Somerville District Court
Somerville, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

October 7, 2021

Tighe&Bond

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Section 1
Existing Conditions and Site Observations

Tighe & Bond visited the Somerville District Court on September 17, 2020. While on site, we inspected the air handling units and toured the occupied portions of the building to determine if the spaces generally matched usage noted on the architectural plans.

Site Visit Attendees:

- Office of Court Management:
  - Mike Stack, Courthouse Facilities Staff
  - "Winnie", Courthouse Facilities Staff
- Tighe & Bond:
  - Sean Pringle, PE, Project Mechanical Engineer
  - Caitlin DeWolfe, Staff Engineer

1.1 Existing Ventilation System

The courthouse is a two-story building (including the basement), constructed in 1961, with a floor area of approximately 31,000 gross square feet. We were able to examine drawings dated 1967, as well as 1990 and 1994 partial renovation drawings.

The HVAC system includes four constant volume air handling units (AHU). Two of the AHU's are located on the ground floor and two are in the attic. The drawings indicate that in 1990, AHU-1 and AHU-2 were replaced. The age of AHU-3 and AHU-4 is unknown, but they appear significantly older than the 1990 renovation, likely from the 1967 construction. The controls systems are significantly newer on all AHU's. All AHU's are in fair to poor condition. Most exhaust dampers could not be inspected because they were within ductwork, and not visible. Table 1 summarizes the air handling units' designed airflow rates, the MERV rating of the filters, and the condition.

TABLE 1
Existing Air Handlers

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Filters	Condition
AHU-1*	4,300	1,070	2" MERV 8	Fair
AHU-2*	4,300	1,070	2" MERV 8	Fair
AHU-3**	3,540	890	2" MERV 8	Poor
AHU-4**	3,840	960	2" MERV 8	Poor
Fan Coils**	Varies	25% of supply	1" Mesh	Fair to Poor

* Values based on 1990 design documents
** Values based on 1967 design documents

AHU's 1 and 2 have a hot water coil, a DX cooling coil with a remote condenser for each unit, supply fan, remote return air fan, and return dampers, outside air dampers, and exhaust air dampers. These units each serve roughly half of the lower level. Both units had issues preventing proper damper operation. On AHU-1, the actuator linkage was very

loose, and the outside air damper blades were misaligned with each other. On AHU-2, the return air damper was broken, with several loose damper blades.

AHU's 3 and 4 have a hot water coil, a chilled water coil, supply fan, return and outside air dampers, and a single exhaust fan and exhaust damper serving both units. These units each serve roughly half of the first floor, with the courtroom split between the two units. On AHU-3, the damper linkages appeared to be in working condition, but the setscrews were loose on the shafts, preventing the damper from operating.

Several AHU heating coils were found to be dirty. In some units it was noted that the there was a small gap in the filter tray around the air filters, which causes increased dirt buildup on the coils. The cooling coils were not visible, but they should also be inspected, and cleaned if needed.

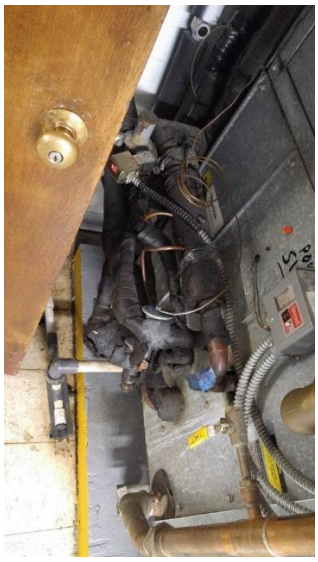
Most first floor rooms along the building perimeter are heated, cooled, and ventilated by fan coils with outside air louvers. The 1994 work shows these units being replaced in kind, presumably in accordance with the 1967 specifications. The facilities staff stated that they recently took over the building and had made repairs to these units, finding the outside air grilles completely clogged and the dampers stuck. These units are controlled with local pneumatic controls, and according to staff the controls are in poor condition. There are no freeze stats and the outside air damper controls do not operate.

No ventilation was observed in the interior single office adjacent to the clerk's office. The 1967 plans show a duct serving this space, however it may have been covered at some point. It also is possible it was blocked by furniture at the time of the visit and not visible.

Staff noted that only three of the five toilet exhaust fans were currently operational.

The ground floor lockup area is served by a constant supply of mixed air through AHU-1 supplied into both the corridors and cells. Air is exhausted from the cells through a toilet exhaust riser, at a slightly higher rate than the supply air.

Chilled water is provided by a single 80-ton water cooled chiller. Hot water is provided from seven modular boilers. Neither the hot nor chilled water systems contain glycol.




Photos 1 & 2 – Representative Air Handler (AHU's 1 & 2)

Photo 3: Representative Air Handler (AHU's 3 & 4).

1.2 Existing Control System

The courthouse has an automated logic building management control system (BMS). It is tied to the existing boiler, chiller, AHU's, and exhaust fans. The fan coils are controlled via local pneumatic controls. While onsite, Tighe & Bond was able to observe various control system screens and setpoints. In addition to typical controls, we understand that the AHU control system provides the following key features:

1. Economizer mode – 100% outdoor air.
2. Safeties and alarms, including freeze stats.

Staff informed us that the AHU's are generally set to a 20% OA damper position, but that they have recently been manually increasing the setting to 50% on moderate days.

Section 2
Recommendations

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

2.1 Filtration Efficiency Recommendations

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

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

We recommend replacing the filters in the air handling units and fan coil units with MERV 13 filters. The TAB Contractor and Engineer shall verify that the existing air handlers and fan coils can accommodate MERV-13 filters. Replace filters in AHU's and fan coils with 2" and 1" MERV 13 filters, respectively.

The fan coils currently have plastic mesh filters, which typically have a particulate removal efficiency in the MERV 5-7 range. We recommend using MERV 8 or higher filters at minimum, and up to MERV 13 if possible. However, the use of higher MERV ratings may reduce the supply airflow and will require replacement at a higher frequency. It is recommended that a testing and balancing contractor confirm the supply airflow and adjust the outdoor air flow as recommended in RTB-1. Since this type of fan coil generally has poor filter fitment and uses the removeable cover as a sealing surface, consider adding gasketing to the fan coil cover and sides of the filter tray.

RF-3: *Install a differential pressure sensor (switch) across the filter banks.*

The existing automated logic controllers associated with the AHU's appeared to have spare binary inputs to accommodate the addition of a differential pressure switch.

RF-3b: *Pressure sensor (switch) shall have a display and be connected to the BMS system.*

2.2 Testing & Balancing Recommendations

The basement AHU's are approximately 26 years old and the attic AHU's are assumed to be over 50 years old. It is unknown to Tighe & Bond when the last time the units were tested and balanced to the proper airflow. Also, the code required outside air flow rates that were used to design the system in 1967, 1990, and 1994 are different than the 2015 IMC and ASHRAE Standard 62.1 requirements.

We recommend the following measures:

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

We recommend rebalancing the air handlers to the recommended minimum O.A. values shown in Table 2. After rebalancing, the spaces should be monitored during peak heating and cooling conditions to confirm space temperature can be maintained.

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	4,300	1,070	820	1,070
AHU-2	4,300	1,070	950	1,070
AHU-3	3,540	890	600	890
AHU-4	3,840	960	580	960

It appears that the original AHU design supply and outdoor airflows are adequate. Where the outside airflow rates calculated by Tighe & Bond are less than the original design values, we recommend balancing to the original designed values, as these exceed the calculated code minimums and will likely result in improved indoor air quality (IAQ).

The 1994 drawings indicate that the fan coils were replaced to match the original capacities and features from the 1967 design. The original 1967 design outdoor airflow requirements and the outdoor airflows for the spaces served by fan coil units based on the 2015 International Mechanical Code (IMC) are listed in Table 3

TABLE 3
Recommended Fan Coil 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)
B – Private Office	300	75	0*	0*
B – Civil Office	800	200	0*	0*
B – Halls	1,600	400	0*	0*
B – Break Rm	800	200	0*	0*
B – Jury Pool	300	75	0*	0*
1 – Clerk (open office)	2,400	600	80	600
1 – Lobby / Foyer	4,000	1,000	220	1,000
1 – Probation (open office)	2,400	600	80	600
1 – Private Office (typical small)	600	75	15	75
1 – Private Office (typical large)	600	75	30	75
1 – Courtroom (small)	2,400	600	370	600
1 – Judge's Chambers	1,200	300	50	300
1 – Jury Deliberation	1,200	300	160	300

*These areas are also served by AHU's. The AHU's provide adequate outdoor air.

Because of the poor condition of the fan coils, we recommend testing and adjusting the outdoor airflows from these units to match the recommended values above. We recommend maintaining the original design outside air flow rate of 25% of the design supply airflow. It may be necessary to make significant controls improvements before it will be possible to safely introduce this amount of outdoor air.

There appears to be a discrepancy in the basement drawings between the 1990 and 1994 plans. The 1990 plans show new ductwork from AHU's 1 and 2 in all the rooms previously served by fan coils (from the 1967 schedules). However, the 1994 plans appear to show the ceiling fan coil units as being replaced and rebalanced to match the original outdoor air. The ductwork serving these areas provides more than the code required outdoor air. Because of this, we do not recommend using these fan coils to provide outdoor air in addition to that provided by the AHU's.

The airflow rate per person is shown below in Table 4. These values are based on the recommended outdoor airflow and the original design supply airflow rates shown in Table 2 above. The airflow rate per person also 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

	All Spaces	***Courtrooms***	***Non-Courtroom spaces***
Total Occupancy (People)	370	210	160
Total Supply Air (CFM/Person)	110	44	190
Outdoor Air (CFM/Person)	27	10	49

The airflow rate per person for each Courtroom and the Jury Pool Room is shown below in Table 5. These values are based on full occupancy without taking diversity into account, the original design supply airflow rate, and the recommended outdoor airflow rate. The airflow rate per person assumes the full supply airflow is being delivered to the room. 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)

		Total Air		***Outdoor Air***	
Courtroom	***Total People***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outside Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Pool	20	350	18	86	4
Main Courtroom	167	4,400	26	1,100	7
Typical Small Courtroom	63	2,400	38	600	10

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

The airflow rate per person for each Courtroom and the Jury Pool Room, based on a reduced occupancy schedule determined by the Office of Court Management, is shown below in Table 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)

		Total Air		*Outdoor Air*	
Courtroom	***Total People***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outside Airflow (CFM)***	***Airflow Rate (CFM/Person)***
Jury Pool Room	9	350	39	86	10
Main Courtroom	33	4,400	133	1,100	33
Typical Small Courtroom	13	2,400	185	600	46

RTB-2: *Rebalance system return and/or exhaust flow rate.*

After all repairs are made and equipment providing ventilation air has been balanced, re-balance the exhaust fan serving AHU-3 and 4 so that the 1st floor is neutral to slightly positive with all equipment operating.

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

We recommend increasing the air handling unit outdoor air flow rate beyond the recommended outdoor air flow rates under non-peak conditions. We do not believe this would cause a threat of coil to freeze based on the total percentage of outside air vs. the total amount of outside air, however cold spots on the coil may develop due to poor mixing.

Due to the current limited fan coil controls, we do not recommend this measure for the fan coils. If the fan coils controls are upgraded and integrated with the BMS, it would be possible to apply this measure to the fan coils as well.

Refer to the control system upgrades section for the required controls to implement this strategy.

RTB-5: *Consider rebalancing all air inlets and outlets.*

Lockup areas only
The lockup ventilation strategy is based on maintaining a slight negative airflow pattern in the cells relative to the corridors in the lockup area. If any exhaust grilles have been accidently closed or if the supply air flow is too high in these areas, the likelihood of cross contamination from one cell to another increases.

For the lockup areas, the ventilation and exhaust airflows are not well identified on the 1994 renovation plans, and the grille locations and types do not match the plans. While some airflows are noted on the plans and consistent with 2015 IMC code requirements, others are not shown. We recommend rebalancing the airflows to the following supply air (SA) and exhaust air (EA) values in the lockup area:

- Individual male cells (including the cell currently used as an office): SA 75 CFM, EA 100 CFM
- Individual female cell**: SA 150 CFM, EA 175 CFM
- Group Cell**: SA 300 CFM, EA 350 CFM

- Corridor: SA 100 CFM
- ** Based on the small size of the existing security grilles, the values listed may not be attainable. Balance to at least 100 cfm, and as close as possible to the values shown while maintaining the offset between SA and EA and acceptable noise levels.

Whole building or spaces with airflow/temperature issues
If the Courthouse experiences regular cooling and heating comfort complaints, we recommend exploring rebalancing all air inlets and outlets throughout the building. Prior to rebalancing the building, we recommend verifying the chiller and boiler plants are maintaining the correct supply water temperatures.

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.

2.3 Equipment Maintenance & Upgrades

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

Replace dampers and actuators that are not functioning. In AHU's 1,2, and 3 damper issues were noted. Test all dampers and actuators for proper operation. Adjust, repair, or replace dampers as necessary.

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

Several air handlers showed signs of buildup on the coils. The hot water coils were visibly dirty. The cooling coils were not observed, but likely are also dirty. The coils should be cleaned to ensure the airflow and heating/cooling capacity can be maintained.

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

2.4 Control System

We recommend the following control system strategies be implemented into the existing control system:

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

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

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

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 Make AHU Adjustments to Reduce Air Leakage

Adjust the filter tray filler strips, door seals, and door hardware to reduce air leakage. These fitment issues cause untreated outside air to be drawn into the AHU supply air system and will clog and damage coils over time.

2.7.2 Replace Toilet Exhaust Fans

We recommend replacing all failed toilet exhaust fans. At the time of the visit, only three of the five toilet exhaust fans were functioning. After replacement, rebalance the toilet exhaust fans to the airflows shown on the drawings. All restrooms should be checked for the presence of airflow at minimum, and preferably rebalanced at the register after the toilet exhausts are repaired.

2.7.3 Replace Fan Coils and Controls

Many high occupant density areas are served by fan coils, many of which are in poor condition and have failed outdoor air controls. Because of the age and condition of the equipment and controls, we recommend replacing the existing units, rather than making repairs. We recommend the new units be connected to the BMS system for better controllability and the ability to implement an occupancy schedule.

If the fan coils are not replaced in the short term, at a minimum, they will require significant control improvements for outside air ventilation control. The new controls should be configured so that the fan and outside air damper operate continuously during occupied periods. At minimum, outdoor air damper, freezestat, and scheduling controls will be required.

2.7.4 Replace AHU-3 and AHU-4

While still operational, these AHU's are approximately 50 years old and beyond their useful life. While the attic location makes replacement difficult, consider replacing these units and the associated exhaust fan in within the next three to five years. As part of this replacement project, consider using return fans instead of exhaust fans. Staff noted that pressurization and air balance is difficult with the current configuration, as the exhaust fan is not effective in returning air from the spaces. Consider the use of energy recovery and/or demand-controlled ventilation with any new system.

Section 3
Testing & Balancing Results

Milharmer Associates Inc. visited the Somerville District Courthouse on January 25, 2021, to test the airflow rates of the air handling units and fan coils. No exhaust fans were tested during the initial visit.

On May 27, 2021, Milharmer returned to test the exhaust fans and retest AHU's 1-4, as sheave changes had been made to improve the airflow. They also tested the chilled water flow rates of the chilled water pumps and pumps and AHUs.

A summary of the tested airflow rates versus the design airflow rates are shown below in Tables 6, 7, and 8. The full testing and balancing report is attached.

TABLE 6
Air Handler Testing & Balancing Results

	Design			Actual		
Unit	**Total Supply Fan Airflow (CFM)**	**Recommended Outdoor Airflow (CFM)**	**Return Airflow (CFM)**	**Supply Fan Airflow (CFM)**	**Outdoor Airflow (CFM)**	**Return Airflow (CFM)**
AHU-1	4,300	1,070	3,230	3,945	1,154	2,791
AHU-2	4,300	1,070	3,230	3,805	1,216	2,589
AHU-3	3,540	890	2,650	2,458	1,022	1,436
AHU-4	3,840	960	2,880	2,593	981	1,612

TABLE 7
Fan Coil Testing & Balancing Results

	Design			Actual		
Unit	**Total Supply Fan Airflow (CFM)**	**Recommended Outdoor Airflow (CFM)**	**Return Airflow (CFM)**	**Supply Fan Airflow (CFM)**	**Outdoor Airflow (CFM)**	**Return Airflow (CFM)**
FF-1-1 (Private Office)	300	75	225	401	152	249
FF-2-2 (Clinic)	400	100	300	374	96	278
FF-2-3 (Clinic)	400	100	300	333	121	212

TABLE 7
Fan Coil Testing & Balancing Results

	Design			Actual		
Unit	**Total Supply Fan Airflow (CFM)**	**Recommended Outdoor Airflow (CFM)**	**Return Airflow (CFM)**	**Supply Fan Airflow (CFM)**	**Outdoor Airflow (CFM)**	**Return Airflow (CFM)**
FF-2-4 (Hall 1)	400	100	300	591	283	308
FF-2-5 (Hall 11)	400	100	300	561	284	277
FF-2-6 (Employee Room)	400	100	300	810	427	383
FF-2-7 (Employee Room)	400	100	300	540	319	221
FC-1-8 (Juvenile Probate)	300	75	225	433	221	212
FC-1-9 (2ND Session Courtroom)	1,200	300	900	1,185	521	664
FC-1-10 (2ND Session Courtroom)	1,200	300	900	1,030	343	687
FC-2-11 (Associate Judge)	600	150	450	548	198	350
FC-2-12 (Clerks Office)	600	150	450	411	102	309
FC-2-13 (Associate Clerk)	600	150	450	390	0	384
FC-1-14 (Clerks Gen. Office)	1,200	300	900	800	88	712
FC-1-15 (Clerks Gen. Office)	1,200	300	900	865	471	394
FC-3-16 (Foyer East)	800	200	600	543	323	220
FC-4-17 (Lobby)	1,200	300	900	Inoperable	Inoperable	Inoperable
FC-4-18 (Lobby)	1,200	300	900	Inoperable	Inoperable	Inoperable

TABLE 7
Fan Coil Testing & Balancing Results

	Design			Actual		
Unit	**Total Supply Fan Airflow (CFM)**	**Recommended Outdoor Airflow (CFM)**	**Return Airflow (CFM)**	**Supply Fan Airflow (CFM)**	**Outdoor Airflow (CFM)**	**Return Airflow (CFM)**
FC-3-19 (Foyer West)	800	200	600	639	247	392
FC-1-20 (Probate)	1,200	300	900	793	335	458
FC-1-21 (Probate)	1,200	300	900	725	401	324
FC-2-22 (Office 142)	600	150	450	589	161	428
FC-2-23 (Office 143)	600	150	450	508	248	260
FC-2-24 (Asst. Judge)	600	150	450	625	285	348
FC-1-25 (3rd Session Courtroom)	1,200	300	900	958	337	621
FC-1-26 (3rd Session Courtroom)	1,200	300	900	943	430	513
FC-2-27 (Chief Probation)	600	150	450	454	102	352
FC-1-28 (Library)	1,200	300	900	804	542	262
FC-1-29 (Judge)	1,200	300	900	978	660	318
FC-2-30 (Secretary)	600	150	450	508	194	314

TABLE 8
Exhaust and Return Fan Testing & Balancing Results

Unit	Serving	Design Airflow (CFM)	Actual Airflow (CFM)
RF-1	Toilets	660	658
RF-2	Toilets	160	75
RF-3	Toilets	310	242
RF-4	Toilets/ Lockup	1,880	1,638
EF-2	Lockup	300	357
RAF-1	AHU-1 Return	3,020	2,435
RAF-2	AHU-2 Return	3,430	2,237
CF-1	AHU-3&4 Exhaust	2,760	Inoperable

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

1. Air Handling Equipment:
    a. AHU-1 is performing within the acceptable airflow range.
    b. AHU-2 is operating at 88% of design supply airflow and 115% of the design outdoor airflow capacity.
        i. Based on the motor current measurements, acceptable airflow can likely be attained with the existing motor by adjusting or replacing the sheaves.
    c. AHU-3 and AHU-4 are approximately 70% of design supply airflow and 100% of outdoor airflow capacity.
        i. Based on the motor current measurements, acceptable airflow cannot be attained with the existing motors, although it can be improved somewhat. We recommend adjusting the sheaves to increase the fan airflow within the limits of the motor, and conducting additional investigations into the cause of the low airflow.
        ii. CF-1 was inoperable at the time of the test. This exhaust fan operates in conjunction with AHU-3 and AHU-4. AHU supply airflow may improve once this fan is repaired.
2. Fan Coils:
    a. The supply airflows for the fan coils that were inconsistent and varied from 65-130% of the design airflow. Most units were 70-100% of the design airflow.
        i. The supply airflow from fan coils is often inconsistent as there are no physical means for adjusting airflow within the units. With the understanding that the existing units provide significantly more outdoor air than required by code, we recommend cleaning,

adjusting, and retesting any units operating below 70% of the design supply airflow.

b. The outdoor airflows for the fan coils were generally above the design 25% outdoor airflow. Most of the units were operating at approximately 25-35% outdoor airflow, with some units operating at over 50% outdoor air.
    i. With the understanding that the existing units provide significantly more outdoor air than required by code, we recommend adjusting all units to provide the design outdoor airflow, but no more than 35% outdoor air, to limit the risk of freezing the coils.
c. After the Covid pandemic has passed, the unit ventilators serving the basement spaces should be balanced to 0 cfm outdoor air per recommendations in Table 3. These spaces are also served by the air handling units that provide adequate ventilation air to the spaces. During the pandemic, the additional outdoor air may be beneficial.
d. The units shown on the drawings as serving the lobby are inoperable. According to staff, they have not operated in many years. These units do not provide outdoor air as indicated on the drawings. There are no openings through the wall to the exterior. The lobby is an occupied space where the public congregates.
    i. Note that the lobby/foyer area is a single open area. based on the reported airflows in the balancing report, the two foyer units are adequate to provide the minimum code required outdoor air for this combined area. However, the airflow distribution is not ideal with only the foyer units operating.
    ii. We recommend replacing the lobby units and adding openings through the wall to allow them to operate with outdoor air.
e. The outdoor airflow for FC-2-13 was recorded as zero. Milharmer stated that the outdoor air damper was stuck closed and could not be opened.
    i. The damper should be repaired or replaced.

3. Exhaust Fans:
    a. Some areas were not accessible during testing, including most holding areas, and as a result not all exhaust opening airflows were documented.
    b. The airflow at individual registers were inconsistent and generally did not match the design.
        i. Based on the inconsistent airflows measured on these exhaust registers, consider rebalancing all supply, return, and exhaust inlets and outlets.
    c. Several registers had no airflow while the fan was operating, possibly indicating a broken or clogged duct, or a closed volume damper.
    d. RF-1 and RF-4 are within the acceptable airflow range.
    e. EF-2 is operating at approximately 120% of the design airflow.
    f. RF-2 and RF-3 are operating at approximately 50% and 80% of the design airflow. The cause of the low airflows should be investigated.

g. Exhaust fan CF-1, which operates in conjunction with AHU-3&4, was inoperable at the time of the testing. This unit should be repaired, and retested.

Disclaimer

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

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Raynham, MA 02767
Tel.: 508-823-8500; Facsimile: 508-823-8600

TEST AND BALANCE REPORT

Project: **Somerville District Court**
Somerville, MA

Project No.: **21-015** **Project Date:** **6/14/2021**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	Somerville District Court		
Address:	Somerville, MA		
Date:	6/14/2021	**Project No.**	21-015

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:	Somerville District Court		
Address:	Somerville, MA		
Date:	6/14/2021	**Project No.**	21-015

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Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

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	8-20-20	8-20-21
2	Shortridge Flow Hood	8-20-20	8-20-21
3	Ampmeter	8-20-20	8-20-21
4	Tachometer	8-20-20	8-20-21
5	Airflow Anemometer	8-20-20	8-20-21
6	Digital Thermometers	8-20-20	8-20-21
7	Shortridge Water Meter	8-20-20	8-20-21
8	Sound Meter	8-20-20	8-20-21
9	Vibration Meter	8-20-20	8-20-21

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

Technician:

SYMBOL SHEET

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

SYMBOL SHEET CONTINUED

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

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

FAN DATA SHEET

	FAN NO. AHU-1		FAN NO. RAF-1	
Serves / Location:	Basement	Outside Equip. Stor.	Basement	Outside Equip. Stor.
Manufacturer:	CARRIER		GREENHECK	
Model Number:	39LF1103JA5036-L		BSQ-200-7	
Size:	NL		NL	
Serial Number:	5191T20705		91J07544	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	BALDOR	NL	BALDOR
Frame Number:	NL	184T	NL	56
Horsepower:	5	5	0.75	0.75
Brake Horsepower:	NL	NA	NL	0.6
Safety Factor:	NL	1	NL	1
Volts/Phase:	208/3	209/3	208-230/460/3	209/3
Motor Amperage:	13.6	7.3	3.2	2.3
Motor RPM:	1725	1725	1725	1725
Speeds:	NL	SINGLE	NL	SINGLE
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	4300	3945		
Return Air CFM:			3230	2435
Exhaust Air CFM:				
Outside Air CFM:	1070	1154		
Suction Pressure:	NL	-1.42	NL	-0.52
Discharge Pressure:	NL	0.21	NL	0.05
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	1.63	NL	0.57
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	1vp44	NL	1VL34
Motor Size/Bore:	NL	1 1/8	NL	5/8
Fan Drive:	NL	7 1/4	NL	NA
Fan Size/Bore:	NL	1 3/16	NL	NA
Belt Size / Number:	NL	BX33	NL	A58*1
Shafts C-C:	NL	NA	NL	23
Turns Open:	NL	2	NL	2

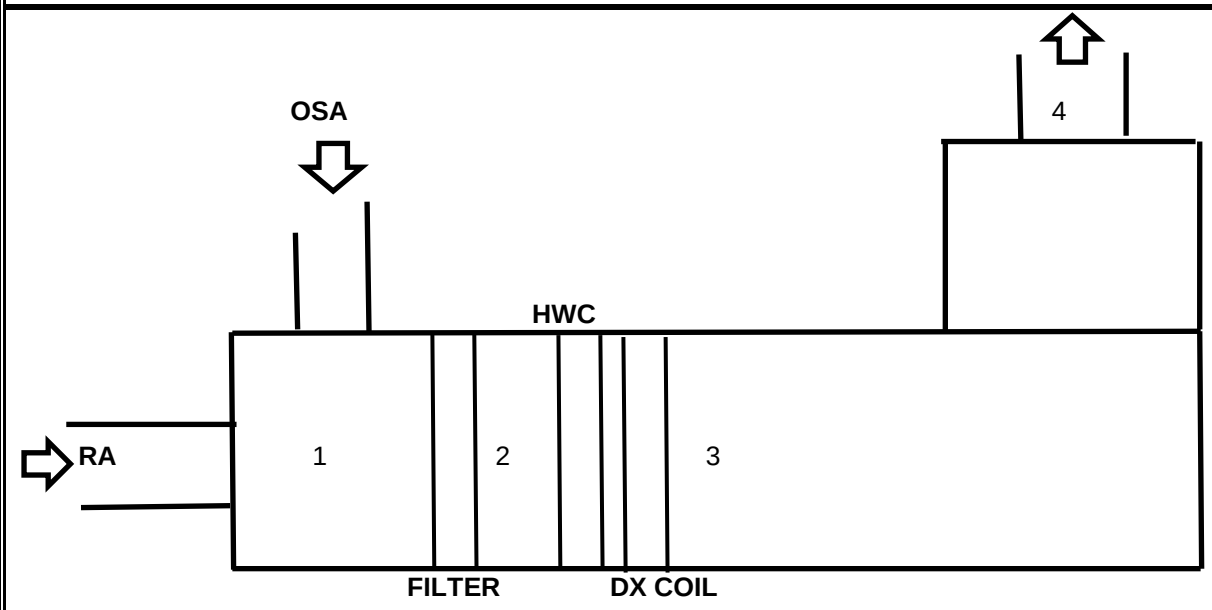
Comments: **** Outside air damper is at 50%**

HW Temp. Entering 140°, leaving 80°

Air Temp. Entering 50.3°, leaving 62°

Project:	Somerville District Court		
Address:	Somerville, MA		
Date:	6/14/2021	**Project No.**	21-015

AHU-1 STATIC PROFILE



LOCATION	STATIC
1	-0.34
2	-0.6
3	-1.42
4	0.21

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Supply Duct (Corridor)

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

AIR DENSITY DATA

STATIC PRESS @ CL:	0.26	InWg.	DESIGN CFM =	4300
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3940
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**3945**

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	942	1587	1332	2044	1806	1365	
B	935	1522	560	1584	1621	1535	
C	806	1077	549	936	1242	1523	
D	684	730	567	777	1300	1345	
E							
F							
G							
H							
I							

NO. OF READINGS = 24 AVERAGE FPM = 1182

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-1 / RAF-1 TRAVERSE NUMBER : T1
Return TRAVERSE LOCATION: Return Duct (Corridor)

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	28	" WIDTH x	10 " DEPTH	Sq Ft =	1.94

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.38	InWg.	DESIGN CFM =	3230
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2435
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2435**

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	1541	1270	1352	1151	1200		
B	1449	1398	1349	759	1056		
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 10 AVERAGE FPM = 1253

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-1 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: O.A. Duct (Storage Rm)

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	22 " DEPTH	Sq Ft =	4.58

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.02	InWg.	DESIGN CFM =	1070
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1153
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1154**

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	188	262	312	153	106		
B	222	350	356	258	186		
C	213	329	300	294	184		
D	283	296	271	288	181		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 252

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

FAN DATA SHEET

	FAN NO. AHU-2		FAN NO. RAF-2	
Serves / Location:	Basement	Janitors Room		
Manufacturer:	CARRIER		GREENHECK	
Model Number:	39LF1103JA5016-L		BSQ-200-7	
Size:	NL		NL	
Serial Number:	5191T20704		91J07546	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	CENTURY	NL	MAGNETEK
Frame Number:	NL	184T	NL	HA56
Horsepower:	5	5	3/4	3/4
Brake Horsepower:	NL	3.4	NL	0.65
Safety Factor:	NL	1.15	NL	1.25
Volts/Phase:	208/3	208/3	208/3	208/3
Motor Amperage:	13.6	8.7	2.5	2.4
Motor RPM:	1755	1755	1725	1725
Speeds:	NL	SINGLE	NL	SINGLE
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	4300	3805		
Return Air CFM:			3230	2237
Exhaust Air CFM:				
Outside Air CFM:	1070	1216		
Suction Pressure:	NL	-1.65	NL	-0.6
Discharge Pressure:	NL	0.67	NL	0.1
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	2.32	NL	0.7
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	5 1/4	NL	3"
Motor Size/Bore:	NL	1 1/8	NL	5/8"
Fan Drive:	NL	MB74L	NL	NA
Fan Size/Bore:	NL	1 3/16	NL	NA
Belt Size / Number:	NL	BX35/1	NL	A58/1
Shafts C-C:	NL	9	NL	NA
Turns Open:	NL	1 1/2	NL	2

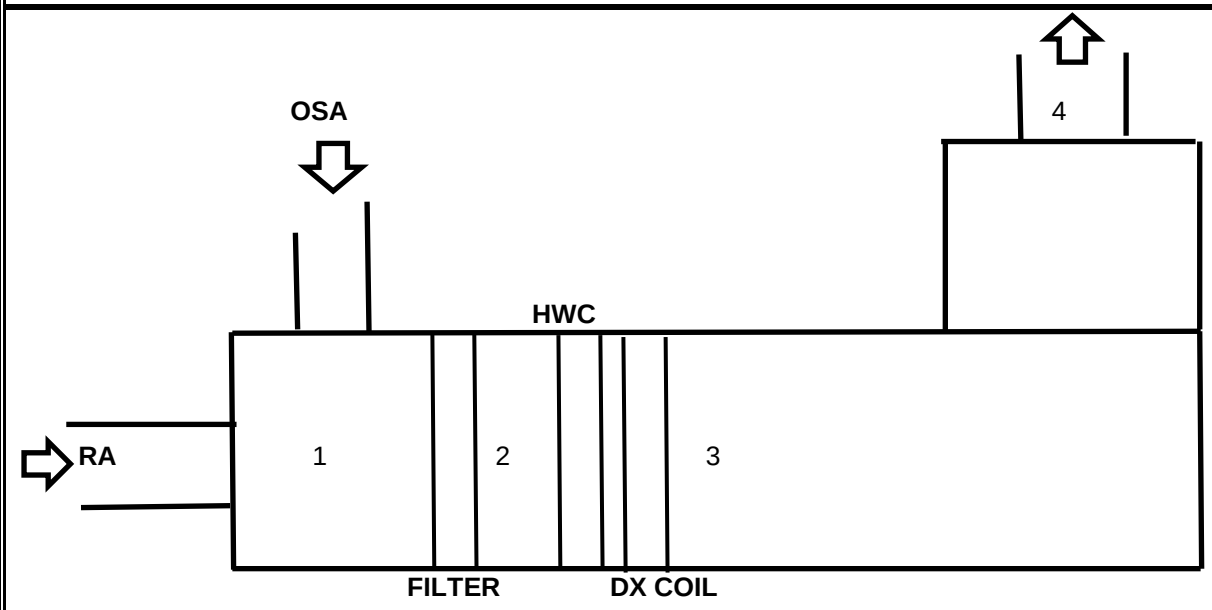
Comments: ***& Outside air damper is at 50%**

HW Temp. Entering 104°, leaving 124°

Air Temp. Entering 41.7°, leaving 63.7°

Project:	Somerville District Court		
Address:	Somerville, MA		
Date:	6/14/2021	**Project No.**	21-015

AHU-2 STATIC PROFILE



LOCATION	STATIC
1	-0.61
2	-0.8
3	-1.65
4	0.67

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-2 TRAVERSE NUMBER : T1
Supply Line 1 TRAVERSE LOCATION: Supply Duct (Corridor)

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	22	" WIDTH x	16	" DEPTH	Sq Ft =	2.44

AIR DENSITY DATA

STATIC PRESS @ CL:	0.41	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2743
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2747**

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	1419	1316	1012	582			
B	1629	1377	1190	575			
C	1451	1271	1263	561			
D	1222	1207	1257	623			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 1122

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-2 TRAVERSE NUMBER : T2
Supply Line 2 TRAVERSE LOCATION: Supply Duct (Corridor)

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	28	" WIDTH x	8	" DEPTH	Sq Ft =	1.56

AIR DENSITY DATA

STATIC PRESS @ CL:	0.41	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1056
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1058**

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	747	1022	936	634	165		
B	752	952	736	535	311		
C							
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 10 AVERAGE FPM = 679

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-2 / RAF-2 TRAVERSE NUMBER : T1
Return TRAVERSE LOCATION:

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

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.61	InWg.	DESIGN CFM =	3230
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2239
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2237**

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

TEST HOLE	1	2	3	4	5	6	7
A	704	898	918	829			
B	809	912	934	803			
C	769	868	959	904			
D	799	919	845	563			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 840

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
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TRAVERSE DATA

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

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	30	" WIDTH x	22 " DEPTH	Sq Ft =	4.58

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.02	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1216
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1216**

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	326	367	346	334	316		
B	287	294	341	322	276		
C	333	224	284	237	256		
D	149	168	196	156	92		
E							
F							
G							
H							
I							

NO. OF READINGS = 20 AVERAGE FPM = 265

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

FAN DATA SHEET

	FAN NO. AHU-3		FAN NO. AHU-4	
Serves / Location:	Basement	Outside Equip. Stor.	Main Court Rm.	Attic
Manufacturer:	TRANE Climate Changer		TRANE	
Model Number:	L8		L8	
Size:	NA		NA	
Serial Number:	K126478		K126479	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	MARATHON	NL	BALDOR
Frame Number:	NL	182T	NL	184T
Horsepower:	3	3	5	5
Brake Horsepower:	NL	2.1	NL	3.4
Safety Factor:	NL	1.15	NL	1
Volts/Phase:	208/3	209/3	208/3	209/3
Motor Amperage:	9.5	6.8	13	5.4
Motor RPM:	1760	1760	1725	1725
Speeds:	NL	SINGLE	NL	SINGLE
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3840	2593	3540	2458
Return Air CFM:	2880	1612	2655	1436
Exhaust Air CFM:				
Outside Air CFM:	960	981	890	1022
Suction Pressure:	NL	-0.36	NL	.34
Discharge Pressure:	NL	0.04	NL	0.13
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	NL	0.4	NL	0.47
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	NA	NL	NA
Motor Size/Bore:	NL	NA	NL	NA
Fan Drive:	NL	NA	NL	NA
Fan Size/Bore:	NL	NA	NL	NA
Belt Size / Number:	NL	NA	NL	NA
Shafts C-C:	NL	NA	NL	NA
Turns Open:	NL	NA	NL	NA

Comments: **Associated Exhaust Fan to AHU-3 & AHU-4 is not running.**

AHU-3:
HW Temp. Entering 139°, leaving 129°
Air Temp. Entering 50.2°, leaving 60.6°

AHU-4:
HW Temp. Entering 139°, leaving 84°
Air Temp. Entering 48.4°, leaving 76.1°

Outside air dampers for AHU-3 & AHU-4 are at 50%.

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : T1
Return TRAVERSE LOCATION: Return Duct Attic

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	24	" WIDTH x	12	" DEPTH Sq Ft =	2.00

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.05	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	771
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**772**

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	162	511	502	455			
B	117	528	435	475			
C	102	498	412	431			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 386

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : T2
Return TRAVERSE LOCATION: Return Duct Attic

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

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.03	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	840
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**840**

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	268	299	264	257			
B	305	362	350	297			
C	301	350	383	317			
D	315	340	348	283			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 315

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-3 TRAVERSE NUMBER : T1
Outside Air TRAVERSE LOCATION: O.A. Attic

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	24	" WIDTH x	14	" DEPTH	Sq Ft =	2.33

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.06	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	981
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**981**

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	435	414	447	334			
B	429	408	456	441			
C	388	408	455	430			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 420

J							
K							
L							
M							
N							
O							
P							
Q							
R							

OA Damper @ 50%

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-4 TRAVERSE NUMBER : T1
Return TRAVERSE LOCATION: Return Duct Attic

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

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.07	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1435
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1436**

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	511	671	455	439			
B	721	638	452	331			
C	741	619	491	427			
D	688	615	413	400			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 538

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: AHU-4 TRAVERSE NUMBER : T1
Outiside Air TRAVERSE LOCATION: OA Attic

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	24	" WIDTH x	14	" DEPTH	Sq Ft =	2.33

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.04	InWg.	DESIGN CFM =	NL
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1021
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1022**

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	436	416	497			
B	450	391	463	478			
C	380	405	427	460			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 438

J							
K							
L							
M							
N							
O							
P							
Q							
R							

OA damper @ 50%.

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

AIR DISTRIBUTION

SYSTEM: FCU's
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
Basement	FF-1-1	Low					
Unassigned	Supply	18x6	0.75	400	534	300	401
Unassigned	Return	19 3/4 x 4	0.55	409	452	225	249
	O.A.					75	152
Basement	FF-2-2	Low					
Clinic	Supply	24x6	1	400	374	400	374
Clinic	Return	23 3/4 x 4	0.66	454	421	300	278
	O.A					100	96
Basement	FF-2-3	Low					
Clinic	Supply	24x6	1	400	333	400	333
Clinic	Return	23 3/4 x 4	0.66	454	321	300	212
	O.A					100	121
Basement	FF-2-4	High					
Hall 1	Supply	24x6	1	400	591	400	591
Hall 1	Return	23 3/4 x 4	0.66	454	466	300	308
	O.A					100	283
Basement	FF-2-5	High					
Hall 11	Supply	24x6	1	400	561	400	561
Hall 11	Return	23 3/4 x 4	0.66	454	419	300	277
	O.A					100	284
Basement	FF-2-6	High					
Employee Rm.	Supply	24x6	1	400	810	400	810
Employee Rm.	Return	23 3/4 x 4	0.66	454	580	300	383
	O.A					100	427

Comments:

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

AIR DISTRIBUTION

SYSTEM: FCU's
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
Basement	FF-2-7	High					
Employee Rm.	Supply	24x6	1	400	540	400	540
Employee Rm.	Return	23 3/4 x 7 1/4	1.2	250	184	300	221
	O.A.					100	319
Basement	FF-1-8	Low					
Juvenile Probate	Supply	18x6	0.75	400	577	300	433
Juvenile Probate	Return	19 3/4 x 4	0.55	409	385	225	212
	O.A					75	221
1st Fl.	FC-1-9	High					
101	Supply	60x6	2.5	480	474	1200	1185
101	Return	61x5	2.12	425	313	900	664
	O.A					300	521
1st Fl.	FC-1-10	High					
101	Supply	60x6	2.5	480	412	1200	1030
101	Return	61x5	2.12	425	324	900	687
	O.A					300	343
1st Fl.	FC-2-11	High					
108	Supply	30x6	1.25	480	438	600	548
108	Return	34x5	1.18	381	297	450	350
	O.A					150	198
1st Fl.	FC-2-12						
113	Supply	30x6	1.25	480	329	600	411
113	Return	34x5	1.18	381	262	450	309
	O.A					150	102

Comments:

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

AIR DISTRIBUTION

SYSTEM: FCU's
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
1st. Fl.	FC-2-13	High					
115	Supply	30x6	1.25	480	312	600	390
115	Return	34x5	1.18	381	325	450	384
	O.A.					150	0
1st Fl.	FC-1-14	High					
119	Supply	60x6	2.5	480	320	1200	800
119	Return	61x5	2.12	425	336	900	712
	O.A					300	88
1st Fl.	FC-1-15	High					
119	Supply	60x6	2.5	480	346	1200	865
119	Return	61x5	2.12	425	186	900	394
	O.A					300	471
1st Fl.	FC-3-16	High					
Foyer East	Supply	42x6	1.75	457	310	800	543
Foyer East	Return	42.5 x 5	1.48	405	149	600	220
	O.A					200	323
1st Fl.	FC-4-17						
Lobby	Supply					1200	DELETED
Lobby	Return					900	*1
	O.A					300	*1
1st Fl.	FC-4-18						
Lobby	Supply					1200	DELETED
Lobby	Return					900	*1
	O.A					300	*1

Comments: ***1 No motor, no outside air.**

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

AIR DISTRIBUTION

SYSTEM: FCU's
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
1st Fl.	FC-3-19						
Employee Rm.	Supply	42x6	1.75	457	365	800	639
Employee Rm.	Return	42.5 x 5	1.48	405	265	600	392
	O.A.					200	247
1st Fl.	FC-1-20	High					
151	Supply	60x6	2.5	480	317	1200	793
151	Return	61x5	2.12	425	216	900	458
	O.A					300	335
1st Fl.	FC-1-21	High					
151	Supply	60x6	2.5	480	290	1200	725
151	Return	61x5	2.12	425	153	900	324
	O.A					300	401
1st Fl.	FC-2-22	High					
142	Supply	30x6	1.25	480	471	600	589
142	Return	34x5	1.18	381	363	450	428
	O.A					150	161
1st Fl.	FC-2-23	High					
144	Supply	30x6	1.25	480	406	600	508
144	Return	34x5	1.18	381	220	450	260
	O.A					150	248
1st Fl.	FC-2.24	High					
148	Supply	30x6	1.25	480	500	600	625
148	Return	34x5	1.18	381	288	450	348
	O.A					150	285

Comments:

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

AIR DISTRIBUTION

SYSTEM: FCU's
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
1st Fl.	FC-1-25	High					
150	Supply	60x6	2.5	480	383	1200	958
150	Return	61x5	2.12	425	293	900	621
	O.A.					300	337
1st Fl.	FC-1-26	High					
150	Supply	60x6	2.5	480	377	1200	943
150	Return	61x5	2.12	425	242	900	513
	O.A					300	430
1st Fl.	FC-2-27	High					
133	Supply	30x6	1.25	480	363	600	454
133	Return	34x5	1.18	381	298	450	352
	O.A					150	102
1st Fl.	FC-1-28	High					
125	Supply	60x6	2.5	480	322	1200	804
125	Return	61x5	2.12	425	124	900	262
	O.A					300	542
1st Fl.	FC-1-29	High					
105	Supply	60x6	2.5	480	391	1200	978
105	Return	61x5	2.12	425	150	900	318
	O.A					300	660
1st Fl.	FC-2-30	High					
Secretary	Supply	30x6	1.25	480	406	600	508
Secretary	Return	34x5	1.18	381	266	450	314
	O.A					150	194

Comments:

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

FAN DATA SHEET

	FAN NO. RF-1		FAN NO. RF-2	
Serves / Location:	Clerk	Roof	Clerk	Roof
Manufacturer:	DAYTON		DAYTON	
Model Number:	6KWK6		5DVR7	
Size:	NL		NL	
Serial Number:	17446728 20L		17168127 20J	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	DAYTON	NL	DAYTON
Frame Number:	NL	48Y	NL	DIRECT DRIVE
Horsepower:	NL	1/4	NL	DIRECT DRIVE
Brake Horsepower:	NL	2.1	NL	DIRECT DRIVE
Safety Factor:	NL	1	NL	DIRECT DRIVE
Volts/Phase:	115/1		115/1	
Motor Amperage:	3.1		2.0/1.6/1.3	
Motor RPM:	1725		1500	
Speeds:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
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:	660	658	160	75
Outside Air CFM:				
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Motor Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Drive:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Fan Size/Bore:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Belt Size / Number:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Shafts C-C:	NL	DIRECT DRIVE	NL	DIRECT DRIVE
Turns Open:	NL	DIRECT DRIVE	NL	DIRECT DRIVE

Comments:

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: RF-1 TRAVERSE NUMBER : T1
TRAVERSE LOCATION: Clerks Hallway

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

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.19	InWg.	DESIGN CFM =	660
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	658
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**658**

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	301	397	185	409			
B	331	314	295	341			
C	333	201	247	235			
D	199	491	200	201			
E							
F							
G							
H							
I							

NO. OF READINGS = 16 AVERAGE FPM = 293

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: RF-2 TRAVERSE NUMBER : T1
TRAVERSE LOCATION: Inside Judges Hallway

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	10	" WIDTH x	6 " DEPTH	Sq Ft =	0.42

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.02	InWg.	DESIGN CFM =	160
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	75
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**75**

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	175	210	169				
B	191	200	159				
C	166	190	166				
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 9 AVERAGE FPM = 181

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

AIR DISTRIBUTION

SYSTEM: RF-1 & RF-2

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	RF-1						
111	1	8x6	FH	NA	NA	80	126
112	2	8x6	FH	NA	NA	80	117
117	3	6x6	FH	NA	NA	80	0
Bsmt Guard Rm.	4	8x6	FH	NA	NA	80	*1
B03	5	10x6	FH	NA	NA	120	61
Handicap Restrm	6	10x6	FH	NA	NA	100	60
B04	7	10x6	FH	NA	NA	120	48
					TOTALS:	660	412
	RF-2						
106	1	8x6	FH	NA	NA	80	54
107	2	8x6	FH	NA	NA	80	0
					TOTALS:	160	54

Comments: ***1 Unable to access.**

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

FAN DATA SHEET

	FAN NO. RF-3		FAN NO. RF-4	
Serves / Location:	Probation	Roof	Probation	Roof
Manufacturer:	DAYTON		DAYTON	
Model Number:	2RB59		16D542	
Size:	NL		NL	
Serial Number:	17622570 21A		17731414 21B	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	DAYTON	NL	DAYTON
Frame Number:	NL	48Z	NL	56
Horsepower:	NL	1/4	NL	1/2
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.35	NL	1.25
Volts/Phase:	115/1		208-230/460/3	
Motor Amperage:	6.2		1.7/1.7/0.85	
Motor RPM:	1725		1725	
Speeds:	1	Belt Driven	1	Belt Driven
Heater Size:	NL	CB Protected	NL	CB Protected
Heater Amps.:	NL	CB Protected	NL	CB Protected
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	310	242	1800	1638
Outside Air CFM:				
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA	NL	NA
Motor Drive:	NL	VP40	NL	1VP40
Motor Size/Bore:	NL	1/2	NL	5/8
Fan Drive:	NL	AK39	NL	5
Fan Size/Bore:	NL	3/4	NL	3/4
Belt Size / Number:	NL	4L220/1	NL	4L250/1
Shafts C-C:	NL	5 1/8	NL	5 3/4
Turns Open:	NL	0	NL	0

Comments:

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: RF-3 TRAVERSE NUMBER : T1
TRAVERSE LOCATION: Library Hallway

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	12	" WIDTH x	6	" DEPTH	Sq Ft =	0.50

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.17	InWg.	DESIGN CFM =	310
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	242
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**242**

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	418	514	441				
B	449	535	499				
C	450	535	521				
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 9 AVERAGE FPM = 485

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: RF-4 TRAVERSE NUMBER : T1
TRAVERSE LOCATION: Probation Hallway

DUCT SIZE (ROUND)		" DIAMETER			Sq Ft =	0.00
DUCT SIZE (RECT.)	28	" WIDTH x	28	" DEPTH	Sq Ft =	5.44

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.69	InWg.	DESIGN CFM =	1800
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1639
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1638**

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	157	102	612	195	541		
B	38	219	545	138	417		
C	162	359	125	159	496		
D	163	553	160	206	505		
E	162	502	157	380	475		
F							
G							
H							
I							

NO. OF READINGS = 25 AVERAGE FPM = 301

J							
K							
L							
M							
N							
O							
P							
Q							
R							

Difficult traverse location (turning vanes)

TECHNICIAN: Dan Abbett

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

AIR DISTRIBUTION

SYSTEM: RF-3 & RF-4

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	RF-3						
107	1	12x18	FH	NA	NA	150	37
127	2	8x6	FH	NA	NA	80	93
126	3	8x6	FH	NA	NA	80	55
					TOTALS:	310	185
	RF-4						
147	1	8x6	FH	NA	NA	80	93
1st. Fl. Janitor	2	6x6	FH	NA	NA	80	34
137	3	8x6	FH	NA	NA	80	82
Bsmt Juve Female	4	12x8	FH	NA	NA	200	*1
Bsmt Juve Female	5	12x8	FH	NA	NA	200	*1
Bsmt Juve Male	6	12x8	FH	NA	NA	200	*1
Bsmt Juve Male	7	12x8	FH	NA	NA	200	*1
B28	8	10x6	FH	NA	NA	120	111
B27	9	10x6	FH	NA	NA	120	124
B29	10	10x6	FH	NA	NA	100	92
	11	10x6	FH	NA	NA	100	*1
	12	10x6	FH	NA	NA	100	*1
	13	10x6	FH	NA	NA	100	*1
	14	10x6	FH	NA	NA	100	*1
	15	10x6	FH	NA	NA	100	*1
					TOTALS:	1880	

Comments: ***1 Unable to access.**

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

FAN DATA SHEET

	FAN NO. EF-2		FAN NO.	
Serves / Location:	Clerk	Roof		
Manufacturer:	DAYTON			
Model Number:	2RB59			
Size:	NL			
Serial Number:	17471261 20L			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	DAYTON		
Frame Number:	NL	48Z		
Horsepower:	NL	1/4		
Brake Horsepower:	NL	NA		
Safety Factor:	NL	1.35		
Volts/Phase:	115/208-230/1			
Motor Amperage:	6.2/2.8-3.1			
Motor RPM:	1725			
Speeds:	1	Belt Driven		
Heater Size:	NL	CB Protected		
Heater Amps.:	NL	CB Protected		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	300	357		
Outside Air CFM:				
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	VP40		
Motor Size/Bore:	NL	1/2		
Fan Drive:	NL	AK39		
Fan Size/Bore:	NL	3/4		
Belt Size / Number:	NL	4L220/1		
Shafts C-C:	NL	5		
Turns Open:	NL	0		

Comments:

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** 21-015

TRAVERSE DATA

SYSTEM: EF-2 TRAVERSE NUMBER : T1
TRAVERSE LOCATION: Clerks Hallway

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	14	" WIDTH x	6 " DEPTH	Sq Ft =	0.58

AIR DENSITY DATA

STATIC PRESS @ CL:	-0.3	InWg.	DESIGN CFM =	300
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	357
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**357**

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	807	779	777				
B	515	725	676				
C	379	488	366				
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 9 AVERAGE FPM = 612

J							
K							
L							
M							
N							
O							
P							
Q							
R							

Difficult traverse location (turning vanes)

TECHNICIAN: Dan Abbett

Project: Somerville District Court
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AIR DISTRIBUTION

SYSTEM: EF-2
SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
B43	1	8X8	FH	NA	NA	100	*1
B45	2	8X8	FH	NA	NA	100	*1
B44	3	8X8	FH	NA	NA	100	*1
					TOTALS:	300	

Comments: ***1 Unable to access.**

Project: Somerville District Court
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FLOW METERING DATA

SYSTEM: Hot Water

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	GAUGE Pd	SET Pd	DESIGN GPM	SET GPM	BALANCING VLV SET @
Boiler Rm.	Pump # 6	3"	NA	NA	170	147	NA
Boiler Rm.	Pump # 4	3"	NA	NA	170	155	NA
Storage Rm.	AHU-1	1 1/2"	NA	NA	NA	27	NA
Janitor Rm.	AHU-2	1 1/2"	NA	NA	NA	28	NA
Attic	AHU-3						*1
Attic	AHU-4						*1

Comments: All readings with Ultrasonic Meter
P-6 Suc=22.5 Dis=55.5 = 33 x 2.31 = 76.2 ft.hd.
P-4 Suc=22.5 Dis=36 = 13.5 x 2.31 = 31.2 ft.hd.

*1 Unable to get readings with Ultrasonic meter.

Project: Somerville District Court
Address: Somerville, MA
Date: 6/14/2021 **Project No.** **21-015**

FLOW METERING DATA

SYSTEM: Chilled Water

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	GAUGE Pd	SET Pd	DESIGN GPM	SET GPM	BALANCING VLV SET @
Boiler Rm.	Pump # 7	4"	NA	NA	126	123	NA
Boiler Rm.	Pump # 5	4"	NA	NA	126	124	NA
Attic	AHU-3						*1
Attic	AHU-4						*1

Comments: All readings with Ultrasonic Meter
P-7 Suc=22 Dis=37 = 15 x 2.31 = 34.6 ft.hd.
P-5 Suc=22 Dis=38 = 16 x 2.31 = 36.9 ft.hd.

*1 Unable to get readings with Ultrasonic meter.