



**East Boston Division
Boston Municipal Court
East Boston, MA**

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management
August 23, 2021

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 one fan serves 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

	<i>All spaces</i>	<i>Courtrooms</i>	<i>Non-Courtroom Spaces</i>
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)

<i>Courtroom</i>	<i>Total People</i>	<i>Total Air</i>		<i>Outdoor Air</i>	
		<i>Supply Airflow (CFM)</i>	<i>Airflow Rate (CFM/Person)</i>	<i>Outdoor Airflow (CFM)</i>	<i>Airflow Rate (CFM/Person)</i>
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)

<i>Courtroom</i>	<i>Total People</i>	<i>Total Air</i>		<i>Outdoor Air</i>	
		<i>Supply Airflow (CFM)</i>	<i>Airflow Rate (CFM/Person)</i>	<i>Outdoor Airflow (CFM)</i>	<i>Airflow Rate (CFM/Person)</i>
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.

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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