Orleans, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

November 29, 2021

Tighe&Bond

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Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the Orleans District Court on February 11, 2021. While on site we inspected the ventilation equipment located around the building, and toured the facility to determine if the spaces generally matched usages noted on the architectural plans.

Site Visit Attendees:

- *Office of Court Management:*
  - District Court Facilities Staff
- *Tighe & Bond*
  - Todd Holland, PE, Senior Mechanical Engineer
  - Matt Mancini, Staff Mechanical Engineer

1.1 Existing Ventilation System

The Orleans District Court is a single-story building constructed in 1971 and is approximately 21,000 square feet in size. McQuay unit ventilators provide heating, cooling, and were designed to provide ventilation air to the building. There are 21 units on the first floor, and 12 units in the basement. Each unit contains a supply fan, single-row water coil, and a 1" thick MERV-7 filter. Perimeter units have an outdoor air (OA) damper that connects to an exterior louver. Nine units are on interior walls and have no OA intake. The original design intent seemed to provided ventilation air only in perimeter rooms and was drawn through interior spaces by the exhaust systems. Ventilating interior spaces via this method is not acceptable per current code requirements.

Photo 1 – Representative Unit Ventilator

All units appear to be from the original construction in 1971 and are in poor condition. The OA dampers and actuators do not appear to be functional.

Photo 2 – Non-Functional Outdoor Air Damper

A conditions assessment report, dated March 1980, noted that the systems were in "good condition with local temperature control" and noted "no operational problems". However, it also mentioned that it "may be possible to reduce minimum outside air quantities". This was a common, but often ill-advised energy conservation measure during that period, and appears to have been implemented. Many of the OA intake louvers are boarded up with plywood, leaving only a small gap at the bottom. We do not know if these intakes were boarded up to address other issues, such as coil freezing, wind-driven rain, or excessive indoor humidity in summer.

Photos 3 and 4 – Outdoor Air Intakes Boarded Over

The 1980 report also noted that expansion joints in the concrete were not sealed and subject to air infiltration.

The lockup area is served by roof-mounted exhaust fans connected to grilles over the toilets in each of the holding cells. While the exhaust airflow rates noted in the design drawings appear to meet code, there does not appear to be a dedicated source of makeup air for the area.

The unit ventilators are on a two-pipe loop, switched between heating in winter and cooling in summer. A modular gas-fired hydronic boiler with six sections and atmospheric combustion, rated for 1.76 million Btu/hr output, provides hot water to the unit ventilators and unit heaters.

A 70-ton air cooled chiller, located on grade in the parking lot, provides chilled water in summer. This unit was installed in 1996 and is reported to have marginal capacity to cool the building in peak conditions. The chiller is beyond its expected service life of 20 years and uses R-22 refrigerant, which has been phased out of production.

One small (3/4 ton) mini-split heat pump serves a break room on the basement level.

Facilities personnel noted that the building has problems with high humidity in summer, and mold growth on the basement level. Most areas have a portable scrubber unit and an industrial dehumidifier in the space. Because of the noise they make, these units are switched on by cleaning personnel in the evening and turned off by facilities personnel when they arrive in the morning.

Two central exhaust fans that were not operational at the time of our visit. One is dedicated to Courtroom 1, and the other serves Courtroom 2, the Juvenile Courtroom, and 12 other spaces on the basement level.

Table 1 summarizes the unit ventilators' designed airflow rates, the MERV rating of the installed filters, and the condition.

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Pre/Final Filters	Condition
UV-A	300	75	MERV-7	Poor
UV-B	400	100	MERV-7	Poor
UV-C	600	300	MERV-7	Poor
UV-D	800	400	MERV-7	Poor
UV-E	1,000	250-300	MERV-7	Poor
UV-F	1,200	600	MERV-7	Poor

1.2 Existing Control System

A Powers pneumatic system controls the existing HVAC equipment. The compressor, air dryer, and distribution system appear to be in good condition, and we observed no major air leaks. However, this 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 the Orleans District Court.

Many of the exhaust fans, including the two largest systems that serve courtrooms and staff areas, are not operational. It is not known to Tighe & Bond whether this is due to control or equipment maintenance issues.

Section 2
Recommendations

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

Building areas without adequate ventilation and filtration significantly increase the risk of spreading viruses like COVID-19, 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.

The Orleans District Court appears to have little or no mechanical ventilation. The only operational exhaust fans serve the holding cells and large toilet rooms. Other areas, including the courtrooms, conference rooms, offices, and small toilet rooms, have inadequate or nonexistent mechanical ventilation.

2.1 Filtration Efficiency Recommendations

Since the unit ventilators are currently supplying inadequate ventilation and have MERV-7 filters that cannot be upgraded to MERV-13, we recommend using air cleaning devices that are discussed in Section 2.5.

2.2 Testing & Balancing Recommendations

The unit ventilators are approximately 50 years old and it is unknown to Tighe & Bond if they were ever tested and balanced. Also, the code requirements to determine the outdoor air flow rates that were used to design the original system are likely very 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 unit ventilator supply air and minimum outdoor air flow rates.*

> We recommend testing and balancing the outdoor air flow rates for all unit ventilators units to the recommended minimum O.A. rates listed in Table 2, or to the O.A. rates on the original design drawings. We also recommend investigating why the outdoor air intakes were covered over to begin with. If it was to address coil freeze or wind-driven rain problems, the solution may be different than if it was simply an energy conservation measure.

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)
UV-A	300	75	40	**75**
UV-B	400	100	70	**100**
UV-C	600	300	75	**150**
UV-D	800	400	275	**275**
UV-E	1,000	250-300	140	**250**
UV-F	1,200	600	184	**300**

Note: Although the ASHRAE Position Document on Infectious Aerosols recommends using the latest published standards and codes as a baseline for minimum ventilation, the mechanical code in effect at the time the HVAC systems were designed and constructed is what governs the required outdoor air flowrate for the HVAC equipment, if there have been no additions, renovations, alterations or changes in occupancy to the building. The 2015 International Mechanical Code does not prevent the continued use of existing systems.

The six sizes of unit ventilators in Table 2 show the O.A. flow rates shown on the original design drawings. Typically, the O.A. flow rates are 25% of the total supply, and 50% for units serving courtrooms. We are recommending 25% O.A. across the board, except for the 800-cfm unit that serves the Juvenile Courtroom, which must be slightly higher to meet code, but not as high as the original 50%.

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 the spaced with mechanical ventilation. 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)	253	176	77
Total Supply Air (CFM/Person)	99	50	214
Outdoor Air (CFM/Person)	12	8	20

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 rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4
Airflow Rate per Person (Full Occupancy)

		Total Air		*Outdoor Air*	
Courtroom	***Total People***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outdoor Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Deliberation Rm.	11	400	36	68	6
Courtroom 1	157	6,000	38	919	6
Courtroom 2	47	2,000	43	275	6
Juvenile Courtroom	47	800	17	275	6

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. At times when the supply airflow is reduced due to the space temperature being satisfied, the airflow rate per person will also be reduced.

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 Deliberation Rm.	3	400	133	68	23
Courtroom 1	26	6,000	231	919	35
Courtroom 2	9	2,000	222	275	31
Juvenile Courtroom	8	800	100	275	34

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 outlets.*

We recommend testing all exhaust systems and grilles serving holding cells, toilet rooms, courtrooms, and other areas.

RTB-6: *Test and balance all unit ventilator chilled and hot water coils.*

Testing and balancing the dual-temperature 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 condition 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 unit ventilator dampers and actuators for proper operation*.

Repair or replace dampers and actuators that are not functioning properly.

RE-2: *Clean unit ventilator coils and drain pans.*

RE-5: *Install freeze stats on each unit ventilator.*

RE-7: *Test the existing unit ventilator dual-temperature coil 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 unit ventilators 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

Because the unit ventilators cannot have their filters upgraded to MERV-13, we recommend the following:

RFC-1: *Install portable HEPA filters.*

If the Orleans District Court is to continue to operate at any capacity, we recommend installing portable HEPA filters in all occupied areas. They should also be deployed in courtrooms, depending on the occupancy and how much noise is generated. The noise levels will vary depending on the manufacturer, and how many are required for each space. According to EPA guidelines, units should be sized to provide 5 air changes per hour (ACH) airflow.

This would have the added benefit of taking the place of the large portable air scrubbers, which are too noisy to be run during occupied hours. Below is a list of specific areas where we recommend placing portable HEPA filtration units, including offices if those spaces are regularly occupied by more than one person. If any of these spaces have only a single occupant, a HEPA filter is not needed.

- Courtroom 1
- Courtroom 2
- Jury Deliberation Rm
- Juvenile Courtroom
- Juvenile Probation
- Probation Office
- Clerk Magistrate
- Magistrate's Offices
- Judge's Lobbies (3)
- Court Clinic
- Main Lobby
- Staff Lounge
- Court Officers
- DA Witness Office
- Maintenance

RFC-2: *Install Bipolar Ionization.*

If the unit ventilators are not replaced and cannot be made to provide adequate OA capacity, we recommend installing bipolar ionization (BI) units. Bipolar ionization units charge airborne particles causing them to agglomerate and increase in size, and then fall to the floor. One benefit is that ions work to purify the supply air and continue to work in the space. It is not necessary to bring all the air back to the unit, as with an air filter.

The CDC's position on bipolar ionization is "Relative to other air cleaning and disinfecting technologies, bipolar ionization has a less documented track record in regard to cleaning/disinfecting large and rapidly moving volumes of moving air within heating, ventilation, and air conditioning systems. This is not to imply that the technology doesn't work as advertised, only that in the absence of an established body of evidence reflecting proven efficacy under as-used conditions, the technology is still considered by many to be an 'emerging technology'."

2.6 Humidity Control

We recommend that the Orleans District Court continue to deploy portable dehumidifiers and attempt to keep relative humidity in the space below 60% RH in summer. This is consistent with recommendations to limit the transmissibility of airborne pathogens such as coronavirus.

2.7 Other Recommendations

2.7.1 Repair or Replace Exhaust Fans

The exhaust fans that serve the courtrooms and ancillary offices were not operating at the time of our visit. We were unable to determine if this was due to control, electrical, or mechanical issues. These fans are an important part of the ventilation scheme, should be brought back online, and scheduled according to the recommendation in Section 2.4.

2.7.2 Replace Unit Ventilators

The unit ventilators are well beyond their expected service life of 20 years and are in poor condition. New unit ventilators have more efficient electronically-commutated motors, have much quieter fans, and can use MERV-13 filters. We also recommend providing mechanical ventilation to all interior zones.

2.7.3 Remove or Replace Covers on Outdoor Air Intakes

In order to achieve the proper amount of outdoor ventilation air for the unit ventilators, it may be necessary to remove some the restrictive covers added to the exterior louvers over the years. We recommend replacing these covers and adding hoods if there has been a problem with wind-driven rain entering the unit ventilators.

2.7.4 Provide Ventilation Air for Holding Area

The holding cells are served by exhaust fans, but there does not appear to be a source of conditioned makeup air, other than pulling from adjacent office spaces. Tighe & Bond recommends installing a dedicated makeup air unit to provide conditioned ventilation air for the cells, corridor, and support offices.

2.7.5 Install a Building Management System

If the HVAC systems servicing this building are replaced, we recommend replacing the pneumatic control system with a Building Management System to control and monitor HVAC equipment. Pneumatic air systems are antiquated and do not offer the same benefits as a BMS. This recommendation is an energy saving and maintenance measure, and only affects the indoor air quality of the building insofar as the ability to better schedule starting and stopping the ventilation systems, and to monitor alarms if they stop functioning correctly.

