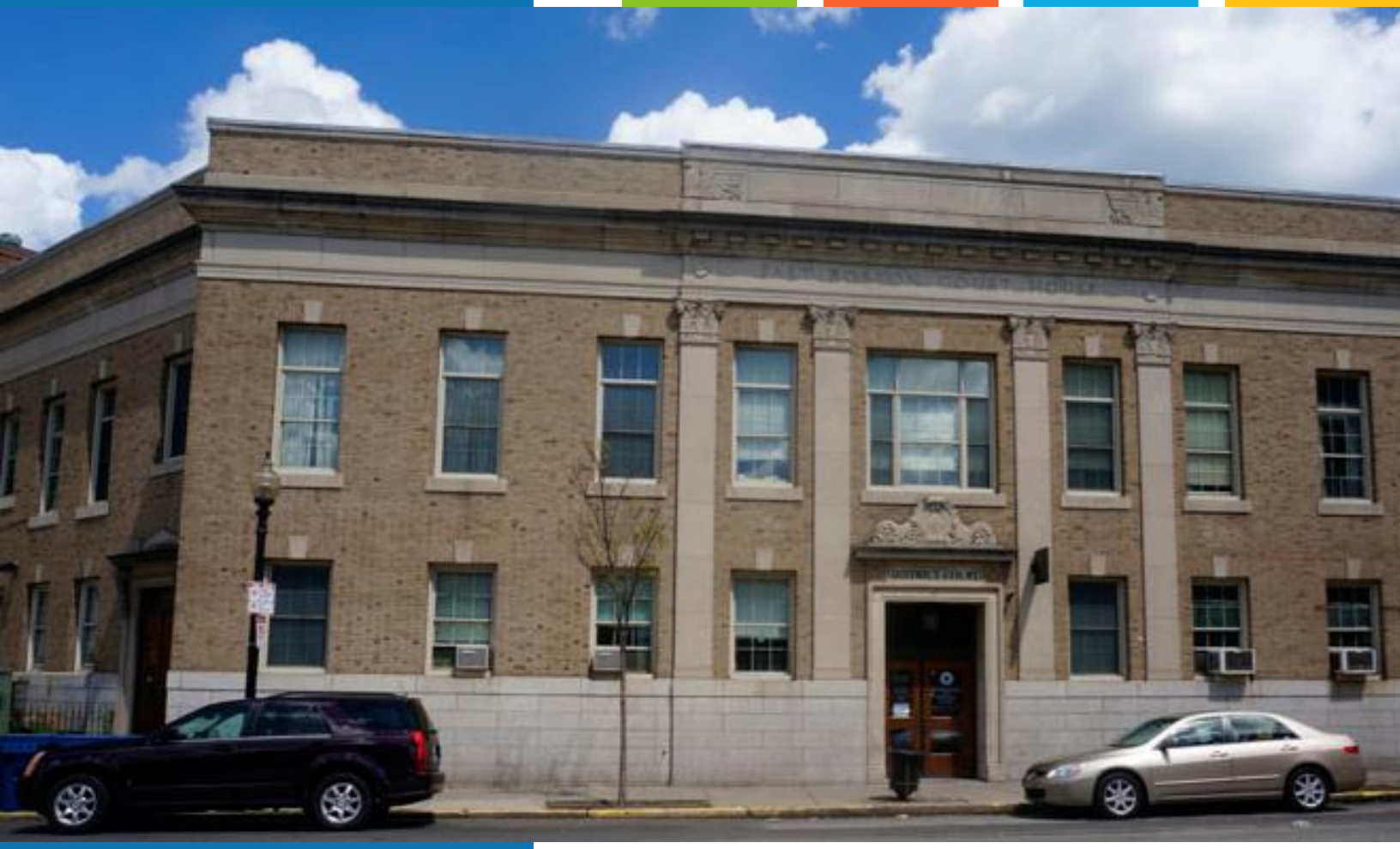

East Boston Division
Boston Municipal Court
East Boston, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

May 7, 2024

Tighe&Bond

100% Recyclable

Section 1
Existing Conditions & Site Observations

Tighe & Bond visited the East Boston Division, Boston Municipal Court on May 5, 2021. While on site we inspected the air handling equipment located in the mechanical rooms and toured the facility to determine if the spaces generally matched usages noted on the architectural plans.

Site Visit Attendees:

- *Office of Court Management:*
  - Jonathan Talley Courthouse Facilities Staff
- *Tighe & Bond*
  - Ryan Ablondi, PE, Mechanical Engineer
  - Tim Bill, Staff Mechanical Engineer

1.1 Existing Ventilation System

The East Boston Division, Boston Municipal Court was constructed in 1931 and is approximately 21,500 square feet in size. Some renovations have been made over the years including the Access / Air improvements Project which included the installation of new rooftop air handling units (RTU) and was completed in 2006.

Three constant volume rooftop air handling units, installed in 2006, supply ventilation air to the 2nd floor of the building. Each unit contains a supply fan, refrigerant (DX) cooling coils, 2" MERV 13 filters and a power exhaust fan for air economizer. The mixed air dampers and actuators are in good condition, but the coils appeared to be dirty. Facilities personnel stated that the RTUs only provide cooling air to the building and do not operate during the winter months. Additionally, we were not able to confirm whether the RTU fans shut off or remain running when the space temperature is satisfied. There is no ventilation air being provided to the building if the units are not operating. According to the unit schedules, there are electric heating coils in the units. Based on the scheduled capacities of the electric heating coils the units should be able to operate year-round to provide ventilation.

According to the drawings provided to Tighe & Bond, there are four exhaust fans serving the building. Two fans serve toilet rooms and two fans serve the lockup area. None of the roof exhaust fans were operating at the time of the visit. Courthouse facilities staff mentioned that the fan serving the lockup area was not working.

There is no mechanical ventilation on the first floor of the courthouse. The state has purchased and installed portable HEPA filters in each of the courtrooms as well as two in the clerks and probation offices.

The holding area consists of two holding cells and is served by a single exhaust fan that currently, is not working. There is no operational mechanical ventilation in the holding area.

A 1,900 MBH, oil fired, steam boiler provides steam for radiators throughout the courthouse.

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

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Pre/Final Filters	Condition
RTU-1	3,000	1,020	2" MERV 13	Good
RTU-2	3,400	1,020	2" MERV 13	Good
RTU-3	4,000	1,200	2" MERV 13	Good

1.2 Existing Control System

All of the existing HVAC equipment is under local control. We did not see any evidence or components of a Building Management System (BMS) during our site visit. We are not aware of any demand control ventilation sequences in use at this courthouse.

Section 2
Recommendations

Below is a list of recommendations for the East Boston Division, Boston Municipal Court. Please refer to the "Master Recommendation List" for further explanation and requirements of the stated recommendations.

Building areas without adequate ventilation and filtration significantly increase the risk of spreading viruses like COVID-19, especially areas with high occupant density and where people occupy the same space for relatively long periods of time. Consider significantly reducing occupancy or relocating occupants to other areas with adequate ventilation.

2.1 Filtration Efficiency Recommendations

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

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

RF-1: *MERV-13 filters.*

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

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

2.2 Testing & Balancing Recommendations

The air handling units are approximately 15 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 outdoor air flow rates that were used to design the original system may be different than the 2015 International Mechanical Code (IMC) and current ASHRAE Standard 62.1 requirements.

We recommend the following testing and balancing measures be implemented:

RTB-1: *Test and balance air handling unit supply air and minimum outdoor air flow rates.*

> We recommend testing and balancing the outdoor air flow rates for all air handling units to the recommended minimum O.A. rates listed in Table 2.

TABLE 2
Recommended Air Handler O.A. Flow Rates

Unit	Original Supply Airflow (CFM)	Original Design Min. O.A. (CFM)	Current Code Min. O.A. Requirements (CFM)	Recommended Minimum O.A. (CFM)
RTU-1	3,000	1,020	589	1,020
RTU-2	3,400	1,020	681	1,020
RTU-3	4,000	1,200	378	1,200

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

During the pandemic, we recommend maintaining the outdoor airflows at the original designed values where they exceed the code minimums calculated by Tighe & Bond. Supplying more outdoor than required by code will provide better indoor air quality.

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

TABLE 3
Average Airflow Rate per Person

	All spaces	***Courtrooms***	***Non-Courtroom Spaces***
Total Occupancy (People)	146	106	40
Total Supply Air (CFM/Person)	71	43	145
Outdoor Air (CFM/Person)	22	13	45

The airflow rate per person for each Courtroom and the Jury Pool Room is shown below in Table 4. These values are based on full occupancy without taking diversity into account, the original full design supply airflow rate, and the recommended outdoor airflow rate. The airflow rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4
Airflow Rate per Person (Full Occupancy)

		Total Air		Outdoor Air	
Courtroom	***Total People***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outdoor Airflow (CFM)***	***Airflow Rate (CFM/Person)***
First Session	107	3,400	32	1,020	10
Second Session	45	1,200	27	360	8

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

The airflow rate per person for each Courtroom and the Jury Pool Room, based on a reduced occupancy schedule determined by the Office of Court Management, is shown below in Table 4a. The airflow rate per person assumes the full supply airflow is being delivered to the room.

TABLE 4a
Airflow Rate per Person (Reduced Occupancy)

		Total Air		Outdoor Air	
Courtroom	***Total People***	***Supply Airflow (CFM)***	***Airflow Rate (CFM/Person)***	***Outdoor Airflow (CFM)***	***Airflow Rate (CFM/Person)***
First Session	22	3,400	155	1,020	46
Second Session	13	1,200	92	360	28

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

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

We recommend testing and balancing the power exhaust fan airflow rates to ensure the correct quantity of exhaust air is being relieved from the building.

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

If the airflow to each space has not been recently tested, we recommend testing the airflow rates in the holding cells, control room, Courtrooms, and other densely occupied areas as a minimum. These systems are very old and the airflow rate delivered to and returned from these spaces may not match the original design intent.

If specific areas within the Courthouse experiences regular cooling and heating comfort complaints this may be an indication of a lack of airflow to the space. We recommend testing and balancing the air inlets and outlets serving those spaces to the designed values.

RTB-6: *Test and balance all air handler dx coils.*

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

2.3 Equipment Maintenance & Upgrades

We recommend the following equipment maintenance and upgrades:

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

Replace dampers and actuators that are not functioning properly.

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

2.4 Control System Recommendations

We recommend the following for the control system:

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

RC-4: *Confirm the 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.*

As noted above, the state has purchased and installed portable HEPA filters in each of the courtrooms as well as two in the clerks and probation offices. If the Courthouse is to operate at a high capacity (i.e. 50% occupancy or greater), we recommend installing portable HEPA filters in any other potential high traffic areas, such as entrance lobbies.

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 Repair or Replace Holding Cell and Toilet Exhaust Fans

We recommend repairing or replacing the holding cell and toilet exhaust fans that are not working or are not exhausting the proper airflow rate.

2.7.2 Mechanical Ventilation Feasibility Study

The first floor of the Courthouse is not mechanically ventilated. Operable windows do exist on the first floor, and natural ventilation is acceptable per code, however windows are typically not opened during cold or hot outdoor air temperatures. We recommend a study of the Courthouse to determine how feasible it is to install mechanical ventilation in all occupied spaces.

2.7.3 Install a Building Management System

We recommend installing a Building Management System (BMS) to control and monitor HVAC equipment. Installing a modern BMS to operate and monitor the mechanical systems in the building can save energy and lower maintenance and operating costs. This recommendation is an energy saving and maintenance measure and does not affect the indoor air quality of the building.

Section 3
Testing & Balancing Results

Milharmer Associates visited the East Boston Courthouse on April 13, 2023 to test the airflow rates of the air handling units and the exhaust fans. Milharmer Associates revisited the East Boston Courthouse on April 5, 2024 to balance exhaust fans. A summary of the tested airflow and water flow rates versus the design airflow rates are shown below in Tables 5 and 6. The full testing and balancing report is attached.

TABLE 5
Air Handler Airflow Testing & Balancing Results

	Design			Actual		
Unit	Total Supply Fan Airflow (CFM)	Recommended Outdoor Airflow (CFM)	Return Airflow (CFM)	Supply Fan Airflow (CFM)	Outdoor Airflow (CFM)	Return Airflow (CFM)
RTU-1	3,000	2,080	1,020	2,930	1,095	1,835
RTU-2	3,400	2,380	1,020	3,466	1,090	2,376
RTU-3	4,000	2,800	1,200	4,058	1,237	2,821

TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow (CFM)	Actual Return/Exhaust Airflow (CFM)
EF-1	Restroom	200	205
EF-2	Restroom	200	207
EF-1 Cell	Holding Cell	180	178
EF-2 Cell	Holding Cell	180	169

The typical balancing tolerance for air systems is ±10% of the design airflow.

In reviewing the airflow report data, the following should be noted:

1. RTU-1, 2, and 3 are all operating within the acceptable airflow range.
2. All EFs are operating within the acceptable airflow range.

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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Tighe&Bond

Milharmer Associates, Inc. TAB Report

April 13, 2023

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: **East Boston Municipal Court**
37 Meridian St., East Boston, MA

Project No.: **23-197** **Project Date:** **4/13/2023**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	East Boston Municipal Court		
Address:	37 Meridian St., East Boston, MA		
Date:	4/13/2023	**Project No.**	23-197

CERTIFICATION

Submitted & Certified by:

Milharmer Associates, Inc.

Certification No.: ***3384*** Certification Expiration Date: **12/31/2023**

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:_____

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

December 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

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

December 31, 2023

Expiration Date

NEBB President

NEBB President-Elect

Project:	East Boston Municipal Court		
Address:	37 Meridian St., East Boston, MA		
Date:	4/13/2023	**Project No.**	23-197

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Project:	East Boston Municipal Court		
Address:	37 Meridian St., East Boston, MA		
Date:	4/13/2023	**Project No.**	23-197

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	8-20-22	8-20-23
2	Shortridge Flow Hood	8-20-22	8-20-23
3	Ampmeter	8-20-22	8-20-23
4	Tachometer	8-20-22	8-20-23
5	Airflow Anemometer	8-20-22	8-20-23
6	Digital Thermometers	8-20-22	8-20-23
7	Shortridge Water Meter	8-20-22	8-20-23
8	Sound Meter	8-20-22	8-20-23
9	Vibration Meter	8-20-22	8-20-23

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

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: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

FAN DATA SHEET

	FAN NO. RTU-1		FAN NO. RTU-2	
Serves / Location:	2ND FL/COURT2	ROOF	2ND FL & MAIN COURT	ROOF
Manufacturer:	CARRIER		CARRIER	
Model Number:	50HJ-009-M-541HQ		50HJ-009-M-541HQ	
Size:	NL		NL	
Serial Number:	1605G50640		1605G50641	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	GE	NL	GE
Frame Number:	NL	56HZ	NL	56HZ
Horsepower:	NL	NL	NL	NL
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	1.15	NL	1.15
Volts/Phase:	230/3	228/3	230/3	228/3
Motor Amperage:	10.2	7.8	10.2	7.4
Motor RPM:	1725	1727	1725	1727
Speeds:	NL	1	1	1
Heater Size:	NL	CB	NL	CB
Heater Amps.:	NL	CB	NL	CB
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3000	2930	3400	3466
Return Air CFM:	1980	1835	2380	2376
Exhaust Air CFM:				
Outside Air CFM:	1020	1095	1020	1090
Suction Pressure:	NL	-0.68	NL	-0.77
Discharge Pressure:	NL	0.66	NL	0.82
Fan Static Pressure:	NL	NA	NL	NA
External Pressure:	1.5	1.34	1.5	1.59
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	1023	NL	1056
Motor Drive:	NL	1VP50	NL	1VP50
Motor Size/Bore:	NL	7/8	NL	7/8
Fan Drive:	NL	AFD84	NL	AFD84
Fan Size/Bore:	NL	1	NL	1
Belt Size / Number:	NL	A53 X 1	NL	A53 X 1
Shafts C-C:	NL	17.5"	NL	17.25"
Turns Open:	NL	CLOSED	NL	1

Comments: *** RTU-1, Outside air damper @ 3.0 volts.**

**** RTU-2, Outside air damper @ 2.8 volts.**

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

TRAVERSE DATA

SYSTEM: RTU-1 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Roof/Intake

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	20	" DEPTH Sq Ft =	5.00

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	3000
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	2930
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**2932**

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	559	510	597	495			
B	527	546	476	507			
C	699	751	712	654			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 586

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: David Burns

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

TRAVERSE DATA

SYSTEM: RTU-1 TRAVERSE NUMBER : T1
OSA TRAVERSE LOCATION: Roof/Intake

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	20	" DEPTH Sq Ft =	5.00

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	1020
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1095
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1095**

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	333	371	312	299			
B	229	217	234	278			
C	109	84	78	83			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 219

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: David Burns

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
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TRAVERSE DATA

SYSTEM: RTU-2 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Roof/Intake

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	20 " DEPTH	Sq Ft =	5.00

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	3400
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	3466
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**3468**

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	689	690	654	698			
B	714	661	644	625			
C	681	775	784	704			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 693

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: David Burns

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

TRAVERSE DATA

SYSTEM: RTU-2 TRAVERSE NUMBER : T1
OSA TRAVERSE LOCATION: Roof/Intake

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	20 " DEPTH	Sq Ft =	5.00

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	1020
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1090
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1091**

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	229	257	281	302			
B	200	224	260	212			
C	168	163	172	148			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 218

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: David Burns

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

FAN DATA SHEET

	FAN NO.	RTU-3	FAN NO.	
Serves / Location:	2ND FL/OFFICES	ROOF		
Manufacturer:	CARRIER			
Model Number:	50HJ-012-M-561HQ			
Size:	NL			
Serial Number:	1605G50633			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	GE		
Frame Number:	NL	143T		
Horsepower:	NL	5		
Brake Horsepower:	NL	NA		
Safety Factor:	NL	1.15		
Volts/Phase:	230/3	230/3		
Motor Amperage:	13.5	10		
Motor RPM:	1725	1729		
Speeds:	1	1		
Heater Size:	NL	CB		
Heater Amps.:	NL	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	4000	4058		
Return Air CFM:	2800	2821		
Exhaust Air CFM:				
Outside Air CFM:	1200	1237		
Suction Pressure:	NL	-0.71		
Discharge Pressure:	NL	0.68		
Fan Static Pressure:	NL	NA		
External Pressure:	1.5	1.39		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	1064		
Motor Drive:	NL	1VP40		
Motor Size/Bore:	NL	7/8		
Fan Drive:	NL	BK65		
Fan Size/Bore:	NL	1		
Belt Size / Number:	NL	BX48 X 1		
Shafts C-C:	NL	17.5"		
Turns Open:	NL	4		

Comments:

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

TRAVERSE DATA

SYSTEM: RTU-3 TRAVERSE NUMBER : T1
Supply TRAVERSE LOCATION: Roof/Intake

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	20	" DEPTH Sq Ft =	5.00

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	4000
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	4058
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**4060**

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	878	765	722	709			
B	906	857	824	711			
C	913	928	792	734			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 812

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: David Burns

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

TRAVERSE DATA

SYSTEM: RTU-3 TRAVERSE NUMBER : T1
OSA TRAVERSE LOCATION: Roof/Intake

DUCT SIZE (ROUND)		" DIAMETER		Sq Ft =	0.00
DUCT SIZE (RECT.)	36	" WIDTH x	20 " DEPTH	Sq Ft =	5.00

AIR DENSITY DATA

STATIC PRESS @ CL:	NA	InWg.	DESIGN CFM =	1200
DUCT AIR TEMP :	70	Deg F	ACTUAL CFM =	1237
BAROMETRIC PRESS :	29.92	In Hg.	SCFM=	**1237**

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	267	233	229	218			
B	262	237	199	178			
C	288	278	283	296			
D							
E							
F							
G							
H							
I							

NO. OF READINGS = 12 AVERAGE FPM = 247

J							
K							
L							
M							
N							
O							
P							
Q							
R							

TECHNICIAN: David Burns

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

FAN DATA SHEET

	FAN NO. EF-1		FAN NO. EF-2	
Serves / Location:	1ST FL BATHROOM	BASEMENT	2ND FL BATHROOM	ROOF
Manufacturer:	NO TAG		DAYTON	
Model Number:	NL		48C189	
Size:	NL		NL	
Serial Number:	NL		18647483	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL		NL	VARI
Frame Number:	NL		NL	NL
Horsepower:	NL		NL	1/5
Brake Horsepower:	NL		NL	NA
Safety Factor:	NL		NL	NL
Volts/Phase:			115/1	5/1
Motor Amperage:			2.3	1.8
Motor RPM:		DIRECT DRIVE	350-1750	DIRECT DRIVE
Speeds:		1	NL	SET @ 9
Heater Size:	NL	CB	NL	CB
Heater Amps.:	NL	CB	NL	CB
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	200	205	200	299
Outside Air CFM:				
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:				
Motor Drive:				
Motor Size/Bore:				
Fan Drive:				
Fan Size/Bore:				
Belt Size / Number:				
Shafts C-C:				
Turns Open:				

Comments:

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

AIR DISTRIBUTION

SYSTEM: EF-1 & 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
	EF-1						
TOILET 1	1	12X4	FH	NA	NA	100	101
TOILET 2	2	12X4	FH	NA	NA	100	104
					TOTAL	200	205
	EF-2						
TOILET 3	1	12X4	FH	NA	NA	100	254
TOILET 4	2	12X4	FH	NA	NA	100	45 *1
					TOTAL	200	299

Comments: *1 Inlet clogged, needs to be cleaned.

Project: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

FAN DATA SHEET

	FAN NO.	EF-CELL 1	FAN NO.	EF-CELL 2
Serves / Location:	WOMENS CELL	ROOF	MENS CELL	ROOF
Manufacturer:	DAYTON		DAYTON	
Model Number:	16D531		16D531	
Size:	NL		NL	
Serial Number:	18346752		17220306	
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	DAYTON	NL	DAYTON
Frame Number:	NL	NL	NL	NL
Horsepower:	NL	1/20	NL	1/20
Brake Horsepower:	NL	NA	NL	NA
Safety Factor:	NL	NL	NL	NL
Volts/Phase:	115/1	115/1	115/1	115/1
Motor Amperage:	2.0-1.6/1.3	2	2.0/1.6/1.3	2
Motor RPM:	1550/1300/1050	DIRECT DRIVE	1550/1300/1050	DIRECT DRIVE
Speeds:	3	HIGH	3	HIGH
Heater Size:	NL	CB	NL	CB
Heater Amps.:	NL	CB	NL	CB
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	180	517	180	363
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: East Boston Municipal Court
Address: 37 Meridian St., East Boston, MA
Date: 4/13/2023 **Project No.** 23-197

AIR DISTRIBUTION

SYSTEM: EF- Cell 1 & EF Cell 2

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EF-Cell 1						
WOMENS	1	12X10	FH	NA	NA	180	517
	EF- Cell 2						
MENS	1	12X10	FH	NA	NA	180	363

Comments:

Tighe&Bond

Milharmer Associates, Inc. TAB Report

April 5, 2024

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: **East Boston Municipal Court**
East Boston, MA

Project No.: **24-180** **Project Date:** **4/5/2024**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	East Boston Municipal Court		
Address:	East Boston, MA		
Date:	4/5/2024	**Project No.**	24-180

CERTIFICATION

Submitted & Certified by:

Milharmer Associates, Inc.

Certification No.: ***3384*** Certification Expiration Date: **12/31/2024**

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:_____

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

December 31, 2024

Expiration Date

NEBB President

NEBB President-Elect

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

December 31, 2024

Expiration Date

NEBB President

NEBB President-Elect

Project:	East Boston Municipal Court		
Address:	East Boston, MA		
Date:	4/5/2024	**Project No.**	24-180

TABLE OF CONTENTS

Project: East Boston Municipal Court
Address: East Boston, MA
Date: 4/5/2024 **Project No.** 24-180

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	8-20-23	8-20-24
2	Shortridge Flow Hood	8-20-23	8-20-24
3	Ampmeter	8-20-23	8-20-24
4	Tachometer	8-20-23	8-20-24
5	Airflow Anemometer	8-20-23	8-20-24
6	Digital Thermometers	8-20-23	8-20-24
7	Shortridge Water Meter	8-20-23	8-20-24
8	Sound Meter	8-20-23	8-20-24
9	Vibration Meter	8-20-23	8-20-24

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

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: East Boston Municipal Court
Address: East Boston, MA
Date: 4/5/2024 **Project No.** 24-180

AIR DISTRIBUTION

SYSTEM: EF-Cell 1 & Cell 2
SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	Cell 1						
Womens	1	12X10	FH	NA	NA	180	178 *1
	Cell 2						
Mens	1	12X10	FH	NA	NA	180	169 *1

Comments: *1 Changed speed to low and amps to 1.4.

Project: East Boston Municipal Court
Address: East Boston, MA
Date: 4/5/2024 **Project No.** 24-180

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
Toilet 3	1	12X4	FH	NA	NA	100	98
Toilet 4	2	12X4	FH	NA	NA	100	109
Comments: *1 Changed speed to 6 and amps to 1.2.					TOTALS:	200	207 *1