



**Edward W. Brooke Courthouse
Boston, MA**

**HVAC SYSTEM
EVALUATIONS
COVID-19**

Office of Court Management
October 26, 2021

Section 1

Existing Conditions & Site Observations

Tighe & Bond visited the Edward W. Brooke Courthouse on September 23, 2020. While on site we inspected the air handling equipment located in the mechanical rooms and toured the facility to determine if the spaces generally matched usages noted on the architectural plans.

Site Visit Attendees:

- *Office of Court Management:*
 - Scott Arneil, Manager of Facilities – Region 5
 - Courthouse Facilities Staff
- Tighe & Bond
 - Jason Urso, PE, Senior Mechanical Engineer
 - Caitlin DeWolfe, Staff Mechanical Engineer

1.1 Existing Ventilation System

The Edward W. Brooke Courthouse was constructed in 1999, renovated in 2006, and is approximately 425,000 square feet in size. Thirteen variable air volume (VAV) air handling units serve the normally occupied areas and provide heating, cooling, and ventilation air to the building. Each unit contains a chilled water cooling coil and a hot water/glycol heating coil. The units were designed to have a 25%-30% pre-filter and an 80%-85% final filter, however only one MERV 13 final filter was observed in each unit during our site visit. There were no prefilters installed. A dedicated return fan serves each air handling unit. Supply air is distributed throughout the building via variable air volume boxes. There are approximately 77 exhaust fans in the building, of which six serve toilet rooms. Ebtron airflow stations measure the air handling unit outside air, return air, and supply airflow rates.

The air handling units overall are in good condition. Filters are not all installed tight to the unit casing, causing some air to bypass around the filters and dirt to accumulate on the coils. The air handlers have a 1" space and a 2" space for filters, allowing a prefilter to be installed in front of the existing MERV 13 filters. Damper actuators appear to be in good condition. The outdoor air dampers in each unit consist of two sections, each section controlled by a separate actuator. A Siemens pneumatic actuator controls the blades of the larger section while a Belimo electric actuator controls the smaller damper section. During our site visit, most of the larger O.A. damper sections were closed and the smaller sections were open. We presume the smaller dampers provide the minimum quantity of outdoor air during normal operation and the larger dampers are used during an economizer mode, providing 100% outdoor, however this must be confirmed.

Air is supplied to and exhausted from the holding cells. Slightly more air is exhausted from the cells than supplied, creating an airflow pattern that travels from the corridor into each cell.

Pneumatic actuators control the hot and chilled water control valves for each air handling unit and appear to be in good condition.

During our site visit, facilities staff indicated they have a lack of heat in the lobby area. There are no other temperature control issues that facilities staff are aware of. We also noticed that there are no supply air diffusers or grilles in offices B602 through B610 and there is no supply air in the hall outside these offices. AHU-13 was not operating at the time of our site investigations, and AHU-5 had a puddle of water around the perimeter of the unit. It is unclear what may have caused the puddle of water. In reviewing the 2004 design drawings, it appears the zones originally supplied from AHU-13 were allocated to AHU-4 and AHU-13 was abandoned in place.

Two 850 ton, water cooled chillers provide chilled water to the air handling units and four 8,000 MBH, gas fired steam boilers generate steam for the building.

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

TABLE 1
Existing Air Handling Units

Unit	Design Airflow (CFM)	Design Min. O.A. (CFM)	Filter	Condition
AHU-1	26,000	6,200	MERV 13	Good
AHU-2	20,500	5,000	MERV 13	Good
AHU-3	26,000	6,400	MERV 13	Good
AHU-4	27,000	6,000	MERV 13	Good
AHU-5	21,000	8,000	MERV 13	Good
AHU-6	27,400	11,000	MERV 13	Good
AHU-7	29,000	12,000	MERV 13	Good
AHU-8	32,000	7,000	MERV 13	Good
AHU-9	17,000	4,000	MERV 13	Good
AHU-10	15,000	3,600	MERV 13	Good
AHU-11	16,000	4,000	MERV 13	Good
AHU-12	6,800	3,800	MERV 13	Good
AHU-13	5,600	5,600	MERV 13	Good



Photo 1 – Representative Air Handler

1.2 Existing Control System

Two different Building Management Systems (BMS) control the HVAC equipment in the building. According to the 2013 Trane automatic temperature control (ATC) record drawings, it appears the Siemens system controls most of the air handlers and the Trane system integrates the Siemens controls into the overall Trane BMS.

The Courtrooms and Jury Pool rooms monitor carbon dioxide (CO₂) levels and the outdoor air flow rate in air handlers AHU-1 through AHU-12 is modulated, based on CO₂ levels. This sequence is called Demand Control Ventilation (DCV).

Section 2 Recommendations

Below is a list of recommendations that we propose for the E.W. Brooke Courthouse. Please refer to the "Master Recommendation List" for further explanation and requirements of the stated recommendations.

2.1 Filtration Efficiency Recommendations

We recommend installing MERV 7 prefilters in front of the existing MERV 13 filters. Prefilters will provide added filtration of dirt and debris and extend the life of the MERV 13 filters. However, prior to installing the filters we recommend that a testing and balancing Contractor test and document the static pressure profile of the units, as outlined in recommendation RF-1 in the Overview of Recommendations document. This will help determine if the units can accommodate an increase in system static pressure with the addition of the MERV 7 filter on top of a MERV 13 filter. We also recommend the gaps between the filters and unit casing are sealed or blocked with Z-flashing to prevent air from bypassing around the filters.

2.2 Testing & Balancing Recommendations

All air handling units are approximately 21 years old and it is unknown to Tighe & Bond when the last time the units were tested and balanced. Also, the code requirements to determine the outside air flow rates that were used to design the original system were different than the 2015 International Mechanical Code (IMC) and ASHRAE Standard 62.1 requirements.

We recommend the following testing and balancing measures be implemented:

RTB-1: *Test and rebalance air handling unit supply air and minimum outside 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.

Our ventilation air analysis discovered that many spaces were not receiving the correct quantity of outdoor air based on today's code requirements at full occupancy. Our calculations showed that the quantity of outdoor air required per code would result in a significant increase in outdoor air for some air handlers, increasing the load on the heating and cooling coils. These loads appear to exceed the capacity of the existing heating and cooling coils. One potential option is to replace the heating and cooling coils with larger coils that can accommodate the code required ventilation air, assuming there is room inside the air handlers. This will create a larger pressure drop in the air handling units, which may require fan motor replacements. A second option is to increase the minimum airflow settings on the VAV boxes serving these areas. This may lead to space temperature complaints since more air may be supplied than is required. A third option is to temporarily reduce the occupancy of the spaces that are not receiving the code required ventilation air. We recommend option three since this can be implemented immediately with no cost to modify the existing HVAC systems. Table 3 lists the

spaces, along with the associated air handling unit, that would require a reduced occupancy. The recommended outdoor air flow rates listed in Table 2 reflect the outdoor air requirements based on a reduced occupancy shown in Table 3.

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	26,000	6,200	6,050	6,200
AHU-2	20,500	5,000	7,400	5,400
AHU-3	26,000	6,400	8,375	7,000
AHU-4	27,000	6,000	7,700	7,000
AHU-5	21,500	8,000	13,100	10,000
AHU-6	27,400	11,000	15,500	12,500
AHU-7	29,000	12,000	16,900	13,000
AHU-8	32,000	7,000	7,600	7,600
AHU-9	17,000	4,000	4,650	4,650
AHU-10	15,000	3,600	2,800	3,600
AHU-11	16,000	4,000	3,100	4,000
AHU-12	6,800	3,800	3,350	3,800
AHU-13	N/A	N/A	N/A	N/A

TABLE 3
Recommended Occupancy During COVID-19 Pandemic

Room & Associated AHU	2015 IMC Permitted Occupancy (# of People)	Recommended Occupancy (# of People)
AHU-2		
Interview Room 1-2014	6	2
Interview Room 2-2015	6	2
Interview Room 3-2021	6	2
Interview Room 4-2022	6	2
Interview Room 5-2023	6	2
Interview Room 6-2024	6	2
AHU-3		
Kitchen 2216	4	3
Kitchen 3529	4	3
Conference Room 3525	10	6
AHU-4		
Staff Conf. Room 1010	8	6
Mediation Room 1021	8	6
Juvenile Group Therapy 2142	16	7
Kitchen 2109	7	3
Family Services 3800 Waiting	24	8
Kitchenette 1516	13	8
Small Claims Large Hearing 1514	61	28
AHU-5		
Courtroom 4259	116	80
Courtroom 4263	116	80
Non-Jury Courtroom 4301	66	60
Non-Jury Courtroom 4304	79	42
Pre-Trial Conference 4302	7	5
Pre-Trial Conference 4303	6	4
Conference 4232	12	4
Conference 4238	7	3
Conference 5231	11	4
Conference 5238	7	3
Courtroom 5259	119	85
Courtroom 5263	117	85
Non-Jury Courtroom 5302	56	54

Non-Jury Courtroom 5305	47	36
-------------------------	----	----

Pre-Trial Conference 5301	6	5
---------------------------	---	---

Pre-Trial Conference 5304	6	5
---------------------------	---	---

AHU-6

Courtroom 4253	141	110
----------------	-----	-----

Courtroom 4254	115	82
----------------	-----	----

Courtroom 4258	116	82
----------------	-----	----

Conference Room 4224	11	4
----------------------	----	---

Conference Room 4225	10	4
----------------------	----	---

Conference Room 4231	11	4
----------------------	----	---

Conference Room 5224	12	4
----------------------	----	---

Conference Room 5225	10	4
----------------------	----	---

Courtroom 5253	141	116
----------------	-----	-----

Courtroom 5254	116	86
----------------	-----	----

Courtroom 5258	115	86
----------------	-----	----

AHU-7

Courtroom 4001	77	62
----------------	----	----

Courtroom 4004	116	75
----------------	-----	----

Courtroom 4005	116	75
----------------	-----	----

Courtroom 4008	116	75
----------------	-----	----

Conference Room 4025	12	4
----------------------	----	---

Conference Room 4027	12	4
----------------------	----	---

Conference Room 4028	10	4
----------------------	----	---

Conference Room 4034	7	3
----------------------	---	---

Courtroom 5001	77	60
----------------	----	----

Courtroom 5004	115	78
----------------	-----	----

Courtroom 5005	116	78
----------------	-----	----

Courtroom 5008	116	78
----------------	-----	----

Conference Room 5025	12	4
----------------------	----	---

Conference Room 5027	12	4
----------------------	----	---

Conference Room 5028	10	4
----------------------	----	---

Conference Room 5034	9	4
----------------------	---	---

The average airflow rate per person is shown below in Table 4. These values are based on the original design supply airflow rate, the recommended outdoor air flow rates shown in Table 2 above, and the recommended occupancy shown in Table 3 above. The airflow rate per person assumes a diversity factor of 70%, meaning the maximum number of occupants assumed to be in all zones at all times equates to 70% of the code required occupancy.

TABLE 4
Average Airflow Rate per Person

	<i>All spaces</i>	<i>Courtrooms</i>	<i>Non-Courtroom Spaces</i>
Total Occupancy (People)	3,186	1,575	1,611
Total Supply Air (CFM/Person)	83	38	127
Outdoor Air (CFM/Person)	26	18	35

The airflow rate per person for each Courtroom and the Jury Pool Room is shown below in Table 5. These values are based on the recommended full occupancy, the original design supply airflow rate, and the recommended outdoor airflow rate, without taking diversity into account. 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 5
Airflow Rate per Person (Full Occupancy)

Courtroom	Total People	Total Air		Outdoor Air	
		Supply Airflow (CFM)	Airflow Rate (CFM/Person)	Outside Airflow (CFM)	Airflow Rate (CFM/Person)
Jury Pool Room	41	925	23	225	5
Courtroom 4001	62	2,100	34	940	15
Courtroom 4004	75	2,600	35	1,165	16
Courtroom 4005	75	2,600	35	1,165	16
Courtroom 4008	75	2,600	35	1,165	16
Courtroom 4253	110	3,690	34	1,680	15
Courtroom 4254	82	2,800	34	1,275	16
Courtroom 4258	82	2,800	34	1,275	16
Courtroom 4259	80	2,800	35	1,350	16
Courtroom 4263	80	2,800	35	1,350	16
Non-Jury Courtroom 4301	60	2,025	34	950	15
Non-Jury Courtroom 4304	42	1,550	37	720	17
Courtroom 5001	60	2,100	35	950	16
Courtroom 5004	78	2,700	35	1,200	16
Courtroom 5005	78	2,700	35	1,200	16
Courtroom 5008	78	2,700	35	1,200	16
Courtroom 5253	116	3,890	34	1,775	15
Courtroom 5254	86	2,900	34	1,325	15
Courtroom 5258	86	2,900	34	1,325	15
Courtroom 5259	85	2,900	34	1,350	16
Courtroom 5263	85	2,900	34	1,350	16
Non-Jury Courtroom 5302	54	1,845	34	860	16
Non-Jury Courtroom 5305	36	1,315	37	610	17
Courtroom 6025	89	1,800	20	500	6
Courtroom 6027	79	1,800	23	500	6
Courtroom 6029	86	1,800	21	500	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 scheduled determined by the Office of Court Management, is shown below in Table 5a. 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 5a

Airflow Rate per Person (Reduced Occupancy)

Courtroom	Total People (Reduced Occupancy)	Total Air		Outdoor Air	
		Supply Airflow (CFM)	Airflow Rate (CFM/Person)	Outside Airflow (CFM)	Airflow Rate (CFM/Person)
Jury Pool Room	15	925	62	225	15
Courtroom 4001	11	2,100	191	940	86
Courtroom 4004	16	2,600	163	1,165	73
Courtroom 4005	21	2,600	124	1,165	56
Courtroom 4008	20	2,600	130	1,165	58
Courtroom 4253	24	3,690	154	1,680	87
Courtroom 4254	20	2,800	140	1,275	79
Courtroom 4258	16	2,800	175	1,275	99
Courtroom 4259	20	2,800	140	1,350	65
Courtroom 4263	20	2,800	140	950	65
Non-Jury Courtroom 4301	15	2,025	135	720	63
Non-Jury Courtroom 4304	15	1,550	103	950	48
Courtroom 5001	11	2,100	191	1,200	86
Courtroom 5004	15	2,700	180	1,200	81
Courtroom 5005	20	2,700	135	1,200	61
Courtroom 5008	22	2,700	123	1,775	55
Courtroom 5253	24	3,890	162	1,325	92
Courtroom 5254	20	2,900	145	1,325	82
Courtroom 5258	16	2,900	181	1,350	103
Courtroom 5259	20	2,900	145	1,350	67
Courtroom 5263	20	2,900	145	950	67
Non-Jury Courtroom 5202	15	1,845	123	860	57
Non-Jury Courtroom 5205	15	1,315	88	610	41
Courtroom 6025	17	1,800	106	500	29
Courtroom 6027	17	1,800	106	500	29
Courtroom 6029	18	1,800	100	500	27

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

To accommodate the revised outdoor air flow rates, the return fans may have to be rebalanced.

RTB-3: *Increase outside air flow rate beyond minimum under non-peak conditions.*

Due to the age of the units, the ability for the coils to maintain the supply air temperature is uncertain. We recommend increasing the outdoor air flow rate by only 10% beyond the recommended outdoor air flow rates. We do not believe this would cause a threat of a potential coil to freeze given the amount of outside air as a percentage of total supply air, however cold spots on the coil may develop due to poor mixing. This may cause nuisance freeze stat trips via the existing freeze stat.

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

To ensure the proper quantity of supply air is delivered to each zone, we recommend testing and balancing VAV boxes to their original airflow rates. The VAV boxes are 21 years old and may have fallen out of calibration.

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

If the Courthouse experiences regular cooling and heating comfort complaints, we recommend testing and rebalancing all air inlets and outlets in the spaces experiencing temperature control issues. Prior to rebalancing, we recommend verifying the chiller and boiler plants are maintaining the correct supply water temperatures. Incorrect supply water temperatures may be contributing to the temperature control complaints instead of a lack of airflow.

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

Testing and balancing the air handler 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.

RE-2: *Clean air handler coils***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 airflow stations and reheat coils and changing dirty filters in the fan powered VAV boxes. 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

We recommend the following control system modifications:

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

RC-3: *Install controls required to introduce outside air beyond the minimum requirements in a stepped approach.*

The existing BMS appears to be sophisticated enough to implement this type of sequence. Prior to implementing this control strategy, the TAB Contractor should verify the quantity of outside air the outdoor air louvers can accommodate without exceeding an intake air velocity of 450 feet/minute (FPM). Exceeding this air velocity through an intake air louver may result in rain or snow entering the louver.

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

According to the 2013 Trane Automatic Temperature Controls (ATC) record document, AHU-1 through AHU-12 operate with an economizer sequence. An economizer sequence allows 100% outdoor air to be supplied to rooms while exhausting 100% of the return air. We recommend testing to ensure this sequence is working correctly to maximize the quantity of outdoor air when outdoor temperature conditions allow.

RC-5: Disable demand control ventilation sequences.

Disabling demand control ventilation sequences will result in the air handling units supplying the code required quantity of outdoor air at all times. The DCV sequence may otherwise reduce outdoor air based on a low concentration of CO₂, indicating a period of relatively low occupancy.

We also recommend calibrating the airflow stations to ensure they are providing the correct airflow readings.

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 Provide Ventilation Air To Offices B602 – B610.

During our visit, we observed that there were no supply diffusers or grilles in offices B602 through B610 in the basement. We recommend adding ventilation air into these spaces by connecting into the existing ductwork distribution system in the basement. Further field investigation and design is required.

2.8 E.W. Brooke Courthouse Recommendations Checklist

Recommended Immediate Actions

1. ✓ RTB-1: Test and balance air handling unit airflow rates
 - a. Rebalancing tasks (*discovered during TAB*)
 - i. Fix/rebalance: AHU-1, AHU-5, AHU-6, and AHU-7 supply fans
2. Reduce occupancy for select spaces (see Table 3)
3. RTB-2: Rebalance system return airflow rate
 - a. Rebalancing tasks (*discovered during TAB*)
 - i. Fix/rebalance AHU-1, AHU-4, AHU-5, AHU-6, and AHU-7 return fans
4. RTB-6: Test and balance air handling units chilled and hot water coils
5. RE-1: Test air handling system dampers and actuators for proper operation
6. RC-1: Implement and pre and post-occupancy flush sequence
7. Disable demand control ventilation sequences
8. Install ventilation to offices B602 and B610
9. Fix or replace and rebalance toilet exhaust fan F-66 (*discovered during TAB*)

Recommended Actions

10. Install MERV 7 pre-filters
11. RTB-3: Increase outdoor air beyond minimum under nonpeak conditions
12. RTB-4: Test and balance VAV box airflow rates
13. RE-2: Clean air handler coils
14. RE-4: Inspect VAV boxes and controllers
15. RE-7: Test air handler coil control valves for proper operation
16. RC-3: Install controls required to introduce outside air beyond the minimum requirements
17. Confirm economizer control sequence is operational
18. Calibrate airflow stations
19. Install portable HEPA filters

Optional Actions

20. (RTB-5) Test and balance air inlets and outlets

Section 3

Testing & Balancing Results

Milharmer Associates, Inc. visited the Edward W. Brook Trial Courthouse on November 19 through December 4, 2020 to test the airflow rates of the air handling units and the toilet exhaust fans. The Office of Court Management's Automatic Temperature Controls (ATC) Contractor was also on site to assist in the balancing process. Milharmer Associates returned on September 10, 2021 to retest the equipment. An updated summary of the tested airflow rates versus the design airflow rates are shown below in Tables 6 and 7. The full testing and balancing report from their visit on September 10 is attached.

TABLE 6
Air Handler Testing & Balancing Results

Unit	Design			Actual		
	Total Supply Fan Airflow (CFM)	Recommended Outdoor Airflow (CFM)	Return Fan Airflow (CFM)	Supply Fan Airflow (CFM)	Outdoor Airflow (CFM)	Return Fan Airflow (CFM)
AHU-1	26,000	6,200	19,800	23,516	5,688	17,824
AHU-2	20,500	5,000	15,500	22,623	5,450	17,088
AHU-3	26,000	6,400	19,600	27,035	6,890	20,093
AHU-4	27,000	6,000	21,000	25,439	6,108	19,210
AHU-5	21,500	8,000	13,500	19,464	7,309	12,119
AHU-6	27,400	11,000	16,400	24,778	10,055	14,732
AHU-7	29,000	12,000	17,000	26,601	10,844	15,701
AHU-8	32,000	7,000	25,000	29,573	6,898	22,773
AHU-9	17,000	4,000	13,000	16,546	3,804	12,999
AHU-10	15,000	3,600	11,400	14,018	3,687	10,509
AHU-11	16,000	4,000	12,000	14,901	3,914	10,960
AHU-12	6,800	3,800	3,000	6,314	3,436	2,878
AHU-13	5,600	5,600	0	Not Tested	Not Tested	Not Tested

TABLE 7
Return & Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow	Actual Return/Exhaust Airflow
		(CFM)	(CFM)
F-34	Toilet Exhaust	3,975	3,904
F-35	Toilet Exhaust	2,775	3,323
F-36	Toilet Exhaust	3,580	3,954
F-37	Toilet Exhaust	5,675	6,032
F-51	Toilet Exhaust	3,400	3,984
F-66	Toilet Exhaust	1,450	789

Typical balancing tolerances for air systems is $\pm 10\%$ of the design airflow. In reviewing the airflow report data, the following should be noted:

1. After retesting, all air handling units are supplying air within 10% of the design value.
2. After retesting, all return fans are performing within acceptable range.
3. The ATC Contractor was unable to calibrate the airflow station. It is our understanding that Trane is or has engineered a solution to calibrate the flow stations.
4. AHU-11 and AHU-12 contain dirty coils and should be cleaned to help improve airflow.
5. AHU-13 was not operational during re-testing.
6. The TAB Contractor suggests all air handlers have the capacity to install MERV 13 filters.
7. After retesting, the toilet exhaust fan F-66 is still not performing within acceptable range. This fan may have to be replaced.

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.

\\Tighebond.com\data\Data\Projects\M\1671 Comm. of MA Court System\011 - COVID-19 Courthouse Evaluations\Report_Evaluation\Draft Reports\EW Brooke\EW Brooke Trial Courthouse Report.docx

MILHARMER ASSOCIATES, INC.

534 New State Highway, Route 44, Suite 3

Raynham, MA 02767

Tel.: 508-823-8500; Facsimile: 508-823-8600



TEST AND BALANCE REPORT

Project: **Edward W Brooke Courthouse**

24 New Chardon St., Boston, MA

Project No.: **20-551**

Project Date: **9/10/2021**

MECHANICAL CONTRACTOR

Tighe & Bond



A N.E.B.B. Certified Company

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No.

20-551

CERTIFICATION

Submitted & Certified by:
Milharmer Associates, Inc.

Certification No.: **3384**

Certification Expiration Date: **3-31-23**

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



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

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





Certification

SCOTT F. MILLER

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

Testing, Adjusting and Balancing of Environmental Systems

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

CP-23541

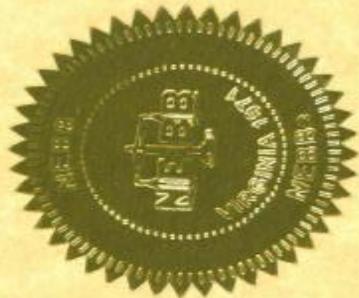
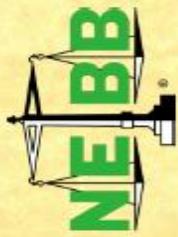
NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect



Firm Certification

MILHARMER ASSOCIATES, INC.

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

Testing, Adjusting and Balancing of Environmental Systems

3384

NEBB Certification Number

March 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No.