2.7.6 Caulk and Seal Air Leakage in Building Envelope

The conditions assessment from March 1980 noted that expansion joints in the concrete were not sealed and subject to air infiltration. Tightening up the building envelope, by insulating and air sealing, should also be considered. A blower door test can quantify how leaky the building is relative to similar structures, and help identify the major leaks. Plugging these leaks will increase energy efficiency, improve thermal comfort and IAQ, and allow the ventilation systems to work as designed.

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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Section 3
Testing & Balancing Results

Wing's Testing & Balancing Co. visited the Orleans District Courthouse on November 12, 2021 to test the airflow rates of the unit ventilators 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)**
UV-C Room M24	600	150	450	**455**	**228**	**227**
UV-B Room M27	400	100	300	**332**	94	**236**
UV-F Room M30	1,200	300	900	**739**	**243**	**496**
UV-F Courtroom 1	1,200	300	900	**N/A[1]**	**N/A[1]**	**N/A[1]**
UV-F Courtroom 1	1,200	300	900	**727**	**435**	**292**
UV-F Courtroom 1	1,200	300	900	**294**	**249**	**0[2]**
UV-F Courtroom 1	1,200	300	900	**647**	**447**	**200**
UV-F Courtroom 1	1,200	300	900	**702**	**257**	**445**
UV-C Judge Room M4	600	150	450	580	**104[3]**	476
UV-E Courtroom 2	1,000	250	750	**832**	**165**	**667**
UV-E Courtroom 2	1,000	250	750	**874**	**292**	**582**
UV-B Judge Room M19	400	100	300	405	96	311
UV-B Judge Room M19	400	100	300	376	110	266

UV-C Room M12	600	150	450	**332**	163	**169**
UV-E Room M12	1000	250	750	**870**	**322**	**548**
UV-A Room M16	300	75	225	**231**	76	**155**
UV-F Lobby	1200	300	900	**762**	**144**	**618**
UV-F Lobby	1200	300	900	**643**	**224**	**419**
UV-B Room M13	400	100	300	**307**	**77**	**230**

1. Unit is not operational. The blower motors need to be replaced.
2. Unit has one broken blower motor which needs to be replaced.
3. The OA louver is clogged and should be cleaned.

TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow (CFM)	Actual Return/Exhaust Airflow (CFM)
EF-4	Courtroom M5	2,020	0[1]
EF-5	Jury Toilets	1,113	1,003
EF-6	Lock Up	2,730	0[1]
EF-7	Clerks' Office	3,126	462[2]
EF-8	Cells 1 and 2	N/A	0[1]
EF-9	Cells 3 and 4	N/A	0[1]
EF-?	Unknown	N/A	N/A

1. Fan is not operational and must be repaired or replaced.
2. Fan is in very poor condition and should be replaced.

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. Most unit ventilators are performing outside of the acceptable airflow range. Measured airflow rates outside of the 10% tolerance of the design airflow are shown in **red text** in tables 5 and 6.
2. The balancing contractor noted that many of the unit ventilators had pneumatic actuators for the outside air dampers that have been cut and capped. The OA dampers are now locked in a fixed position. We recommend replacing the actuators with electronic actuators.

3. UV-A serving Conference Room M22 and one of the UV-F's serving the First Session Courtroom are not operational and should be replaced.
4. The balancing contractor noted that some of the OA louvers are clogged and the units are not getting the design outside airflow rates even if the dampers are 100% open. It was also noted that many of the units are old and have corroded coils, and debris lining the interior of the unit. We recommend cleaning the outside air louvers, the inside of each unit ventilator, and the coils of each of the units in order to improve airflow.
5. Toilet exhaust fans EF-4, EF-6, EF-7, EF-8, and EF-9 are very old and either not operational or barely operational. We recommend replacing these fans.
6. The balancing contractor noted that there was a sidewall exhaust fan on the lower roof similar to EF-7 that there is no record of in the mechanical drawings we have been provided (this unit is labeled EF-? In Table 6). We are not certain what area this fan serves. The fan is in poor condition, generates very little airflow, and should probably be replaced.
7. The balancing contractor noted that the unit ventilators do not have control valves or circuit setters in the hydronic pipe connections to each unit. Therefore, they were not able to get water flow readings for the hot and chilled water to the coils of the unit ventilators.
8. Only one of the seven exhaust fans tested was developing the proper airflow. Replacing the entire fan units likely makes more sense, rather than just the motors, given the age and condition of the rest of the assemblies.

WING'S TESTING & BALANCING CO., INC.

Orleans
District Court
HVAC Ventilation Survey

* * * *

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

November 12th, 2021

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WING'S TESTING & BALANCING CO., INC.

November 12th, 2021

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

Re: Orleans District Court HVAC Ventilation Survey

Dear, Jason

Wing's has completed the HVAC Survey for the above referenced location. Once on site, it was noted that all UVs have MERV-8 filters. Also, several exhaust fans were not operating, including both that serve lock-up. The results of our testing are as follows:

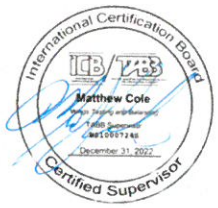
- There are two different set-ups for the outside air louvers in the UVs. One style is pneumatic activators which are no longer functional and are set in a fixed position. We could only get readings for this style. The older style has tin boxes with a manually adjusted louver located below the filters. These we set to design as best as possible.
- UV-A serving Conference Room M22 and UV-F serving First Session are not operational and need to be replaced.
- UV-C serving Judges Chambers has an outside air louver that is clogged with debris and need to be cleaned in order to get proper OA ventilation.
- Many of the UVs are old with corroded coils, dirt and debris coating the interior. These units do not meet design flow even at the highest speed.
- EF-6 does not have a motor tag.
- There is a side-wall mounted fan on the lower roof similar to EF-7. This fan does not appear at any prints or drawings. There is very little air being discharged from this fan and it is in poor condition. The ductwork to this fan is buried behind sheet rocked walls and ceilings. It is uncertain what areas of the building this fan serves. It may tie into the ductwork off at EF-7, but it is uncertain.

