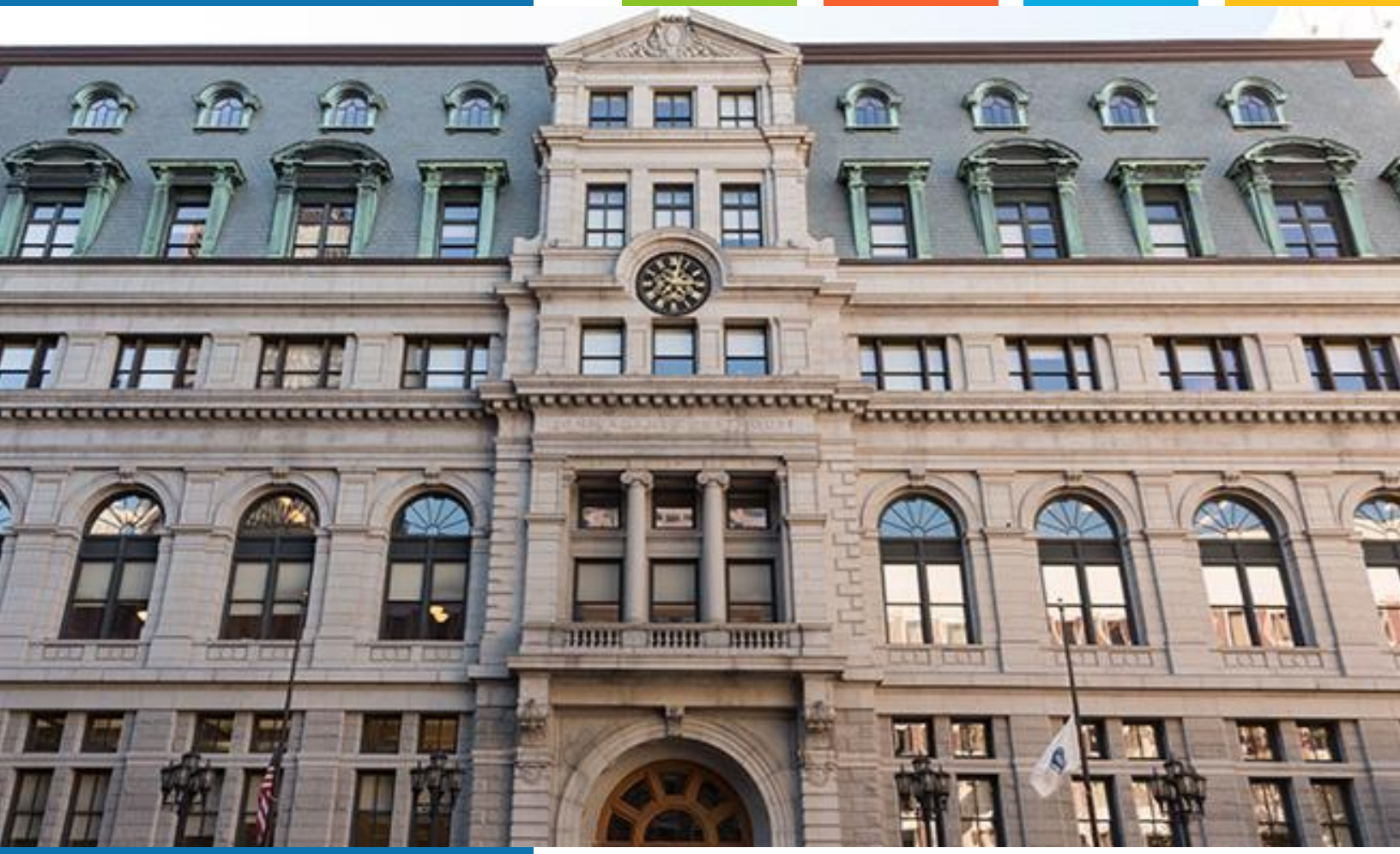


John Adams Courthouse
Boston, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

March 14, 2022

Tighe&Bond

100% Recyclable

Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the John Adams Courthouse on April 22, 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.

Site Visit Attendees:

- *Office of Court Management:*
  - Jose Ramos, Courthouse Facilities Staff
- *Tighe & Bond*
  - Ryan Ablondi, Senior Mechanical Engineer
  - Tim Bill, Staff Mechanical Engineer

1.1 Existing Ventilation System

The John Adams Courthouse was constructed in 1893 and is approximately 245,000 square feet in size. In 2004 the courthouse went through a major renovation which included a complete HVAC system replacement. There are twenty-eight air handling units (AHUs) serving the building, all in good condition. All AHUs, with the exception of AHU-12 have MERV 13 filters with BMS dirty filter alarms, hot water heating coils with face & bypass dampers, chilled water cooling coils and a supply fan. AHU-12 is a Variable Air Volume (VAV) unit dedicated to the Seven Justice Courtroom which has a return fan, MERV-13 filters, hot water coil, chilled water coil and supply fan. Twenty-two of the remaining air handling units are constant volume, 100% outdoor air units providing conditioned ventilation air to fan coil units (FCUs) and individual rooms. Four of the units are constant volume, mixed air units serving 4th & 5th floor Libraries. AHU-23 is a constant volume, mixed air unit serving the Special Collections room.

There are hundreds of FCUs throughout the courthouse, all of which have chilled water coils and hot water coils, with the exception of FCU-35 serving the security office on the ground floor which is a cooling only unit. The several FCUs we inspected during the walkthrough were in good condition. The fan coil units are a mix of ceiling hung units and cabinet style units installed below windows. All of them have standard ½", non-MERV rated filters. This is a concern because the fan coil units are recirculating air within the space, however the fan coil units are not rated for the pressure drop of a MERV-13 filter and installing them may put undue strain on the fan motors.

Cooling is provided to the AHUs and FCUs from a 950 ton chiller plant consisting of two 475 ton centrifugal water cooled chillers. Heat rejection for the chiller plant is provided by two cooling towers, each with two cells located on the roof. There is a 175 ton free-cool heat exchanger to provide free cooling in winter. The cooling towers are piped so that CT-1 & 2 serve the chiller when in mechanical cooling and CT-3 & 4 are dedicated to the free-cool heat exchanger.

Hot water is provided to the building by seven 1,615 MBH modular boilers, each with a dedicated circulator pump. The boilers and associated circulator pumps are staged by local heat timer controls. HW is distributed throughout the building by two 1,100 gpm variable speed pumps.

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)	Filters	Condition
AHU-1	1,045	1,045	MERV 13	Good
AHU-2	2,565	2,565	MERV 13	Good
AHU-3	1,495	1,495	MERV 13	Good
AHU-4	2,305	2,305	MERV 13	Good
AHU-5	3,300	3,300	MERV 13	Good
AHU-6	1,355	1,355	MERV 13	Good
AHU-7	710	710	MERV 13	Good
AHU-8	1,435	1,435	MERV 13	Good
AHU-9	2,005	2,005	MERV 13	Good
AHU-10	4,030	4,030	MERV 13	Good
AHU-11	1,655	1,655	MERV 13	Good
AHU-12	5,400	3,940	MERV 13	Good
AHU-14	1,650	1,650	MERV 13	Good
AHU-15	1,765	1,765	MERV 13	Good
AHU-16	1,890	1,890	MERV 13	Good
AHU-17	1,325	1,325	MERV 13	Good
AHU-18	1,130	1,130	MERV 13	Good
AHU-19	3,380	3,380	MERV 13	Good
AHU-20	3,485	3,485	MERV 13	Good
AHU-21	2,415	2,415	MERV 13	Good
AHU-22	2,095	2,095	MERV 13	Good
AHU-23	1,700	100	MERV 13	Good
AHU-26	6,750	1,500	MERV 13	Good
AHU-27	4,240	1,500	MERV 13	Good
AHU-28	4,250	1,750	MERV 13	Good

AHU-30	740	740	MERV 13	Good
AHU-31	3,015	3,015	MERV 13	Good
AHU-32	4,000	1,500	MERV 13	Good

Photo 1 – Representative Air Handler

1.2 Existing Control System

The HVAC equipment is controlled by a Trane Building Management System (BMS) which was installed as part of the 2004 renovation. Air handlers, exhaust fans, boilers, chillers, pumps, etc… are all tied into the system. AHU-12 serving the Seven Justice Courtroom operates with a demand control ventilation (DCV) sequence of operation, where outdoor ventilation air is reduced when the space is not fully occupied.

Section 2
Recommendations

Below is a list of recommendations for the John Adams Courthouse. Please refer to the "Master Recommendation List" for further explanation and requirements of the stated recommendations.

2.1 Filtration Efficiency Recommendations

The filters in the air handlers were already upgraded with 2" MERV 13 filters. The use of 2" MERV 13 meets the minimum ASHRAE recommendations for filtration during the pandemic. We recommend that a testing and balancing contractor test and document the airflow and static pressure profile of all air handlers, as outlined in recommendation RF-1 in the Overview of Recommendations document. This will help determine if the equipment can accommodate the increase in system static pressure associated with the addition of the MERV 13 filters.

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

RF-1: *MERV-13 filters.*

> We recommend the continued use of MERV-13 filters which meet the ASHRAE minimum recommendation. Existing filters should be checked to ensure they are within their service lives and installed properly. The filter racks should be inspected to ensure that filters fit tightly and that end spacers are in place to minimize filter bypass.