20-551

TABLE OF CONTENTS

SECTION 1 TAB Qualifications

- A. N.E.B.B. Certification
- B. N.E.B.B. Company Certificate
- C. N.E.B.B. Supervisor Certificate
- D. Instrument Sheet
- E. Symbol Sheet

SECTION 2 TAB Building Systems

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

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
B.H.P.	Brake Horsepower	H.P.	Horsepower
CFM	Cubic Feet Per Minute	HPS	High Pressure Steam
CH	Chiller	HRC	Heat (Recovery or Recliam) Coil
CHWR	Chilled Water Return	HVAC	Heating, Ventilation and
CHW or CHWS	Chilled Water Supply	HWR	Air Conditioning
CT	Cooling Tower	HWS	Hot Water Return or
CWR	Condenser Water Return		Heating Water Return
CW or CWS	Condenser Water Supply	HX	Hot Water Supply or
			Heating Water Supply
			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
S.P. "W.C."	Static Pressure Measured in Inches of Water Column	#	Decrease or Increase PSI or Pounds Per Square Inch Decrease or Increase

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

REPORT SUMMARY

The following is the report is the re-test for the E.W. Brooke Courthouse.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
AHU-1	23,516 CFM	17,824 CFM	5,688 CFM
AHU-2	22,623 CFM	17,088 CFM	5,450 CFM
AHU-3	27,035 CFM	20,093 CFM	6,890 CFM
AHU-4	25,439 CFM	19,210 CFM	6,108 CFM
AHU-5	19,464 CFM	12,119 CFM	7,309 CFM
AHU-6	24,778 CFM	14,732 CFM	10,055 CFM
AHU-7	26,601 CFM	15,701 CFM	10,844 CFM
AHU-8	29,573 CFM	22,773 CFM	6,898 CFM
AHU-9	16,546 CFM	12,999 CFM	3,804 CFM
AHU-10	14,018 CFM	10,509 CFM	3,687 CFM
AHU-11	14,901 CFM	10,960 CFM	3,914 CFM
AHU-12	6,314 CFM	2,878 CFM	3,436 CFM
AHU-14	4,971 CFM	NA	4,971 CFM

FANS

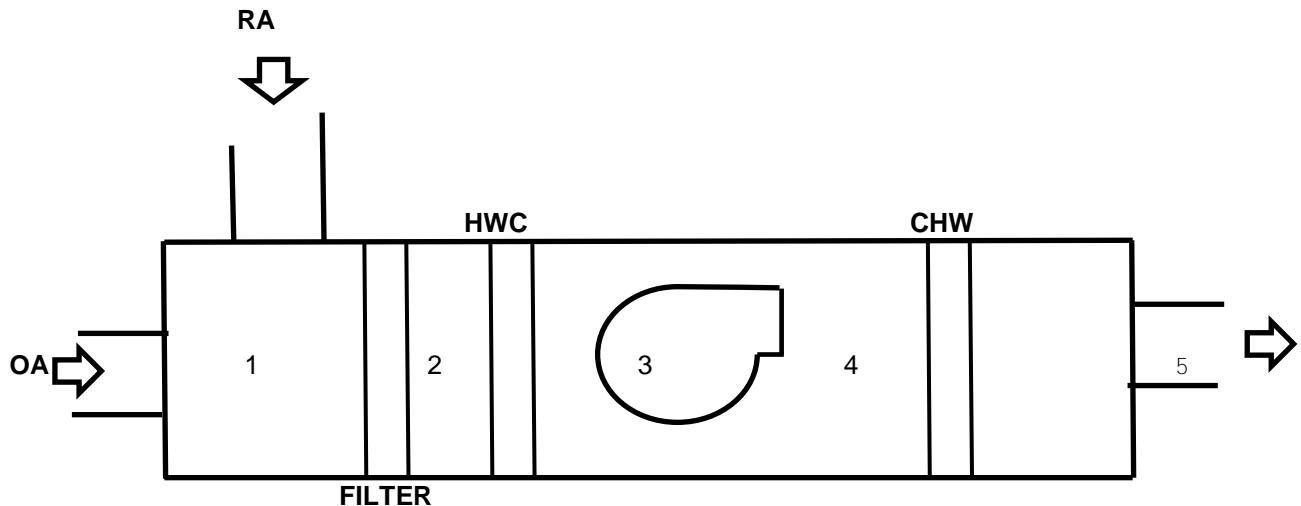
UNIT	EXHAUST
F-34	3,904 CFM
F-35	3,323 CFM
F-36	3,954 CFM
F-37	6,032 CFM
F-51	3,984 CFM
F-66	789 CFM

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021	Project No.		20-551
FAN DATA SHEET				
	FAN NO. AHU-1		FAN NO. F-1	
Serves / Location:	Flrs. 1, 2 & 3 VAV's	Lower Penthouse	AHU-1	Lower Penthouse
Manufacturer:	CARRIER		WOODS AIR	
Model Number:	39NXB615NVR83980		66KG 14P/A	
Size:	NL		NL	
Serial Number:	3796T83980		963629H-1 15HP	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	TOSHIBA
Frame Number:	NL	S326T	NL	254TZ
Horsepower:	NL	50	NL	15
Brake Horsepower:	NL	30.54	NL	NA
Safety Factor:	NL	1.15	NL	NL
Volts/Phase:	460/3	421/3	460/3	164/3
Motor Amperage:	59	32.9	18.5	5.5
Motor RPM:	1775	1627	1775	705
Speeds:	VFD	60 HZ	VFD	36 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	26000	23516		
Return Air CFM:			19800	17824
Exhaust Air CFM:				
Outside Air CFM:	6200	5688		
Suction Pressure:	NL	-0.77	NL	-0.22
Discharge Pressure:	NL	2.72	NL	-0.15
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	3.49	NL	0.37
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	1050		NL	NL
Motor Drive:	NL	2B5V110	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	2B5V184	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	5VX960/2	NL	NL
Shafts C-C:	NL	24.5	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-1 STATIC PROFILE



LOCATION	STATIC
1	-0.45"
2	-0.57"
3	-0.77"
4	+2.72"
5	+2.05"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 52 " WIDTH x 32 " DEPTH Sq Ft = 11.56

AIR DENSITY DATA

STATIC PRESS @ CL:	0.97	InWg.	DESIGN CFM =	26000
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	23516
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	23585

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	960	1046	1446	1648	2012	2064	
B	1007	1163	1705	1674	2214	2119	
C	1095	1280	1946	2126	2385	2272	
D	1258	1470	2058	3027	2591	2491	
E	1289	1559	2669	2934	3144	3561	
F	1432	2304	3042	2887	2244	3138	
G							
H							
I							

NO. OF READINGS = 36 AVERAGE FPM = 2035

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 52 " WIDTH x 36 " DEPTH Sq Ft = 13.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.62	InWg.	DESIGN CFM =	19800
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	17824
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	17807

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	386	782	634	511	301	505	
B	1821	1677	1011	840	375	524	
C	2133	1967	1949	882	1047	601	
D	2053	2178	2206	1502	962	323	
E	1406	2205	2236	2262	1869	1072	
F	1857	1978	2148	2278	2137	742	
G							
H							
I							

NO. OF READINGS = 36 AVERAGE FPM = 1371

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 34 " WIDTH x 76 " DEPTH Sq Ft = 17.94

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	5685
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	5688

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	264	266					
B	356	308					
C	321	347					
D	289	399					
E	284	334					
F							
G							
H							
I							

NO. OF READINGS = 10 AVERAGE FPM = 317

J							
K							
L							
M							
N							
O							
P							
Q							
R							

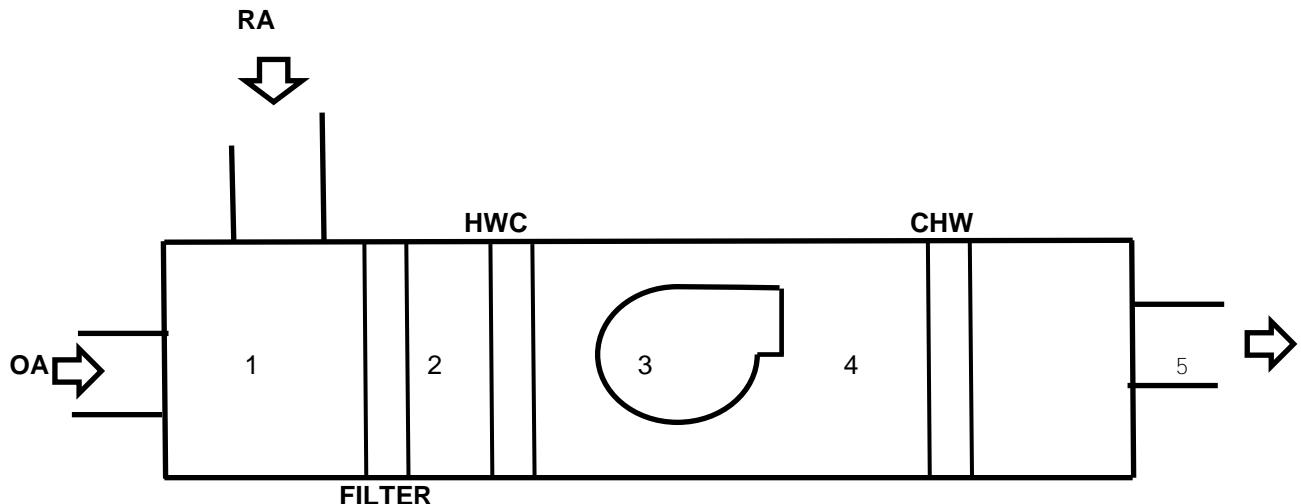
TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. AHU-2		FAN NO. F-2	
Serves / Location:	Flrs. 1, 2 & 3	Lower Penthouse	AHU-2	Lower Penthouse
Manufacturer:	CARRIER		WOODS AIR	
Model Number:	39NXB495NBR83970		36J1/2 13P/A	
Size:	NL		NL	
Serial Number:	3695T83970		963630H-10HP	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	TOSHIBA
Frame Number:	NL	S324T	NL	215TZ
Horsepower:	NL	40	NL	10
Brake Horsepower:	NL	23.17	NL	NA
Safety Factor:	NL	1.15	NL	NL
Volts/Phase:	460/3	382/3	460/3	165/3
Motor Amperage:	48	27.5	12	3.8
Motor RPM:	1775	1489	1745	707
Speeds:	VFD	49.6 HZ	VFD	43.5 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	20500	22623		
Return Air CFM:			NL	17088
Exhaust Air CFM:				
Outside Air CFM:	5000	5450		
Suction Pressure:	NL	-0.98	NL	-0.25
Discharge Pressure:	NL	2.97	NL	-0.18
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	3.95	NL	0.43
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	1162		NL	NL
Motor Drive:	NL	2B5V90	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	2B5V136	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	5VX780/2	NL	NL
Shafts C-C:	NL	21"	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-2 STATIC PROFILE



LOCATION	STATIC
1	-0.56"
2	-0.64"
3	-0.98"
4	+2.97"
5	+2.20"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-2 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 42 " WIDTH x 36 " DEPTH Sq Ft = 10.50

AIR DENSITY DATA

STATIC PRESS @ CL:	1.24	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	22623
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	22705

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	1947	1823	1693	1560	1950	2029	1833
B	2106	1696	1810	1767	1920	1986	1956
C	2290	1999	1777	1976	1969	1912	2194
D	2365	2330	2122	1930	2316	2092	2138
E	2565	2384	2193	2288	2700	2308	2231
F	2687	2859	2705	2629	2797	2449	2211
G							
H							
I							

NO. OF READINGS = 42 AVERAGE FPM = 2155

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-2 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 44 " WIDTH x 36 " DEPTH Sq Ft = 11.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.12	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	17088
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	17093

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	1271	1347	1036	892	873	919	
B	1544	1670	1405	1439	1385	1350	
C	1731	1791	1559	1645	1678	1509	
D	1565	1737	1655	1796	1750	1693	
E	1460	1768	1737	1794	1913	1594	
F	1760	1752	1703	1699	1909	1594	
G							
H							
I							

NO. OF READINGS = 36 AVERAGE FPM = 1553

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-2 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 35 " WIDTH x 58 " DEPTH Sq Ft = 14.10

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	5450
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	5454

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	413	350	350				
B	425	408	414				
C	373	409	329				
D	369	370	431				
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 387

J							
K							
L							
M							
N							
O							
P							
Q							
R							

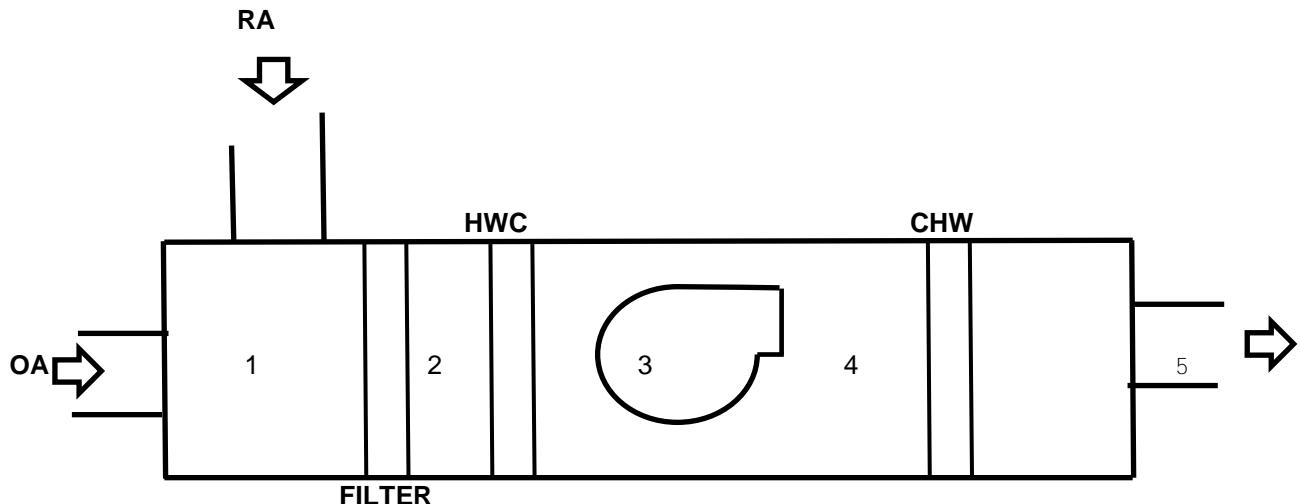
TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. AHU-3		FAN NO. F-3	
Serves / Location:	Flrs. 1, 2 & 3	Rm. 6-705	AHU-3	Rm 6-705
Manufacturer:	CARRIER		COOK	
Model Number:	39NXB615NVL83971		445 CPV	
Size:	NL		NL	
Serial Number:	3695T83971		010S4396080000007010896	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	MARATHON
Frame Number:	NL	S324T	NL	215T
Horsepower:	NL	40	NL	10
Brake Horsepower:	NL	35.1	NL	NA
Safety Factor:	NL	1.15	NL	NL
Volts/Phase:	460/3	460/3	460/3	218/3
Motor Amperage:	48	34.6	12.6	4.8
Motor RPM:	1775	1800	1745	925
Speeds:	VFD	60 HZ	VFD	46.84 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	26000	27035		
Return Air CFM:			NL	20093
Exhaust Air CFM:				
Outside Air CFM:	6400	6890		
Suction Pressure:	NL	-1.93	NL	-0.46
Discharge Pressure:	NL	3.75	NL	-0.23
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	5.68	NL	0.69
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	1024		NL	NL
Motor Drive:	NL	3B5V64	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	3B5V110	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	5VX780/2	NL	NL
Shafts C-C:	NL	25.1	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-3 STATIC PROFILE



LOCATION	STATIC
1	-1.41"
2	-1.61"
3	-1.93"
4	+3.75"
5	+2.58"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: 6-705

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 52 " WIDTH x 34 " DEPTH Sq Ft = 12.28

AIR DENSITY DATA

STATIC PRESS @ CL:	1.36	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	27035
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	27140

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	2921	2881	2446	2414	2738	1965	2343
B	3079	3213	2603	2525	2875	1981	2494
C	2697	3270	2567	2752	3103	1965	2548
D	2401	3284	2534	3001	2712	2288	2388
E	2112	2443	2157	2617	2620	2124	2285
F							
G							
H							
I							

NO. OF READINGS = 65 AVERAGE FPM = 2202

J	1672	1739	1415	2286	2286	765	
K	2123	1872	1958	2263	2260	1113	
L	2692	2229	2024	2232	1924	906	
M	2638	1733	1930	2171	1549	760	
N	1991	1436	1612	1752	1448	0	
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: 6-705

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 50 " WIDTH x 36 " DEPTH Sq Ft = 12.50

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.46	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	20093
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	20082

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	2019	1697	1806	1899	1622	1795	
B	1934	1877	1845	1751	1742	1583	
C	1923	1860	2241	1825	1622	1443	
D	1208	1615	1948	1906	1768	1426	
E	0	1102	1012	1176	1568	1012	
F							
G							
H							
I							

NO. OF READINGS = 30 AVERAGE FPM = 1607

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: 6-705

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 96 " WIDTH x 28 " DEPTH Sq Ft = 18.67

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	6890
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	6894

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	332	284	695	118	294	198	
B	531	627	489	313	251	297	
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 369

J							
K							
L							
M							
N							
O							
P							
Q							
R							

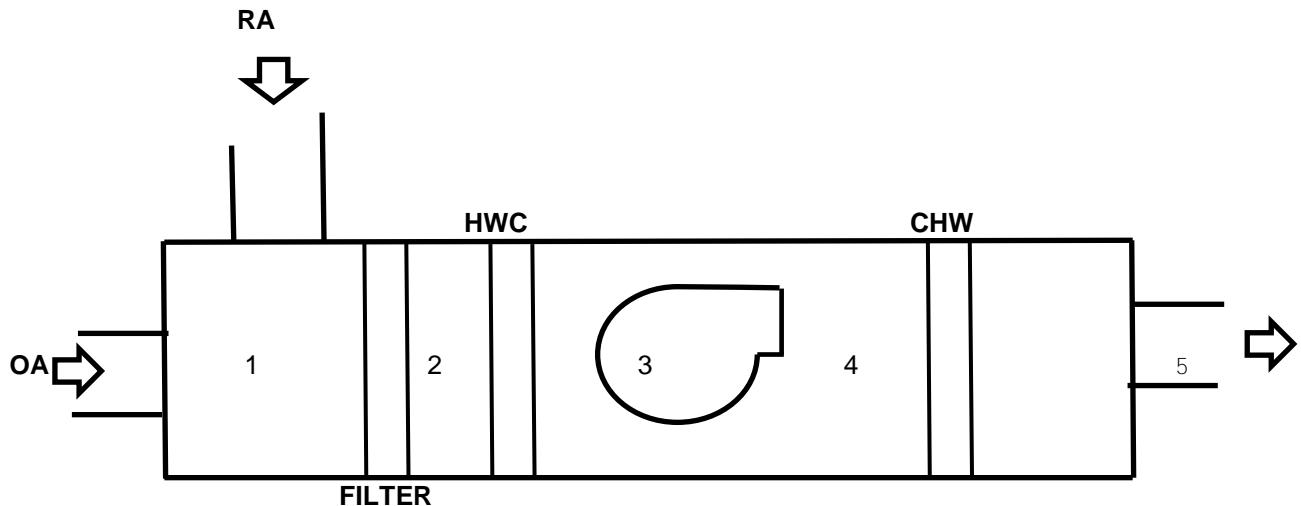
TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. AHU-4		FAN NO. F-4	
Serves / Location:	Flrs. 1, 2 & 3	Rm. 6-463	AHU-3	Rm 6-463
Manufacturer:	CARRIER		WOOD	
Model Number:	39XB745NVL83972		NA	
Size:	NL		NL	
Serial Number:	3695T83972		NA	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	NA
Frame Number:	NL	S324T	NL	NA
Horsepower:	NL	40	NL	NA
Brake Horsepower:	NL	34.7	NL	NA
Safety Factor:	NL	1.15	NL	NA
Volts/Phase:	460/3	460/3	460/3	131/3
Motor Amperage:	48	34.2	NL	5.5
Motor RPM:	1775	1800	NL	563
Speeds:	VFD	60 HZ	VFD	50 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	27000	25439		
Return Air CFM:			21000	19210
Exhaust Air CFM:				
Outside Air CFM:	6000	6108		
Suction Pressure:	NL	-1.06	NL	-0.29
Discharge Pressure:	NL	4.17	NL	-0.12
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	5.23	NL	0.41
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	938		NL	NL
Motor Drive:	NL	3B5V66	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	3B5V124	NL	NL
Fan Size/Bore:	NL	B2 7/16	NL	NL
Belt Size / Number:	NL	5VX780/3	NL	NL
Shafts C-C:	NL	23.8	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-4 STATIC PROFILE



LOCATION	STATIC
1	-0.79"
2	-0.85"
3	-1.06"
4	+4.17"
5	+3.55"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-4 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: 6-463

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 62 " WIDTH x 38 " DEPTH Sq Ft = 16.36

AIR DENSITY DATA

STATIC PRESS @ CL:	3.14	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	25439
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	25649

AIR DENSITY RATIO CORRECTION = 1.01

SCFM CORRECTION FACTOR 1.01

ACTUAL DENSITY 0.076

TEST HOLE	1	2	3	4	5	6	7
A	937	1119	1279	1306	1258	1367	1620
B	945	1168	1283	1160	1262	1363	1785
C	849	1137	1065	1350	1242	1704	1834
D	814	1119	1042	1511	1475	1887	1753
E	969	2222	1360	1482	1648	1708	1692
F							
G							
H							
I							

NO. OF READINGS = 55 AVERAGE FPM = 1555

J	1935	1567	1257	1135			
K	2061	2102	1939	1865			
L	1888	2078	2266	2108			
M	1693	1946	2033	2103			
N	1748	1884	2018	2174			
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-4 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: 6-463

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 54 " WIDTH x 32 " DEPTH Sq Ft = 12.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.47	InWg.	DESIGN CFM =	21000
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	19210
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	19199

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	1550	1558	1884	1998	1726	1647	1200
B	1696	1670	1822	1711	1492	1558	1486
C	1640	1674	1779	1540	1419	1620	1682
D	1609	1494	1744	1388	1212	1793	1845
E	1332	1469	1611	1331	1195	1712	1942
F							
G							
H							
I							

NO. OF READINGS = 35 AVERAGE FPM = 1601

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-4 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: 6-463

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 40 " WIDTH x 60 " DEPTH Sq Ft = 16.67

AIR DENSITY DATA

STATIC PRESS @ CL: NA InWg. DESIGN CFM = NL
DUCT AIR TEMP : 70 Deg F ACTUAL CFM = 6108
BAROMETRIC PRESS : 29.92 In Hg. SCFM= 6112

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	312	344	361				
B	368	388	417				
C	394	401	382				
D	377	329	325				
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 366

J							
K							
L							
M							
N							
O							
P							
Q							
R							

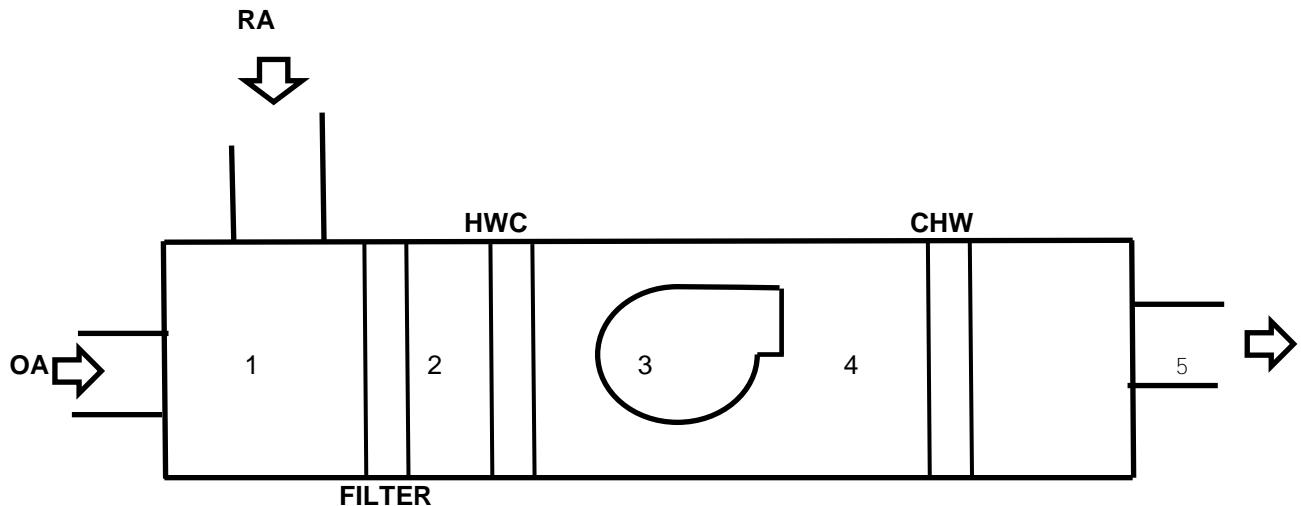
TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021	Project No.		20-551
FAN DATA SHEET				
	FAN NO. AHU-5		FAN NO. F-5	
Serves / Location:	Flrs. 4 & 5	Upper Penthouse	AHU-5	Upper Penthouse
Manufacturer:	CARRIER		WOOD	
Model Number:	39NXB515NVB83973		38J1/2 23P/A	
Size:	NL		NL	
Serial Number:	3695T83973		96363H 10HP	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	TOSHIBA
Frame Number:	NL	S324T	NL	215TZ
Horsepower:	NL	40	NL	10
Brake Horsepower:	NL	25.35	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	387/3	460/3	197/3
Motor Amperage:	48	29.7	12	5
Motor RPM:	1775	1501	1745	826
Speeds:	VFD	60 HZ	VFD	45 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	21500	19464		
Return Air CFM:			13500	12119
Exhaust Air CFM:				
Outside Air CFM:	8000	7309		
Suction Pressure:	NL	-1.17	NL	-0.51
Discharge Pressure:	NL	3.13	NL	0.05
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	4.3	NL	0.56
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	938		NL	NL
Motor Drive:	NL	3B5V66	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	3B5V110	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	5VX780/3	NL	NL
Shafts C-C:	NL	24.9	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-5 STATIC PROFILE



LOCATION	STATIC
1	-0.83"
2	-0.99"
3	-1.17"
4	+3.13"
5	+2.65"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-5 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 44 " WIDTH x 30 " DEPTH Sq Ft = 9.17

AIR DENSITY DATA

STATIC PRESS @ CL:	1.83	InWg.	DESIGN CFM =	21500
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	19464
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	19563

AIR DENSITY RATIO CORRECTION = 1.01

SCFM CORRECTION FACTOR 1.01

ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	2551	2056	1988	1642	1266	1342	1755
B	2689	2216	2214	1744	1331	1470	1895
C	2653	2356	2389	1807	1765	1807	1912
D	2731	2521	2470	2177	2038	2147	2177
E	2759	2578	2681	2453	2385	2266	2319
F							
G							
H							
I							

NO. OF READINGS = 40 AVERAGE FPM = 2123

J	1919						
K	2016						
L	2027						
M	2158						
N	2264						
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-5 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 48 " WIDTH x 30 " DEPTH Sq Ft = 10.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.8	InWg.	DESIGN CFM =	13500
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	12136
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	12119

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	1222	1227	1269	1563	1429	1112	
B	1396	1203	1175	1529	1465	1089	
C	1401	1315	1129	1210	1263	1145	
D	934	1289	1184	1134	1289	1163	
E	1102	1203	1169	891	806	1103	
F							
G							
H							
I							

NO. OF READINGS = 30 AVERAGE FPM = 1214

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-5 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 70 " WIDTH x 32 " DEPTH Sq Ft = 15.56

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	7305
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	7309

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	509	641	573	528	653	624	
B	308	216	222	239	513	609	
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 470

J							
K							
L							
M							
N							
O							
P							
Q							
R							

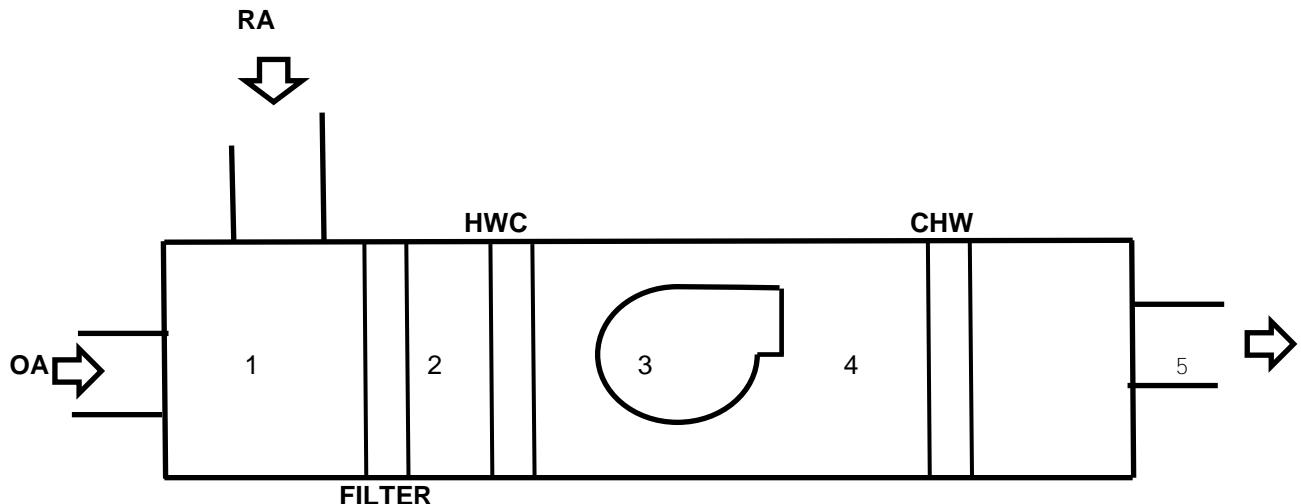
TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. AHU-6		FAN NO. F-6	
Serves / Location:	Flrs. 4 & 5	Lower Penthouse	AHU-6	Lower Penthouse
Manufacturer:	CARRIER		WOOD	
Model Number:	39NXB745NBL83974		36JG 15P/A	
Size:	NL		NL	
Serial Number:	3695T83974		963632H 15HP	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	BALDOR	NL	TOSHIBA
Frame Number:	NL	326T	NL	254TZ
Horsepower:	NL	50	NL	15
Brake Horsepower:	NL	37	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	429/3	460/3	164
Motor Amperage:	57	39.1	18.5	6.1
Motor RPM:	1775	1645	1775	703
Speeds:	VFD	54.84 HZ	VFD	30 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	27400	24778		
Return Air CFM:			16400	14732
Exhaust Air CFM:				
Outside Air CFM:	11000	10055		
Suction Pressure:	NL	-1.98	NL	-0.57
Discharge Pressure:	NL	3.13	NL	-1.06
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	5.11	NL	1.63
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	982		NL	NL
Motor Drive:	NL	3B5V86	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	3B5V154	NL	NL
Fan Size/Bore:	NL	B2 7/16	NL	NL
Belt Size / Number:	NL	5VX850/3	NL	NL
Shafts C-C:	NL	23 1/2	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-6 STATIC PROFILE



LOCATION	STATIC
1	-1.74"
2	-1.88"
3	-1.98"
4	+3.13"
5	+2.65"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-6 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 32 " WIDTH x 56 " DEPTH Sq Ft = 12.44

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	24764
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	24778

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	1951	1962	1890	2067	2019	2099	1945
B	1904	1845	1983	1978	2040	2077	1979
C	1945	1961	1608	1900	2044	1951	2031
D	1942	1973	1900	1935	2114	2076	2078
E	2021	1971	2009	1896	2115	2065	2068
F	2059	1899	2130	2002	2046	2081	2036
G	2010	2102	2159	1930	2036	2076	2089
H	2042	2184	2021	1706	2043	1992	2031
I							

NO. OF READINGS = 64 AVERAGE FPM = 1990

J	1851						
K	1959						
L	1889						
M	1892						
N	1958						
O	1917						
P	1863						
Q	2012						
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-6 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 62 " WIDTH x 30 " DEPTH Sq Ft = 12.92

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.76	InWg.	DESIGN CFM =	16400
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	14751
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	14732

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	1148	1122	1023	1127	1109	1021	1244
B	1201	1191	1006	1018	888	1033	1560
C	1233	1188	1102	903	891	960	1400
D	1429	1179	1123	1016	1023	941	1433
E	1388	1069	1169	1143	1067	999	1624
F							
G							
H							
I							

NO. OF READINGS = 35 AVERAGE FPM = 1142

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-6 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: Lower Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 38 " WIDTH x 66 " DEPTH Sq Ft = 17.42

AIR DENSITY DATA

STATIC PRESS @ CL: NA InWg. DESIGN CFM = NL
DUCT AIR TEMP : 70 Deg F ACTUAL CFM = 10049
BAROMETRIC PRESS : 29.92 In Hg. SCFM= 10055

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	649	500	507				
B	716	416	522				
C	744	489	588				
D	687	423	683				
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 577

J							
K							
L							
M							
N							
O							
P							
Q							
R							

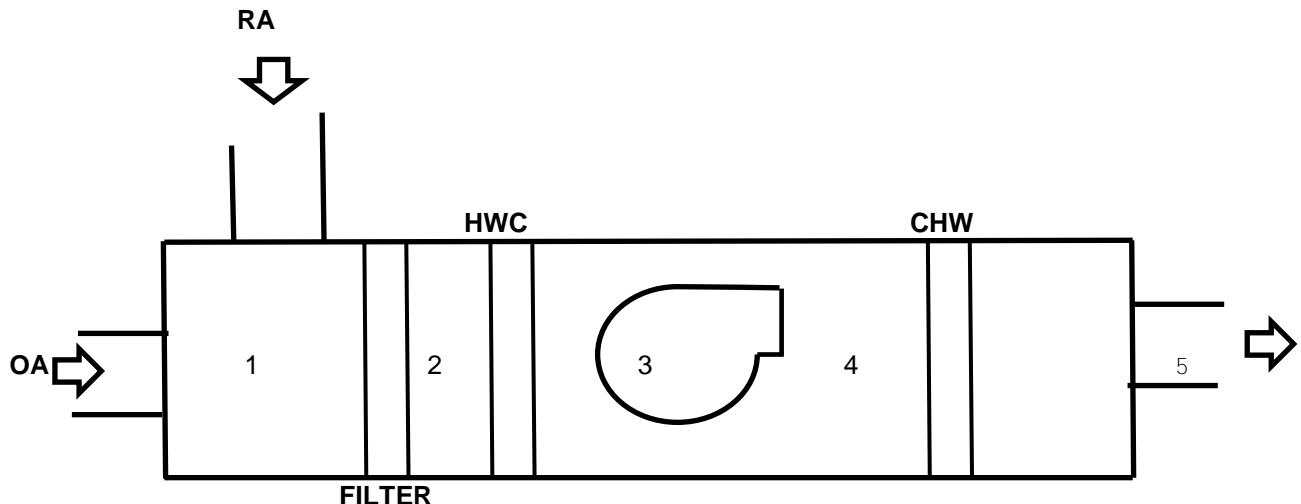
TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. AHU-7		FAN NO. F-7	
Serves / Location:	Flrs. 4 & 5	Upper Penthouse	AHU-7	Upper Penthouse
Manufacturer:	CARRIER		WOOD	
Model Number:	39Nxb745NVL83975		NA	
Size:	NL		NL	
Serial Number:	3796T83975		NA	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	NA
Frame Number:	NL	S326T	NL	NA
Horsepower:	NL	50	NL	NA
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	NA
Volts/Phase:	460/3	430/3	460/3	165/3
Motor Amperage:	59	27.4	NA	5.9
Motor RPM:	1775	1650	NA	710
Speeds:	VFD	60 HZ	VFD	35 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	29000	26601		
Return Air CFM:			17000	15701
Exhaust Air CFM:				
Outside Air CFM:	12000	10844		
Suction Pressure:	NL	-1	NL	-0.33
Discharge Pressure:	NL	3.95	NL	-0.04
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	4.95	NL	0.37
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	982	NA	NL	NL
Motor Drive:	NL	3B5V86	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	3B5V154	NL	NL
Fan Size/Bore:	NL	B2 7/16	NL	NL
Belt Size / Number:	NL	5BX850/3	NL	NL
Shafts C-C:	NL	23.3	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-7 STATIC PROFILE



LOCATION	STATIC
1	-0.68"
2	-0.78"
3	-1.00"
4	+3.95"
5	+3.29"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-7 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 50 " WIDTH x 31 " DEPTH Sq Ft = 10.76

AIR DENSITY DATA

STATIC PRESS @ CL:	1.82	InWg.	DESIGN CFM =	29000
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	26601
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	26735

AIR DENSITY RATIO CORRECTION = 1.01

SCFM CORRECTION FACTOR 1.01

ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	2567	2578	2409	2433	2511	2532	2308
B	2531	2521	2384	2412	2494	2560	2345
C	2604	2522	2367	2542	2455	2412	2473
D	2538	2504	2566	2385	2437	2459	2461
E	2551	2528	2759	2354	2416	2462	2442
F							
G							
H							
I							

NO. OF READINGS = 45 AVERAGE FPM = 2471

J	2318	2528					
K	2212	2520					
L	2377	2616					
M	2356	2532					
N	2584	2344					
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-7 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 78 " WIDTH x 28 " DEPTH Sq Ft = 15.17

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.9	InWg.	DESIGN CFM =	17000
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	15727
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	15701

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	917	915	1016	675	1364	1250	1047
B	944	1067	816	594	1131	1119	1378
C	963	1097	1021	907	1068	1215	1388
D	816	1047	870	965	868	1148	1429
E							
F							
G							
H							
I							

NO. OF READINGS = 28 AVERAGE FPM = 1037

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-7 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 66 " WIDTH x 46 " DEPTH Sq Ft = 21.08

AIR DENSITY DATA

STATIC PRESS @ CL: NA InWg. DESIGN CFM = NL
DUCT AIR TEMP : 70 Deg F ACTUAL CFM = 10838
BAROMETRIC PRESS : 29.92 In Hg. SCFM= 10844

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	449	416	503	488			
B	570	349	641	591			
C	488	565	606	503			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 514

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

FAN DATA SHEET

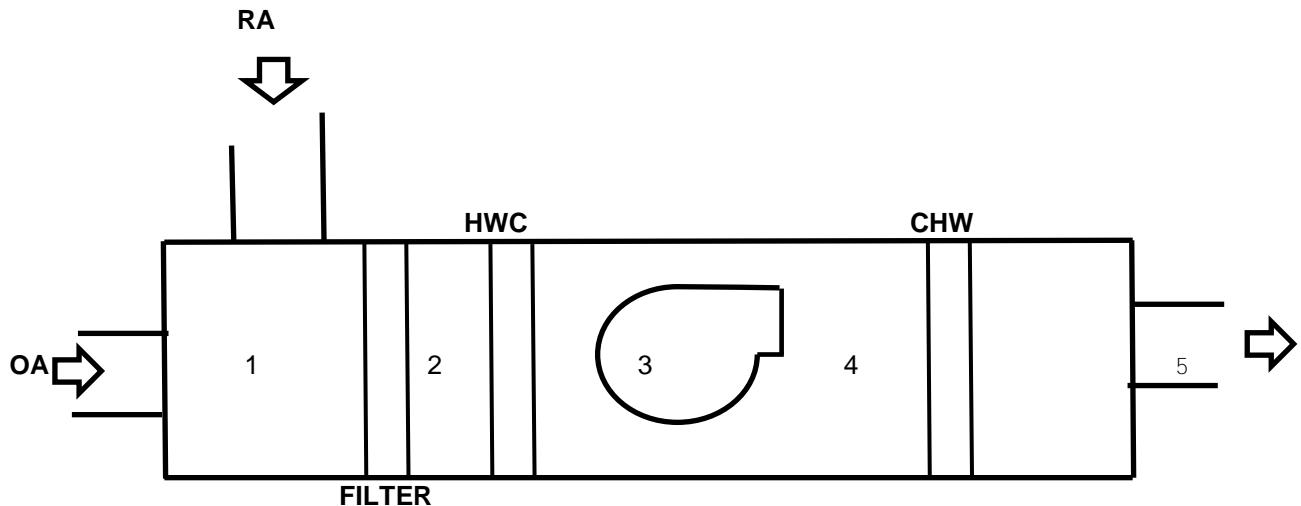
	FAN NO. AHU-8		FAN NO. F-8	
Serves / Location:	Flrs. 4, 5 & 6	6-724	AHU-8	6-724
Manufacturer:	CARRIER		COOK	
Model Number:	39NXB745NVR83976		NA	
Size:	NL		NL	
Serial Number:	3796T83976		NA	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	NA
Frame Number:	NL	S326T	NL	NA
Horsepower:	NL	50	NL	NA
Brake Horsepower:	NL	36.9	NL	NA
Safety Factor:	NL	1.15	NL	NA
Volts/Phase:	460/3	460/3	460/3	166/3
Motor Amperage:	59	36.4	NA	6
Motor RPM:	1775	1792	NA	711
Speeds:	VFD	59.76 HZ	VFD	41.76 HZ
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	32000	29573		
Return Air CFM:			NL	22773
Exhaust Air CFM:				
Outside Air CFM:	7000	6898		
Suction Pressure:	NL	-0.94	NL	-0.18
Discharge Pressure:	NL	3.14	NL	-0.06
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	4.08	NL	0.24
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	982	NA	NL	NL
Motor Drive:	NL	3B5V86	NL	NL
Motor Size/Bore:	NL	B2 1/8	NL	NL
Fan Drive:	NL	2B5V154	NL	NL
Fan Size/Bore:	NL	B2 7/16	NL	NL
Belt Size / Number:	NL	5VX850/3	NL	NL
Shafts C-C:	NL	23.3	NL	NL
Turns Open:	NL	FIXED	NL	NL

Comments:

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-8 STATIC PROFILE



LOCATION	STATIC
1	-0.67"
2	-0.75"
3	-0.94"
4	+3.14"
5	+2.50"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-8 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: 6-724

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 62 " WIDTH x 36 " DEPTH Sq Ft = 15.50

AIR DENSITY DATA

STATIC PRESS @ CL:	2.76	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	29573
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	29791

AIR DENSITY RATIO CORRECTION = 1.01

SCFM CORRECTION FACTOR 1.01

ACTUAL DENSITY 0.076

TEST HOLE	1	2	3	4	5	6	7
A	2289	2521	2248	1825	1951	1338	933
B	2665	2693	2494	1988	1736	1011	821
C	2936	2895	2695	2048	1638	1032	877
D	2766	2932	2606	2438	1386	1077	988
E	2345	2826	2765	2779	1591	1068	1932
F							
G							
H							
I							

NO. OF READINGS = 45 AVERAGE FPM = 1908

J	976	1800					
K	1094	1803					
L	1013	1647					
M	1236	2155					
N	1786	2215					
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-8 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: 6-724

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 63 " WIDTH x 34 " DEPTH Sq Ft = 14.88

AIR DENSITY DATA

STATIC PRESS @ CL: -0.2 InWg. DESIGN CFM = NL
DUCT AIR TEMP : 70 Deg F ACTUAL CFM = 12382
BAROMETRIC PRESS : 29.92 In Hg. SCFM= 12383

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	514	586	767	900	1078	1039	1110
B	465	516	767	831	1043	1149	1136
C	621	551	608	657	912	1127	1114
D	640	241	454	698	848	1046	1093
E	664	392	514	912	836	1158	1050
F							
G							
H							
I							

NO. OF READINGS = 55 AVERAGE FPM = 832

J	1032	1014	954	750			
K	1023	935	877	681			
L	1064	978	851	611			
M	980	926	805	450			
N	1076	998	925	814			
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

FAN DATA SHEET

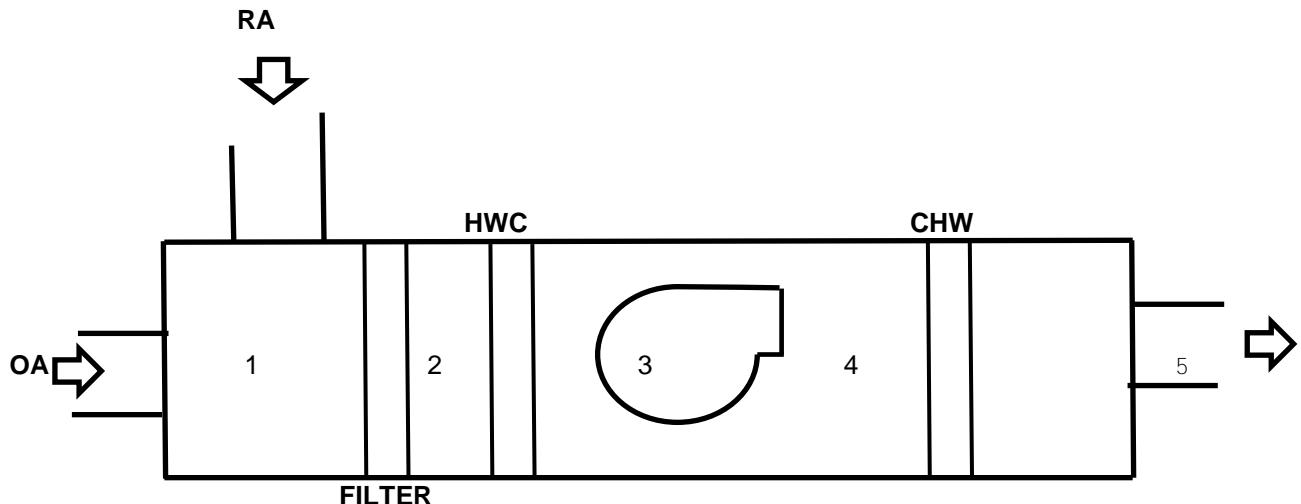
	FAN NO. AHU-9		FAN NO. F-9	
Serves / Location:	Flr. 6	Upper Penthouse	AHU-9	Upper Penthouse
Manufacturer:	CARRIER		WOODS	
Model Number:	39NXD495NVL83977		NA	
Size:	NL		NL	
Serial Number:	3796T83977		NA	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	BALDOR	NL	NA
Frame Number:	NL	286T	NL	NA
Horsepower:	NL	30	NL	NA
Brake Horsepower:	NL	23.9	NL	NA
Safety Factor:	NL	1.15	NL	NA
Volts/Phase:	460/3	381/3	460/3	145/3
Motor Amperage:	36	28.4	NA	3.3
Motor RPM:	1780	1478	NA	625
Speeds:	VFD	49.3 Hz	VFD	37.8 Hz
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	17000	16546		
Return Air CFM:			NL	12999
Exhaust Air CFM:				
Outside Air CFM:	4000	3804		
Suction Pressure:	NL	-1.07	NL	-0.01
Discharge Pressure:	NL	2.68	NL	0.03
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	3.75	NL	0.13
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	982	NA	NL	NL
Motor Drive:	NL	2B5V80	NL	NL
Motor Size/Bore:	NL	B1 7/8	NL	NL
Fan Drive:	NL	2B5V124	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	5VX730/2	NL	NL
Shafts C-C:	NL	20.2	NL	NL
Turns Open:	NL	FIXED	NL	NL

Comments:

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-9 STATIC PROFILE



LOCATION	STATIC
1	-0.77"
2	-1.01"
3	-1.07"
4	+2.68"
5	+2.10"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-9 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 38 " WIDTH x 30 " DEPTH Sq Ft = 7.92

AIR DENSITY DATA

STATIC PRESS @ CL:	1.1	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	16546
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	16600

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	2331	2551	2511	2260	2654	2541	
B	2464	2317	2375	2504	2288	2318	
C	2349	1896	2429	2319	2383	2397	
D	1856	1374	1839	1740	2130	2060	
E	1382	739	1636	1899	1519	1638	
F							
G							
H							
I							

NO. OF READINGS = 30 AVERAGE FPM = 2090

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-9 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 50 " WIDTH x 30 " DEPTH Sq Ft = 10.42

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.08	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	12999
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	13004

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	1428	1555	967	964	1014	867	
B	1972	1523	1466	1116	1076	1158	
C	1855	1213	1251	1107	1050	1193	
D	1536	1071	1263	1022	1082	1188	
E	1833	1384	1176	777	1132	1199	
F							
G							
H							
I							

NO. OF READINGS = 30 AVERAGE FPM = 1248

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-9 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 60 " WIDTH x 32 " DEPTH Sq Ft = 13.33

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3802
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	3804

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	215	305	294	286			
B	219	320	391	251			
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 8 AVERAGE FPM = 285

J							
K							
L							
M							
N							
O							
P							
Q							
R							

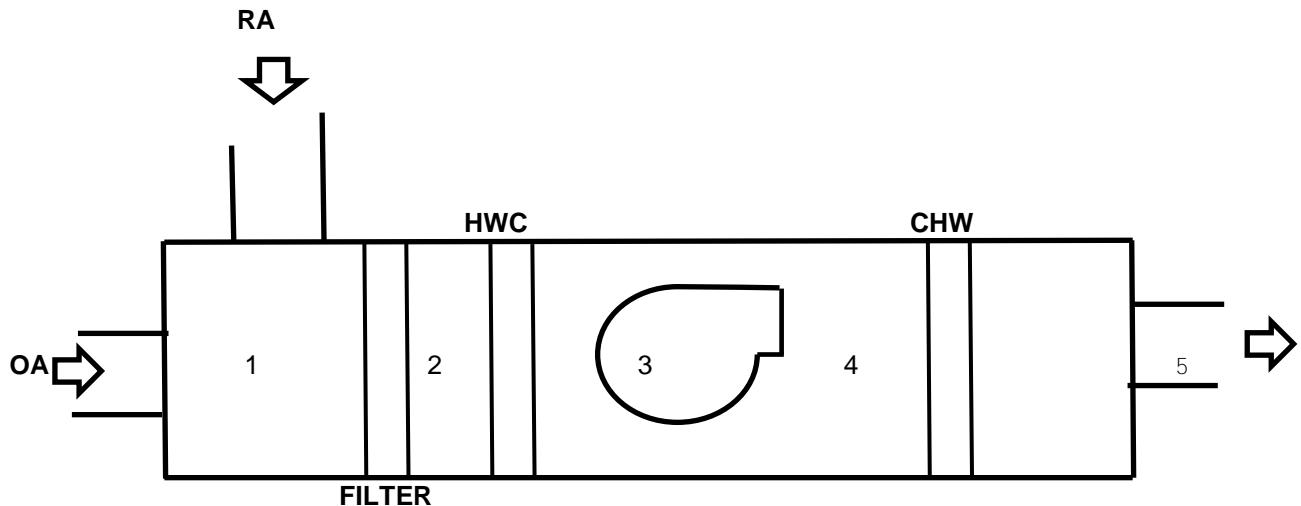
TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021	Project No.		20-551
FAN DATA SHEET				
	FAN NO. AHU-10		FAN NO. F-10	
Serves / Location:	Flr. 6	Upper Penthouse	AHU-10	Upper Penthouse
Manufacturer:	CARRIER		WOODS	
Model Number:	39NXB495NVR83978		NA	
Size:	NL		NL	
Serial Number:	3796T83978		NA	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	NA
Frame Number:	NL	S284T	NL	NA
Horsepower:	NL	25	NL	NA
Brake Horsepower:	NL	11.4	NL	NA
Safety Factor:	NL	1.15	NL	NA
Volts/Phase:	460/3	378/3	460/3	155/3
Motor Amperage:	30.3	13.7	NA	3.3
Motor RPM:	1740	1473	NA	665
Speeds:	VFD	49.13 Hz	VFD	2217 Hz
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	15000	14018		
Return Air CFM:			NL	10509
Exhaust Air CFM:				
Outside Air CFM:	3600	3687		
Suction Pressure:	NL	-0.92	NL	-0.11
Discharge Pressure:	NL	2.7	NL	0.02
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	3.62	NL	0.13
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	982	NA	NL	NL
Motor Drive:	NL	2B5V64	NL	NL
Motor Size/Bore:	NL	B1 7/8	NL	NL
Fan Drive:	NL	2B5V80	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	5VX540/2	NL	NL
Shafts C-C:	NL	15.5	NL	NL
Turns Open:	NL	FIXED	NL	NL
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-10 STATIC PROFILE