- EFs 4, 8 and 9 are not functional and need replacing.
- The water has no circuit setters. There is no control over the water valves in the UV units. In order to get water readings, it would take several days of tracing out pipes to 21 units in the lower lever and even then we could not ensure that the UVs will be calling for heating.

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

Very truly yours,

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



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

SUPPLY FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/8/2021
AREA SERVED:	UVs	**TECH:**	BS

FAN DATA

	UV-C		UV-B		UV-F	
FAN NUMBER	UV-C		UV-B		UV-F	
LOCATION	Conference Rm M24		Conference Rm M27		Conference Rm M30	
AREA SERVED	Conference Rm M24		Conference Rm M27		Conference Rm M30	
MANUFACTURER	McQuay		McQuay		McQuay	
MODEL OR SIZE	NA		NA		NA	
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	600	455	400	332	1200	739
RETURN AIR	300	227	300	236	600	496
OUTSIDE AIR	300	228	100	94	600	243(1)
DISCH. STATIC	---	+0.04"	---	+0.03"	---	+0.05"
SUCTION STATIC	---	-0.04"	---	-0.03"	---	-0.05"
TOTAL STATIC	---	0.08"	---	0.06"	---	0.10"
FAN RPM	DD	DD	DD	DD	DD	DD
PULLEY O.D.	DD		DD		DD	
ESP	---		---		---	
VFD SPEED	No VFD		No VFD		No VFD	
O.A.D.MIN POS	100%		100%		100%	

MOTOR DATA

MANUFACTURER	AO Smith		Dayton		NA	
MODEL OR FR.	484		NA		NA	
HORSEPOWER	1/15	1/15	1/15	1/15	1/15	1/15
MOTOR RPM	1075	1075	1075	1075	1075	1075
VOLTAGE / PH.	115/1	115/1	115/1	115/1	115/1	115/1
AMPS LEG 1	1.07		1.0		1.07	
AMPS LEG 2	---	0.6	---	0.6	---	0.8
AMPS LEG 3	---		---		---	
SHEAVE O.D.	DD		DD		DD	
BELTS - QUANTITY / SIZE	DD		DD		DD	
SHEAVE POSITION	DD		DD		DD	
SPEED	High		High		High	

REMARKS

(1) OA damper open 100% but still short of design.

NA Not Available
ND No Design
DD Direct Drive

SUPPLY FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/9/2021
AREA SERVED:	UV-F	**TECH:**	BS

FAN DATA

FAN NUMBER	UV-F		UV-F		UV-F	
LOCATION	First Session		First Session		First Session	
AREA SERVED	First Session		First Session		First Session	
MANUFACTURER	McQuay		McQuay		McQuay	
MODEL OR SIZE	NA		NA		NA	
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	1200	(1)	1200	727	1200	294 (2)
RETURN AIR	600		600	292	600	0
OUTSIDE AIR	600	(3)	600	435 (3)	600	249 (3)
DISCH. STATIC	---		---	+0.05"	---	+0.02"
SUCTION STATIC	---		---	-0.04"	---	-0.02"
TOTAL STATIC	---		---	0.09"	---	0.09"
FAN RPM	DD	DD	DD	DD	DD	DD
PULLEY O.D.	DD		DD		DD	
ESP	---		---		---	
VFD SPEED	No VFD		No VFD		No VFD	
O.A.D.MIN POS	NA		NA		NA	

MOTOR DATA

MANUFACTURER	NA		NA		NA	
MODEL OR FR.	NA		NA		NA	
HORSEPOWER	1/15	1/15	1/15	1/15	1/15	1/15
MOTOR RPM	1075	1075	1075	1075	1075	1075
VOLTAGE / PH.	115/1	115/1	115/1	115/1	115/1	115/1
AMPS LEG 1	1.07		1.07		1.07	
AMPS LEG 2	---		---	0.8	---	0.4
AMPS LEG 3	---		---		---	
SHEAVE O.D.	DD		DD		DD	
BELTS - QUANTITY / SIZE	DD		DD		DD	
SHEAVE POSITION	DD		DD		DD	
SPEED	High		High		High	

REMARKS

(1) This unit needs two new blower motors.

(2) This unit has one bad blower motor.

(3) The pneumatics to the OA dampers have been cut and capped. These dampers are sitting in an affixed position.

NA Not Available

ND No Design

DD Direct Drive

SUPPLY FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/9/2021
AREA SERVED:	UVs	**TECH:**	BS

FAN DATA

	UV-C		UV-E		UV-E	
FAN NUMBER						
LOCATION	Judges Chambers		2nd Session Court		2nd Session Court	
AREA SERVED	Judges Chambers		2nd Session Court		2nd Session Court	
MANUFACTURER	McQuay		McQuay		McQuay	
MODEL OR SIZE	NA		S1-124B		S1-124B	
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	600	580	1000	832	1000	874
RETURN AIR	300	476	700	667	700	582
OUTSIDE AIR	300	104 (1)	300	165 (2)	300	292 (2)
DISCH. STATIC	---	+0.05"	---	+0.05"	---	+0.05"
SUCTION STATIC	---	-0.04"	---	-0.03"	---	-0.05"
TOTAL STATIC	---	0.09"	---	0.05"	---	0.10"
FAN RPM	DD	DD	DD	DD	DD	DD
PULLEY O.D.	DD		DD		DD	
ESP	---		---		---	
VFD SPEED	No VFD		No VFD		No VFD	
O.A.D.MIN POS	100%		100%		100%	

MOTOR DATA

MANUFACTURER	AO Smith		Dayton		Dayton	
MODEL OR FR.	48Y		48YZ		48YZ	
HORSEPOWER	1/15	1/15	1/15	1/15	1/15	1/15
MOTOR RPM	1075	1075	1075	1075	1075	1075
VOLTAGE / PH.	115/1	115/1	115/1	115/1	115/1	115/1
AMPS LEG 1	1.07		1.0		1.0	
AMPS LEG 2	---	0.8	---	0.9	---	0.8
AMPS LEG 3	---		---		---	
SHEAVE O.D.	DD		DD		DD	
BELTS - QUANTITY / SIZE	DD		DD		DD	
SHEAVE POSITION	DD		DD		DD	
SPEED	High		High		High	

REMARKS

(1) OA 100% open. OA lowers clogged.

(2) Pneumaics to OA dampers cut and capped.

NA Not Available

ND No Design

DD Direct Drive

SUPPLY FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/10/2021
AREA SERVED:	UVs	**TECH:**	BS

FAN DATA

FAN NUMBER	UV-F		UV-F			
LOCATION	First Session		First Session			
AREA SERVED	First Session		First Session			
MANUFACTURER	McQuay		McQuay			
MODEL OR SIZE	NA		NA			
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	1200	647	1200	702		
RETURN AIR	600	200	600	445		
OUTSIDE AIR	600	447	600	257		
DISCH. STATIC	---	+0.05"	---	+0.05"	---	
SUCTION STATIC	---	-0.04"	---	-0.04"	---	
TOTAL STATIC	---	0.09"	---	0.09"	---	
FAN RPM	DD	DD	DD	DD		
PULLEY O.D.	DD		DD			
ESP	---		---			
VFD SPEED	No VFD		No VFD			
O.A.D.MIN POS	NA		NA			

MOTOR DATA

MANUFACTURER	NA		NA			
MODEL OR FR.	NA		NA			
HORSEPOWER	1/15	1/15	1/15	1/15		
MOTOR RPM	1075	1075	1075	1075		
VOLTAGE / PH.	115/1	115/1	115/1	115/1		
AMPS LEG 1	1.07		1.07			
AMPS LEG 2	---	0.8	---	0.8	---	
AMPS LEG 3	---		---		---	
SHEAVE O.D.	DD		DD			
BELTS - QUANTITY / SIZE	DD		DD			
SHEAVE POSITION	DD		DD			
SPEED	High		High			

REMARKS

NA Not Available
ND No Design
DD Direct Drive

SUPPLY FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/10/2021
AREA SERVED:	UVs	**TECH:**	BS

FAN DATA						
FAN NUMBER	UV-B		UV-B			
LOCATION	Judge M19		Judge M20			
AREA SERVED	Judges Chambers		Judges Chambers			
MANUFACTURER	McQuay		McQuay			
MODEL OR SIZE	NA		NA			
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	400	405	400	376		
RETURN AIR	300	311	300	266		
OUTSIDE AIR	100	96	100	110		
DISCH. STATIC	---	+0.04"	---	+0.04"	---	
SUCTION STATIC	---	-0.04"	---	-0.04"	---	
TOTAL STATIC	---	0.08"	---	0.08"	---	
FAN RPM	DD	DD	DD	DD		
PULLEY O.D.	DD		DD			
ESP	---		---			
VFD SPEED	No VFD		No VFD			
O.A.D.MIN POS	100%		100%			

MOTOR DATA						
MANUFACTURER	Dayton		Dayton			
MODEL OR FR.	NA		NA			
HORSEPOWER	1/20	1/20	1/20	1/20		
MOTOR RPM	1075	1075	1075	1075		
VOLTAGE / PH.	115/1	115/1	115/1	115/1		
AMPS LEG 1	0.8		0.8			
AMPS LEG 2	---	0.6	---	0.6	---	
AMPS LEG 3	---		---		---	
SHEAVE O.D.	DD		DD			
BELTS - QUANTITY / SIZE	DD		DD			
SHEAVE POSITION	DD		DD			
SPEED	High		High			

REMARKS

NA Not Available
ND No Design
DD Direct Drive

SUPPLY FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/12/2021
AREA SERVED:	UVs	**TECH:**	BS

FAN DATA

	UV-C		UV-E		UV-A	
FAN NUMBER						
LOCATION	Clerk of Courts M12		Clerk of Courts M12		Clerks Office M16	
AREA SERVED	Clerk of Courts		Clerk of Courts		Clerks Office	
MANUFACTURER	McQuay		McQuay		McQuay	
MODEL OR SIZE	NA		NA		NA	
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	600	332	1000	870	300	231
RETURN AIR	300	169	700	548	200	155
OUTSIDE AIR	300	163	300	322 (1)	100	76
DISCH. STATIC	---	+0.03"	---	+0.05"	---	+0.03"
SUCTION STATIC	---	-0.03"	---	-0.05"	---	-0.03"
TOTAL STATIC	---	0.06	---	0.10"	---	0.06"
FAN RPM	DD	DD	DD	DD	DD	DD
PULLEY O.D.	DD		DD		DD	
ESP	---		---		---	
VFD SPEED	No VFD		No VFD		No VFD	
O.A.D.MIN POS	100%		100%		100%	

MOTOR DATA

MANUFACTURER	Dayton		NA		NA	
MODEL OR FR.	NA		NA		NA	
HORSEPOWER	1/15	1/15	1/15	1/15	1/15	1/15
MOTOR RPM	1075	1075	1075	1075	1075	1075
VOLTAGE / PH.	115/1	115/1	115/1	115/1	115/1	115/1
AMPS LEG 1	1.07		1.0		0.6	
AMPS LEG 2	---	0.8	---	0.8	---	0.4
AMPS LEG 3	---		---		---	
SHEAVE O.D.	DD		DD		DD	
BELTS - QUANTITY / SIZE	DD		DD		DD	
SHEAVE POSITION	DD		DD		DD	
SPEED	High		High		High	

REMARKS

(1) This unit has a pneumatic outside air accuator that is cut and capped. The OA is in a fixed position.