2.2 Testing & Balancing Recommendations

The air handling units are approximately 17 years old and the units have not been tested and balanced since their installation. 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)
AHU-1	1,045	1,045	504	**1,045**
AHU-2	2,565	2,565	1,373	**2,565**
AHU-3	1,495	1,495	818	**1,495**
AHU-4	2,305	2,305	2,180	**2,305**
AHU-5	3,300	3,300	1,439	**3,300**
AHU-6	1,355	1,355	756	**1,355**
AHU-7	710	710	389	**710**
AHU-8	1,435	1,435	1,370	**1,435**
AHU-9	2,005	2,005	1,234	**2,005**
AHU-10	4,030	4,030	1,894	**4,030**
AHU-11	1,655	1,655	817	**1,655**
AHU-12	5,400	3,940	1,628	**3,940**
AHU-14	1,650	1,650	925	**1,650**
AHU-15	1,765	1,765	1,410	**1,765**
AHU-16	1,890	1,890	1,163	**1,890**
AHU-17	1,325	1,325	615	**1,325**
AHU-18	1,130	1,130	680	**1,130**
AHU-19	3,380	3,380	1,528	**3,380**
AHU-20	3,485	3,485	1,413	**3,485**
AHU-21	2,415	2,415	1,697	**2,415**
AHU-22	2,095	2,095	1,351	**2,095**
AHU-23	1,700	100	140	**140**
AHU-26	6,750	1,500	1,053	**1,500**
AHU-27	4,240	1,500	884	**1,500**
AHU-28	4,250	1,750	719	**1,750**

AHU-30	740	740	225	**740**
AHU-31	3,015	3,015	1,464	**3,015**
AHU-32	4,000	1,500	681	**1,500**

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.

Where we recommend increasing the outdoor air beyond the original design, it appears the cooling and heating coils should be able to provide leaving air conditions similar to the original design under peak outdoor air conditions, assuming the coils are clean and their performance has not degraded significantly over time. Supply air temperatures during the heating and cooling season should be monitored to ensure they are not dropping below design values. If the supply air temperature does drop below design values, the outdoor airflow rate should be reduced, but not below the originally designed outdoor air flow rates.

Where we do not recommend increasing outdoor air to the current code requirements, it appears the cooling and/or heating coils cannot maintain the proper leaving air temperature under peak outdoor air conditions.

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.

TABLE 3
Average Airflow Rate per Person

	All spaces	***Courtrooms***	***Non-Courtroom Spaces***
Total Occupancy (People)	2,175	697	1,478
Total Supply Air (CFM/Person)	33	18	40
Outdoor Air (CFM/Person)	28	4	40

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. For the VAV system serving the Seven Justice Courtroom, when the supply airflow is reduced due to the space

temperature being satisfied, the airflow rate per person will also be reduced. The other courtrooms listed in Table 4 are constant volume systems.

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)***
Seven Justice Courtroom	286	5,445	19	3,940	14
Single Justice Courtroom	133	3,760	28	1,000	8
Panel Courtroom 3-201	139	4,240	31	1,000	7
Panel Courtroom 3-101	139	4,240	31	1,000	7

Note: Courtroom occupant density is based on 70 people/1,000 square feet, per the 2015 International Mechanical Code

The airflow rate per person for each Courtroom and the Jury Pool Room, based on a reduced occupancy schedule determined by the Office of Court Management, is shown below in Table 4a. The airflow rate per person assumes the full supply airflow is being delivered to the room. For the VAV system serving the Seven Justice Courtroom, when the supply airflow is reduced due to the space temperature being satisfied, the airflow rate per person will also be reduced. The other courtrooms listed in Table 4 are constant volume systems.

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)***
Seven Justice Courtroom	42	5,445	130	3,940	94
Single Justice Courtroom	19	3,760	198	1,000	53
Panel Courtroom 3-201	19	4,240	223	1,000	53
Panel Courtroom 3-101	13	4,240	326	1,000	77

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

RTB-2: *Rebalance system return air flow rate.*

We recommend testing and balancing the return fan airflow rate for AHU-12 to ensure the correct quantity of return air is being delivered to the air handler.

RTB-4: *Test and balance VAV box flow rates.*

We recommend testing and balancing the VAV boxes serving the Seven Justice Courtroom to ensure the space is being supplied the proper quantity of air.

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, control room, Courtrooms, 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 experience 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 AHU and FCU 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 system dampers and actuators for proper operation*.

Replace dampers and actuators that are not functioning properly.

During the site walkthrough, Tighe & Bond witnessed the mixed air dampers for AHU-12 were not working properly. The BMS screen showed that the EA damper and the OA damper were commanded to 60% open and the RA damper was commanded to 40% open. When inspecting the AHU we found the EA damper 0% open, the RA damper only slightly open (did not seem like 40%) and the OA damper roughly 60% open as commanded. With this configuration, the RA fan was blowing against a mostly closed AHU section which can put added strain on the fan and motor and shorten the life of the fan.

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

RE-4: *Inspect VAV boxes and controllers.*

VAV boxes regulate the supply air delivered to each space. At a minimum, we recommend cycling the damper positions and testing the airflow to verify the maximum and minimum airflow rates are being delivered as designed. Consider cleaning the airflow stations and reheat coils. Any boxes not delivering the expected airflow rates should be rebalanced or replaced.

RE-7: *Test the existing air handler 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.

RC-4: *Confirm the economizer control sequence is operational.*

AHU-12, AHU-26 and AHU-27 are the only AHUs operating with an economizer sequence of operation.

RC-5: *Disable demand control ventilation sequences.*

AHU-12 is the only AHU with DCV sequence of operation.

2.5 Additional Filtration and Air Cleaning

We recommend the installation of the following air cleaning devices:

RFC-1: *Install portable HEPA filters.*

If the Courthouse is to operate at a high capacity (i.e. 50% occupancy or greater), we recommend installing portable HEPA filters in high traffic areas, such as entrance lobbies. They should also be considered for Courtrooms, depending on the occupancy of the room and how much noise is generated from the filters. The noise levels will vary depending on the manufacturer.

2.6 Humidity Control

Installing duct mounted or portable humidifiers can help maintain the relative humidity levels recommended by ASHRAE. The feasibility of 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 Maximum Occupancy for Single Justice Courtroom and Jury Pool

During the site walk through, Tighe and Bond learned that the Court is looking into how to maximize ventilation in the Single Justice Courtroom 2-200 and the associated Conference Suite 2-100. The Single Justice Courtroom and some surrounding ancillary spaces are served by AHU-15 which is a 100% OA unit designed to supply 1,765 CFM of OA at 1.75 in w.c. ESP. The Conference Suite and some surrounding ancillary spaces are served by AHU-16 which is a 100% OA unit designed to supply 1,890 CFM of OA at 1.50 in w.c. ESP. With the current design OA flow of 1,000 CFM each, the Single Justice Courtroom and the Conference Suite can accommodate 137 people a piece.

We estimate that each AHU could handle a 25% increase in airflow to these space which can be achieved by rebalancing the system to reduce the flow to the ancillary spaces, but the occupancy of those spaces must also be reduced. By increasing the OA flow to the Single Justice Courtroom and Conference Suite to 1,250 CFM each, the spaces could each accommodate 177 people. We recommend further engineering to confirm how much additional airflow these air handlers can accommodate.

2.7.2 Program Lead / Lag Schedule for Cooling Towers

As mentioned in the Existing Ventilation Section Above, the cooling towers are being operated so that CT-1 & 2 serve the chiller when in mechanical cooling and CT-3 & 4 are dedicated to the free-cool heat exchanger. Because the chiller plant is in Mechanical cooling mode far more often than free-cool mode, CT-1 & CT-2 reached the end of their useful life much quicker than CT-3 & CT-4. As a result, CT-1 & CT-2 have recently been rebuilt with stainless steel hot water boxes and partition walls. CT-3 & 4 appear to be in relatively good condition, likely with several years of usable life remaining before a similar rebuild may be necessary.

The CW pumps in the plant are headered together with automatic control valves between the inlet and discharge of each pump. This piping arrangement allows for any of the three CW pumps to draw from either of the dual cell cooling towers.

We recommend working with your controls contractor to develop a Lead / Lag control sequence for the cooling towers to equalize the run time and prevent further uneven wear and tear on the cooling towers.

2.7.3 Insulate AHU-12 OA Duct

During the site walk through, Tighe & Bond noted that AHU-12 OA duct was not insulated. It appears the outside air duct has been mistaken for the exhaust duct and vice versa. Currently the exhaust air duct is insulated, and the outside air duct is not. Typically, the outside air duct is insulated because the cold air coming in during the winter can potentially lead to condensation building up on the ductwork. Currently there does not appear to be any evidence of water damage from condensation build up but we recommend insulating the OA duct for AHU-12.