LOCATION	STATIC
1	-0.73"
2	-0.76"
3	-0.92"
4	+2.70"
5	+2.04"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-10 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 40 " WIDTH x 24 " DEPTH Sq Ft = 6.67

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	14018
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	14026

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	2186	2103	2156	2170	1977	2062	
B	2085	2177	2193	2085	2000	1926	
C	2026	2162	2247	2039	2081	1999	
D	2116	1898	2234	2215	2050	2071	
E	2151	1935	2290	2264	2085	2097	
F							
G							
H							
I							

NO. OF READINGS = 30 AVERAGE FPM = 2103

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-10 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 44 " WIDTH x 28 " DEPTH Sq Ft = 8.56

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	10509
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	10514

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	1157	1418	1150	1109	1221	1026	
B	1300	1456	1200	1121	1200	1056	
C	1420	1609	1122	1100	1333	1000	
D	1265	1521	1279	1168	1321	1012	
E	1108	1439	1318	1109	1288	1022	
F							
G							
H							
I							

NO. OF READINGS = 30 AVERAGE FPM = 1228

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-10 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: Upper Penthouse

DUCT SIZE (ROUND) " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 52 " WIDTH x 26 " DEPTH Sq Ft = 9.39

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3687
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	3690

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	325	363	419	465			
B	320	344	387	520			
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 8 AVERAGE FPM = 393

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

FAN DATA SHEET

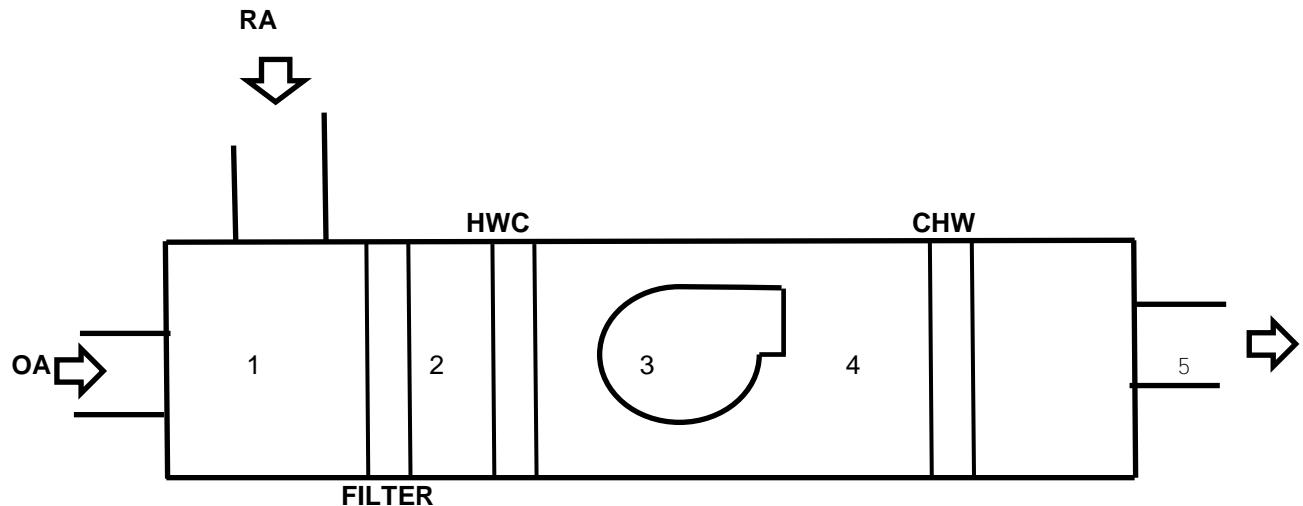
	FAN NO. AHU-11	FAN NO. F-11		
Serves / Location:	1st, 2nd & 3rd Vest. B-804	AHU-11 B-804		
Manufacturer:	CARRIER			
Model Number:	39Nxb495Nvr83966	365 CPV		
Size:	NL	NL		
Serial Number:	3196T83966	010S4396080000021010896		
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	MAGNETEK
Frame Number:	NL	S284T	NL	3213T
Horsepower:	NL	25	NL	7 1/2
Brake Horsepower:	NL	20.8	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	460/3	460/3	187/3
Motor Amperage:	30.1	20.5	9.6	4
Motor RPM:	1740	1800	1755	805
Speeds:	VFD	60 Hz	VFD	32 Hz
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	16000	14901		
Return Air CFM:			12000	10960
Exhaust Air CFM:				
Outside Air CFM:	4000	3914		
Suction Pressure:	NL	-0.72	NL	-0.03
Discharge Pressure:	NL	3.72	NL	0.29
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	4.44	NL	0.32
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	1024	NA	NL	NL
Motor Drive:	NL	2B5V64	NL	NL
Motor Size/Bore:	NL	B1 7/8	NL	NL
Fan Drive:	NL	2B5V110	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	5VX680/2	NL	NL
Shafts C-C:	NL	20	NL	NL
Turns Open:	NL	FIXED	NL	NL

Comments: ** Hot water coil is dirty.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-11 STATIC PROFILE



LOCATION	STATIC
1	-0.47"
2	-0.50"
3	-0.72"
4	+3.72"
5	+3.13"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-11 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: B-804

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 22 " WIDTH x 14 " DEPTH Sq Ft = 2.14

AIR DENSITY DATA

STATIC PRESS @ CL:	1.76	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2962
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	2977

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	1592	1487	1283	1221	1176		
B	1371	1495	1272	1234	1154		
C	1444	1466	1304	1326	1420		
D	1685	1598	1376	1289	1507		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 1385

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-11 TRAVERSE NUMBER : S-2
Supply TRAVERSE LOCATION: Garage

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 20 " WIDTH x 10 " DEPTH Sq Ft = 1.39

AIR DENSITY DATA

STATIC PRESS @ CL:	1.92	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2929
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	2945

AIR DENSITY RATIO CORRECTION = 1.01

SCFM CORRECTION FACTOR 1.01

ACTUAL DENSITY 0.075

TEST HOLE	1	2	3	4	5	6	7
A	1998	2231	2195	2222	2054		
B	2064	2187	2153	2204	1956		
C	1955	2209	2118	2157	1932		
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 15 AVERAGE FPM = 2109

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-11 TRAVERSE NUMBER : S-3
Supply TRAVERSE LOCATION: B-804

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 16 " WIDTH x 44 " DEPTH Sq Ft = 4.89

AIR DENSITY DATA

STATIC PRESS @ CL:	1.68	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	9010
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	9053

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	1307	1408	1364	1114			
B	1741	1487	1581	1111			
C	1804	1574	1863	1390			
D	1921	1968	2037	1682			
E	1916	2120	2166	1674			
F	2044	1945	2247	2209			
G	2385	2169	2395	2163			
H	1933	2001	2131	2126			
I							

NO. OF READINGS = 32 AVERAGE FPM = 1843

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-11 TRAVERSE NUMBER : R-1
Return TRAVERSE LOCATION: B-804

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 22 " WIDTH x 72 " DEPTH Sq Ft = 11.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.82	InWg.	DESIGN CFM =	12000
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	10960
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	10944

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	643	740	1066	1042			
B	933	1001	1016	1187			
C	792	860	862	1067			
D	944	751	920	1058			
E	1064	1031	1106	1261			
F	1036	766	928	986			
G	1282	863	1035	1171			
H	1240	1057	1018	1157			
I							

NO. OF READINGS = 32 AVERAGE FPM = 996

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-11 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: B-804

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 63 " WIDTH x 30 " DEPTH Sq Ft = 13.13

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3914
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	3916

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	364	301	320	253	266		
B	361	317	292	267	241		
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 10 AVERAGE FPM = 298

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

FAN DATA SHEET

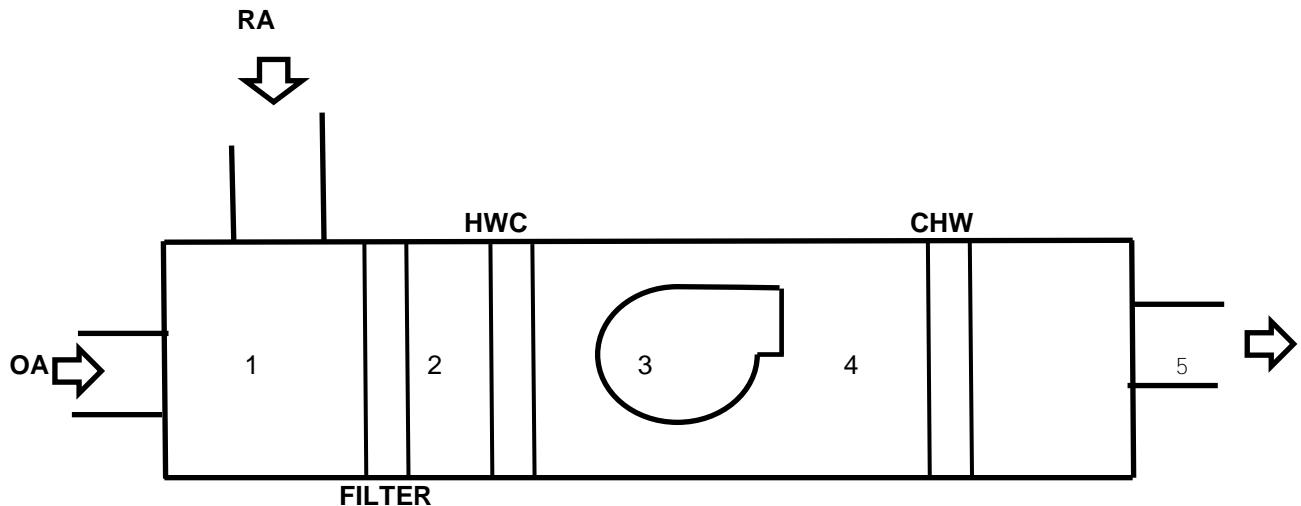
	FAN NO. AHU-12		FAN NO. F-12	
Serves / Location:	Basement	B-804	AHU-12	B-804
Manufacturer:	CARRIER		COOK	
Model Number:	39NXB175NVR83967		180 CIC	
Size:	NL		NL	
Serial Number:	3196T83967		01004396080200007010896	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK	NL	BALDOR
Frame Number:	NL	ILLEGIBLE	NL	145T
Horsepower:	NL	10	NL	1 1/2
Brake Horsepower:	NL	8.9	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	430/3	460/3	169/3
Motor Amperage:	12.2	9.4	2.2	1.1
Motor RPM:	1750	1650	1740	707
Speeds:	VFD	60 Hz	VFD	37 Hz
Heater Size:	NL	VFD Protected	NL	VFD Protected
Heater Amps.:	NL	VFD Protected	NL	VFD Protected
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	6800	6314		
Return Air CFM:			3000	2878
Exhaust Air CFM:				
Outside Air CFM:	3800	3436		
Suction Pressure:	NL	-1.45	NL	-0.08
Discharge Pressure:	NL	1.52	NL	0.02
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	2.97	NL	0.1
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	2085	NA	NL	NL
Motor Drive:	NL	BK90	NL	NL
Motor Size/Bore:	NL	1 3/8	NL	NL
Fan Drive:	NL	1B5V70	NL	NL
Fan Size/Bore:	NL	B1 15/16	NL	NL
Belt Size / Number:	NL	BX48/1	NL	NL
Shafts C-C:	NL	12 4/5	NL	NL
Turns Open:	NL	FIXED	NL	NL

Comments: ** Hot water coil is dirty.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-12 STATIC PROFILE



LOCATION	STATIC
1	-1.31"
2	-1.34"
3	-1.45"
4	+1.52"
5	+1.05"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-12 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: B-804

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 28 " WIDTH x 24 " DEPTH Sq Ft = 4.67

AIR DENSITY DATA

STATIC PRESS @ CL:	1.01	InWg.	DESIGN CFM =	6800
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	6314
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	6333

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	1165	1253	1146	1222	1237	1302	1479
B	1305	1625	1195	1399	1565	1387	1501
C	1381	1287	1381	1351	1528	1544	1372
D	1379	1207	1325	1250	1338	1356	1403
E							
F							
G							
H							
I							