NA Not Available
ND No Design
DD Direct Drive

SUPPLY FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/12/2021
AREA SERVED:	UVs	**TECH:**	BS

FAN DATA

FAN NUMBER	UV-F		UV-F		UV-B	
LOCATION	Lobby		Lobby		Waiting M13	
AREA SERVED	Lobby		Lobby		Waiting M13	
MANUFACTURER	McQuay		McQuay		McQuay	
MODEL OR SIZE	NA		NA		NA	
	DESIGN	**ACTUAL**	**DESIGN**	**ACTUAL**	**DESIGN**	**ACTUAL**
TOTAL CFM	1200	762	1200	643	400	307
RETURN AIR	600	618	600	419	300	230
OUTSIDE AIR	600	144 (1)	600	224 (1)	100	77
DISCH. STATIC	---	+0.05"	---	+0.04"	---	+0.04"
SUCTION STATIC	---	-0.05"	---	-0.04"	---	-0.04"
TOTAL STATIC	---	0.10"	---	0.08"	---	
FAN RPM	DD	DD	DD	DD	DD	DD
PULLEY O.D.	DD		DD		DD	
ESP	---		---		---	
VFD SPEED	No VFD		No VFD		No VFD	
O.A.D.MIN POS	NA		NA		100%	

MOTOR DATA

MANUFACTURER	Dayton		Dayton		NA	
MODEL OR FR.	NA		NA		NA	
HORSEPOWER	1/15	1/15	1/15	1/15	1/20	1/20
MOTOR RPM	1075	1075	1075	1075	1075	1075
VOLTAGE / PH.	115/1	115/1	115/1	115/1	115/1	115/1
AMPS LEG 1	1.07		1.7		0.8	
AMPS LEG 2	---	0.7	---	0.6	---	0.6
AMPS LEG 3	---		---		---	
SHEAVE O.D.	DD		DD		DD	
BELTS - QUANTITY / SIZE	DD		DD		DD	
SHEAVE POSITION	DD		DD		DD	
SPEED	High		High		High	

REMARKS

(1) OA dampers are capped pneumatics with a fixed position.

NA Not Available
ND No Design
DD Direct Drive

EXHAUST FAN REPORT

PROJECT:	Orleans District Court	**DATE:**	11/9/2021
AREA SERVED:	EFs	**TECH:**	BS

FAN DATA

FAN NUMBER		EF-4 (1)	EF-5	EF-6 (1)	EF-7 (4)	EF-? (3,4)
LOCATION		Roof	Roof	Roof	Roof	Roof
AREA SERVED		Court M5	Jury Toilets	Lock up	Clerk's Office	
MANUFACTURER		CentriMaster	CentriMaster	CentriMaster	Cook	
MODEL OR SIZE		P18E	PR12BS	P18G	TWB-265-NB	TWB-210-8W
TOTAL CFM	**DESIGN**	2020	1113	2730	3126	NA
	ACTUAL	0	1003	0	462	NA
FAN RPM	**DESIGN**	---	DD	---	---	---
	ACTUAL	0	DD	0	516	530
PULLEY	**O.D.**	5.0" x 1	DD	5.25" x 1	9.5" x 3/4	7.0" x 3/4
SERVICE		1.15	1.00	NA	1.35	1.25

MOTOR DATA

MANUFACTURER		AO Smith	GE	NA (2)	Dayton	Dayton
MODEL NUMBER		484	562	NA	48Y	56
MOTOR HP	**DESIGN**	1/4	1/6	1/2	1/2	1/2
	ACTUAL	1/4	1/8	NA	1/6	1/2
MOTOR RPM		1775	1075	NA	1725	1725
VOLTAGE/PHASE		115/1	115/1	NA	230/1	230/1
MOTOR AMPS	**DESIGN**	3.3	2.4	NA	3.6	3.8
	ACT. LEG 1					
	ACT. LEG 2		2.1		3.6	3.6
	ACT. LEG 3					
SHEAVE		2.5" x 1/2	DD	3.0" x 5/8	3.0" x 1/2	3.75" x 5/8
BELTS - QUANTITY/SIZE		3L240	DD	1/4L270	1/382K	1/4L300
SHEAVE POSITION		1/2 Open	DD	3/4 Open	1/2 Open	1/2 Open
C to C		6.0		7.0	7.5	6.5

REMARKS

(1) Fan is very old, does not operate and needs replacing.
(2) This fan has no motor tag.
(3) This fan does not appear on any of the drawings. It appears to be in conjuction with EF-7 but the duct is burried behind sheetrocks.
(4) These fans are very old and in very poor condition and need replacing.

NA Not Available
ND No Design
DD Direct Drive

EXHAUST FAN REPORT

PROJECT:	Orleans District Court				**DATE:**	11/12/2021
AREA SERVED:	EFs				**TECH:**	BS
FAN DATA						
FAN NUMBER		EF-8 (1)	EF-9 (1)			
LOCATION		Roof	Roof			
AREA SERVED		Cells 1+2	Cells 3+4			
MANUFACTURER		ClimateMaster	ClimateMaster			
MODEL OR SIZE		PR81	PR82			
TOTAL CFM	**DESIGN**	NA	NA			
	ACTUAL	0	1			
FAN RPM	**DESIGN**	DD	DD			
	ACTUAL	DD	DD			
PULLEY	**O.D.**	DD	DD			
SERVICE						
MOTOR DATA						
MANUFACTURER		NA	NA			
MODEL NUMBER		NA	NA			
MOTOR HP	**DESIGN**	1/15	1/15			
	ACTUAL	1/15	1/15			
MOTOR RPM		1550	1550			
VOLTAGE/PHASE		115/1	115/1			
MOTOR AMPS	**DESIGN**	2.5	2.5			
	ACT. LEG 1					
	ACT. LEG 2					
	ACT. LEG 3					
SHEAVE		DD	DD			
BELTS - QUANTITY/SIZE		DD	DD			
SHEAVE POSITION		DD	DD			
C to C						

REMARKS

(1) These fans are not operational and need replacing.

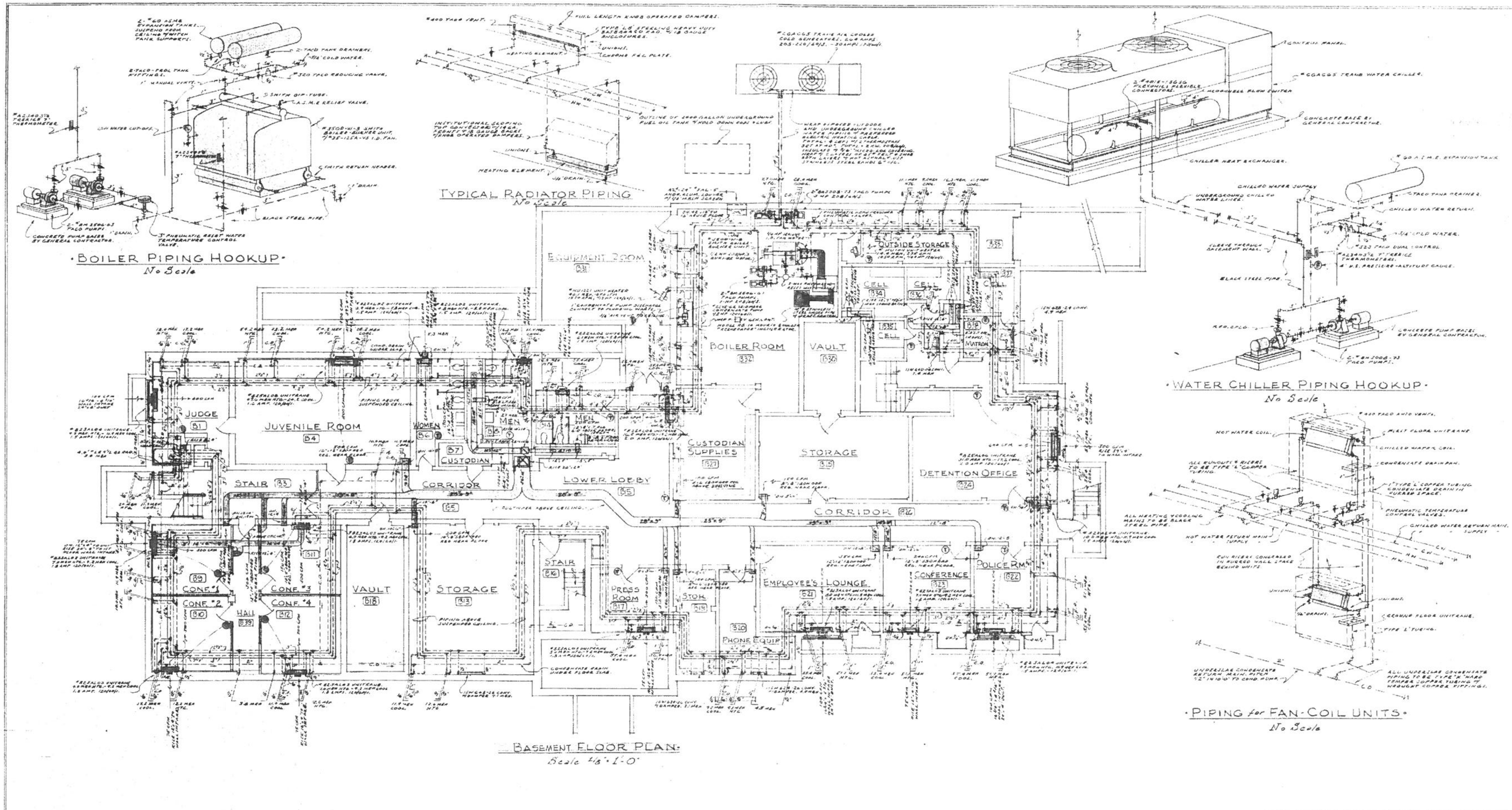
NA Not Available
ND No Design
DD Direct Drive

AIR DEVICE REPORT

PROJECT:	Orleans District Court	**DATE:**	11/12/21
SYSTEM / AREA:	EF-5	**TECH:**	BS

LOCATION	NO.	SIZE	A K	DESIGN		TEST		FINAL		NOTES
				FPM	CFM	FPM	CFM	FPM	CFM	
EF-5										
Toilet M8	1	12"x8"	0.48		200	650	312			
Women's B6	2	16"x8"	0.64		300	332	312			
Men's B8	3	12"x8"	0.48		200	239	115			
Restroom B14	4	8"x8"	0.32		100	419	134			
Restroom B14	5	12"x8"	0.48		200	286	137			
Restroom B14	6	8"x8"	0.32		100	291	93			
					1100		1003			

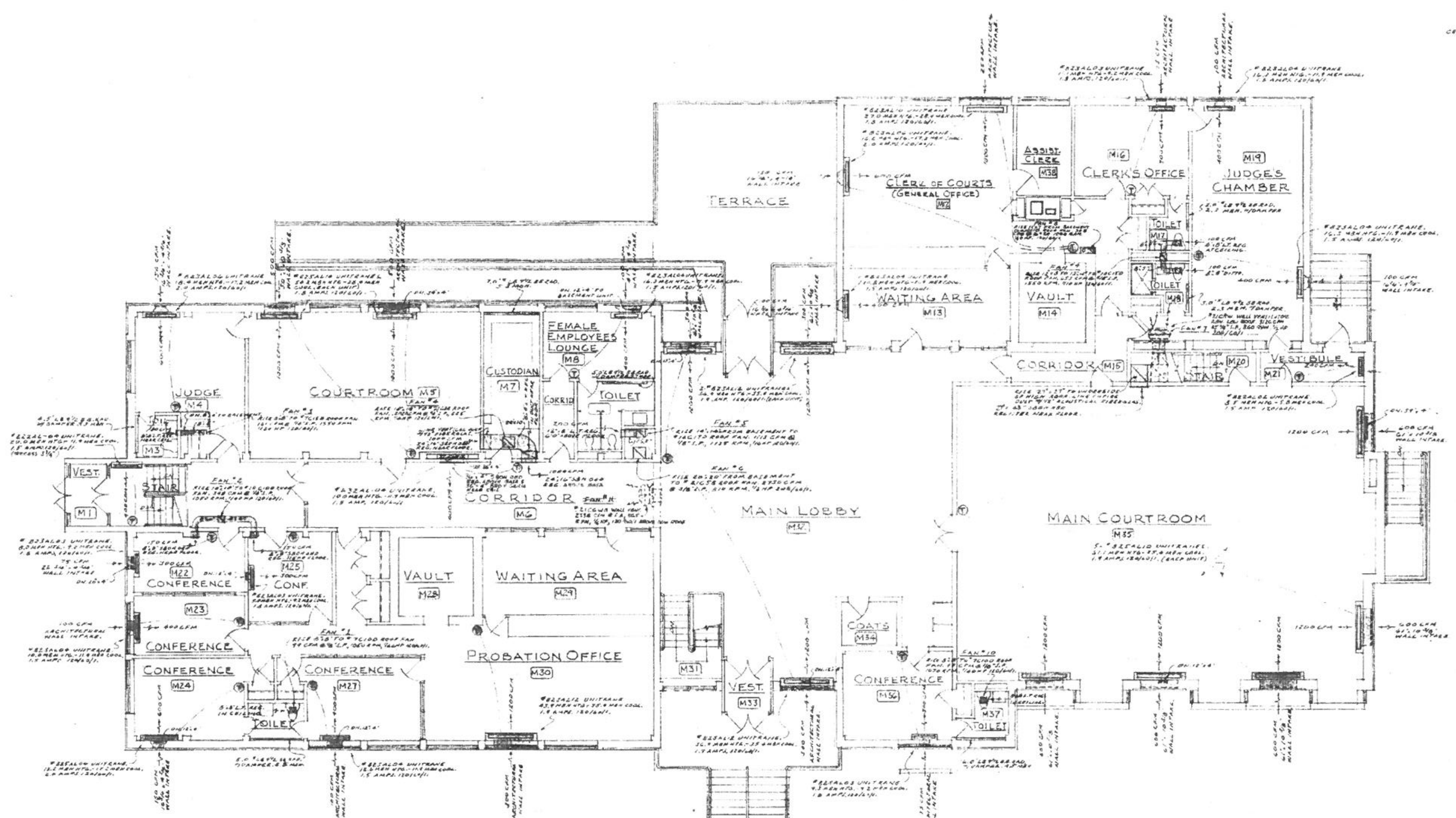
REMARKS



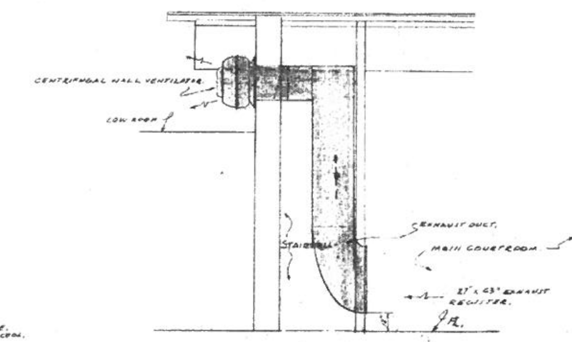
GERALD W. MONJEAU No. 8916 — Commonwealth of Massachusetts, Professional Engineer

Registered Architect No. 1438 — Commonwealth of Massachusetts

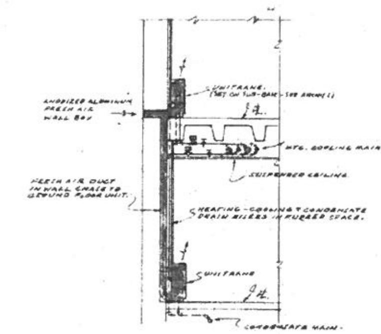
COURTHOUSE FOR THE SECOND DISTRICT OF THE COUNTY OF BARNSTABLE · ORLEANS, MASSACHUSETTS · BASEMENT FLOOR PLAN	SHEET NO. H & V 1
SCALE: 1/8" = 1'-0"	
DATE: 28 FEBRUARY 1969	WALTER M. GAFFNEY Associates ARCHITECTS
DRAWN BY: G.M.	JOB NO. 6747
CHECK'D BY: G.W.M.	PROFESSIONAL BUILDING · HYANNIS, MASS.



MAIN FLOOR PLAN.
Scale 1/8" = 1'-0"



DETAIL of MAIN COURTROOM EXHAUST VENT.
Scale 1/4" = 1'-0"



DETAIL of FAN-COIL UNITS.
Scale 1/4" = 1'-0"

GERALD W. MONJEAU — Commonwealth of Massachusetts Registered Professional Engineer

ALBERT V. RIEW? No. 1438 W. Yarmouth, Mass. — Commonwealth of Massachusetts Registered Architect

COURTHOUSE FOR THE SECOND DISTRICT OF THE COUNTY OF BARNSTABLE · ORLEANS, MASSACHUSETTS · MAIN FLOOR PLAN	SHEET NO. H&V 2
SCALE: 1/8" = 1'-0"	WALTER M. GAFFNEY Associates ARCHITECTS PROFESSIONAL BUILDING · HYANNIS, MASS.
DATE: 28 FEBRUARY 1964	
DRAWN BY: G.M. — JOB No. 6247	
CHK'D. BY: G.W.M.	