Section 3
Testing & Balancing Results

Milharmer Associated visited the John Adams Courthouse on December 15, 2021 to test the airflow rates of the air handling units and the 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	1,045	1,045	0	804	801	0
AHU-2	2,565	2,565	0	2,320	2,320	0
AHU-3	1,495	1,495	0	1,404	1,404	0
AHU-4	2,305	2,305	0	2,267	2,267	0
AHU-5	3,300	3,300	0	3,213	3,213	0
AHU-6	1,355	1,355	0	1,238	1,238	0
AHU-7	710	710	0	757	757	0
AHU-8	1,435	1,435	0	972	972	0
AHU-9	2,005	2,005	0	1,857	1,857	0
AHU-10	4,030	4,030	0	Not Tested	Not Tested	Not Tested
AHU-11	1,655	1,655	0	1,772	1,772	0
AHU-12	5,400	3,940	1,460	5,342	1,427	3,915
AHU-14	1,650	1,650	0	1,648	1,648	0
AHU-15	1,765	1,765	0	1,911	1,911	0
AHU-16	1,890	1,890	0	1,801	1,801	0
AHU-17	1,325	1,325	0	1,277	1,277	0
AHU-18	1,130	1,130	0	1,099	1,099	0
AHU-19	3,380	3,380	0	3,417	3,417	0
AHU-20	3,485	3,485	0	3,381	3,381	0

AHU-21	2,415	2,415	0	2,495	2,495	0
AHU-22	2,095	2,095	0	2,699	2,699	0
AHU-23	1,700	140	1,560	1,871	386	1,485
AHU-26	6,750	1,500	5,250	4,327	1,786	2,541
AHU-27	4,240	1,500	2,740	4,569	2,286	2,283
AHU-28	4,250	1,750	2,500	5,870	2,078	3,792
AHU-30	740	740	0	825	825	0
AHU-31	3,015	3,015	0	2,236	2,236	0
AHU-32	4,000	1,500	2,500	4,117	1,461	2,656

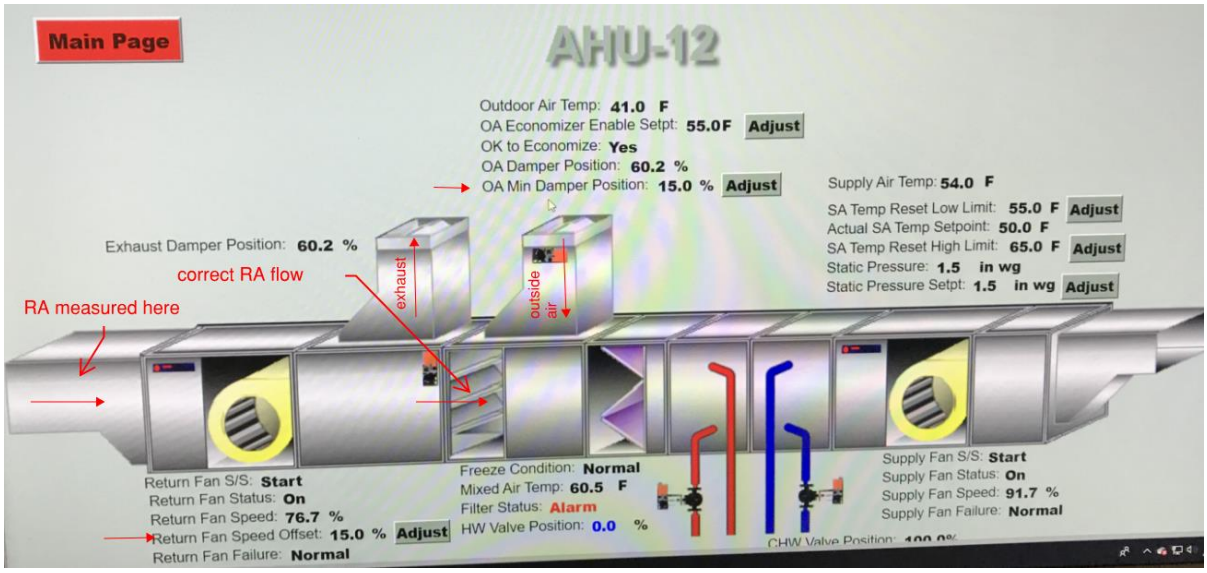
TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow (CFM)	Actual Return/Exhaust Airflow (CFM)
EF-1	Restroom	5,400	4,034
EF-2	Restroom	5,400	4,301
EF-8	Restroom	2,995	3,164
EF-12	Restroom	4,725	3,967
EF-13	Restroom	1,545	1,260
EF-14	Restroom	4,720	3,459
EF-15	Restroom	1,455	1,549
EF-16	Restroom	1,475	1,247
EF-17	Restroom	1,500	1,358
EF-18	Restroom	1,500	1,223
EF-19	Restroom	815	536
EF-20	Restroom	880	492
EF-21	Restroom	2,310	2,838
EF-22	Restroom	750	1,213
EF-28	Restroom	500	338
EF-29	Restroom	410	321

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. The TAB report notes that AHU-1 is performing at 80% of design airflow and will require a sheave change to increase the airflow to meet the design.
2. The TAB contractor noted that the belt for AHU-6 is damaged and needs to be replaced.
3. The TAB report notes that AHU-8 is performing at 68% of design airflow and will require a sheave change to increase the airflow to meet the design.
4. AHU-10 was not tested because there was no access to traverse airflow.
5. AHU-12: The TAB report appears to show a return air value of 3,915 CFM and a calculated outside air value of 1,427 CFM which would indicate an outside air value that is much lower than the recommended OA value of 3,940. The outside airflow is calculated by subtracting the return airflow from the overall supply airflow. The return air value appears to have been determined by traversing the return air duct on the inlet side of the unit. Due to the configuration of this unit, we believe this is not an accurate way to determine the amount of outside air being supplied to the unit. As shown in the BMS screen shot below, the location where the RA value was measured is upstream of the exhaust air which means that a large portion of the 3,915 CFM that was measure as "return air" is actually being exhausted. Also, as shown on the BMS screenshot below, the minimum outside air damper position is set to 15% open. This is likely not enough to get the recommended amount of outside air for this unit. Finally, as noted above in section 2.7.3, the OA duct for AHU-12 is currently not insulated. We recommend having the TAB contractor rebalance the units minimum OA damper position to provide the recommended amount of outside air. Due to the current min position of 15% it is safe to assume that the recommended outside airflow is significantly higher than what is currently being provided. We recommend keeping an eye on condensation buildup on the OA duct with the increased amount of outside air during cold weather. As noted in section 2.7.3, we recommend insulating the OA duct to protect against condensation buildup.



6. AHU-22 is performing at 128% of design airflow and will require a sheave change to decrease the airflow to meet the design.
7. AHU-26 is performing at 83% of design airflow and will require a sheave change to increase the airflow to meet the design. The scheduled airflow is higher than the airflow listed at all the diffusers served by the unit.
8. AHU-28 is performing at 138% of design airflow and will require a sheave change to decrease the airflow to meet the design.
9. AHU-31 is performing at 74% of design airflow and will require a sheave change to increase the airflow to meet the design.
10. Exhaust Fan EF-1, 2, 10,12, 13, 14, 18, 20, 21, 28, and 29 are all operating below the acceptable airflow range. We recommend investigating each unit further to determine the cause of the deficient airflow and correcting the issue.
11. EF-8 overall airflow is within an acceptable range of the design, however the air distribution as noted on page 60 of the TAB report is unbalanced. The report noted an exhaust grille in 3-201, which is a courtroom, as 81 CFM when it is designed for 1,000 CFM. Also, the exhaust grille in 1M-504, the executive office suite, was measured at 2,236 when the design is 680 CFM. We recommend having the balancer rebalance the air distribution for this fan.
12. The TAB report notes that there was a register served by EF-19 that could not be located. If the register is getting the design airflow, EF-19 is operating at an acceptable airflow.
13. EF-20 serves a room that was locked and the register was not tested.

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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TEST AND BALANCE REPORT

Project: **John Adams Courthouse PH4**
1 Pemberton Sq., Boston, MA

Project No.: **21-538** **Project Date:** **12/15/2021**

MECHANICAL CONTRACTOR
Tigh & Bond

3384

A N.E.B.B. Certified Company

Project:	John Adams Courthouse PH4		
Address:	1 Pemberton Sq., Boston, MA		
Date:	12/15/2021	**Project No.**	21-538

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

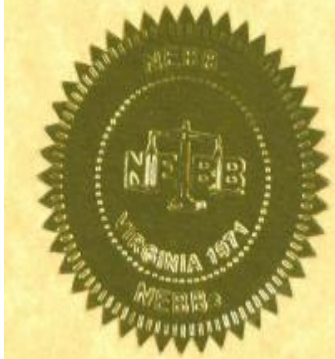
NEBB Certification Number

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

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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
AC or ACU	Air Conditioner Unit		Protection For Motors
ACCU	Air Cooled Condensing Unit		Located at Starter Motor
ADJ P.D.	Adjusted Pitch Diameter		
AMP	Amperage	HEPA	High Efficiency Particulate
AVG	Average		Arrestance
A.D.	Air Density	HOA	Hand/Off/Auto Switch
		H.P.	Horsepower
B.H.P.	Brake Horsepower	HPS	High Pressure Steam
		HRC	Heat (Recovery or Recliam) Coil
CFM	Cubic Feet Per Minute	HVAC	Heating, Ventilation and
CH	Chiller		Air Conditioning
CHWR	Chilled Water Return	HWR	Hot Water Return or
CHW or CHWS	Chilled Water Supply		Heating Water Return
CT	Cooling Tower	HWS	Hot Water Supply or
CWR	Condenser Water Return		Heating Water Supply
CW or CWS	Condenser Water Supply	HX	Heat Exchanger
DB	Dry Bulb	I.D.	Inside Diameter
D.D.	Direct Drive		
DIA	Diameter	LAT	Leaving Air Temperature
		L.D.	Linear Supply Diffuser
EAT	Entering Air Temperature	LPS	Low Pressure Steam
EDC	Electric Duct Coil	L.T.	Light Troffer
EDH	Electric Duct Heater	LWT	Leaving Water Temperature
EF	Exhaust Fan		
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:	John Adams Courthouse PH4		
Address:	1 Pemberton Sq., Boston, MA		
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REPORT SUMMARY

Attached is the report for John Adams Courthouse with the following comments:

1. AHU-1 is running at approximately 80% of design airflow and will need a sheave to increase airflow to design.

2. AHU-8 is running at approximately 68% of design airflow and will need a sheave to increase airflow to design.

3. AHU-22 is running at approximately 128% of design airflow and will need a sheave to decrease airflow to design.

4. AHU-26 is running at approximately 83% of design airflow and will need a sheave to increase airflow to design.

5. AHU-28 is running at approximately 138% of design airflow and will need a sheave to decrease airflow to design.

6. AHU-26 is running at approximately 74% of design airflow and will need a sheave to increase airflow to design.

Project:	John Adams Courthouse PH4		
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REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
AHU-1	804 CFM	NA	804 CFM
AHU-2	2,320 CFM	NA	2,320 CFM
AHU-3	1,404 CFM	NA	1,404 CFM
AHU-4	2,267 CFM	NA	2,267 CFM
AHU-5	3,213 CFM	NA	3,213 CFM
AHU-6	1,238 CFM	NA	1,238 CFM
AHU-7	757 CFM	NA	757 CFM
AHU-8	972 CFM	NA	972 CFM
AHU-9	1,857 CFM	NA	1,857 CFM
AHU-10	*1	*1	*1
AHU-11	1,772 CFM	NA	1,772 CFM
AHU-12	5,342 CFM	3,915 CFM	1,427 CFM
AHU-14	1,648 CFM	NA	1,648 CFM
AHU-15	1,911 CFM	NA	1,911 CFM
AHU-16	1,801 CFM	NA	1,801 CFM
AHU-17	1,277 CFM	NA	1,277 CFM
AHU-18	1,099 CFM	NA	1,099 CFM
AHU-19	3,417 CFM	NA	3,417 CFM
AHU-20	3,381 CFM	NA	3,381 CFM
AHU-21	2,495 CFM	NA	2,495 CFM
AHU-22	2,699 CFM	NA	2,699 CFM
AHU-23	1,871 CFM	NA	1,871 CFM
AHU-26	4,327 CFM	2,541 CFM	1,786 CFM
AHU-27	4,569 CFM	2,283 CFM	2,286 CFM
AHU-28	5,870 CFM	3,792 CFM	2,078 CFM
AHU-30	825 CFM	NA	825 CFM
AHU-31	2,236 CFM	NA	2,236 CFM
AHU-32	4,117 CFM	2,656 CFM	1,461 CFM

*1 Could not get access to traverse airflow.

Project:	John Adams Courthouse PH4		
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REPORT SUMMARY

FANS

UNIT	EXHAUST
EF-1	4,034 CFM
EF-2	4,301 CFM
EF-8	3,164 CFM
EF-12	3,967 CFM
EF-13	1,260 CFM
EF-15	1,549 CFM
EF-14	3,429 CFM
EF-16	1,247 CFM
EF-17	1,358 CFM
EF-18	1.223 CFM
EF-19	536 CFM
EF-20	492 CFM
EF-22	1,213 CFM
EF-21	2,838 CFM
EF-28	338 CFM
EF-29	321 CFM

Project: John Adams Courthouse PH4
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FAN DATA SHEET

	FAN NO. AHU-1		FAN NO. AHU-2	
Serves / Location:	Ground Fl. FCU's	G-901	Ground Fl. FCU's	G-910
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB003UA0C0UA		MCCB006UA0C0UB	
Size:	NL		NL	
Serial Number:	K02M90584A		K02M90592S	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	CENTURY
Frame Number:	NL	P145T	NL	182T
Horsepower:	NL	1.5	NL	3
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	471/3	460/3	471/3
Motor Amperage:	2.1	1.4	4	4
Motor RPM:	1745	1745	1770	1770
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1045	804	2465	2320
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	1045	804	2465	2320
Suction Pressure:	NL	-0.39	NL	-0.89
Discharge Pressure:	NL	0.38	NL	0.59
Fan Static Pressure:	1.2	0.77	1.75	1.48
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VL40	NL	1VP44
Motor Size/Bore:	NL	7/8	NL	1 1/8
Fan Drive:	NL	NA	NL	NA
Fan Size/Bore:	NL	NA	NL	NA
Belt Size / Number:	NL	BX40	NL	BX42/1
Shafts C-C:	NL	15	NL	16 1/4
Turns Open:	NL	Closed	NL	5

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
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TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: G901

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	18	" WIDTH x	13	" DEPTH	Sq Ft =	1.63

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.09	InWg.	DESIGN CFM =	1045
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	804
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**804**

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

TEST HOLE	1	2	3	4	5	6	7
A	293	483	598				
B	286	558	606				
C	442	584	604				
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 9 AVERAGE FPM = 495

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
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TRAVERSE DATA

SYSTEM: AHU-2 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: G910

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	12	" DEPTH	Sq Ft =	2.50

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.3	InWg.	DESIGN CFM =	2465
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2320
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2319**

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

TEST HOLE	1	2	3	4	5	6	7
A	814	968	831	834	731		
B	902	1052	1048	1023	762		
C	878	1083	1065	1055	795		
D	893	1043	989	1000	792		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 928

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
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FAN DATA SHEET

	FAN NO. AHU-3		FAN NO. AHU-4	
Serves / Location:	1st Fl. FCU's	1-915	1st Fl. FCU's	1-501
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB006UA0C0UA		MCCB006UA0C0UB	
Size:	NL		NL	
Serial Number:	K02M90600A		K02M91841A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	MARATHON	NL	CENTURY
Frame Number:	NL	143T-85	NL	182T
Horsepower:	NL	1	NL	3
Brake Horsepower:	NL	NA	NL	2.16
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	470/3	460/3	471/3
Motor Amperage:	1.55	1.1	8 / 4	2.7
Motor RPM:	1750	1750	1770	1770
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1495	1404	2305	2267
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	1495	1404	2305	2267
Suction Pressure:	NL	-0.43	NL	-1.74
Discharge Pressure:	NL	0.34	NL	0.29
Fan Static Pressure:	1.6	0.77	1.5	2.03
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VL40	NL	1VP44
Motor Size/Bore:	NL	7/8	NL	1 1/8
Fan Drive:	NL	AX39	NL	1B38SH
Fan Size/Bore:	NL	1	NL	SH 1
Belt Size / Number:	NL	A40/1	NL	BX43/1
Shafts C-C:	NL	16"	NL	16 1/2"
Turns Open:	NL	Closed	NL	2

Comments:

Project: John Adams Courthouse PH4
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TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 1-915

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	31	" WIDTH x	14	" DEPTH Sq Ft =	3.01

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.19	InWg.	DESIGN CFM =	1495
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1403
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1404**

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

TEST HOLE	1	2	3	4	5	6	7
A	405	405	482	499	519		
B	459	467	455	413	508		
C	484	461	489	398	573		
D	472	416	427	384	597		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 466

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
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TRAVERSE DATA

SYSTEM: AHU-4 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: G910

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	26	" WIDTH x	16 " DEPTH	Sq Ft =	2.89

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.77	InWg.	DESIGN CFM =	2305
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2267
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2264**

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

TEST HOLE	1	2	3	4	5	6	7
A	740	671	746	639			
B	829	839	783	740			
C	885	853	823	747			
D	945	826	758	732			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 785

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
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FAN DATA SHEET

	FAN NO. AHU-5		FAN NO. AHU-6	
Serves / Location:	FCU's	1-524	FCU's	1-104
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB008UA0C0UB		MCCB003UA0C0UA	
Size:	NL		NL	
Serial Number:	K02M91849A		K02M91857A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	NA	NL	A.O. Smith
Frame Number:	NL	NA	NL	P145T
Horsepower:	NL	NA	NL	2
Brake Horsepower:	NL	NA	NL	2.16
Safety Factor:	NL	NA	NL	1.15
Volts/Phase:	NL	NA	460/3	470/3
Motor Amperage:	NL	NA	2.8	2.2
Motor RPM:	NL	NA	1745	1745
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3300	3213	1355	1133
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	3300	3213	1355	1133
Suction Pressure:	NL	-0.83	NL	-0.83
Discharge Pressure:	NL	0.17	NL	*1
Fan Static Pressure:	1.5	1	1.5	*1
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	NA	NL	1VP34
Motor Size/Bore:	NL	NA	NL	7/8"
Fan Drive:	NL	NA	NL	BK32H
Fan Size/Bore:	NL	NA	NL	H 1 3/16"
Belt Size / Number:	NL	NA	NL	B39/1 *1
Shafts C-C:	NL	NA	NL	15 1/2"
Turns Open:	NL	NA	NL	3

Comments: ***1 Belt damaged - replacement needed.**

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TRAVERSE DATA

SYSTEM: AHU-5 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 1-524

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	14	" DEPTH	Sq Ft =	3.50

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.14	InWg.	DESIGN CFM =	3300
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3213
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**3214**

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

TEST HOLE	1	2	3	4	5	6	7
A	468	554	675	938	1115	1169	
B	698	687	922	1098	1165	1095	
C	730	936	997	1103	1125	1049	
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 18 AVERAGE FPM = 918

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Sean Hayward

Project: John Adams Courthouse PH4
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TRAVERSE DATA

SYSTEM: AHU-6 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 1-524

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	16	" WIDTH x	14 " DEPTH	Sq Ft =	1.56

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.08	InWg.	DESIGN CFM =	1355
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1237
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1238**

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

TEST HOLE	1	2	3	4	5	6	7
A	800	814	760	786			
B	780	801	796	726			
C	865	892	725	799			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 795

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Sean Hayward

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-7		FAN NO. AHU-8	
Serves / Location:	FCU's	1M-912	FCU's	1M-511
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB003UA0C0UB		MCCB003UA0C0UA	
Size:	NL		NL	
Serial Number:	K02M92689A		K02M91871A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	A.O. Smith
Frame Number:	NL	X143T	NL	P145T
Horsepower:	NL	1	NL	2
Brake Horsepower:	NL	NA	NL	2.16
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	479/3	460/3	479/3
Motor Amperage:	1.5	1.3	2.8	2.7
Motor RPM:	1745	1745	1745	1745
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	710	757	1435	972
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	710	757	1435	972
Suction Pressure:	NL	-0.72	NL	-1.81
Discharge Pressure:	NL	0.27	NL	0.98
Fan Static Pressure:	1.5	0.99	1.5	+/- 1.79
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	NA	NL	1VL44
Motor Size/Bore:	NL	NA	NL	7/8"
Fan Drive:	NL	NA	NL	BK32H
Fan Size/Bore:	NL	NA	NL	H 1 3/16"
Belt Size / Number:	NL	NA	NL	NX40/1
Shafts C-C:	NL	NA	NL	15 3/4"
Turns Open:	NL	NA	NL	Closed

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-7 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 1M-912

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	12	" WIDTH x	12	" DEPTH	Sq Ft =	1.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.35	InWg.	DESIGN CFM =	710
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	757
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**756**

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

TEST HOLE	1	2	3	4	5	6	7
A	561	617	520	789			
B	706	928	915	1016			
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 8 AVERAGE FPM = 757

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-8 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 1M-511

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	20	" WIDTH x	12	" DEPTH	Sq Ft =	1.67

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.3	InWg.	DESIGN CFM =	1435
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	972
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**972**

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

TEST HOLE	1	2	3	4	5	6	7
A	565	636	568	497			
B	597	645	606	553			
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 8 AVERAGE FPM = 583

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-9		FAN NO. AHU-10	
Serves / Location:	FCU's	1M-124	FCU's	2-656
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB006UA0C0UB		MCCB010UA0C0UA	
Size:	NL		NL	
Serial Number:	K02M91880A		K02H21936A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	A.O. Smith
Frame Number:	NL	P145T	NL	S184T
Horsepower:	NL	2	NL	5
Brake Horsepower:	NL	NA	NL	2.16
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	472/3	460/3	472/3
Motor Amperage:	2.6	1.4	6.8	4.2
Motor RPM:	1745	1745	1760	1760
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	2005	1787	4030	*1
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	2005	1787	4030	*1
Suction Pressure:	NL	-1.04	NL	-0.55
Discharge Pressure:	NL	0.58	NL	0.37
Fan Static Pressure:	1.5	1.62	1.75	0.92
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VL40	NL	1VP65
Motor Size/Bore:	NL	7/8"	NL	1 1/8"
Fan Drive:	NL	AK41	NL	BK77H
Fan Size/Bore:	NL	1"	NL	H1 3/16
Belt Size / Number:	NL	AX42/1	NL	BX55/1
Shafts C-C:	NL	17 1/2"	NL	6 1/4
Turns Open:	NL	2	NL	2

Comments: ***1 Unable to get readings.**

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-9 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: Outside room 1M-124

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	18	" WIDTH x	18 " DEPTH	Sq Ft =	2.25

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.46	InWg.	DESIGN CFM =	2005
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1857
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1856**

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

TEST HOLE	1	2	3	4	5	6	7
A	721	804	826	888			
B	737	817	848	853			
C	764	877	816	852			
D	846	874	844	837			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 825

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Greg Miller

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-10 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 1M-511

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

AIR DENSITY DATA

STATIC PRESS @ CL:		InWg.	DESIGN CFM =	
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	#DIV/0!
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**#DIV/0!**

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

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

NO. OF READINGS = 0 AVERAGE FPM = #DIV/0!

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: _____

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-11		FAN NO. AHU-12	
Serves / Location:	FCU's	2-021	VAV's	2-913
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB006UA0C0UA		MCCB012UA0C0UA	
Size:	NL		NL	
Serial Number:	K02H21954A		K02H21877A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	BALDOR
Frame Number:	NL	P145T	NL	184T
Horsepower:	NL	1.5	NL	5
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	472/3	460/3	472/3
Motor Amperage:	2.1	1.4	6.6	5.7
Motor RPM:	1745	1745	1750	1800
Speeds:	NL	Belt Driven	VFD	60 Hz
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1655	1772	5400	5342 *1
Return Air CFM:			1460	3915
Exhaust Air CFM:				
Outside Air CFM:	1655	1772	3940	1427 *2
Suction Pressure:	NL	NA	NL	-1.03
Discharge Pressure:	NL	NA	NL	0.6
Fan Static Pressure:	1.8	NA	1.5	1.63
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VL40	NL	AK66
Motor Size/Bore:	NL	7/8"	NL	1 1/8
Fan Drive:	NL	AK41	NL	AK104
Fan Size/Bore:	NL	1"	NL	1 7/16
Belt Size / Number:	NL	4L440/1	NL	AX51/1
Shafts C-C:	NL	17 1/2	NL	13 1/4
Turns Open:	NL	2	NL	FIXED

Comments: ***1 Total of VAV's at max cfm.**

***2 Outside Air damper is at 50%.**

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-11 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: Womens 2-021

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	24	" WIDTH x	16 " DEPTH	Sq Ft =	2.67

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.03	InWg.	DESIGN CFM =	1655
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1772
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1773**

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

TEST HOLE	1	2	3	4	5	6	7
A	718	750	658	580			
B	692	649	657	643			
C	707	529	703	659			
D	708	626	743	608			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 664

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Greg Miller

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-12 TRAVERSE NUMBER : T1
Return TRAVERSE LOCATION: 2M-913

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	24	" DEPTH	Sq Ft =	5.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.21	InWg.	DESIGN CFM =	1460
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3915
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**3915**

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

TEST HOLE	1	2	3	4	5	6	7
A	827	902	848	856	714		
B	974	964	977	948	750		
C	1063	1016	1062	1025	736		
D	1068	819	979	1042	856		
E	182	203	296	0	453		
F							
G							
H							
I							

NO. OF READINGS = 25 AVERAGE FPM = 783

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-14		FAN NO. AHU-15	
Serves / Location:	FCU's	2M-910	FCU's	2M-901
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB006UA0C0UA		MCCB006UA0C0UA	
Size:	NL		NL	
Serial Number:	K02H21893A		K02H1907A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	A.O. Smith
Frame Number:	NL	P145T	NL	P145T
Horsepower:	NL	1.5	NL	1.5
Brake Horsepower:	NL	NA	NL	2.16
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	471/3	460/3	471/3
Motor Amperage:	2.1	1.3	2.1	2.1
Motor RPM:	1745	1745	1745	1745
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1650	1648	1765	1911
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	1650	1648	1765	1911
Suction Pressure:	NL	-0.68	NL	1.56
Discharge Pressure:	NL	0.38	NL	0.59
Fan Static Pressure:	1.6	1.06	1.75	2.15
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VP34	NL	1VP34
Motor Size/Bore:	NL	7/8	NL	7/8
Fan Drive:	NL	AK44	NL	BK36
Fan Size/Bore:	NL	1	NL	1
Belt Size / Number:	NL	A42/1	NL	BX40/1
Shafts C-C:	NL	15 1/2	NL	16
Turns Open:	NL	1	NL	1

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-14 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 2M-910

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	13	" WIDTH x	13	" DEPTH	Sq Ft =	1.17

AIR DENSITY DATA

STATIC PRESS @ CL:	0.38	InWg.	DESIGN CFM =	1650
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1648
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1650**

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

TEST HOLE	1	2	3	4	5	6	7
A	830	1385	1634	1811			
B	977	1462	1665	1696			
C	1153	1361	1574	1541			
D	1039	1315	1484	1537			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 1404

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
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TRAVERSE DATA

SYSTEM: AHU-15 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 2m-901

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	18	" WIDTH x	16	" DEPTH Sq Ft =	2.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-1.03	InWg.	DESIGN CFM =	1765
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1911
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1907**

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

TEST HOLE	1	2	3	4	5	6	7
A	971	941	913	680			
B	1049	920	1004	726			
C	1191	948	957	845			
D	1154	1112	1034	842			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 955

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-16		FAN NO. AHU-17	
Serves / Location:	FCU's	2M-902	FCU's	2M-701
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB006UA0C0UA		MCCB003UA0C0UA	
Size:	NL		NL	
Serial Number:	K02H21923A		K02H21869A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	NA
Frame Number:	NL	P145T	NL	NA
Horsepower:	NL	1.5	NL	NA
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	NA
Volts/Phase:	460/3	471/3	NL	NA
Motor Amperage:	2.1	1.5	NL	NA
Motor RPM:	1745	1745	NL	NA
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1890	1801	1325	1277
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	1890	1801	1325	1277
Suction Pressure:	NL	-0.74	NL	-1.39
Discharge Pressure:	NL	0.39	NL	0.57
Fan Static Pressure:	1.5	1.13	1.75	1.96
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VP34	NL	NA
Motor Size/Bore:	NL	7/8	NL	NA
Fan Drive:	NL	AK44	NL	NA
Fan Size/Bore:	NL	1	NL	NA
Belt Size / Number:	NL	A40/1	NL	NA
Shafts C-C:	NL	15	NL	NA
Turns Open:	NL	1 1/2	NL	NA

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-16 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 2M-902

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	32	" WIDTH x	16	" DEPTH	Sq Ft =	3.56

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.35	InWg.	DESIGN CFM =	1890
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1801
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1801**

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

TEST HOLE	1	2	3	4	5	6	7
A	915	866	696	523	225	-131	
B	887	878	677	410	122	-171	
C	879	771	873	377	134	-156	
D	1019	736	909	613	272	-166	
E							
F							
G							
H							
I							

NO. OF READINGS = 24 AVERAGE FPM = 507

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-17 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 2M-701

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	20	" WIDTH x	12	" DEPTH Sq Ft =	1.67

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.36	InWg.	DESIGN CFM =	1325
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1277
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1277**

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

TEST HOLE	1	2	3	4	5	6	7
A	694	677	767	793	741		
B	782	810	808	787	765		
C	770	823	818	772	712		
D	824	840	822	677	645		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 766

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-18		FAN NO. AHU-19	
Serves / Location:	FCU's	3-701	FCU's	3M-907
Manufacturer:	TRANE		TRANE	
Model Number:	NL		MCCB008UA0C0UB	
Size:	NL		NL	
Serial Number:	NL		K02G02997A	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	NA	NL	A.O. Smith
Frame Number:	NL	NA	NL	S182T
Horsepower:	NL	NA	NL	3
Brake Horsepower:	NL	NA	NL	2.16
Safety Factor:	NL	NA	NL	1.15
Volts/Phase:	NL	NA	460/3	471/3
Motor Amperage:	NL	NA	4	3
Motor RPM:	NL	NA	1760	1760
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1130	1099	3380	3417
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	1130	1099	3380	3417
Suction Pressure:	NL	NA	NL	-0.82
Discharge Pressure:	NL	NA	NL	1.02
Fan Static Pressure:	1.5	NA	1.75	1.84
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	NA	NL	1VP50
Motor Size/Bore:	NL	NA	NL	1 1/8
Fan Drive:	NL	NA	NL	BK55
Fan Size/Bore:	NL	NA	NL	1 3/16
Belt Size / Number:	NL	NA	NL	BX56/2
Shafts C-C:	NL	NA	NL	19 1/4
Turns Open:	NL	NA	NL	2

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-18 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 3-701

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	12 1/4	" WIDTH x	12 1/4	" DEPTH	Sq Ft =	1.04

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	1130
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1099
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1100**

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

TEST HOLE	1	2	3	4	5	6	7
A	1055						
B							
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 1 AVERAGE FPM = 1055

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-19 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 3M-907

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	24	" WIDTH x	20 " DEPTH	Sq Ft =	3.33

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.72	InWg.	DESIGN CFM =	3380
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3417
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**3413**

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

TEST HOLE	1	2	3	4	5	6	7
A	1686	1524	1187	1058	613	-409	
B	1530	1630	1235	649	518	279	
C	1725	1573	1062	1165	389	391	
D	1659	1694	1358	1021	590	475	
E							
F							
G							
H							
I							

NO. OF READINGS = 24 AVERAGE FPM = 1025

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-20		FAN NO. AHU-21	
Serves / Location:	FCU's	3M-906	VAV's	3M-904
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB008UA0C0UB		MCCB006UA0C0UA	
Size:	NL		NL	
Serial Number:	K02D54098		K02D54107	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	A.O. Smith
Frame Number:	NL	S184T	NL	P145T
Horsepower:	NL	5	NL	2
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	471/3	460/3	471/3
Motor Amperage:	6.8	4.4	2.8	2.6
Motor RPM:	1760	1760	1745	1745
Speeds:	NL	Belt Driven	VFD	60 Hz
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3485	3381	2415	2495
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	3485	3381	2415	2495
Suction Pressure:	NL	-0.86	NL	-0.95
Discharge Pressure:	NL	0.46	NL	0.98
Fan Static Pressure:	2	1.32	1.75	1.93
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VP44	NL	1VP34
Motor Size/Bore:	NL	1 1/8	NL	7/8
Fan Drive:	NL	BK65H	NL	BS32
Fan Size/Bore:	NL	H 1/3/16	NL	1
Belt Size / Number:	NL	BX52/1	NL	BX38
Shafts C-C:	NL	18	NL	16 1/4
Turns Open:	NL	2	NL	4

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-20 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 3M-906

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	16 " DEPTH	Sq Ft =	3.33

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.15	InWg.	DESIGN CFM =	3485
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3381
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**3382**

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

TEST HOLE	1	2	3	4	5	6	7
A	2326	1835	1354	315	178	300	
B	2375	1853	1254	338	182	222	
C	2307	1822	1194	274	230	287	
D	1953	1855	1201	203	237	247	
E							
F							
G							
H							
I							

NO. OF READINGS = 24 AVERAGE FPM = 1014

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-21 TRAVERSE NUMBER : T1
Return TRAVERSE LOCATION: 3M-904

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	18	" WIDTH x	18	" DEPTH	Sq Ft =	2.25

AIR DENSITY DATA

STATIC PRESS @ CL:	0.1	InWg.	DESIGN CFM =	2415
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2495
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2497**

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

TEST HOLE	1	2	3	4	5	6	7
A	1074	893	862	974			
B	1177	968	1394	1363			
C	1173	1329	715	1384			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 1109

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Sean Hayward

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-22		FAN NO. AHU-23	
Serves / Location:	FCU's	3M-904	FCU's	3M-903
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB006UA0C0UB		MCCB006UA0C0UB	
Size:	NL		NL	
Serial Number:	K02D54114		K02D54122	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	CENTURY	NL	A.O. Smith
Frame Number:	NL	145T	NL	145T
Horsepower:	NL	2	NL	1 1/2
Brake Horsepower:	NL	NA	NL	2.16
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	472/3	460/3	NA
Motor Amperage:	2.5	2.8	2.1	NA
Motor RPM:	1730	1730	1745	1745
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	2095	2699	1700	1871
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	2095	2699	1700	1871 386
Suction Pressure:	NL	-1.33	NL	-0.67
Discharge Pressure:	NL	0.81	NL	0.59
Fan Static Pressure:	2	1.14	1.5	1.26
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VP44	NL	1VP34
Motor Size/Bore:	NL	7/8	NL	7/8
Fan Drive:	NL	BK36	NL	AK44
Fan Size/Bore:	NL	1	NL	1
Belt Size / Number:	NL	A42/1	NL	A44/1
Shafts C-C:	NL	16 1/2	NL	17
Turns Open:	NL	1	NL	3

See pg 47

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-22 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 3M-904

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	14	" WIDTH x	14	" DEPTH	Sq Ft =	1.36

AIR DENSITY DATA

STATIC PRESS @ CL:	0.22	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1634
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1635**

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

TEST HOLE	1	2	3	4	5	6	7
A	1141	1075	1135				
B	1132	1052	1420				
C	1192	1282	1373				
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 9 AVERAGE FPM = 1200

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Sean Hayward

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-22 TRAVERSE NUMBER : T2
Outside Air TRAVERSE LOCATION: 3M-904

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	12	" WIDTH x	12	" DEPTH	Sq Ft =	1.00

AIR DENSITY DATA

STATIC PRESS @ CL:	0.47	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1065
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1067**

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

TEST HOLE	1	2	3	4	5	6	7
A	1042	1229	1040				
B	1002	1045	1031				
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 6 AVERAGE FPM = 1065

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Sean Hayward

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-23 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: 3M-903

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	8	" DEPTH	Sq Ft =	1.67

AIR DENSITY DATA

STATIC PRESS @ CL:	0.3	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1304
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1306**

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

TEST HOLE	1	2	3	4	5	6	7
A	314	720	944	1082	942		
B	219	717	897	1011	978		
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 10 AVERAGE FPM = 782

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Sean Hayward

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-23 TRAVERSE NUMBER : T2
Supply TRAVERSE LOCATION: 3M-903

DUCT SIZE (ROUND)	8	" DIAMETER		Sq Ft =	0.35
DUCT SIZE (RECT.)		" WIDTH x	" DEPTH	Sq Ft =	0.00

AIR DENSITY DATA

STATIC PRESS @ CL:	0.03	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	567
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**567**

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

TEST HOLE	1	2	3	4	5	6	7
A	1716	1638					
B	1613	1671					
C	1563	1631					
D	1517	1648					
E							
F							
G							
H							
I							

NO. OF READINGS = 8 AVERAGE FPM = 1625

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Sean Hayward

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-23 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 3M-903

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	8	" WIDTH x	6	" DEPTH	Sq Ft =	0.33

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.15	InWg.	DESIGN CFM =	141
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	386
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**386**

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

TEST HOLE	1	2	3	4	5	6	7
A	1178	1179	1158	1002			
B	1192	1186	1251	1106			
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 8 AVERAGE FPM = 1157

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Sean Hayward

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-26		FAN NO. AHU-27	
Serves / Location:	FCU's	4-306	FCU's	4-135
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB012UA0C0UB		MCCB010UA0C0UA	
Size:	NL		NL	
Serial Number:	K02D54128		K02D54136	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	CENTURY	NL	A.O. Smith
Frame Number:	NL	S184T	NL	S184T
Horsepower:	NL	5	NL	5
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	230/460/3	473/3	460/3	472/3
Motor Amperage:	13.6/6.8	6.2	6.8	6.1
Motor RPM:	1760	1760	1760	1760
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	6750 / 5225 *1	4327	4250 / 4000 *1	4569
Return Air CFM:	5250 / 3760 *1	2541	2750 / 2260 *1	2283
Exhaust Air CFM:				
Outside Air CFM:	1500 / 1465 *1	1786	1500 / 1740 *1	2286
Suction Pressure:	NL	-1.18	NL	-1.37
Discharge Pressure:	NL	0.73	NL	0.34
Fan Static Pressure:	1.5	1.91	1.5	1.71
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VP62	NL	1VP71
Motor Size/Bore:	NL	1 1/8	NL	1 1/8
Fan Drive:	NL	BK85	NL	BK90
Fan Size/Bore:	NL	1 7/16	NL	1 3/16
Belt Size / Number:	NL	B43 / 1	NL	BX40
Shafts C-C:	NL	12	NL	9 1/4
Turns Open:	NL	4	NL	2

Comments: ***1 Connected CFM on drawing H-009**

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-26 TRAVERSE NUMBER : T1
Return Grill TRAVERSE LOCATION: 4-306

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	21 1/4	" WIDTH x	45 1/4	" DEPTH	Sq Ft =	6.68

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	3760
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2541
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2542**

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

TEST HOLE	1	2	3	4	5	6	7
A	450	298	429				
B	349	424	333				
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 6 AVERAGE FPM = 381

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-26 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: 4th Fl. Mens

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	36 " DEPTH	Sq Ft =	9.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.05	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1786
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1787**

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

TEST HOLE	1	2	3	4	5	6	7
A	551	0	0	400	242	438	
B	0	0	0	316	285	416	
C	0	112	0	335	0	207	
D	0	398	399	166	0	0	
E	201	337	273	0	324	398	
F	284	0	183	398	0	480	
G							
H							
I							

NO. OF READINGS = 36 AVERAGE FPM = 198

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-27 TRAVERSE NUMBER : T1
Return + Outside Air TRAVERSE LOCATION: 4-135

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	46	" WIDTH x	10	" DEPTH	Sq Ft =	3.19

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	3760
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	4569
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**4571**

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

TEST HOLE	1	2	3	4	5	6	7
A	1442	1378	1639	1225			
B	1177	1547	1468	1178			
C	1083	1458	1410	1395			
D	1493	1535	1511	1362			
E	1472	1533	1571	1557			
F	1552	1469	1548	1710			
G	1539	1441	1422	1634			
H	1367	1442	1336	1608			
I	1307	1348	1340	1585			

NO. OF READINGS = 40 AVERAGE FPM = 1430

J	1408	1165	1276	1279			
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett & Alanna Clark

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-27 TRAVERSE NUMBER : T1
Return Grill TRAVERSE LOCATION: 4-135

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	21 1/4	" WIDTH x	45 1/4	" DEPTH	Sq Ft =	6.68

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	2260
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2283
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2284**

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

TEST HOLE	1	2	3	4	5	6	7
A	401	383	268				
B	289	352	358				
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 6 AVERAGE FPM = 342

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-28		FAN NO. AHU-30	
Serves / Location:		5-904	FCU's	5th Fl.
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB010UA0C0UA		MCCB003UA0C0UA	
Size:	NL		NL	
Serial Number:	K02D54144		K02D54152	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	A.O. Smith
Frame Number:	NL	S184T	NL	X143T
Horsepower:	NL	5	NL	1
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	471/3	460/3	472/3
Motor Amperage:	6.8	5.5	1.5	1.2
Motor RPM:	1760	1760	1745	1745
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	4250	5870	740	825
Return Air CFM:	2500	3792		
Exhaust Air CFM:				
Outside Air CFM:	1750	2078 *1	740	825
Suction Pressure:	NL	-1.12	NL	-1.29
Discharge Pressure:	NL	0.8	NL	0.62
Fan Static Pressure:	1.5	1.92	1.75	1.91
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VP65	NL	1VL40
Motor Size/Bore:	NL	1 1/8	NL	7/8
Fan Drive:	NL	BK90	NL	AK30H
Fan Size/Bore:	NL	1 3/16	NL	H 1 3/16
Belt Size / Number:	NL	B40 / 1	NL	A39/1
Shafts C-C:	NL	10	NL	16
Turns Open:	NL	0	NL	2 1/2

Comments: ***1 Outside Air damper @ 0%**

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-28 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: 5-904

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	28	" WIDTH x	22 " DEPTH	Sq Ft =	4.28

AIR DENSITY DATA

STATIC PRESS @ CL:	0.74	InWg.	DESIGN CFM =	4250
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	5870
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**5884**

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

TEST HOLE	1	2	3	4	5	6	7
A	2314	2103	1849	839			
B	2220	1695	1555	1312			
C	1936	1227	879	1230			
D	2196	1007	264	923			
E	2563	748	0	585			
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 1372

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-28 TRAVERSE NUMBER : T1
Return TRAVERSE LOCATION: 5-904

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	24	" WIDTH x	16 " DEPTH	Sq Ft =	2.67

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.44	InWg.	DESIGN CFM =	2500
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3792
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**3790**

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

TEST HOLE	1	2	3	4	5	6	7
A	1173	1655	1842	1756			
B	1310	1322	1650	1721			
C	1052	1237	1535	1638			
D	931	1147	1395	1388			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 1422

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-30 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: 5-143

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	12	" WIDTH x	18	" DEPTH	Sq Ft =	1.50

AIR DENSITY DATA

STATIC PRESS @ CL:	0.4	InWg.	DESIGN CFM =	740
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	825
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**826**

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

TEST HOLE	1	2	3	4	5	6	7
A	0	0	0	0	0		
B	0	903	426	0	0		
C	0	1235	1482	959	364		
D	0	1562	1939	1131	1001		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 550

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

FAN DATA SHEET

	FAN NO. AHU-31		FAN NO. AHU-32	
Serves / Location:	FCU's	5M-106	Library	5M-106
Manufacturer:	TRANE		TRANE	
Model Number:	MCCB008UA0C0UB		MCCB010UA0C0UA	
Size:	NL		NL	
Serial Number:	K02B22672		K02B22688	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	A.O. Smith	NL	A.O. Smith
Frame Number:	NL	NA	NL	S182T
Horsepower:	NL	3	NL	3
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	471/3	460/3	472/3
Motor Amperage:	4	3.1	4	3.4
Motor RPM:	1765	1765	1765	1765
Speeds:	NL	Belt Driven	NL	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3015	2236	4000	4117
Return Air CFM:			2500	3056
Exhaust Air CFM:				
Outside Air CFM:	3015	2236	1500	1061
Suction Pressure:	NL	-2.2	NL	-1.17
Discharge Pressure:	NL	0.19	NL	0.67
Fan Static Pressure:	1.75	2.39	1.75	1.81
External Pressure:	NL	NA	NL	NA
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VP50	NL	1VP50
Motor Size/Bore:	NL	1 1/8	NL	1 1/8
Fan Drive:	NL	BK55	NL	BK62H
Fan Size/Bore:	NL	1 3/16	NL	H 1 3/16
Belt Size / Number:	NL	B49 / 1	NL	BX32/1
Shafts C-C:	NL	19	NL	9 1/2
Turns Open:	NL	3 1/2	NL	4

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: AHU-31 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION:

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	17 " DEPTH	Sq Ft =	3.54

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.11	InWg.	DESIGN CFM =	3015
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2236
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2237**

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

TEST HOLE	1	2	3	4	5	6	7
A	758	782	555	550	245		
B	859	755	718	551	433		
C	855	780	733	584	313		
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 15 AVERAGE FPM = 631

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

AIR DISTRIBUTION

SYSTEM: AHU-32
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Library	1	24X12	1.6	613	546	980	874
Library	2	24X12	1.6	613	621	980	994
Library	3	24X12	1.6	613	828	980	1325
Library	4	24X12	1.6	613	522	980	835
5-138	5	4"	FH	NA	NA	40	46
5-139	6	4"	FH	NA	NA	40	43
					TOTAL:	4000	4117
	RETURN						
Library	1	36X24	5.69	439	466	2500	2656
	OUTSIDE AIR	NA	NA	NA	NA	1500	1461 *1

Comments: *1 Outside Air damper is set at 0%, changed to 50% to get our reading.Left damper at 0%.