NO. OF READINGS = 28 AVERAGE FPM = 1353

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-12 TRAVERSE NUMBER : OA-1
O.A. TRAVERSE LOCATION: B-804

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 34 " WIDTH x 24 " DEPTH Sq Ft = 5.67

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.14	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3436
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	3437

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	348	428	744	745			
B	231	513	832	801			
C	208	707	812	853			
D	269	724	754	732			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 606

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

FAN DATA SHEET

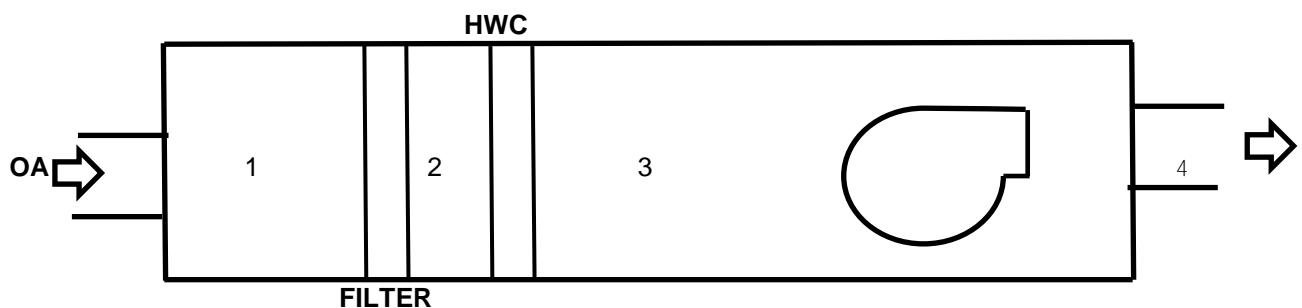
	FAN NO. AHU-14	FAN NO.		
Serves / Location:	Boiler Room	Lower Penthouse		
Manufacturer:	CARRIER			
Model Number:	39NXH112NVR83979			
Size:	NL			
Serial Number:	3796T83979			
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	MAGNETEK		
Frame Number:	NL	E184T		
Horsepower:	NL	5		
Brake Horsepower:	NL	3.8		
Safety Factor:	NL	1.15		
Volts/Phase:	460/3	460		
Motor Amperage:	6.15	4.5		
Motor RPM:	1750	1747		
Speeds:	NL	1		
Heater Size:	NL	NA		
Heater Amps.:	NL	NA		
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:	5600	4971		
Return Air CFM:				
Exhaust Air CFM:				
Outside Air CFM:	5600	4971		
Suction Pressure:	NL	-0.78		
Discharge Pressure:	NL	0.33		
Fan Static Pressure:	NL	NA		
External Pressure:	NL	1.12		
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	NL	NA		
Motor Drive:	NL	6" OD		
Motor Size/Bore:	NL	1 1/8		
Fan Drive:	NL	1 3/8 OD		
Fan Size/Bore:	NL	1 3/16		
Belt Size / Number:	NL	BX48/1		
Shafts C-C:	NL	12		
Turns Open:	NL	4		

Comments: ** 100% outside air, belt is out of alignment.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

AHU-14 STATIC PROFILE



LOCATION	STATIC
1	-0.28"
2	-0.44"
3	-0.78"
4	+0.33"

** Pressures measured with VAV Boxes at full cooling position.

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: AHU-14 TRAVERSE NUMBER : S-1
Supply TRAVERSE LOCATION: Lower Penthouse

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:	0.36	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	4971
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	4978

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	1200	1197	986	977	763		
B	1417	1300	756	892	826		
C	1489	1120	799	594	811		
D	1461	1191	741	752	610		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 994

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. F-34		FAN NO. F-35	
Serves / Location:	Toilet Exhaust	Lower Penthouse	Toilet Exhaust	Upper Penthouse
Manufacturer:	COOK		COOK	
Model Number:	180 SQIB		165 SQIB	
Size:	NL		NL	
Serial Number:	010S4396080000085010896		018S4396080000097010896	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	NEMA	NL	MARATHON
Frame Number:	NL	145T	NL	145T-85
Horsepower:	NL	2	NL	1 1/2
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	477/3	460/3	477/3
Motor Amperage:	2.8	2	2.2	2.2
Motor RPM:	1745	1720	1750	1750
Speeds:	NL	SINGLE	NL	SINGLE
Heater Size:	NL	NA	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	NL	3904	NL	3323
Outside Air CFM:				
Suction Pressure:	NL	-0.81	NL	-0.12
Discharge Pressure:	NL	0.05	NL	0.16
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	0.86	NL	0.28
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VL40	NL	1VL40
Motor Size/Bore:	NL	7/8	NL	7/8
Fan Drive:	NL	5" OD	NL	5 1/2" OD
Fan Size/Bore:	NL	3/4"	NL	3/4"
Belt Size / Number:	NL	A48/1	NL	A23/1
Shafts C-C:	NL	19 1/4	NL	18 1/2
Turns Open:	NL	1	NL	3
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: F-34

TRAVERSE NUMBER : E-1

TRAVERSE LOCATION: Lower Penthouse

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:

-0.41 InWg.

DESIGN CFM =

NL

DUCT AIR TEMP :

70 Deg F

ACTUAL CFM =

3904

BAROMETRIC PRESS :

29.92 In Hg.

SCFM=

3903

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	1093	1114	841	883	1033	1234	1321
B	1220	1124	956	934	962	984	1166
C	1214	1144	957	975	1000	1085	1125
D	1124	1122	979	962	1068	1136	1094
E							
F							
G							
H							
I							

NO. OF READINGS = 36 AVERAGE FPM = 1116

J	1386	1050					
K	1398	1340					
L	1324	1363					
M	1225	1223					
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: F-35

TRAVERSE NUMBER : E-1

TRAVERSE LOCATION: Upper Penthouse

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:

-0.74 InWg.

DESIGN CFM =

NL

DUCT AIR TEMP :

70 Deg F

ACTUAL CFM =

3323

BAROMETRIC PRESS :

29.92 In Hg.

SCFM=

3319

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	1257	1317	1233	1224	1071		
B	1343	1303	1167	1112	1199		
C	1245	1111	1132	1072	996		
D	1193	1116	1028	1027	862		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 1150

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. F-36		FAN NO. F-37	
Serves / Location:	Toilet Exhaust	6-463	Toilet Exhaust	6-705
Manufacturer:	COOK		COOK	
Model Number:	180 SQIB		210 SQIB	
Size:	NL		NL	
Serial Number:	010S4396080000109010896		010S4396080000121010896	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	BALDOR	NL	MARATHON
Frame Number:	NL	145T	NL	182T
Horsepower:	NL	3	NL	3
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	460/3	477/3	460/3	477/3
Motor Amperage:	4	2.7	4	3.4
Motor RPM:	1725	1720	1750	1727
Speeds:	NL	SINGLE	NL	SINGLE
Heater Size:	NL	NA	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	NL	3954	NL	6032
Outside Air CFM:				
Suction Pressure:	NL	-0.7	NL	-0.8
Discharge Pressure:	NL	0.03	NL	0.03
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	0.73	NL	0.83
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	5 1/8" OD
Fan Size/Bore:	NL	NA	NL	1/2
Belt Size / Number:	NL	NA	NL	A59/1
Shafts C-C:	NL	NA	NL	21 1/2
Turns Open:	NL	NA	NL	1
Comments:				

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: F-36 TRAVERSE NUMBER : E-1
TRAVERSE LOCATION: 6-463

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 28 " WIDTH x 16 " DEPTH Sq Ft = 3.11

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.69	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3954
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	3950

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	1466	1516	1381	639	439	1396	1268
B	1518	1217	1227	704	527	1222	1420
C	1519	1128	1373	1403	842	1486	1450
D	1555	1377	1589	1553	1515	1497	1361
E							
F							
G							
H							
I							

NO. OF READINGS = 28 AVERAGE FPM = 1271

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: F-37 TRAVERSE NUMBER : E-1
TRAVERSE LOCATION: 6-705

DUCT SIZE (ROUND) _____ " DIAMETER Sq Ft = 0.00
DUCT SIZE (RECT.) 32 " WIDTH x 18 " DEPTH Sq Ft = 4.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.6	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	5032
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	5027

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	1599	1659	1697	1705	450	1109	1501
B	1637	1589	1643	1691	1459	832	1298
C	1483	1239	1404	1560	1642	1578	907
D	1147	555	262	990	1576	1541	1268
E							
F							
G							
H							
I							

NO. OF READINGS = 32 AVERAGE FPM = 1258

J	1323						
K	859						
L	597						
M	455						
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: F-37

TRAVERSE NUMBER : E-2

TRAVERSE LOCATION: 6-705

DUCT SIZE (ROUND)

" DIAMETER

Sq Ft =

0.00

DUCT SIZE (RECT.)

14

" WIDTH x 12 "

DEPTH Sq Ft =

1.17

AIR DENSITY DATA

STATIC PRESS @ CL:

-0.51 InWg.

DESIGN CFM =

NL

DUCT AIR TEMP :

70 Deg F

ACTUAL CFM =

1000

BAROMETRIC PRESS :

29.92 In Hg.

SCFM=

999

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	853	1037	753				
B	959	1013	861				
C	953	866	810				
D	855	792	534				
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 857

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project:	Edward W Brooke Courthouse			
Address:	24 New Chardon St., Boston, MA			
Date:	9/10/2021		Project No.	20-551
FAN DATA SHEET				
	FAN NO. F-51		FAN NO. F-66	
Serves / Location:	Toilet Exhaust	Garage	Toilet Exhaust	Roof
Manufacturer:	COOK		COOK	
Model Number:	NA		135C5B	
Size:	NL		NL	
Serial Number:	NA		010S4396080000236010396	
MOTOR	DESIGN	TESTED	DESIGN	TESTED
Manufacturer:	NL	WATT SAVER	NL	MARATHON
Frame Number:	NL	E145T	NL	56
Horsepower:	NL	21	NL	1/2
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.25
Volts/Phase:	460/3	477/3	460/3	477/3
Motor Amperage:	3.2	2.8	1.1	1.1
Motor RPM:	1740	1720	1725	1725
Speeds:	NL	SINGLE	NL	SINGLE
Heater Size:	NL	NA	NL	NA
Heater Amps.:	NL	NA	NL	NA
FAN	DESIGN	TESTED	DESIGN	TESTED
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	NL	3984	NL	789
Outside Air CFM:				
Suction Pressure:	NL	-1.13	NL	-1.62
Discharge Pressure:	NL	-0.03	NL	0.03
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	1.16	NL	1.65
RPM	DESIGN	TESTED	DESIGN	TESTED
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1VL40	NL	3" OD
Motor Size/Bore:	NL	7/8"	NL	5/8
Fan Drive:	NL	4 3/4" OD	NL	AK30
Fan Size/Bore:	NL	1 7/8"	NL	3/4
Belt Size / Number:	NL	AX50	NL	4L210/1 *1
Shafts C-C:	NL	20 3/8"	NL	5 1/4
Turns Open:	NL	2	NL	4
Comments:	*1 Belt was loose and cracked.			

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: F-51

TRAVERSE NUMBER : E-1

TRAVERSE LOCATION: Garage

DUCT SIZE (ROUND)

" DIAMETER

Sq Ft =

0.00

DUCT SIZE (RECT.)

30

" WIDTH x 14 "

DEPTH Sq Ft =

2.92

AIR DENSITY DATA

STATIC PRESS @ CL:

-1.21 InWg.

DESIGN CFM =

NL

DUCT AIR TEMP :

70 Deg F

ACTUAL CFM =

3984

BAROMETRIC PRESS :

29.92 In Hg.

SCFM=

3974

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	1249	1437	1331	1320	1003		
B	1508	1486	1410	1272	1030		
C	1499	1576	1472	1384	1154		
D	1616	1510	1442	1379	1239		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 1366

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott

Project: Edward W Brooke Courthouse
Address: 24 New Chardon St., Boston, MA
Date: 9/10/2021

Project No. 20-551

TRAVERSE DATA

SYSTEM: F-66

TRAVERSE NUMBER : E-1

TRAVERSE LOCATION: 6th Fl. Stair 5

DUCT SIZE (ROUND)

" DIAMETER

Sq Ft =

0.00

DUCT SIZE (RECT.)

27

" WIDTH x 10 "

DEPTH Sq Ft =

2.57

AIR DENSITY DATA

STATIC PRESS @ CL:

-1.62 InWg.

DESIGN CFM =

NL

DUCT AIR TEMP :

70 Deg F

ACTUAL CFM =

789

BAROMETRIC PRESS :

29.92 In Hg.

SCFM=

786

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	276	295	312	287	282		
B	324	343	318	312	311		
C	331	338	325	322	229		
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 15 AVERAGE FPM = 307

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbott