Lynn Juvenile Court
Lynn, MA

HVAC SYSTEM EVALUATIONS COVID-19

Office of Court Management

December 26, 2021

Tighe&Bond

100% Recyclable

Note: This report was updated on 12-9-2021 to reflect rooftop air handler zoning discovered during testing and balancing. This affected RTU's 7 and 8. Note that while the balancer was able to identify rooms are served by each unit, the design RTU and room airflows are still unknown.

Existing Conditions & Site Observations

Tighe & Bond visited the Lynn Juvenile Courthouse on January 28, 2021. While on site we inspected the rooftop air handling equipment and toured the facility to determine if the spaces generally matched usages noted on the architectural plans.

Site Visit Attendees:

- *Property Management*
  - Maria Klein, Owner
- *Tighe & Bond*
  - Sean Pringle, PE, Mechanical Engineer
  - Tim Bill, Staff Mechanical Engineer

1.1 Existing Ventilation System

The Lynn Juvenile Courthouse is located in a single story building that was constructed in 1920. The building was substantially renovated in 1999 to allow it to be used as a courthouse. It is approximately 20,000 square feet in size.

Eight packaged rooftop air handling units (RTU) provide ventilation air to the building. The units appear to be original from the 1999 renovation, and are approximately 22 years old. Each unit contains a supply fan, DX cooling coils, a natural gas furnace, and a 2" MERV 13 filter. All of the RTU's have outdoor air and return air dampers with economizer function. RTU's 5 and 6 were missing exhaust stacks for the gas fired heating section. In several units, the filters had fallen out of the racks due to rusted or loose retaining hardware, and as a result these coils were somewhat dirtier than the rest. The coils were otherwise fairly clean; the owner indicated that they are cleaned twice a year. The supply fans only run when there is a heating or cooling call to the spaces served. There is no ventilation or air circulation when the space is not being heated or cooled.

The design drawings indicate that a humidifier is located in the supply duct just below the roof in each RTU zone. The owner confirmed that there were humidifiers present, and we observed humidistats in several of the spaces. She believed they were operational, as at least one had been repaired in the last few years. Due to the ceiling locations we were not able to directly observe the humidifiers.

The lockup area is served by RTU-6 and an exhaust fan. Air is supplied to the corridors and cells and is exhausted from the cells. Based on the airflows on the drawings for the individual cells, and lock-up area as a whole are negatively pressurized. However, the exhaust fan serving the lockup area was off at the time of the visit and may require repair.

In addition to the exhaust fan serving the lockup area, there are two other exhaust fans serving toilet rooms. The exhaust fan serving the employee restrooms was not operational and the exhaust fan serving the public restrooms was running at the time of the visit.

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

TABLE 1
Existing Air Handling Units

Unit	Original Design Airflow (CFM)	Original Design Min. O.A. (CFM)	Filters	Condition
RTU-1	2,900	580	2" MERV 13	Fair
RTU-2	2,000	400	2" MERV 13	Fair
RTU-3	3,000	600	2" MERV 13	Fair
RTU-4	3,000	600	2" MERV 13	Fair
RTU-5	1,800	360	2" MERV 13	Fair
RTU-6	1,800	400	2" MERV 13	Fair
RTU-7*	1,600*	Unknown	2" MERV 13	Fair
RTU-8*	1,600*	Unknown	2" MERV 13	Fair

*Supply Airflow estimated based on equipment nameplate cooling capacity, assuming 400 CFM/Ton.

Photo 1 – Representative Rooftop Air Handler

1.2 Existing Control System

The Courthouse does not have a building wide control system. Each RTU has local thermostatic and humidistat controls. As noted above, the RTU fans only operate when there is a call for heating or cooling. All RTU's and supplemental electric heating devices utilize local thermostats and electronic controls, without any functioning time clocks.

The economizer controllers in RTU 4 and 5 indicated an error on the controller display and may not have been working.

Section 2
Recommendations

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

2.1 Filtration Efficiency Recommendations

The filters in the RTU's were recently upgraded with 2" MERV 13 filters. The use of 2" MERV 13 meets the minimum ASHRAE recommendations for filtration during the pandemic. We recommend maintaining the current level of filtration. However, we recommend that a testing and balancing Contractor test and document the airflow and static pressure profile of all RTU's, 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.

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

This recommendation applies to the RTU's.

RF-3a: *Connect the pressure sensor to a local alarm.*

As there is no BMS, provide a local alarm. Provide a local alarm in area that will be noticed by staff.

2.2 Testing & Balancing Recommendations

The air handling units are approximately 22 years old and it is unknown to Tighe & Bond when the last time the units were tested and balanced. Also, the code requirements to determine the outside air flow rates that were used to design the original system may be different than the 2015 International Mechanical Code (IMC) and current ASHRAE Standard 62.1 requirements.

The available drawings for the areas served by RTU's 7 and 8 were limited. Ductwork routing and diffuser locations were on the drawings, but no diffusers or total airflow data was indicated. Any airflows indicated in this report for these units and areas are estimates. Further engineering review is recommended. Refer to recommendation RTB-5.