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

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-1						
G-104	1	22X26	3.97	680	509	2700	2013
G-104	2	22X26	3.97	680	507	2700	2021
					TOTAL:	5400	4034
	EF-2						
G-002	1	22X28	4.28	1262	1005	5400	4301
	EF-8						
3-201	1	18X18	2.07	483	39	1000	81 *1
1M-504	2	18X18	2.07	328	1080	680	2236
1M-Restroom	3	6X6	FH	NA	NA	75	84
1M Hall	4	6X6	FH	NA	NA	75	60
1M Restroom	5	6X6	FH	NA	NA	75	61
1M 910	6	8X4	FH	NA	NA	75	59
1-506	7	18X18	FH	NA	NA	640	343
1-410	8	6X6	FH	NA	NA	75	61
1-917	9	6X6	FH	NA	NA	75	45
1-411	10	6X6	FH	NA	NA	75	51
1-504	11	9X9	FH	NA	NA	150	83
					TOTAL:	2995	3164
	EF-12						
4-127	1	24X48	FH	NA	NA	3000	2999
2-200	2	18X18	FH	NA	NA	1000	0
1M-502	3	12X12	FH	NA	NA	410	551
1-507	4	12X12	FH	NA	NA	280	417
					TOTAL:	4690	3967

Comments: *1 Court in session.

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

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-13						
4-Womens	1	12X12	FH	NA	NA	300	266
4-202	2	4"	FH	NA	NA	40	31
4 Hall	3	9X9	FH	NA	NA	150	130
4-201	4	15X15	FH	NA	NA	600	500
4-Mens	5	10X10	FH	NA	NA	225	193
4-118	6	9X9	FH	NA	NA	160	140
					TOTAL:	1475	1260
	EF-15						
3-600	2	18X12	FH	NA	NA	550	1128
2M-721	3	9X9	FH	NA	NA	180	138
2-722	4	18X8	0.87	345	86	300	75
1-107	5	18X8	0.77	351	128	270	99
1-113	6	4"	FH	NA	NA	40	26
1-112	7	4"	FH	NA	NA	40	25
1-111	8	6X6	FH	NA	NA	75	58
					TOTAL:	1455	1549

Comments:

Project: John Adams Courthouse PH4

Address: 1 Pemberton Sq., Boston, MA

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AIR DISTRIBUTION

SYSTEM: EF-14

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
2-100	1	24X24	3.75	320	0	1200	0
1M-122	2	18X18	FH	NA	NA	850	935
1M-104	3	4"	FH	NA	NA	20	32
1M-101	4	10X10	FH	NA	NA	160	203
1M-916	5	6X6	FH	NA	NA	100	125
1M-102	6	4"	FH	NA	NA	20	27
1M-005	7	6X6	FH	NA	NA	75	94
1M-116	8	6X6	FH	NA	NA	60	26
1M-125	9	4"	FH	NA	NA	20	39
1M-116	10	4"	FH	NA	NA	40	39
1M-118	11	6X6	FH	NA	NA	60	79
1M-115	12	4"	FH	NA	NA	40	33
1M-114	13	4"	FH	NA	NA	40	34
1M-113	14	4"	FH	NA	NA	40	33
1M-112	15	4"	FH	NA	NA	40	36
1M-111	16	4"	FH	NA	NA	40	27
1M-130	17	4"	FH	NA	NA	40	53
1M-128	18	6X6	FH	NA	NA	75	82
1M-129	19	6X6	FH	NA	NA	75	91
1M-131	20	6X6	FH	NA	NA	100	104
1M-134	21	6X6	FH	NA	NA	80	26
1M-133	22	6X6	FH	NA	NA	80	74
1M-136	23	6X6	FH	NA	NA	50	69
1-517	24	12X12	FH	NA	NA	280	316
1-518	25	4"	FH	NA	NA	40	33
1-016	26	4"	FH	NA	NA	40	42
G-923	27	6X6	FH	NA	NA	100	53
1-017	28	6X6	FH	NA	NA	60	42
1-700	29	18X8	FH	NA	NA	500	427
1-510	30	9X9	FH	NA	NA	150	116
1-901	31	6X6	FH	NA	NA	75	35
1-600	32	6X6	FH	NA	NA	100	52
1-601	33	6X6	FH	NA	NA	60	52
Comments:					TOTALS:	4710	3429

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

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-16						
4-302	1	6X6	FH	NA	NA	75	75
3-566	2	6X6	FH	NA	NA	100	88
3-Corr.	3	6X6	FH	NA	NA	60	94
3-565	4	4"	FH	NA	NA	40	47
2M Women	5	9X9	FH	NA	NA	225	211
2-030	6	9X9	FH	NA	NA	225	155
2-723	7	12X8	0.57	526	235	300	134
1-103	8	6X6	FH	NA	NA	75	73
1- Janitor	9	6X6	FH	NA	NA	75	88
1-106	10	6X6	FH	NA	NA	75	77
G-006	11	9X9	FH	NA	NA	150	134
G-902	12	6X6	FH	NA	NA	75	71
					TOTAL:	1475	1247
	EF-17						
5-127	1	24X24	3.75	400	362	1500	1358
	EF-18						
5-127	1	24X24	3.75	400	326	1500	1223
	EF-19						
5M Corr.	1	9X9	FH	NA	NA	160	152
5M Mens	2	6X6	FH	NA	NA	75	76
5M Women	3	6X6	FH	NA	NA	75	72
5-	4	9X9	FH	NA	NA	225	236
5-	5	NA	NA	NA	NA	280	NA *1
					TOTAL:	815	536

Comments: *1 Unable to locate register.

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
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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-20						
5M-106	1	6X6	FH	NA	NA	75	85
5M-108	2	4"	FH	NA	NA	40	23
5M-109	3	6X6	FH	NA	NA	80	NA *1
5-	4	18X8	FH	NA	NA	460	228
5-	5	9X9	FH	NA	NA	225	156
					TOTAL:	880	492
	EF-22						
4-Men	1	6X6	FH	NA	NA	75	59
4-211	2	4"	FH	NA	NA	40	45
4-211	3	4"	FH	NA	NA	40	38
4-209	4	4"	FH	NA	NA	40	37
4-Women	5	6X6	FH	NA	NA	75	102
4-213	6	16X8	FH	NA	NA	260	226
4-207	7	16X8	FH	NA	NA	260	203
2-Women	8	9X9	FH	NA	NA	225	190
1-305	9	6X6	FH	NA	NA	75	66
1-306	10	6X6	FH	NA	NA	75	54
G-Mens	11	8X8	FH	NA	NA	150	138
G-911	12	6X6	FH	NA	NA	75	55
					TOTAL:	1390	1213

Comments: *1 Room 5M-109 is locked.

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
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AIR DISTRIBUTION

SYSTEM: EF-21
SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
5-Restroom	1	6X6	FH	NA	NA	75	68
2M	2	9X9	FH	NA	NA	200	182
2M	3	4"	FH	NA	NA	30	50
2-	4	18X8	0.87	460	330	400	287
2-	5	4"	FH	NA	NA	20	13
1M-914	6	9X9	FH	NA	NA	150	136
1M-911	7	6X6	FH	NA	NA	75	73
1M-306	8	8X8	FH	NA	NA	200	187
1M-305	9	6X6	FH	NA	NA	60	56
1M-309	10	8X6	FH	NA	NA	120	105
1-001	11	4"	FH	NA	NA	30	34
1-400	12	12X6	FH	NA	NA	150	138
1-391	13	8X4	FH	NA	NA	80	66
1-355	14	10X10	FH	NA	NA	160	143
1-309	15	18X6	FH	NA	NA	295	257
1-354	16	4"	FH	NA	NA	40	32
1-356	17	4"	FH	NA	NA	40	37
G-500	18	6X6	FH	NA	NA	60	67
G-501	19	6X6	FH	NA	NA	60	54
G-501	20	9X9	FH	NA	NA	200	165
G-500	21	6X6	FH	NA	NA	60	59
G-501	22	6X6	FH	NA	NA	60	54
G-Hall	23	6"	FH	NA	NA	60	53
G-307	24	8X6	FH	NA	NA	145	116
G-	25	9X9	FH	NA	NA	120	87
G-Office	26	6X6	FH	NA	NA	60	27
G-Elev. Lobby	27	6X6	FH	NA	NA	70	61
G-022	28	4"	FH	NA	NA	20	25
G-404	29	6X6	FH	NA	NA	80	61
G-400	30	10X10	FH	NA	NA	280	145
Comments:					TOTALS:	3400	2838

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
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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-28						
4-300	1	12X18	FH	NA	NA	500	338
	EF-29						
4-304	1	4"	FH	NA	NA	40	41
4-30	2	4"	FH	NA	NA	20	16
4-Restroom	3	8X4	FH	NA	NA	75	28
4-Custodial	4	8X4	FH	NA	NA	75	31
4-136	5	9X9	NA	NA	NA	200	205
					TOTAL:	410	321

Comments:

Project: John Adams Courthouse PH4
Address: 1 Pemberton Sq., Boston, MA
Date: 12/15/2021 **Project No.** 21-538

TRAVERSE DATA

SYSTEM: WEF-1 TRAVERSE NUMBER : T1
Exhaust TRAVERSE LOCATION: 5-909

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	22	" WIDTH x	46	" DEPTH Sq Ft =	7.03

AIR DENSITY DATA

STATIC PRESS @ CL:	-1.45	InWg.	DESIGN CFM =	6150
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	7735
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**7712**

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

TEST HOLE	1	2	3	4	5	6	7
A	277	1803	1697	1689	1285	889	
B	1095	1659	1674	1170	1787	680	
C	1573	1383	633	604	1312	831	
D	943	836	720	491	881	503	
E							
F							
G							
H							
I							

NO. OF READINGS = 24 AVERAGE FPM = 1101

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett