National TAB

Testing, Adjusting, and Balancing Equipment

Function		Range	Minimum Accuracy	Instrument Information	Calibration Date	Date Due
AIR	AIR PRESSURE	0 in wg to 10 in wg	2% +/- 0.001 in wg	Evergreen S-PVF-1 S/N 2200484C	3/24/2025	3/24/2027
	AIR VELOCITY INSTRUMENT	50 fpm to 3900 fpm	+/- 5 % +/- 7 fpm	Evergreen S-PVF-1 S/N 2200484C	3/24/2025	3/24/2027
	DIRECT HOOD READING	100 cfm to 2000 cfm	+/- 5 % +/- 7 cfm	Evergreen S-PVF-1 S/N 2200484C	3/24/2025	3/24/2027
TEMPERATURE	AIR METER	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - SRH77A S/N 071118034	7/12/2024	7/12/2025
	AIR PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - PD1388 7-6 S/N 5028	7/12/2024	7/12/2025
	IMMERSION METER	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - SRH77A S/N 071118034	7/12/2024	7/12/2025
	IMMERSION PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - PD1388 7-6 S/N 1075	7/12/2024	7/12/2025
	CONTACT METER	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - SRH77A S/N 071118034	7/12/2024	7/12/2025
	CONTACT PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper ATKINS - PD1388 7-6 S/N 4011	7/12/2024	7/12/2025
HUMIDITY	HUMIDITY PROBE	10 % RH to 90 % RH	3% of reading	Cooper ATKINS - SRH77A S/N 071118034	7/12/2024	7/12/2025
ELECTRICAL	VOLTAGE MEASUREMENT	0 VAC to 600 VAC	2 % reading +/- 5 digits	Fluke 373 True RMS, S/N: 33290686	7/12/2024	7/12/2025
	AMPERAGE MEASUREMENT	0 Amperers to 100 Amperes	2 % reading +/- 5 digits	Fluke 373 True RMS, S/N: 33290686	7/12/2024	7/12/2025
ROTATION	ROTATION MEASUREMENT	60 rpm to 5000 rpm	2 % reading 2 rpm	SHIMPO DT-207LR S/N: D1530081R	7/12/2024	7/12/2025
HYDRONIC	PRESSURE MEASUREMENT	-30 in Hg to 200 psi	±2% of reading +/- 1 psi	Alnor HM680 S/N: 70807241	5/11/2024	5/31/2025
	DIFFERENTIAL PRESSURE MEASUREMENT	0 psi - 80 psi	±2% of reading +/- 1 psi	Alnor HM680 S/N: 70807241	5/11/2024	5/31/2025

Abbreviation List

A = Area (ft^2)	S.F. = Service Factor
AHU = Air Handling Unit	SF = Supply Fan
A_k = Effective Area	SP = Static Pressure
BHP = Brake Horsepower (IP) HP	SR = Supply Register
Btu = British Thermal Unit	T = Temperature
Btu/h = Btuh = BTUH = BTU/Hour	T_{ma} = Mixed Air Temperature
CL = Center Distance (used in belt formula)	T_{oa} = Outside Air Temperature
CD = Ceiling Diffuser	T_{ra} = Return Air Temperature
CF = Correction Factor	H = Head (in wc, ft wc, psi)
CFM = Volumetric Flow: Cubic Feet Per Minute	h = Enthalpy
CO2 = Carbon Dioxide	HP = Horsepower
CO = Carbon Monoxide	hr = Hour
C_v = Flow Constant	K_v = Flow constant (SI)
d = Diameter (in.) IP	kW = Kilowatt = 1000 Watts
Δ = Difference or Change (Final - Initial)	LAT = Leaving Air Temperature
DB = Dry Bulb	lb = Pounds
EA = Exhaust Air	LWT = Leaving Water Temperature
EAT = Entering Air Temperature	ma = Mixed Air
EF = Exhaust Fan	MIN = Minimum
Eff = Efficiency	MAX = Maximum
EG = Exhaust Grille	N/A = Not Applicable
ESP = External Static Pressure	NA = No Access
EWT = Entering Water Temperature	NL = Not Listed
°F = Degrees Fahrenheit, °F	NPSHA = Net Positive Suction Head Available
FPB = Fan Powered Box	NS = Not Specified
FLA = Full Load Amps	OA = Outside Air
fpm = Feet per Minute (fpm)	OAT = Outside Air Temperature
ft = Foot	PD = Sheave Pitch Diameter
gal = Gallons	P.D. = Pressure Drop
GPM = Gallons Per Minute (GPM)	PF = Power Factor
h = Enthalpy (BTU/lb dry air)	SG = Supply Grille
P = Pressure	SR = Supply Register
ppm = parts per million	TP = Total Pressure
psi = Pounds Per Square Inch	T_{ra} = Return Air Temperature
psid = PSI Differential	TS = Tip Speed (fpm) IP, (m/s) SI
r = Radius (in)	TSP = Total Static Pressure
$\%_{ra}$ = % of Return Air	V = Velocity
RA = Return Air	VAV = Variable Air Volume
RAT = Return Air Temperature	VD = Volume Damper
RF = Return Fan	VFD = Variable Frequency Drive
RG = Return Grille	W = Watt
RH = Relative Humidity	WB = Wet Bulb
RPM = Revolutions Per Minute	wg = wc = water gauge = water column
RTU = Roof Top Unit	WHP = Water Horsepower (IP)
SA = Supply Air	ω = Humidity Ratio

Issue List

- DOAS Powering Off Intermittently
- DOAS Return Unbalanced
- DOAS Supply Below Design
- EF-2 Below Design
- EF-3 Above Design
- FC-100 No Damper
- FC-101 Below Design
- FC-101 No Damper
- FC-120 Diffuser 2 Above Design
- FC-201 Missing Diffuser
- FC-204 No Damper
- FC-212 No Damper
- FC-225 No Damper
- FC-306 Not Ducted
- Heated Air Collecting at Highest Point
- RTU-2 Economizer Not Functional
- RTU-3 Below Design
- RTU-3 VFD Appears Non-Functional

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name : DOAS Powering Off Intermittently

Description : Fan stops spinning randomly during operation. It appears to re-start without any resetting.

Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Closed		
Priority :	Medium	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Project Issue Response Details

- **12/20/2024 National TAB - Jordan Best**
  - DOAS was powering off due @ 60 HZ because it was over amping. Fan speed was reduced until supply motor fell to FLA. This caused the unit to fall slightly outside of 10% low.

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name : DOAS Return Unbalanced

Description : Returns for DOAS above ceiling were unable to be balanced evenly due to missing and jammed dampers. Return airflows air similar to supply air totals and should not disproportionately affect any of the three floors.

Created By : National TAB

Assigned To : National TAB - Jordan Best

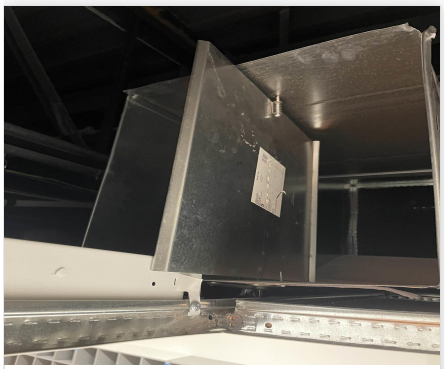
Status : Open

Priority : Low

Asset Tag :

Originated Date : 12/20/2024 - Jordan Best - National TAB

Project Issue File Details



12/20/2024

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	DOAS Supply Below Design		
Description :	Design airflow was able to be achieved but caused the unit to over amp thus causing the cycling of the supply fan motor referenced in another created issue. Supply fan speed reduced until it met FLA, causing unit to fall slightly below design.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Medium	**Asset Tag :**	
Originated Date :	12/20/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	EF-2 Below Design		
Description :	EF-2 is operating below design. The unit is equipped with no speed controller and is operating at its highest speed.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	High	**Asset Tag :**	
Originated Date :	12/19/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	EF-3 Above Design		
Description :	EF-3 is operating above design. The unit is not equipped with a speed controller and the fan speed cannot be decreased.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	High	**Asset Tag :**	
Originated Date :	12/19/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-100 No Damper		
Description :	Damper for FC-100 is not installed. Diffuser is above design.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Urgent	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-101 Below Design		
Description :	FC-101 is operating below design. The fan is operating at its highest set point and cannot be increased. Diffusers are balanced proportionately low.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	High	**Asset Tag :**	
Originated Date :	12/19/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-101 No Damper		
Description :	Damper for FC-101 is not installed. Diffuser is above design.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Urgent	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-120 Diffuser 2 Above Design		
Description :	FC-120, diffuser 2 is above design with the damper fully shut.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Medium	**Asset Tag :**	
Originated Date :	12/20/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-201 Missing Diffuser		
Description :	OA duct intended for area/unit 201 is present but there is no diffuser installed.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Urgent	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-204 No Damper		
Description :	Damper for FC-204 is not installed. Diffuser is above design.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Urgent	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-212 No Damper		
Description :	Damper for FC-212 is not installed. Diffuser is above design.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Urgent	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-225 No Damper		
Description :	Damper for FC-225 is not installed. Diffuser is above design.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Urgent	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	FC-306 Not Ducted		
Description :	FC-306 is not ducted to the DOAS unit therefore is not receiving any supply air.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Urgent	**Asset Tag :**	
Originated Date :	12/18/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	Heated Air Collecting at Highest Point		
Description :	All heated air is collecting at the highest point in the multi-purpose room. The temperature disparity from the ceiling to floor could range up to 50 degrees. Electricians on site said they observed ceiling temps above 100 degrees. I suspect this could prevent units and thermostats from functioning properly.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	Medium	**Asset Tag :**	
Originated Date :	12/20/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	RTU-2 Economizer Not Functional		
Description :	Economizer for RTU-2 is not operational. Appears to be installed correctly, will not respond to commands from controller. OA set manually by loosening bolts on shaft and adjusting damper then tightening bolts to fix damper at said position.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	High	**Asset Tag :**	
Originated Date :	12/20/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name :	RTU-3 Below Design		
Description :	RTU-3 is below design, supply fan is operating at its highest set point.		
Created By :	National TAB	**Assigned To :**	National TAB - Jordan Best
Status :	Open		
Priority :	High	**Asset Tag :**	
Originated Date :	12/20/2024 - Jordan Best - National TAB		

Springer School Addition (Cincinnati, OH)

Project Issue Information

Issue Name : RTU-3 VFD Appears Non-Functional

Description : VFD for RTU-3 does not appear to be functional. When fan is running, VFD displays all 0's. Unit was read out in test mode. Suspect incomplete startup by Trane or malfunctioning VFD. Recommend contacting Trane to further investigate.

Created By : National TAB

Assigned To : National TAB - Jordan Best

Status : Open

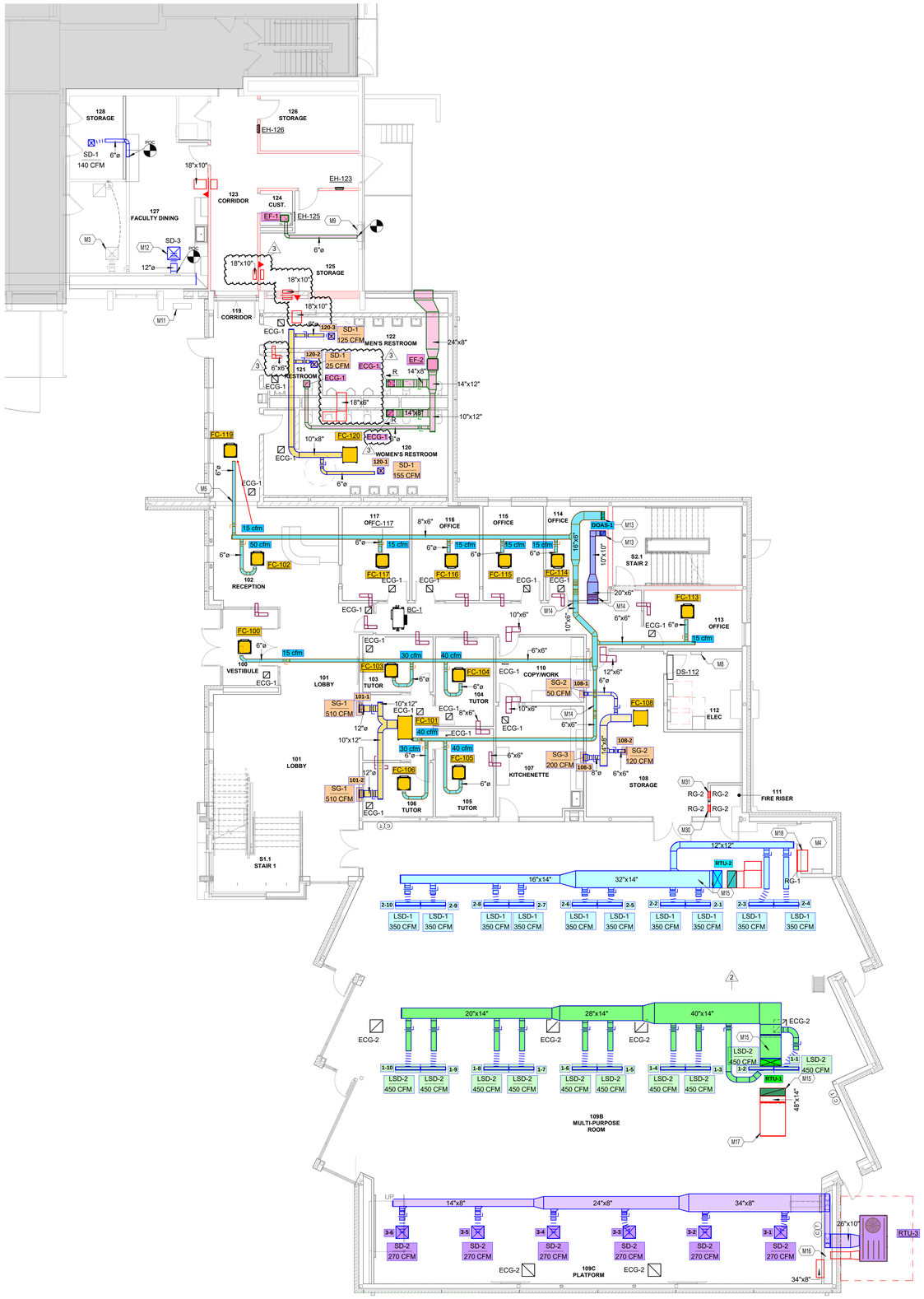
Priority : High

Asset Tag :

Originated Date : 12/20/2024 - Jordan Best - National TAB

Project Issue File Details

12/20/2024



1 M101 FIRST FLOOR DUCTWORK PLAN

1/8" = 1'-0"

DUCT PLAN GENERAL NOTES:

A. DUCTS SERVING DIFFUSERS AND GRILLES ARE TO BE THE SAME SIZE AS DIFFUSER NECK SIZE OR GRILLE FACE UNLESS NOTED OTHERWISE.
B. AIR TRANSFER DUCTS ARE 6" X 6" UNLESS NOTED OTHERWISE. CONTRACTOR TO PROVIDE ADDITIONAL TRANSFER OPENINGS ABOVE CEILING AS NEEDED FOR AIR RETURN.
C. DO NOT ROUTE DUCTWORK OVER ELECTRICAL EQUIPMENT.
D. PROVIDE VOLUME CONTROL DAMPERS IN RUN-OUT DUCT TO ALL SUPPLY AIR DEVICES.

KEYNOTES

M3 EXISTING ACUTHERM VAV DIFFUSER TO REMAIN.

M4 RETURN AIR THROUGH ROOM #129

M5 COORDINATE THE EXACT LOCATION OF WALL PENETRATION WITH STRUCTURAL.

M8 VRF TEMPERATURE CONTROL PANEL REQUIRING 120 V POWER.

M9 BLANK OFF UNUSED PORTION OF EXISTING LOUVER WITH INSULATED SHEET METAL.

M11 RETURN CONDENSING UNIT TO THIS LOCATION. RECONNECT ALL PIPING, ELECTRICAL, AND CONTROLS AS REQUIRED AND RE-SUPPORT. SALVAGE ALL REFRIGERANT.

M12 EXISTING CFM TO REMAIN.

M13 DUCT UP TO ABOVE.

M14 OFFSET DUCT UNDER STEEL.

M15 DUCT UP TO UNIT ON ROOF ABOVE.

M16 CAVITY TO SERVE AS RETURN AIR PATH.

M17 EXTEND LINED RETURN AIR DUCT AS SHOWN TO REDUCE NOISE.

M18 INSTALL BOTTOM OF GRILLE AT 12" AFF.

M30 LOW THROUGH-WALL TRANSFER.

M31 HIGH THROUGH-WALL TRANSFER.

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DAVID HAMMITT
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ADDITION AND RENOVATION
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ISSUANCES

	12-09-22	SCHEMATIC DESIGN
	03-24-23	DESIGN DEVELOPMENT
	06-02-23	90% CD
	06-30-23	PERMIT & BID SET
2	07-21-23	ADDENDUM #2
3	07-28-23	ADDENDUM #3

DUCTWORK PLAN - FIRST FLOOR

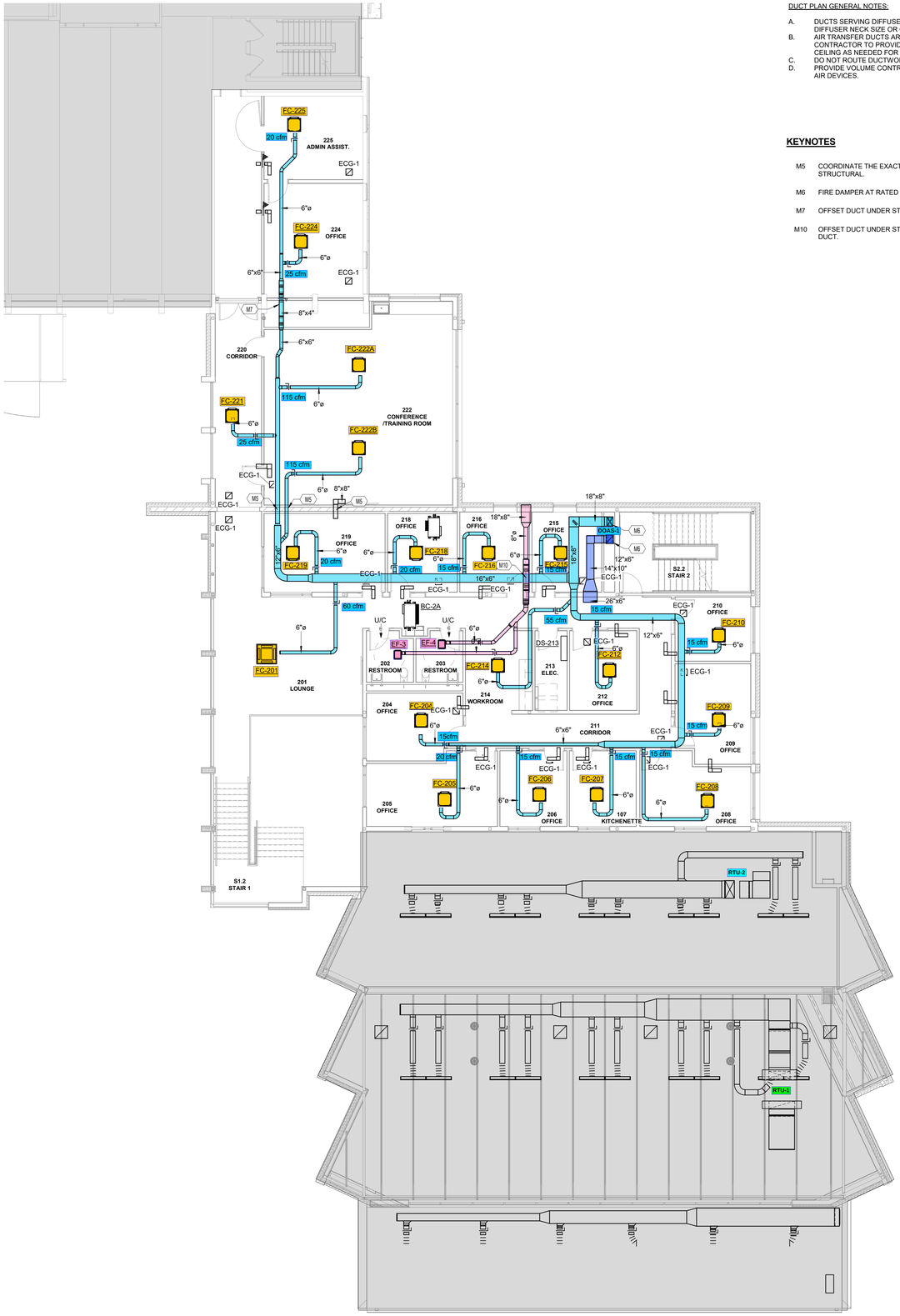
DATE 7/14/2023

COMM NO. 2022099.01

M101

"0.1" REFERENCE LINE"

2 M102 SECOND FLOOR RENO DUCTWORK PLAN
1/8" = 1'-0"



1 M102 SECOND FLOOR DUCTWORK PLAN
1/8" = 1'-0"

DUCT PLAN GENERAL NOTES:

A. DUCTS SERVING DIFFUSERS AND GRILLES ARE TO BE THE SAME SIZE AS DIFFUSER NECK SIZE OR GRILLE FACE UNLESS NOTED OTHERWISE.
B. AIR TRANSFER DUCTS ARE 6" X 6" UNLESS NOTED OTHERWISE. CONTRACTOR TO PROVIDE ADDITIONAL TRANSFER OPENINGS ABOVE CEILING AS NEEDED FOR AIR RETURN.
C. DO NOT ROUTE DUCTWORK OVER ELECTRICAL EQUIPMENT.
D. PROVIDE VOLUME CONTROL DAMPERS IN RUN-OUT DUCT TO ALL SUPPLY AIR DEVICES.

KEYNOTES

M5 COORDINATE THE EXACT LOCATION OF WALL PENETRATION WITH STRUCTURAL.

M6 FIRE DAMPER AT RATED DECK BELOW. ACCESSIBLE FROM THIS LEVEL.

M7 OFFSET DUCT UNDER STRUCTURE.

M10 OFFSET DUCT UNDER STRUCTURE AND OVER SUPPLY OUTSIDE AIR DUCT.

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ISSUANCES

12-09-22	SCHEMATIC DESIGN
03-24-23	DESIGN DEVELOPMENT
06-02-23	90% CD
06-30-23	PERMIT & BID SET

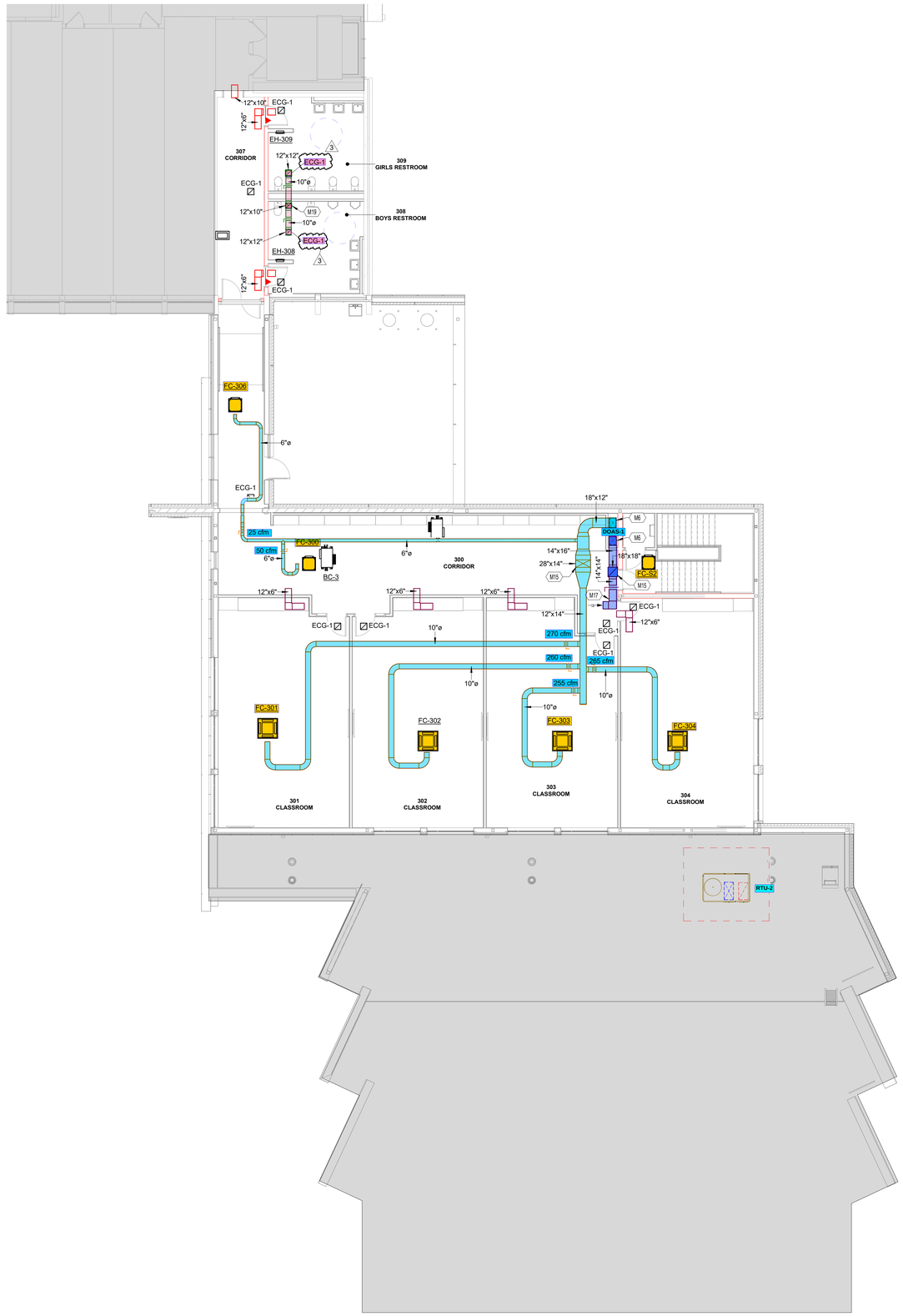
DUCTWORK PLAN - SECOND FLOOR

DATE 6/30/2023

COMM NO. 2022099.01

M102

"0-1" REFERENCE LINE"



1 M103 THIRD FLOOR DUCTWORK PLAN

1/8" = 1'-0"

0'-1" REFERENCE LINE

DUCT PLAN GENERAL NOTES:

A. DUCTS SERVING DIFFUSERS AND GRILLES ARE TO BE THE SAME SIZE AS DIFFUSER NECK SIZE OR GRILLE FACE UNLESS NOTED OTHERWISE.
B. AIR TRANSFER DUCTS ARE 6" X 6" UNLESS NOTED OTHERWISE. CONTRACTOR TO PROVIDE ADDITIONAL TRANSFER OPENINGS ABOVE CEILING AS NEEDED FOR AIR RETURN.
C. DO NOT ROUTE DUCTWORK OVER ELECTRICAL EQUIPMENT.
D. PROVIDE VOLUME CONTROL DAMPERS IN RUN-OUT DUCT TO ALL SUPPLY AIR DEVICES.

KEYNOTES

M6 FIRE DAMPER AT RATED DECK BELOW. ACCESSIBLE FROM THIS LEVEL.

M15 DUCT UP TO UNIT ON ROOF ABOVE.

M17 EXTEND LINED RETURN AIR DUCT AS SHOWN TO REDUCE NOISE.

M19 ROUTE DUCT UP TO FAN ON ROOF ABOVE.

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ADDITION AND RENOVATION
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ISSUANCES

	12-09-22	SCHEMATIC DESIGN
	03-24-23	DESIGN DEVELOPMENT
	06-02-23	90% CD
	06-30-23	PERMIT & BID SET
3	07-28-23	ADDENDUM #3

DUCTWORK PLAN - THIRD FLOOR

DATE 7/14/2023

COMM NO. 2022099.01

M103

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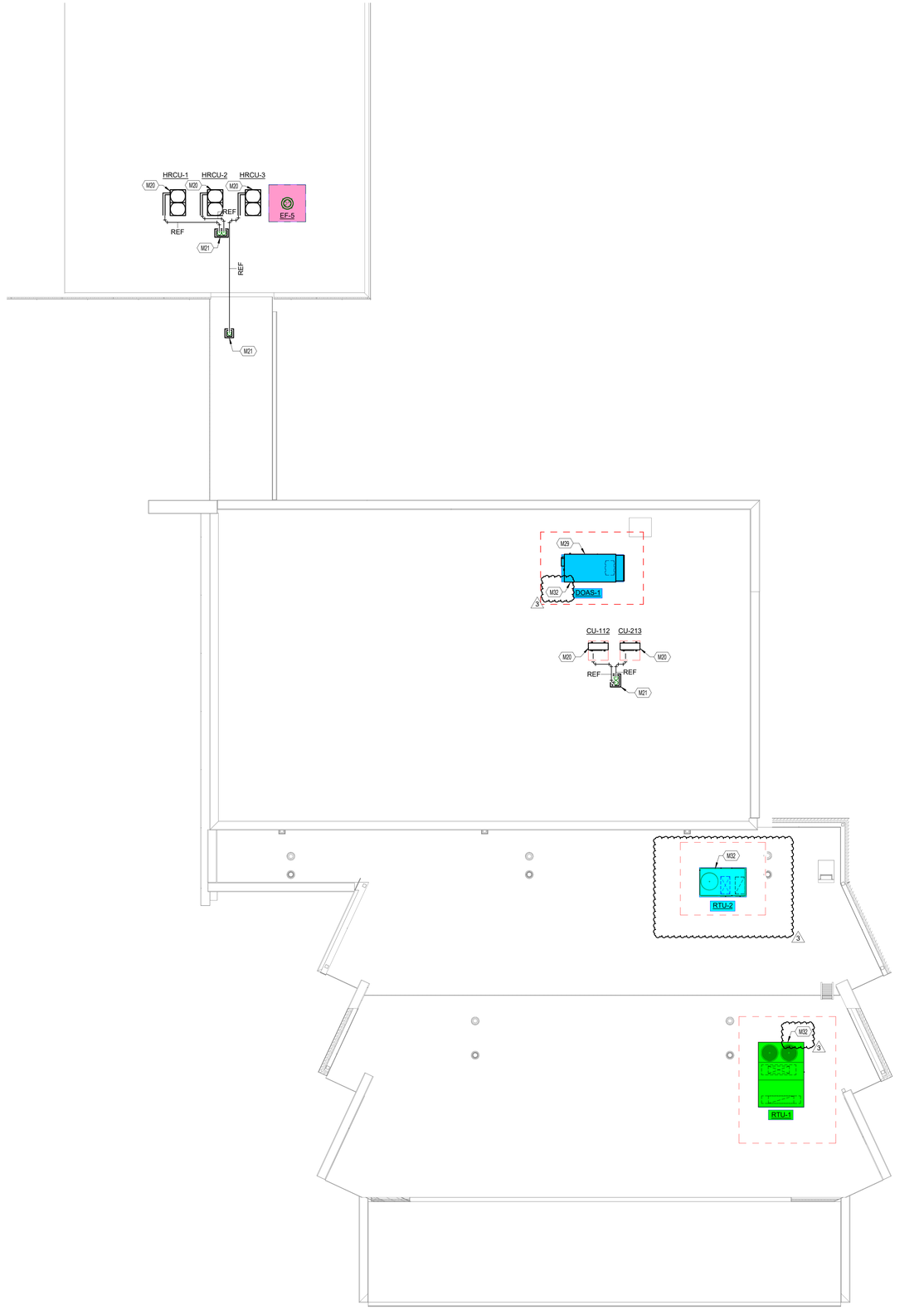

1 M104 ROOF MECHANICAL PLAN
1/8" = 1'-0"

GENERAL NOTES:

A. VRF LINESET ROUTES ARE SCHEMATIC IN NATURE.
B. VRF REFRIGERANT PIPING AND CONDENSATE SHALL BE CONCEALED THROUGHOUT WITHIN NEW STUD WALLS, RACEWAY CHANNELS, OR ABOVE CEILINGS. PIPING EXPOSED TO VIEW IS NOT PERMITTED.
C. DO NOT ROUTE PIPING OVER ELECTRICAL EQUIPMENT.
D. CONDENSATE PIPING IS 1" UNLESS NOTED OTHERWISE.
E. INSULATE CAPPED EXISTING PIPING PER SPECIFICATIONS.

KEYNOTES

M20 INSTALL CONDENSING UNIT ON MOUNTING SUPPORTS PER DETAIL 5/M002.

M21 ROUTE PIPING DOWN WITHIN PIPING CURB.

M29 INSTALL UNIT ON VIBRATION ISOLATION RAIL EQUAL TO KINETICS KSR 2.0. ISOLATION RAIL TO BE INSTALLED ON ROOF CURB.

M32 COORDINATE WITH ARCHITECT AND STRUCTURAL ENGINEER FOR PRECISE LOCATION OF ROOF-MOUNTED HVAC EQUIPMENT. VERIFY COORDINATION WITH STRUCTURAL STEEL BELOW AND ROOF INSULATION. IF NOT BASIS-OF-DESIGN EQUIPMENT IS PURCHASED, ANY ADDITIONAL SCOPE REQUIRED FOR COORDINATION IS THE RESPONSIBILTY OF THE CONTRACTOR. 3

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ISSUANCES

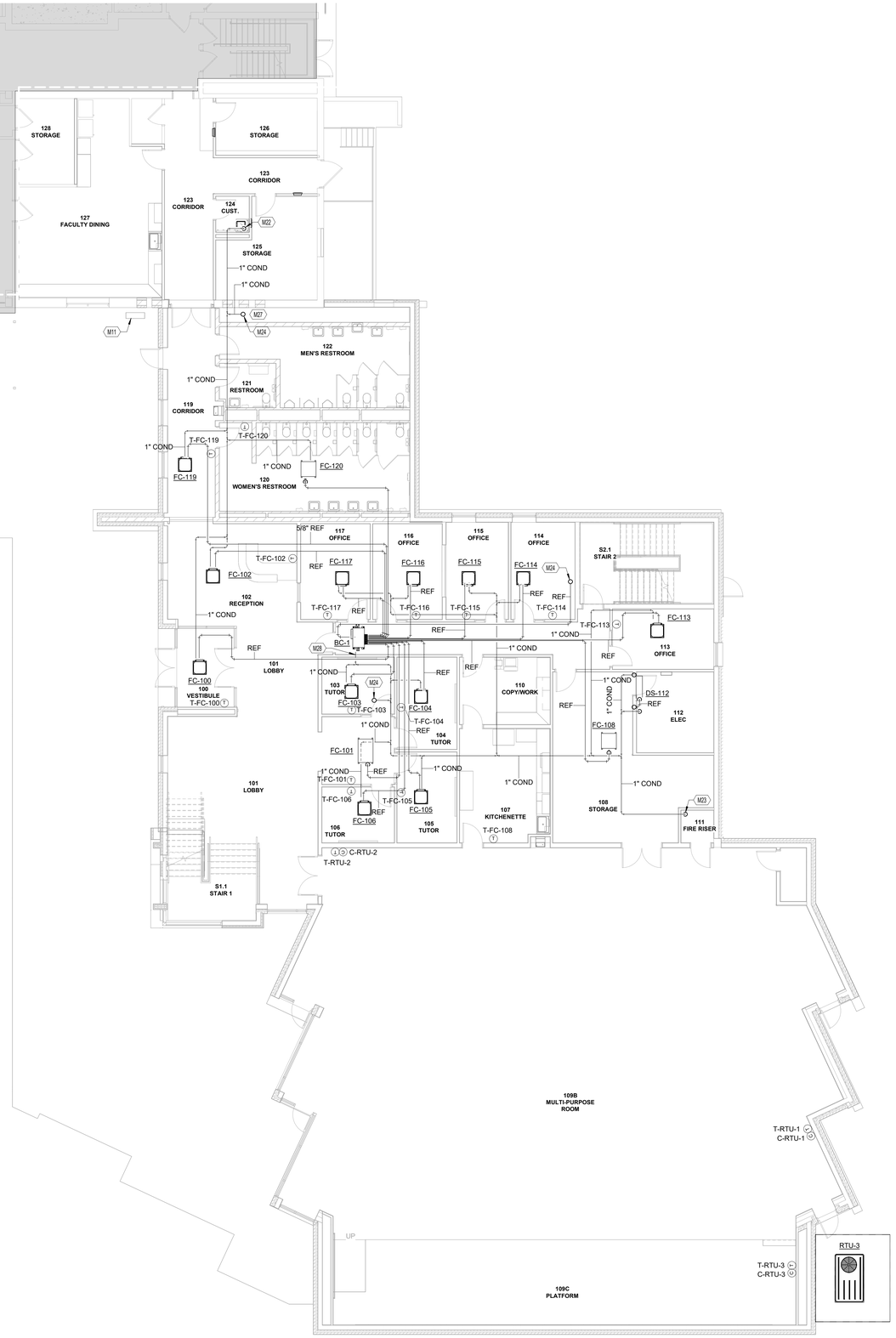
	12-09-22	SCHEMATIC DESIGN
	03-24-23	DESIGN DEVELOPMENT
	06-02-23	90% CD
	06-30-23	PERMIT & BID SET
3	07-28-23	ADDENDUM #3

ROOF MECHANICAL PLAN

DATE 7/14/2023
COMM NO. 2022099.01

M104

0"-1" REFERENCE LINE



1 M201 FIRST FLOOR MECHANICAL PIPING PLAN
1/8" = 1'-0"

GENERAL NOTES:

A. VRF LINESET ROUTES ARE SCHEMATIC IN NATURE.
B. VRF REFRIGERANT PIPING AND CONDENSATE SHALL BE CONCEALED THROUGHOUT WITHIN NEW STUD WALLS, RACEWAY CHANNELS, OR ABOVE CEILINGS. PIPING EXPOSED TO VIEW IS NOT PERMITTED.
C. DO NOT ROUTE PIPING OVER ELECTRICAL EQUIPMENT.
D. CONDENSATE PIPING IS 1" UNLESS NOTED OTHERWISE.
E. INSULATE CAPPED EXISTING PIPING PER SPECIFICATIONS.

KEYNOTES

M11 RETURN CONDENSING UNIT TO THIS LOCATION. RECONNECT ALL PIPING, ELECTRICAL, AND CONTROLS AS REQUIRED AND RE-SUPPORT. SALVAGE ALL REFRIGERANT.

M22 DISCHARGE CONDENSATE INTO MOP BASIN.

M23 DISCHARGE CONDENSATE INTO FLOOR DRAIN.

M24 PIPING UP TO ABOVE.

M27 OFFSET PIPING IN THIS AREA AS REQUIRED TO AVOID EXISTING FINS AND TO MINIMIZE PENETRATIONS OF EXISTING STRUCTURE.

M28 PROVIDE CONDENSATE PIPE FROM BC BOX AS REQUIRED BY MANUFACTURER.

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ADDITION AND RENOVATION
SPRINGER SCHOOL
2121 Madison Rd, Cincinnati, OH 45208

ISSUANCES

12-09-22	SCHEMATIC DESIGN
03-24-23	DESIGN DEVELOPMENT
06-02-23	90% CD
06-30-23	PERMIT & BID SET

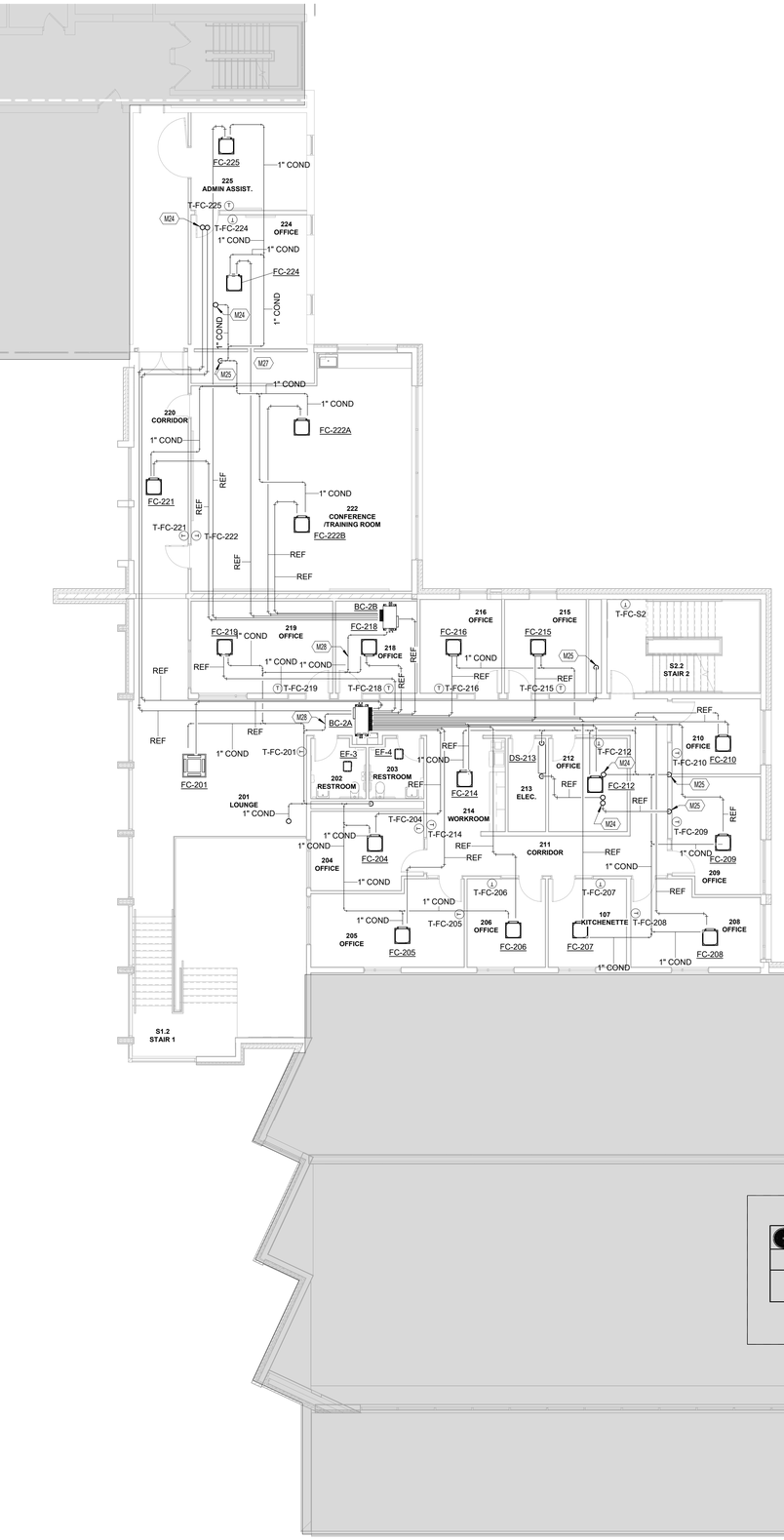
HVAC PIPING PLAN - FIRST FLOOR

DATE 6/30/2023

COMM NO. 2022099.01

M201

"0-1" REFERENCE LINE"



GENERAL NOTES:

A. VRF LINESET ROUTES ARE SCHEMATIC IN NATURE.
B. VRF REFRIGERANT PIPING AND CONDENSATE SHALL BE CONCEALED THROUGHOUT WITHIN NEW STUD WALLS, RACEWAY CHANNELS, OR ABOVE CEILINGS. PIPING EXPOSED TO VIEW IS NOT PERMITTED.
C. DO NOT ROUTE PIPING OVER ELECTRICAL EQUIPMENT.
D. CONDENSATE PIPING IS 1" UNLESS NOTED OTHERWISE.
E. INSULATE CAPPED EXISTING PIPING PER SPECIFICATIONS.

KEYNOTES

M24 PIPING UP TO ABOVE.

M25 PIPING DOWN TO BELOW.

M27 OFFSET PIPING IN THIS AREA AS REQUIRED TO AVOID EXISTING FINS AND TO MINIMIZE PENETRATIONS OF EXISTING STRUCTURE.

M28 PROVIDE CONDENSATE PIPE FROM BC BOX AS REQUIRED BY MANUFACTURER.

1 M202 SECOND FLOOR FLOOR MECHANICAL PIPING PLAN
1/8" = 1'-0"

0.1" REFERENCE LINE

STATE OF OHIO
DAVID HAMMITT
89408
REGISTERED
PROFESSIONAL ENGINEER

SHP
312 Plum St., Ste 700 | 1086 North 4th St., Ste 111 | 223 Fairfield Ave., Ste 100
Cincinnati, OH 45202 | Columbus, OH 43201 | Bellevue, KY 41073
513.381.2112 | 614.223.2124 | 859.360.1234

ADDITION AND RENOVATION
SPRINGER SCHOOL
2121 Madison Rd, Cincinnati, OH 45208

ISSUANCES

12-09-22	SCHEMATIC DESIGN
03-24-23	DESIGN DEVELOPMENT
06-02-23	90% CD
06-30-23	PERMIT & BID SET

HVAC PIPING PLAN - SECOND FLOOR

DATE 6/30/2023

COMM NO. 2022099.01

M202

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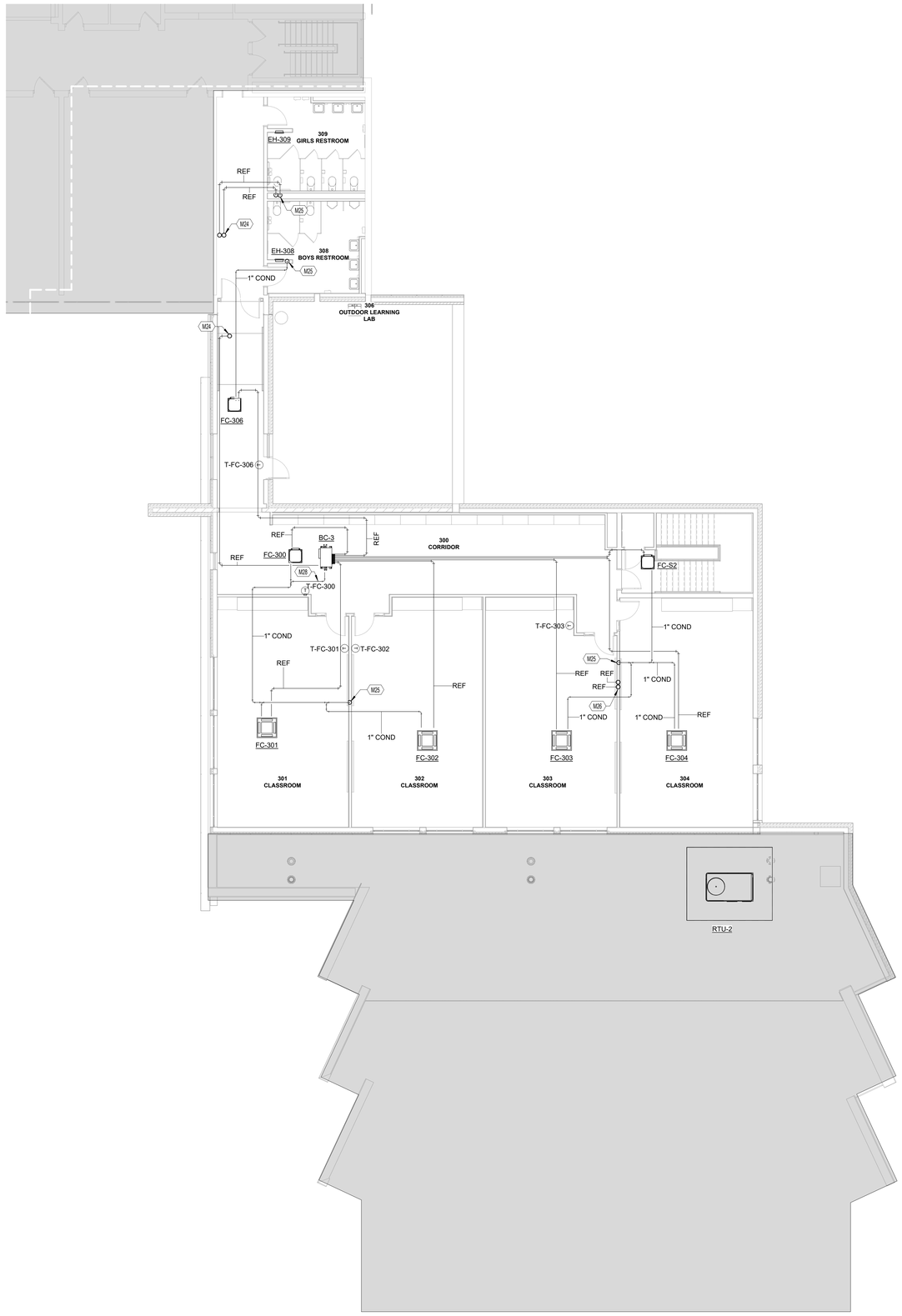

GENERAL NOTES:

A. VRF LINESET ROUTES ARE SCHEMATIC IN NATURE.
B. VRF REFRIGERANT PIPING AND CONDENSATE SHALL BE CONCEALED THROUGHOUT WITHIN NEW STUD WALLS, RACEWAY CHANNELS, OR ABOVE CEILINGS. PIPING EXPOSED TO VIEW IS NOT PERMITTED.
C. DO NOT ROUTE PIPING OVER ELECTRICAL EQUIPMENT.
D. CONDENSATE PIPING IS 1" UNLESS NOTED OTHERWISE.
E. INSULATE CAPPED EXISTING PIPING PER SPECIFICATIONS.

KEYNOTES

M24 PIPING UP TO ABOVE.

M25 PIPING DOWN TO BELOW.

M26 PIPING UP AND DOWN.

M28 PROVIDE CONDENSATE PIPE FROM BC BOX AS REQUIRED BY MANUFACTURER.

1 M203 THIRD FLOOR MECHANICAL PIPING PLAN
1/8" = 1'-0"

"0-1" REFERENCE LINE"

STATE OF OHIO
DAVID HAMMITT
69408
REGISTERED
PROFESSIONAL ENGINEER

SHP
312 Plum St., Ste 700
Cincinnati, OH 45202
513.381.2112
1086 North 4th St., Ste 111
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614.223.2124
223 Fairfield Ave., Ste 100
Bellevue, KY 41073
859.360.1234

ADDITION AND RENOVATION
SPRINGER SCHOOL
2121 Madison Rd, Cincinnati, OH 45208

ISSUANCES

12-09-22	SCHEMATIC DESIGN
03-24-23	DESIGN DEVELOPMENT
06-02-23	90% CD
06-30-23	PERMIT & BID SET

HVAC PIPING PLAN - THIRD FLOOR

DATE 6/30/2023

COMM NO. 2022099.01

M203

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National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: AHU/RTU

Asset: RTU-1 AREA:109B

Unit Data		
	Design	**Actual**
MFG	NA	TRANE
Serial Num	-	241610927D
Model Num	NA	YZJ180A3SAH02K2C0A1A
Configuration	VERTICAL	VERTICAL
Num OA Filters 1	-	1
OA Filter Size 1	-	72”X18
Num PreFilter 1	-	8
PreFilter Size 1	-	20"X30"X2" / 20"X24"X2"

Motor Data		
	Design	**Actual**
Horsepower	-	3
Phase	3	3
Rated Voltage	208	208
Rated Amperage	-	8.8

Test Data		
	Design	**Actual**
SF CFM	4500	4487
RA CFM	2500	2411
OA CFM	2000	2076
RL Voltage	208	209.5/-209.8/210.5
RL Amperage	-	5.15/7.38/8.84
OA Damper Position	-	25%
Brake Horse Power	-	2.42

Performance Data		
	Design	**Actual**
MA Plenum SP	-	-0.48”
Fan Suction SP	-	-0.67”
Fan Discharge SP	-	0.70”
Total ESP	1.66	1.18"
Fan Total SP	-	1.37"

Completed By: Jordan Best on 12/20/2024

Notes:
. Unit is equipped with 2 fan motors.

Written By: Jordan Best on 12/19/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

AHU/RTU

Diffuser Supply (GRD)

RTU-1/109B

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	109B	LSD-2	10	450	223	428	95.1
SGRD2	109B	LSD-2	10	450	454	421	93.6
SGRD3	109B	LSD-2	10	450	522	461	102.4
SGRD4	109B	LSD-2	10	450	372	409	90.9
SGRD5	109B	LSD-2	10	450	406	415	92.2
SGRD6	109B	LSD-2	10	450	401	411	91.3
SGRD7	109B	LSD-2	10	450	517	478	106.2
SGRD8	109B	LSD-2	10	450	599	489	108.7
SGRD9	109B	LSD-2	10	450	586	492	109.3
SGRD10	109B	LSD-2	10	450	531	483	107.3
Total				4500	4611	4487	99.71%

Completed By: Jordan Best on 12/20/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: AHU/RTU

Asset: RTU-2 AREA:109B

Unit Data		
	Design	**Actual**
MFG	NA	TRANE
Serial Num	-	241510959L
Model Num	NA	YHJ120A3SAH05KC2C0A1A
Configuration	VERTICAL	VERTICAL
Num OA Filters 1	-	1
OA Filter Size 1	-	38"x25"
Num PreFilter 1	-	6
PreFilter Size 1	-	16"X24"X2"

Motor Data		
	Design	**Actual**
Horsepower	-	3
Phase	3	3
Rated Voltage	208	208
Rated Amperage	-	8.8

Test Data		
	Design	**Actual**
SF CFM	3500	3410
RA CFM	2450	2397
OA CFM	1050	1013
RL Voltage	208	209/210.3/209.8
RL Amperage	-	7.86/7.02/7.62
OA Damper Position	-	OA SET MANUALLY
Brake Horse Power	-	2.55

Performance Data		
	Design	**Actual**
MA Plenum SP	-	-0.48”
Fan Suction SP	-	-0.94”
Fan Discharge SP	-	0.62”
Total ESP	1.71	1.1"
Fan Total SP	-	1.56"

Completed By: Jordan Best on 12/20/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

AHU/RTU

Diffuser Supply (GRD)

RTU-2/109B

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	109B	LSD-1	10	350	336	322	92.0
SGRD2	109B	LSD-1	10	350	318	333	95.1
SGRD3	109B	LSD-1	10	350	240	317	90.6
SGRD4	109B	LSD-1	10	350	416	381	108.9
SGRD5	109B	LSD-1	10	350	363	354	101.1
SGRD6	109B	LSD-1	10	350	336	342	97.7
SGRD7	109B	LSD-1	10	350	316	321	91.7
SGRD8	109B	LSD-1	10	350	351	343	98.0
SGRD9	109B	LSD-1	10	350	322	336	96.0
SGRD10	109B	LSD-1	10	350	373	361	103.1
Total				3500	3371	3410	97.43%

Completed By: Jordan Best on 12/20/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: AHU/RTU

Asset: RTU-3 AREA:109C

Unit Data		
	Design	**Actual**
MFG	NA	TRANE
Serial Num	-	240512448L
Model Num	NA	YZC060E3RZA2FK6C1A1A
Configuration	HORIZONTAL	HORIZONTAL
Num OA Filters 1	-	1
OA Filter Size 1	-	38”X25”
Num PreFilter 1	-	4
PreFilter Size 1	-	16"X25"X2"

Motor Data		
	Design	**Actual**
Horsepower	-	1
Phase	3	3
Rated Voltage	208	208
Rated Amperage	-	3.3

Test Data		
	Design	**Actual**
SF CFM	1620	1171
RA CFM	920	458
OA CFM	700	713
RL Voltage	208	209.2/209.6/210.2
RL Amperage	-	1.13/1.17/1.15
OA Damper Position	-	5.079 VDC
Brake Horse Power	-	0.40

Performance Data		
	Design	**Actual**
MA Plenum SP	-	-0.026”
Fan Suction SP	-	-0.096”
Fan Discharge SP	-	0.16””
Total ESP	1.00	0.186"
Fan Total SP	-	0.256"

Completed By: Jordan Best on 12/20/2024

Notes:
. Unit VFD displays 0's while fan is running, unit read out in test mode. Suspect VFD has not been set up.
. Unit below design @ highest speed (highest speed may increase after VFD set up)

Written By: Jordan Best on 12/20/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

AHU/RTU

Diffuser Supply (GRD)

RTU-3/109C

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	109C	SD-2	8	270	170	170	63.0
SGRD2	109C	SD-2	8	270	226	226	83.7
SGRD3	109C	SD-2	8	270	219	219	81.1
SGRD4	109C	SD-2	8	270	175	175	64.8
SGRD5	109C	SD-2	8	270	198	198	73.3
SGRD6	109C	SD-2	8	270	183	183	67.8
Total				1620	1171	1171	72.28%

Completed By: Jordan Best on 12/20/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: AHU-DUAL FAN

Asset: DOAS-1 AREA:

UNIT DATA - SUPPLY		
	Design	**Actual**
Manufacturer	NA	TRANE
Model Number	NA	OABD108A3-C1B401KM
Serial Number	-	OA359283-1-1
No. Pre-Filters / Size (1)	-	2/20"X24"X2"
No. Pre-Filters / Size (2)	-	2/20"X24"X2"
No. Pre-Filters / Size (3)	-	2/20"X24"X2"

UNIT DATA - EXHAUST/RETURN		
	Design	**Actual**
Manufacturer	-	TRANE
Model Number	-	OABD108A3-C1B401KM
Serial Number	-	OA359283-1-1
No. Pre-Filters / Size (1)	-	2/20"X24"X2"
No. Pre-Filters / Size (2)	-	2/20"X24"X2"
No. Pre-Filters / Size (3)	-	2/20"X24"X2"

MOTOR DATA - SUPPLY	
	Actual
Motor MFG / Frame	MARATHON/145T
Horsepower / RPM	3/3500
Rated Volts / Phase	208/3
Rated Amperage / SF	7.2/1.15

MOTOR DATA - EXHAUST/RETURN	
	Actual
Motor MFG / FRAME	MARATHON/145T
Horsepower / RPM	1-1/2/1750
Rated Volts / Phase	208/3
Rated Amperage / SF	4.8/1.15

TEST DATA - SUPPLY		
	Design	**Actual**
Total CFM	2150	1827
Fan RPM	-	2849
VFD Speed	-	48.85 HZ
RL Voltage	-	209.3/208.9/210.4
RL Amperage	-	7.2
Motor B.H.P.	-	3

TEST DATA - EXHAUST/RETURN		
	Design	**Actual**
Total CFM	2000	1995
Fan RPM	-	1516
VFD Speed	-	52 HZ
RL Voltage	-	210.7/209.3/211/3
RL Amperage	-	2.35
Motor B.H.P.	-	0.48

PERFORMANCE DATA - SUPPLY		
	Design	**Actual**
Suction S.P.	-	-1.24”
Discharge S.P.	-	0.40”
Total ESP	1.25	1.44”

PERFORMANCE DATA - EXHAUST/RETURN		
	Design	**Actual**
Suction S.P.	-	-0.60”
Total S.P.	-	0.60"
Heat Wheel P.D.	-	0.14”
Pre-Filters P.D.	-	0.16”

Completed By: Jordan Best on 12/20/2024

Notes:
. Amps read from VFD
. Unit was overamping when originally read, decreased set point to satisfy FLA, which left supply slightly under design.

Written By: Jordan Best on 12/20/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

AHU-DUAL FAN

Diffuser Supply (GRD)

DOAS-1/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
FC-100	100	DUCT	6	15	373	55	366.7
FC-101	101	DUCT	6	40		61	152.5
FC-102	102	DUCT	6	50		45	90.0
FC-103	103	DUCT	6	30		28	93.3
FC-104	104	DUCT	6	40		30	75.0
FC-105	105	DUCT	6	40		32	80.0
FC-106	106	DUCT	6	30		26	86.7
FC-113	113	DUCT	6	15		13	86.7
FC-114	114	DUCT	6	15		11	73.3
FC-115	115	DUCT	6	15		13	86.7
FC-116	116	DUCT	6	15		12	80.0
FC-117	117	DUCT	6	15		14	93.3
FC-119	119	DUCT	6	15		14	93.3
FC-201	201	DUCT	6	60	531		-
FC-204	204	DUCT	6	15		98	653.3
FC-205	205	DUCT	6	20		13	65.0
FC-206	206	DUCT	6	15		11	73.3
FC-207	207	DUCT	6	15		18	120.0
FC-208	208	DUCT	6	15		17	113.3
FC-209	209	DUCT	6	15		15	100.0
FC-210	210	DUCT	6	15		12	80.0
FC-212	212	DUCT	6	15		81	540.0
FC-214	214	DUCT	6	55		46	83.6
FC-215	215	DUCT	6	15		14	93.3
FC-216	216	DUCT	6	15		13	86.7
FC-218	218	DUCT	6	20		18	90.0
FC-219	219	DUCT	6	20		18	90.0
FC-221	220	DUCT	6	25		19	76.0
FC-224	224	DUCT	6	25		18	72.0
FC-225	225	DUCT	6	20		57	285.0
FC-300	300	DUCT	6	50	982	43	86.0
FC-301	301	DUCT	10	270		197	73.0
FC-302	302	DUCT	10	260		199	76.5
FC-303	303	DUCT	10	255		210	82.4
FC-304	304	DUCT	10	265		222	83.8
FC-306	300	DUCT	6	25			-
FC-222A 1	222A	DUCT	6	115		68	59.1
FC-222B 1	222B	DUCT	6	115		66	57.4
Total				2070	1886	1827	88.26%

Completed By: Jordan Best on 12/20/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: Fan Coil

Asset: FC-101 AREA:LOBBY HALL

Unit Data		
	Design	**Actual**
MFG	NA	TRANE
Model Num	NA	TPEFYP030MA144A
Serial Num	-	3ZR0216830P912
Configuration	-	HORIZONTAL

Motor Data		
	Design	**Actual**
Horsepower	-	0.162
Phase	1	1
Voltage (rated)	208	208
Amperage (rated)	-	2.03

Test Data		
	Design	**Actual**
SFAN CFM	1020	771
Motor Speed SetPt	-	4/4
RL Voltage	208	209.7
RL Amperage	-	2.03
RA CFM	980	771
OA CFM	40	0

Performance Data		
	Design	**Actual**
Suction ESP	-	-0.32"
Discharge ESP	-	0.28"
Total ESP	-	0.60"

Completed By: Jordan Best on 12/19/2024

Notes:
. OA is not supplied directly to unit, diffuser supplied by DOAS installed near FCU.
. Unit below design, fan operating at highest speed. Diffusers balanced proportionately.

Written By: Jordan Best on 12/19/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

Fan Coil

Diffuser Supply (GRD)

FC-101/LOBBY HALL

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	100	SG-1	12	510	514	397	77.8
SGRD2	100	SG-1	12	510	315	374	73.3
Total				1020	829	771	75.59%

Completed By: Jordan Best on 12/19/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: Fan Coil

Asset: FC-108 AREA:108

Unit Data		
	Design	**Actual**
MFG	NA	TRANE
Model Num	NA	TPEFYP012MA144A
Serial Num	-	3ZR0617530P90W
Configuration	-	HORIZONTAL

Motor Data		
	Design	**Actual**
Horsepower	-	0.114
Phase	1	1
Voltage (rated)	208	208
Amperage (rated)	-	0.89

Test Data		
	Design	**Actual**
SFAN CFM	370	396
Motor Speed SetPt	-	4/4
RL Voltage	208	209.7
RL Amperage	-	0.81
RA CFM	370	396
OA CFM	0	0

Performance Data		
	Design	**Actual**
Suction ESP	-	-0.14"
Discharge ESP	-	0.20"
Total ESP	-	0.34"

Completed By: Jordan Best on 12/19/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

Fan Coil

Diffuser Supply (GRD)

FC-108/108

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	110	SG-2	6	50	77	52	104.0
SGRD2	108	SG-2	6	120	93	125	104.2
SGRD3	107	SG-3	8	200	188	219	109.5
Total				370	358	396	107.03%

Completed By: Jordan Best on 12/19/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: Fan Coil

Asset: FC-120 AREA:120

Unit Data		
	Design	**Actual**
MFG	NA	TRANE
Model Num	NA	TPEFYP012MA144A
Serial Num	-	3ZR0617730P90W
Configuration	-	HORIZONTAL

Motor Data		
	Design	**Actual**
Horsepower	-	0.114
Phase	1	1
Voltage (rated)	208	208
Amperage (rated)	-	0.89

Test Data		
	Design	**Actual**
SFAN CFM	305	321
Motor Speed SetPt	-	4/4
RL Voltage	208	209.2
RL Amperage	-	0.48
RA CFM	305	321
OA CFM	0	0

Performance Data		
	Design	**Actual**
Suction ESP	-	-0.072"
Discharge ESP	-	0.18"
Total ESP	-	0.25"

Completed By: Jordan Best on 12/20/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

Fan Coil

Diffuser Supply (GRD)

FC-120/120

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	120	SD-1	6	155	117	141	91.0
SGRD2	121	SD-1	6	25	138	62	248.0
SGRD3	122	SD-1	6	125	112	118	94.4
Total				305	367	321	105.25%

Completed By: Jordan Best on 12/20/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: FAN - Exhaust

Asset: EF-1 AREA:

Unit Data		
	Design	**Actual**
MFG	NA	GREENHECK
Model Num	NA	SP-B90-QD
Serial Num	-	173888399-0064
Type	CEILING	CEILING

Test Data		
	Design	**Actual**
CFM	50	46
RL Voltage	115	115
RL Amperage	-	0.19

Motor Data		
	Design	**Actual**
Motor MFG	-	GREENHECK
Motor Rpm	688	700
Phase	1	1
Voltage (rated)	115	115
Amperage (rated)	-	0.19

Completed By: Jordan Best on 12/19/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: FAN - Exhaust

Asset: EF-2 AREA:

Unit Data		
	Design	**Actual**
MFG	NA	GREENHECK
Model Num	NA	SQ-120-X
Serial Num	-	23578449
Type	INLINE	INLINE

Test Data		
	Design	**Actual**
CFM	960	798
RL Voltage	115	115
RL Amperage	-	1.83
Total ESP	0.40	0.21"

Completed By: Jordan Best on 12/19/2024

Notes:
. Unit below design, not equipped with speed controller.

Written By: Jordan Best on 12/19/2024

National TAB

Project:Springer School Addition (Cincinnati, OH)

FAN - Exhaust

Diffuser Ret/Exh (GRD)

EF-2/

Asset								
Asset Name	**Type**	**Size**	**DESIGN CFM**	**AK**	**CFM(1)**	**CFM(2)**	**FINAL CFM**	**% to design**
EF-2-EGRD1			60	1	450	63	63	105.0
EF-2-EGRD2			450	1	279	373	373	82.9
EF-2-EGRD3			450	1	76	362	362	80.4
Total			960		805	798	798	83.12%

Completed By: Jordan Best on 12/19/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: FAN - Exhaust

Asset: EF-3 AREA:

Unit Data		
	Design	**Actual**
MFG	NA	GREENHECK
Model Num	NA	SP-B90-QD
Serial Num	-	
Type	CEILING	CEILING

Test Data		
	Design	**Actual**
CFM	50	75
RL Voltage	115	115
RL Amperage	-	0.19

Motor Data		
	Design	**Actual**
Motor MFG	-	GREENHECK
Motor Rpm	688	700
Phase	1	1
Voltage (rated)	115	115
Amperage (rated)	-	0.19

Completed By: Jordan Best on 12/19/2024

Notes:
. Unit above design, not equipped with speed controller, unable to reduce fan speed.

Written By: Jordan Best on 12/19/2024

National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: FAN - Exhaust

Asset: EF-4 AREA:

Unit Data		
	Design	**Actual**
MFG	NA	GREENHECK
Model Num	NA	SP-B90-QD
Serial Num	-	173888399-0069
Type	CEILING	CEILING

Test Data		
	Design	**Actual**
CFM	50	55
RL Voltage	115	115
RL Amperage	-	0.17

Motor Data		
	Design	**Actual**
Motor MFG	-	GREENHECK
Motor Rpm	688	700
Phase	1	1
Voltage (rated)	115	115
Amperage (rated)	-	0.19

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National TAB

Project: Springer School Addition (Cincinnati, OH)

System/Unit: FAN - Exhaust

Asset: EF-5 AREA:

Unit Data		
	Design	**Actual**
MFG	NA	GREENHECK
Model Num	NA	G-090-VG
Serial Num	-	23578481
Type	CRE DNBLAST	CRE DNBLAST

Test Data		
	Design	**Actual**
CFM	560	607
RL Voltage	115	121
RL Amperage	-	1.28
Total ESP	0.40	-0.19"

Motor Data		
	Design	**Actual**
Motor MFG	-	VARI-GREEN
Motor Rpm	1529	1529
Phase	1	1
Voltage (rated)	115	115
Amperage (rated)	-	2.45

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National TAB

Project:Springer School Addition (Cincinnati, OH)

FAN - Exhaust

Diffuser Ret/Exh (GRD)

EF-5/

Asset								
Asset Name	**Type**	**Size**	**DESIGN CFM**	**AK**	**CFM(1)**	**CFM(2)**	**FINAL CFM**	**% to design**
EF-5-EGRD1			280	1	347	305	305	108.9
EF-5-EGRD2			280	1	351	302	302	107.9
Total			560		698	607	607	108.39%

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