We recommend the following testing and balancing measures be implemented:

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

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

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	2,900	580	200	580
RTU-2	2,000	400	120	400
RTU-3	3,000	600	210	600
RTU-4	3,000	600	675	680
RTU-5	1,800	360	160	360
RTU-6	1,800	360	350	350
RTU-7*	1,600*	Unknown	550	550
RTU-8*	1,600*	Unknown	390	390

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.

*Supply Airflow estimated based on equipment nameplate cooling capacity, assuming 400 CFM/Ton.

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.

As noted in section 1.1, since all units currently operate only when there is a call for heating or cooling, ventilation air is intermittent. Code requires that ventilation be continuous during occupied periods.

We believe the outdoor air for RTU's 4, 7, and 8 can safely be increased to the recommended values with the current building operation. This may reduce comfort on extremely cold days if the controls are modified so the supply fan operates continuously during occupied periods. (see Section 2.7.1)

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. If the supply fan shuts off when the space temperature is satisfied, ventilation will be zero, and the average airflow rate per person will be zero.

TABLE 3
Average Airflow Rate per Person

	All spaces	*Courtrooms*	*Non-Courtroom Spaces*
Total Occupancy (People)	230	113	117
Total Supply Air (CFM/Person)	79	39	118
Outdoor Air (CFM/Person)	17	10	24

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. If the supply fan shuts off when the space temperature is satisfied, ventilation air will not be provided and the airflow rate per person will be zero.

TABLE 4
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 Room	34	300	9	73	2
Courtroom #1	86	2,700	31	612	7
Courtroom #2	75	1,350	18	464	6

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

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

TABLE 4a
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	11	300	27	73	7
Courtroom #1	18	2,700	150	612	34
Courtroom #2	10	1,350	135	464	46

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

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

Due to the age of the units, the ability for the coils to maintain the supply air temperature is uncertain. We recommend increasing the outdoor air flow rate by only 10% beyond the recommended outdoor air flow rates during non-peak outdoor air conditions. This may require additional controls to implement.

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

RTU-7 and RTU-8 Areas

The drawings we were able to review did not indicate airflows for these areas. According to the owner, no additional drawings are available. If design documents showing the required airflows are not available, the required airflows should be established by an engineer and rebalanced to provide appropriate air volumes based on loads, and the code required ventilation rates for each space.

Whole Building

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.

Lockup Areas

The lockup area ventilation strategy is based on maintaining a slight negative airflow in the cells relative to the corridors in the lockup area. If the exhaust airflow is too low or if the supply air flow is too high in these areas, the likelihood of cross contamination from one cell to another increases. At the time of the visit the exhaust fan serving the lockup areas was not operational. Once the fan is repaired, the cell supply and exhaust grilles should be tested and balanced to the designed values noted on the original design drawings.

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-2: *Install controls required to introduce outside air beyond the minimum requirements.*

The existing control system does not appear to be sophisticated enough to implement this type of sequence. Additional controls and sensors will be required.

RC-3: *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.*

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.

Due to the limited airflow in the Jury Pool room, we recommend the use of portable HEPA filters or similar air purification approaches for this area if it is to be occupied in the near term, until adequate ventilation is added.

2.6 Humidity Control

This courthouse currently has humidifiers in the supply air ducts of all RTU's. We recommend these humidifiers continue to be used if they are not causing any issues within the spaces or in the building envelope.

2.7 Other Recommendations

2.7.1 Run Ventilation Fans Continuously During Occupied Hours

We highly recommend running the supply fans continuously during occupied hours, to provide mechanical ventilation at all times, as code requires.

Implementing this strategy may cause comfort issues. When the fan continuously runs, the cooling coils and furnace will turn on and off based on the space temperature. Comfort issues may arise if the existing units do not have multiple stages of heating or cooling that would otherwise handle load fluctuations better. During the winter supply air will be below room temperature when a call for heating is not present. Further system analysis and improvements are required to address these issues should they arise.

Consider adding a single electronic time clock to control RTU fans and exhaust fans from a single location in the Courthouse to simplify scheduling and operation. Alternately, the existing individual thermostats serving the RTU's could be replaced with new thermostats that include a programmable fan or an occupancy schedule function. Depending on the current wiring, new control wiring may be required between the thermostats and AHU's.

2.7.2 Replace Toilet and Holding Cell Exhaust Fans

We recommend repairing or replacing any failed toilet exhaust fans. At the time of the visit, two toilet exhaust fans serving the lockup and office restroom areas were not functioning.

2.7.3 Make Filter Hardware Adjustments

In several units the filters had fallen out of the frames due to worn or rusty hardware. Repair or replace hardware to prevent filters from falling out. Otherwise, return and outdoor air will not be filtered before being supplied to the building.

2.7.4 Test Humidifiers for Proper Operation

We were not able to access or assess the humidifiers during the site visit. We recommend they be checked for proper operation, cleaned, and repaired as necessary.

2.7.5 Replace RTU's

While generally in good condition and well maintained, the RTU's are nearing the end of their expected service life of 20-25 years. Plan to replace all RTU's over the next five years. Replacement units should have modulating heating and preferably modulating cooling as well. This will improve thermal comfort when operating the fans continuously as outlined in 2.7.1. As mentioned above, occupants may feel cold with the low supply air temperature in the winter without modulating heat to constantly temper the supply air.

This recommendation is a comfort and energy saving measure and does not affect the indoor air quality of the building.

Section 3
Testing & Balancing Results

Milharmer Associates, Inc. visited the Lynn Juvenile Courthouse on October 7, 2021 to test the airflow rates of the air handling units and the exhaust fans. A summary of the tested airflow 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	2,900	580	2,320	2,716	589	2,127
RTU-2	2,000	400	1,600	1,483	382	1,101
RTU-3	3,000	600	2,400	2,485	654	1,831
RTU-4	3,000	680	2,320	2,652	634	2,018
RTU-5	1,800	360	1,440	1,512	380	1,132
RTU-6	1,800	350	1,450	1,567	377	1,190
RTU-7	Unknown (2,000 est)	400 (*550)	-	1,567	668	899
RTU-8	Unknown (3,000 est)	650 (*400)	-	1,445	629	816

*Revised recommendations based on zoning discovered during airflow testing.

TABLE 6
Exhaust Fan Testing & Balancing Results

Unit	Serving	Design Return/Exhaust Airflow (CFM)	Actual Return/Exhaust Airflow (CFM)
EF-1	Toilets	775	1,102
EF-2	Toilets	400	Inoperable
EF-3	Private Toilet	80	43
EF-4	Holding Cells	1,100	Inoperable

The typical balancing tolerance for air systems is ±10% of the design airflow. Further investigation is required to determine the cause of a low airflow reading at the air handling unit.

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

1. RTU-1 is performing within the acceptable airflow range.
2. RTU-2 is performing at 25% below the design airflow. A sheave change would improve the airflow, but not enough to meet the design airflow.
    a. As the supply airflows were somewhat inconsistent, we recommend rebalancing the diffusers associated with this unit to attempt to improve the supply airflow.
3. RTU's 3 through 6 are performing from 13 to 18% below the design airflow. A sheave change is required for these units to increase the supply airflow to meet design.
4. The outdoor airflows for RTU's 1-6 are within the acceptable airflow range. They should be rebalanced once the supply airflows are adjusted.
5. The design airflows of RTU-7 and RTU-8 are unknown.
    a. The existing ductwork and design airflow for these units is not well documented. A contractor's markup with approximate duct routing, without duct sizes or airflows, was all that was available.
    b. The balancer's report showing the rooms associated with each unit is different than the contractor's markup.
    c. We recommend that an engineer review the existing conditions in detail and establish design supply and return airflows for each space.
    d. Once design airflows have been established, all registers should be individually tested and adjusted so that each space receives adequate supply and outdoor airflow.
6. The outdoor airflow of RTU-7 is 170% of our initial recommended airflow.
    a. If the zoning in the balancer's records are correct, then we suggest rebalancing the outdoor airflow of RTU-7 to 550 CFM.
7. The outdoor airflow of RTU-8 is within the acceptable airflow range based on our initial recommended outdoor airflow.
    a. If the zoning in the balancer's records are correct, then we suggest rebalancing the outdoor airflow of RTU-8 to 400 CFM.
    b. The supply airflow for the Jury Pool area seems very low (130 CFM total). Consider reducing the occupancy or adding additional air cleaning in this space until this is resolved.
8. Toilet exhaust fan EF-1 is performing 40% above the design airflow. This should be adjusted to match the design airflow.
9. EF-2 and EF-4 were not operational during the TAB visit. These units were also not operation during Tighe and Bond's site visit. EF-2 serves staff bathrooms and EF-4 serves holding areas. These exhaust fans should be repaired or replaced.
10. EF-3 is performing at 50% of the design airflow. This is a small fan that serves a single private (Judge's) restroom.
    a. We recommend cleaning the register and ductwork to improve airflow. Consider replacing the fan.

Disclaimer

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

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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: **Lynn Juvenile Courthouse PH 4**
139 Central Ave., Lynn, MA

Project No.: **21-539** **Project Date:** **10/7/2021**

MECHANICAL CONTRACTOR
Tighe & Bond

3384

A N.E.B.B. Certified Company

Project:	Lynn Juvenile Courthouse PH 4		
Address:	139 Central Ave., Lynn, MA		
Date:	10/7/2021	**Project No.**	21-539

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

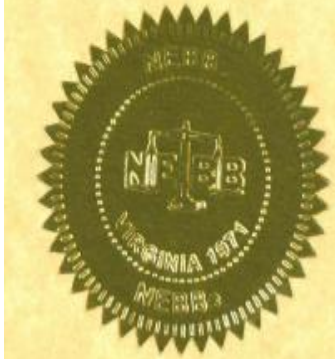
NEBB Certification Number

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:	Lynn Juvenile Courthouse PH 4		
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INSTRUMENT SHEET

The following is a list of Instruments owned and operated by Milharmer Associates, Inc. and used on this project.

Instrument ID Number	Instrument	Calibration Date	Calibration Due Date
1	ADM-870 Digital Multimeter	8-20-21	8-20-22
2	Shortridge Flow Hood	8-20-21	8-20-22
3	Ampmeter	8-20-21	8-20-22
4	Tachometer	8-20-21	8-20-22
5	Airflow Anemometer	8-20-21	8-20-22
6	Digital Thermometers	8-20-21	8-20-22
7	Shortridge Water Meter	8-20-21	8-20-22
8	Sound Meter	8-20-21	8-20-22
9	Vibration Meter	8-20-21	8-20-22

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

Technician:

SYMBOL SHEET

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

SYMBOL SHEET CONTINUED

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

Project:	Lynn Juvenile Courthouse PH 4		
Address:	139 Central Ave., Lynn, MA		
Date:	10/7/2021	**Project No.**	21-539

REPORT SUMMARY

The following is the report for the Lynn Juvenile Court with the following comments:

1. RTU-2 is running at 25% below design airflow and will require a sheave change to increase airflow to design.

2. RTU-3 is running at 18% below design airflow and will require a sheave change to increase airflow to design.

3. RTU-4 is running at 12% below design airflow and will require a sheave change to increase airflow to design.

4. RTU-5 is running at 16% below design airflow and will require a sheave change to increase airflow to design.

5. RTU-6 is running at 13% below design airflow and will require a sheave change to increase airflow to design.

6. RTU-7 and RTU-8 design airflows are unknown, and will have to be evaluated to determine if any changes are required.

7. EF-2 and EF-4 would not run while we were on site.

Project:	Lynn Juvenile Courthouse PH 4		
Address:	139 Central Ave., Lynn, MA		
Date:	10/7/2021	**Project No.**	21-539

REPORT SUMMARY

AIR HANDLING UNITS

UNIT	SUPPLY	RETURN	OUTSIDE AIR
RTU-1	2,716 CFM	2,127 CFM	589 CFM
RTU-2	1,483 CFM	1,101 CFM	382 CFM
RTU-3	2,485 CFM	1,831 CFM	654 CFM
RTU-4	2,652 CFM	2,018 CFM	634 CFM
RTU-5	1,512 CFM	1,132 CFM	380 CFM
RTU-6	1,567 CFM	1,190 CFM	377 CFM
RTU-7	1,567 CFM	1,116 CFM	457 CFM
RTU-8	1,445 CFM	816 CFM	629 CFM

FANS

UNIT	EXHAUST
EF-1	1,102 CFM
EF-2	Not Running
EF-3	43 CFM
EF-4	Not Running

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
Date: 10/7/2021 **Project No.** 21-539

FAN DATA SHEET

	FAN NO.	RTU-1	FAN NO.	
Serves / Location:	Probation Offices	Roof		
Manufacturer:	Carrier			
Model Number:	48TJE008---521GA			
Size:	NL			
Serial Number:	1299G30229			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	GE		
Frame Number:	NL	56Y		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	1.01		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	5.2	4.1/3.9/3.9		
Motor RPM:	1725	1737		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	2900	2716		
Return Air CFM:		2127		
Exhaust Air CFM:				
Outside Air CFM:	580	589		
Suction Pressure:		-0.93		
Discharge Pressure:		0.62		
Fan Static Pressure:		1.55		
External Pressure:		0.62		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	4 1/4" O.D.		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AM74		
Fan Size/Bore:	NL	1"		
Belt Size / Number:	NL	AX48 / 1		
Shafts C-C:	NL	16 3/4"		
Turns Open:	NL	0		

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
Date: 10/7/2021 **Project No.** 21-539

AIR DISTRIBUTION

SYSTEM: RTU-1
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
SEC Office	1	24X24	FH	NA	NA	NL	74
Probation Office	2	24X24	FH	NA	NA	NL	174
Storage	3	24X24	FH	NA	NA	NL	200
Asst. Chief Prob.	4	24X24	FH	NA	NA	NL	186
Probation Off. 1	5	24X24	FH	NA	NA	NL	179
Probation Off. 2	6	24X24	FH	NA	NA	NL	198
Probation Off. 3	7	24X24	FH	NA	NA	NL	191
Probation Off. 4	8	24X24	FH	NA	NA	NL	163
Probation Off. 5	9	24X24	FH	NA	NA	NL	159
Probation Off. 6	10	24X24	FH	NA	NA	NL	171
Office Space	11	24X24	FH	NA	NA	NL	187
Office Space	12	24X24	FH	NA	NA	NL	206
Office Space	13	24X24	FH	NA	NA	NL	187
Office Space	14	24X24	FH	NA	NA	NL	196
Probation Off. 8	15	24X24	FH	NA	NA	NL	101
Probation Waiting	16	24X24	FH	NA	NA	NL	144
					TOTAL:	NL	2716
	RETURN						
Asst. Chief Prob.	1	8X8	FH	NA	NA	NL	275
Probation Off. 1	2	8X8	FH	NA	NA	NL	146
Probation Off. 2	3	8X8	FH	NA	NA	NL	259
Probation Off. 3	4	8X8	FH	NA	NA	NL	249
Office Space	5	24X24	FH	NA	NA	NL	780
Probation Off. 4	6	8X8	FH	NA	NA	NL	144
Probation Off. 5	7	8X8	FH	NA	NA	NL	135
Probation Off. 6	8	8X8	FH	NA	NA	NL	139
					TOTAL:	NL	2127
RTU-1	OUTSIDE AIR	NA	NA	NA	NA	580	589

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
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FAN DATA SHEET

	FAN NO.	RTU-2	FAN NO.	
Serves / Location:	Lobby	Roof		
Manufacturer:	Carrier			
Model Number:	48TJE006---521GA			
Size:	NL			
Serial Number:	1699G21231			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	Marathon		
Frame Number:	NL	54H		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	0.89		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	4.8	3.7/3.9/3.7		
Motor RPM:	1725	1733		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	2000	1483		
Return Air CFM:		1101		
Exhaust Air CFM:				
Outside Air CFM:	400	382		
Suction Pressure:		-0.77		
Discharge Pressure:		0.49		
Fan Static Pressure:		1.26		
External Pressure:		0.51		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	1VL44		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AFD59		
Fan Size/Bore:	NL	5/8"		
Belt Size / Number:	NL	A40 / 1		
Shafts C-C:	NL	13 1/2"		
Turns Open:	NL	0		

Comments:

Project: Lynn Juvenile Courthouse PH 4
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AIR DISTRIBUTION

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

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Vestibule	1	8X8	FH	NA	NA	NL	81
Corridor	2	24X24	FH	NA	NA	NL	132
Corridor	3	24X24	FH	NA	NA	NL	133
Corridor	4	24X24	FH	NA	NA	NL	246
Womens Rm.	5	24X24	FH	NA	NA	NL	26
Corridor	6	8X8	FH	NA	NA	NL	233
Mens Rm.	7	24X24	FH	NA	NA	NL	21
Bathrooms	8	9X9	FH	NA	NA	NL	180
Bathrooms	9	9X9	FH	NA	NA	NL	190
Corridor	10	24X24	FH	NA	NA	NL	241
					TOTAL:	NL	1483
	RETURN						
Corridor	1	48X24	FH	NA	NA	NL	1101
	OUTSIDE AIR						
RTU-2	1	NA	NA	NA	NA	400	382

Comments:

Project: Lynn Juvenile Courthouse PH 4
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FAN DATA SHEET

	FAN NO.	RTU-3	FAN NO.	
Serves / Location:		Roof		
Manufacturer:	Carrier			
Model Number:	48TJE008---521GA			
Size:	NL			
Serial Number:	1299G30228			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	GE		
Frame Number:	NL	56Y		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	1.03		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	5.2	4/4/3.9		
Motor RPM:	1725	1733		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3000	2485		
Return Air CFM:		1831		
Exhaust Air CFM:				
Outside Air CFM:	600	654		
Suction Pressure:		-0.88		
Discharge Pressure:		0.68		
Fan Static Pressure:		1.56		
External Pressure:		0.82		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	4" O.D.		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AM74		
Fan Size/Bore:	NL	1"		
Belt Size / Number:	NL	A48 / 1		
Shafts C-C:	NL	16 3/4"		
Turns Open:	NL	0		

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
Date: 10/7/2021 **Project No.** 21-539

AIR DISTRIBUTION

SYSTEM: RTU-3
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Telephone Equip.	1	24X24	FH	NA	NA	NL	155
Records	2	24X24	FH	NA	NA	NL	116
Storage	3	24X24	FH	NA	NA	NL	104
Records	4	24X24	FH	NA	NA	NL	119
Asst. Clerk Mag.	5	24X24	FH	NA	NA	NL	112
Asst. Clerk Mag.	6	24X24	FH	NA	NA	NL	128
Office Space	7	24X24	FH	NA	NA	NL	126
Office Space	8	24X24	FH	NA	NA	NL	193
Office Space	9	24X24	FH	NA	NA	NL	120
Office Space	10	24X24	FH	NA	NA	NL	152
Office Space	11	24X24	FH	NA	NA	NL	116
Office Space	12	24X24	FH	NA	NA	NL	167
Corridor	13	24X24	FH	NA	NA	NL	102
Witness Victim	14	24X24	FH	NA	NA	NL	122
Witness Victim	15	24X24	FH	NA	NA	NL	103
DA	16	24X24	FH	NA	NA	NL	106
Court Clinic	17	24X24	FH	NA	NA	NL	*1
Clerk Hearing	18	24X24	FH	NA	NA	NL	101
Clerk Hearing	19	24X24	FH	NA	NA	NL	119
Clerk Waiting	20	24X24	FH	NA	NA	NL	137
Mediation Int.	21	24X24	FH	NA	NA	NL	87
					TOTAL:	NL	2485

Comments: *1 Room no longer exists, no diffuser.

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AIR DISTRIBUTION

SYSTEM: RTU-3

SUPPLY [ ] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	RETURN						
Corridor	1	24X24	FH	NA	NA	NL	252
Witness Victim	2	24X24	FH	NA	NA	NL	294
DA	3	24X24	FH	NA	NA	NL	343
Clerk Hearing	4	24X24	FH	NA	NA	NL	255
Clerk Waiting	5	24X24	FH	NA	NA	NL	306
Mediation Int.	6	24X24	FH	NA	NA	NL	381
					TOTAL:	NL	1831
	OUTSIDE AIR						
RTU-3	1	NA	NA	NA	NA	600	654

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
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FAN DATA SHEET

	FAN NO.	RTU-4	FAN NO.	
Serves / Location:		Roof		
Manufacturer:	Carrier			
Model Number:	48TJE008---521GA			
Size:	NL			
Serial Number:	1699G30127			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	GE		
Frame Number:	NL	56Y		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	1.11		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	5.2	4.2/4.1/4.1		
Motor RPM:	1725	1730		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	3000	2652		
Return Air CFM:		2018		
Exhaust Air CFM:				
Outside Air CFM:	680	634		
Suction Pressure:		-0.92		
Discharge Pressure:		0.55		
Fan Static Pressure:		1.47		
External Pressure:		0.71		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	4 1/4" O.D.		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AM74		
Fan Size/Bore:	NL	1"		
Belt Size / Number:	NL	A48 / 1		
Shafts C-C:	NL	16 3/4"		
Turns Open:	NL	0		

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
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AIR DISTRIBUTION

SYSTEM: RTU-4
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Courtroom 1	1	24X24	FH	NA	NA	NL	259
Courtroom 1	2	24X24	FH	NA	NA	NL	234
Courtroom 1	3	24X24	FH	NA	NA	NL	271
Courtroom 1	4	24X24	FH	NA	NA	NL	197
Courtroom 1	5	24X24	FH	NA	NA	NL	337
Courtroom 1	6	24X24	FH	NA	NA	NL	177
Courtroom 1	7	24X24	FH	NA	NA	NL	280
Courtroom 1	8	24X24	FH	NA	NA	NL	272
Courtroom 1	9	24X24	FH	NA	NA	NL	270
Corridor	10	24X24	FH	NA	NA	NL	94
A / V	11	24X24	FH	NA	NA	NL	76
Dock	12	8X8	FH	NA	NA	NL	93
Vestibule	13	24X24	FH	NA	NA	NL	92
					TOTAL:	NL	2652
	RETURN						
Courtroom 1	1	24X24	FH	NA	NA	NL	1204
Courtroom 1	2	24X24	FH	NA	NA	NL	814
					TOTAL:	NL	2018
	OUTSIDE AIR						
RTU-4	1	NA	NA	NA	NA	680	634

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
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FAN DATA SHEET

	FAN NO.	RTU-5	FAN NO.	
Serves / Location:		Roof		
Manufacturer:	Carrier			
Model Number:	48TJE006---521GA			
Size:	NL			
Serial Number:	1699G21232			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	GE		
Frame Number:	NL	56Y		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	0.87		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	5.2	3.6/3.7/3.7		
Motor RPM:	1725	1730		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1800	1512		
Return Air CFM:		1132		
Exhaust Air CFM:				
Outside Air CFM:	360	380		
Suction Pressure:		-0.61		
Discharge Pressure:		0.55		
Fan Static Pressure:		1.16		
External Pressure:		0.6		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	1VL44		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AG58		
Fan Size/Bore:	NL	5/8"		
Belt Size / Number:	NL	A40 / 1		
Shafts C-C:	NL	13 1/2"		
Turns Open:	NL	0		

Comments:

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AIR DISTRIBUTION

SYSTEM: RTU-5
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Jury Deliberation	1	12X12	FH	NA	NA	NL	336
Jury Deliberation	2	12X12	FH	NA	NA	NL	376
Judge Waiting	3	9X9	FH	NA	NA	NL	122
Corridor	4	24X24	FH	NA	NA	NL	0
Judges Lobby	5	9X9	FH	NA	NA	NL	148
Judges Lobby	6	9X9	FH	NA	NA	NL	180
Judges Library	7	9X9	FH	NA	NA	NL	178
Corridor	8	24X24	FH	NA	NA	NL	172
					TOTAL:	NL	1512
	RETURN						
Jury Deliberation	1	14X14	FH	NA	NA	NL	235
Judge Waiting	2	10X10	FH	NA	NA	NL	221
Judges Lobby	3	10X10	FH	NA	NA	NL	235
Corridor	4	24X24	FH	NA	NA	NL	238
Judges Library	5	10X10	FH	NA	NA	NL	203
					TOTAL:	NL	1132
	OUTSIDE AIR						
RTU-5	1	NA	NA	NA	NA	360	380

Comments:

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FAN DATA SHEET

	FAN NO.	RTU-6	FAN NO.	
Serves / Location:		Roof		
Manufacturer:	Carrier			
Model Number:	48TJE006---521GA			
Size:	NL			
Serial Number:	1699G21236			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	Marathon		
Frame Number:	NL	56Y		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	0.87		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	5.2	3.6/3.7/3.7		
Motor RPM:	1725	1730		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1800	1567		
Return Air CFM:		1190		
Exhaust Air CFM:				
Outside Air CFM:	350	377		
Suction Pressure:		-0.69		
Discharge Pressure:		0.49		
Fan Static Pressure:		1.18		
External Pressure:		0.63		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	1VL44		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AG58		
Fan Size/Bore:	NL	5/8"		
Belt Size / Number:	NL	A40 / 1		
Shafts C-C:	NL	13 1/2"		
Turns Open:	NL	0		

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
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AIR DISTRIBUTION

SYSTEM: RTU-6
SUPPLY [X] RETURN [ ] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Corridor	1	24X24	FH	NA	NA	NL	166
Lunch room	2	24X24	FH	NA	NA	NL	81
Lunch room	3	24X24	FH	NA	NA	NL	73
Locker Men	4	24X24	FH	NA	NA	NL	72
Officers Shower	5	8X8	FH	NA	NA	NL	94
Locker Women	6	24X24	FH	NA	NA	NL	71
Court Officer	7	24X24	FH	NA	NA	NL	63
Atty	8	24X24	FH	NA	NA	NL	39
Secure Control	9	24X24	FH	NA	NA	NL	81
Client	10	8X8	FH	NA	NA	NL	66
Secure Trap	11	8X8	FH	NA	NA	NL	57
Lockup Corridor	12	24X24	FH	NA	NA	NL	54
Lockup Corridor	13	24X24	FH	NA	NA	NL	104
Lockup Corridor	14	24X24	FH	NA	NA	NL	115
Large cell	15	8X8	FH	NA	NA	NL	146
Cell	16	8X8	FH	NA	NA	NL	74
Cell	17	8X8	FH	NA	NA	NL	64
Cell	18	8X8	FH	NA	NA	NL	76
Cell	19	8X8	FH	NA	NA	NL	71
					TOTAL:	NL	1567

Comments:

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FAN DATA SHEET

	FAN NO. RTU-7		FAN NO.	
Serves / Location:	Jury Pool Room	Roof		
Manufacturer:	Carrier			
Model Number:	48KCEA05A2A5A			
Size:	NL			
Serial Number:	0518C67359			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	Marathon		
Frame Number:	NL	54H		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	0.87		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	5.2	3.6/3.7/3.7		
Motor RPM:	1725	1730		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	1720	1567		
Return Air CFM:	1320	899		
Exhaust Air CFM:				
Outside Air CFM:	400	451		
Suction Pressure:		-0.43		
Discharge Pressure:		0.44		
Fan Static Pressure:		0.86		
External Pressure:		0.52		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	3 3/4" O.D.		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AFD49		
Fan Size/Bore:	NL	5/8"		
Belt Size / Number:	NL	A39 / 1		
Shafts C-C:	NL	14 1/2"		
Turns Open:	NL	0		

Comments:

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AIR DISTRIBUTION

SYSTEM: RTU-7

SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Courtroom 2	1	12X12	FH	NA	NA	400	342
Courtroom 2	2	12X12	FH	NA	NA	400	355
Courtroom 2	3	9X9	FH	NA	NA	400	338
Courtroom 2	4	24X24	FH	NA	NA	400	339
Pre Conf. Trial	5	9X9	FH	NA	NA	60	77
Pre Conf. Trial	6	9X9	FH	NA	NA	60	116
					TOTAL:	1720	1567
	RETURN						
Courtroom 2	1	48X24	FH	NA	NA	1320	1116
	OUTSIDE AIR						
RTU-7	1	NA	NA	NA	NA	400	451

Comments:

Project: Lynn Juvenile Courthouse PH 4
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FAN DATA SHEET

	FAN NO.	RTU-8	FAN NO.	
Serves / Location:	Judges Office	Roof		
Manufacturer:	Carrier			
Model Number:	48TFE008---501GA			
Size:	NL			
Serial Number:	0901G30080			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	GE		
Frame Number:	NL	56Y		
Horsepower:	1 1/2	1 1/2		
Brake Horsepower:	NL	0.66		
Safety Factor:	NL	1.15		
Volts/Phase:	208/3	208/3		
Motor Amperage:	5.2	3.3/3.4/3.3		
Motor RPM:	1725	1730		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:	Unknown	1445		
Return Air CFM:	Unknown	816		
Exhaust Air CFM:				
Outside Air CFM:	650	629		
Suction Pressure:		-0.59		
Discharge Pressure:		0.44		
Fan Static Pressure:		1.03		
External Pressure:		0.52		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	1VL44		
Motor Size/Bore:	NL	5/8"		
Fan Drive:	NL	AM74		
Fan Size/Bore:	NL	1"		
Belt Size / Number:	NL	A48 / 1		
Shafts C-C:	NL	16 3/4"		
Turns Open:	NL	0		

Comments:

Project: Lynn Juvenile Courthouse PH 4
Address: 139 Central Ave., Lynn, MA
Date: 10/7/2021 **Project No.** 21-539

AIR DISTRIBUTION

SYSTEM: RTU-8
SUPPLY [X] RETURN [X] EXHAUST [ ]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	SUPPLY						
Jury Pool	1	24X24	FH	NA	NA	NL	46
Jury Pool	2	24X24	FH	NA	NA	NL	40
Jury Pool	3	24X24	FH	NA	NA	NL	49
Judges Office	4	24X24	FH	NA	NA	NL	176
Judges Office	5	24X24	FH	NA	NA	NL	153
Judges Sec.,	6	24X24	FH	NA	NA	NL	159
Corridor	7	24X24	FH	NA	NA	NL	193
Corridor	8	24X24	FH	NA	NA	NL	144
Offices	9	24X24	FH	NA	NA	NL	124
Offices	10	24X24	FH	NA	NA	NL	137
Offices	11	24X24	FH	NA	NA	NL	100
Offices	12	24X24	FH	NA	NA	NL	124
					TOTAL:	NL	1445
	RETURN						
Jury Pool	1	24X24	FH	NA	NA	NL	0
Corridor	2	24X24	FH	NA	NA	NL	816
					TOTAL:	NL	816
	OUTSIDE AIR						
RTU-8	1	NA	NA	NA	NA	650	629

Comments:

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FAN DATA SHEET

	FAN NO.	EF-1	FAN NO.	
Serves / Location:	Restrooms	Roof		
Manufacturer:	Central Fan			
Model Number:	PV135			
Size:	NL			
Serial Number:	0707G00198001			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	Marathon		
Frame Number:	NL	48Z		
Horsepower:	1/3	1/3		
Brake Horsepower:	NL	NA		
Safety Factor:	NL	1.35		
Volts/Phase:	115/1	115/1		
Motor Amperage:	2.6	2		
Motor RPM:	1725	1730		
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	NL	1103		
Outside Air CFM:				
Suction Pressure:		-0.43		
Discharge Pressure:		0.12		
Fan Static Pressure:		NA		
External Pressure:		0.55		
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	3 3/4" O.D.		
Motor Size/Bore:	NL	1/2"		
Fan Drive:	NL	AK39		
Fan Size/Bore:	NL	5/8"		
Belt Size / Number:	NL	A22 / 1		
Shafts C-C:	NL	6 1/2"		
Turns Open:	NL	0		

Comments:

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AIR DISTRIBUTION

SYSTEM: EF-1
SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EXHAUST						
Womens	1	8x8	FH	NA	NA	NL	177
Womens	2	8x8	FH	NA	NA	NL	149
Mens	3	8x8	FH	NA	NA	NL	195
Mens	4	8x8	FH	NA	NA	NL	197
Toilet	5	8x8	FH	NA	NA	NL	199
Janitor	6	8x8	FH	NA	NA	NL	85
Toilet	7	8x8	FH	NA	NA	NL	101
						TOTAL:	1103

Comments:

Project: Lynn Juvenile Courthouse PH 4
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FAN DATA SHEET

	FAN NO.	EF-2	FAN NO.	
Serves / Location:	Restrooms	Roof		
Manufacturer:	Central Fan			
Model Number:	PV135			
Size:	NL			
Serial Number:	0707G00198001			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	Marathon		
Frame Number:	NL	48Z		
Horsepower:	1/3	1/3		
Brake Horsepower:	NL	NA		
Safety Factor:	NL	1.35		
Volts/Phase:	115/1	115/1		
Motor Amperage:	2.6			
Motor RPM:	1725			
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	NL	Not Running		
Outside Air CFM:				
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	3 3/4" O.D.		
Motor Size/Bore:	NL	1/2"		
Fan Drive:	NL	AX30		
Fan Size/Bore:	NL	5/8"		
Belt Size / Number:	NL	A21 / 1		
Shafts C-C:	NL	6 1/2"		
Turns Open:	NL	0		

Comments:

Project: Lynn Juvenile Courthouse PH 4
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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
	EXHAUST						
Staff Men	1	6x6	FH	NA	NA	NL	
Staff Wmn.	2	6x6	FH	NA	NA	NL	
Jury Men	3	6x6	FH	NA	NA	NL	
Jury Wmn.	4	6x6	FH	NA	NA	NL	
						TOTAL:	0

Comments:

Project: Lynn Juvenile Courthouse PH 4
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AIR DISTRIBUTION

SYSTEM: EF-3

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EXHAUST						
Judge Tlt.	1	10x10	FH	NA	NA	NL	43
						TOTAL:	43

Comments:

Project: Lynn Juvenile Courthouse PH 4
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FAN DATA SHEET

	FAN NO.	EF-4	FAN NO.	
Serves / Location:	Restrooms	Roof		
Manufacturer:	Central Fan			
Model Number:	PV135			
Size:	NL			
Serial Number:	0707G00198001			
MOTOR	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Manufacturer:	NL	Marathon		
Frame Number:	NL	48Z		
Horsepower:	1/3	1/3		
Brake Horsepower:	NL	NA		
Safety Factor:	NL	1.35		
Volts/Phase:	115/1	115/1		
Motor Amperage:	2.6			
Motor RPM:	1725			
Speeds:	1	1		
Heater Size:	NA	CB		
Heater Amps.:	NA	CB		
FAN	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Supply Air CFM:				
Return Air CFM:				
Exhaust Air CFM:	NL	Not Running		
Outside Air CFM:				
Suction Pressure:				
Discharge Pressure:				
Fan Static Pressure:				
External Pressure:				
RPM	**DESIGN**	**TESTED**	**DESIGN**	**TESTED**
Fan RPM:	NL	NA		
Motor Drive:	NL	4" O.D.		
Motor Size/Bore:	NL	1/2"		
Fan Drive:	NL	AK34		
Fan Size/Bore:	NL	5/8"		
Belt Size / Number:	NL	A22 / 1		
Shafts C-C:	NL	6 1/4"		
Turns Open:	NL	0		

Comments:

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AIR DISTRIBUTION

SYSTEM: EF-4

SUPPLY [ ] RETURN [ ] EXHAUST [X]

ROOM OR LOCATION	UNIT NUMBER	UNIT SIZE	AREAxK FACTOR	DESIGN FT/MIN	TEST FT/MIN	DESIGN CFM	TESTED CFM
	EXHAUST						
Cell	1	6x6	FH	NA	NA	NL	
Cell	2	6x6	FH	NA	NA	NL	
Cell	3	6x6	FH	NA	NA	NL	
Cell	4	6x6	FH	NA	NA	NL	
Cell	5	6x6	FH	NA	NA	NL	
Locker Men	6	6x6	FH	NA	NA	NL	
Offices	7	6x6	FH	NA	NA	NL	
Locker Wmn.	8	6x6	FH	NA	NA	NL	

Comments: