Report By:

National TAB
1329 E. KEMPER ROAD
SUITE 4210
CINCINNATI, OH 45246

Report: TAB Report

Function: Test, Adjust, & Balance

Date: 03/14/2025

Completed By: National TAB

PROJECT

Beautiful Savior Lutheran Church (Olathe, KS)

13145 S Black Bob Rd

Olathe, KS 66062

Client

Airtech Mechanical Services

11937 W 119th St

Suite 296

Overland Park, KS 66214

National TAB

Project: Beautiful Savior Lutheran Church (Olathe, KS)

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CERTIFICATION

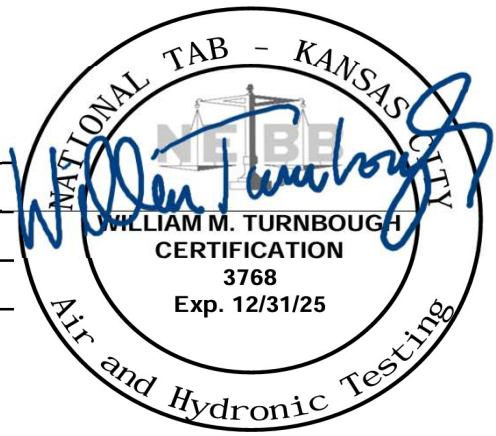
PROJECT: Beautiful Savior (Olathe, KS)

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 NEBB Procedural Standard for Testing, Adjusting and Balancing of Environmental Systems. The measurements shown, and the information given, in this report are certified to be accurate and complete, at the time and date information was gathered. Any variances from design quantities, which exceed NEBB tolerances, are noted in the TAB report project summary.

NEBB TAB FIRM:	National TAB - Kansas City
REGISTRATION NO:	3768
CERTIFIED BY:	Will Turnbough
DATE:	3/18/2025

Submitted and Certified by:

NEBB TAB FIRM:	National TAB - Kansas City
TAB PROFESSIONAL:	Will Turnbough
REGISTRATION NO:	CP-24289
CERTIFICATION EXP:	12/31/2025



Project Summary

The scope of work here is to rebalance four RTU's, all associated FPB's, and all associated air devices. TAB was previously performed in 2023 but since then the RTU's had been moved to another side of the building and the control system was also changed out.

RTU's 1 and 2 are variable systems with Fan Powered Boxes (FPB's) that serve the first floor. To calibrate the FPB's, the FPB dampers were opened up one at a time to full open position. The controls program was too slow to respond to calibrate during max cool. Once max cool was calibrated then the damper was driven to min cool and the airflow was reported. Then the unit was driven to heat and the fan was balanced using the potentiometer.

After all boxes were calibrated, the FPB's were opened to their max open damper position and the RTU's were read out and total flow balanced. The minimum OA damper position was then set for each unit.

RTU's 3 and 4 are constant volume units that serve the second floor. The RTU's were measured by performing a total traverse and then reading the individual grilles with either a flow hood or rotating vane and K factor. The airflow on both RTU's was low. Per the original report, the airflow could not be sped up to design without causing the fan pulleys to fall off the shaft. The RTU's were also designed for a high ratio of outside air. This was reduced to a 25% ratio and was also proportionally reduced to help ensure that there were no performance issues with the equipment.

Remarks

1. RTU-1 outside air damper linkage was broken so the damper had to be set manually. The position was marked with a permanent marker so it can be set there once functional
2. The control software for RTU's 1 and 2 in general was very slow to respond. We were able to work around during TAB to get boxes calibrated. But there is some concern that there could be delays in calls for cooling/heating.
3. FTU-12 and 14 are a low on heating flow with the fan speed maximized.
4. RTU-3 airflow was balanced to 9864 CFM out of design of 12000 CFM. RTU-4 was balanced to 9648 CFM out of 12000 CFM design. Per the original TAB report, the fan speed could not be increased above these limits without causing the fan pulley to fall off. At the time of the original TAB report Daiken was consulted and they said to leave the units low on flow. No performance issues noted with the equipment, but if there are issues due to the low flow recommend consulting Daiken on next steps.

National TAB

Project: Beautiful Savior Lutheran Church (Olathe, KS)

System/Unit: AHU/RTU

Asset: RTU-1 AREA:FIRST FLOOR NORTH

Unit Data		
	Design	**Actual**
MFG	NA	DAIKIN
Serial Num	-	FBOU210201353
Model Num	NA	DPS025AHMG2DV-4
Configuration	HORIZONTAL	HORIZONTAL
Num OA Filters 1	-	3
OA Filter Size 1	-	38X20
Num PreFilter 1	-	9
PreFilter Size 1	-	18X24X2

Motor Data		
	Design	**Actual**
Motor MFG	-	BALD0OR RELIANCE
Frame	-	254T
Horsepower	15	15
Motor Rpm	-	1765
Phase	3	3
Rated Voltage	208	200
Rated Amperage	40.7	41
Service Factor	-	1.15

Test Data		
	Design	**Actual**
SF CFM	8500	8622
SF RPM	1763	1468
RA CFM	5500	5824
OA CFM	3000	2798
RL Voltage	208	176
RL Amperage	40.7	23.9
OA Damper Position	-	[1]
Brake Horse Power	-	5.5

Performance Data		
	Design	**Actual**
MA Plenum SP	-	-0.70"
Fan Suction SP	-	-0.84"
Fan Discharge SP	-	1.93"
Total ESP	3"	2.63"
Fan Total SP	4.9"	2.77"
Cooling Coil P.D.	-	0.14"

Completed By: Tyler Youells on 03/14/2025

Notes:
[1] OA DAMPER LINKAGE BROKEN SET AND MARKED OA POSTION MANUALLY
[2] SF SETPOINT 1.7"
[3] TOTAL FLOW TESTED VIA TRAVERSE WITH ALL VAVS 100% OPEN DUE TO LIMITATIONS IN THE CONTROLS SOFTWARE.

Written By: Tyler Youells on 03/14/2025

Unit Data - PHOTO LOG

03/11/2025

03/11/2025

03/11/2025

VAV-Fan Powered Box

RTU-1/FIRST FLOOR NORTH

Asset												
Asset Name	MFG	Model Num	Service	Type	Inlet Size	Design Max Cool CFM	Max Cool CFM	Design Min Cool CFM	Min Cool CFM	Design Fan CFM (Heat)	Fan CFM (Heat)	Ak (max)
FTU-10	DAIKIN	MQFV15	131	FP-VAV	6	400	386	125	123	250	248	2.66
FTU-11	DAIKIN	MQFV15	130	FP-VAV	6	450	437	150	158	275	278	2.2
FTU-12	DAIKIN	MQFV15	111	FP-VAV	10	1050	1001	325	333	650	518	1.98
FTU-13	DAIKIN	MQFV15	112	FP-VAV	8	850	851	275	282	525	527	1.75
FTU-14	DAIKIN	MQFV15	113	FP-VAV	10	1050	1047	325	331	650	548	1.91
FTU-15	DAIKIN	MQFV15	115	FP-VAV	12	1300	1334	400	420	800	812	1.55
FTU-16	DAIKIN	MQFV15	YOUTH RM	FP-VAV	12	1700	1688	525	538	1050	1100	1.92
FTU-17	DAIKIN	MQFV15	YOUTH RM	FP-VAV	12	1700	1757	525	545	1050	1021	1.76

Diffuser Supply (GRD)

FTU-10/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	CORR	CSD-1	6	75	83	74	98.7
SGRD3	122	CSD-1	8	100	122	93	93.0
SGRD3	133	CSD-1	8	225	199	219	97.3
Total				400	404	386	96.5%

FTU-11/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	119	CSD-1	6	50	49	53	106.0
SGRD3	121	CSD-1	8	200	174	188	94.0
SGRD3	120	CSD-1	8	200	233	196	98.0
Total				450	456	437	97.11%

FTU-12/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	123	CSD-1	8	215	183	196	91.2
SGRD3	123	CSD-1	8	215	244	205	95.3
SGRD3	109	CSD-1	8	150		147	98.0
SGRD4	124	CSD-1	10	235	225	212	90.2
SGRD5	124	CSD-1	10	235	213	241	102.6
Total				1050	865	1001	95.33%

FTU-13/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	125	CSD-1	8	200	175	210	105.0
SGRD3	125	CSD-1	8	225	231	221	98.2
SGRD3	125	CSD-1	8	200	234	209	104.5
SGRD4	125	CSD-1	8	225	174	211	93.8
Total				850	814	851	100.12%

FTU-14/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	109	CSD-1	8	215	229	225	104.7
SGRD3	127	CSD-1	10	150	154	156	104.0
SGRD3	127	CSD-1	10	215	212	204	94.9
SGRD4	127	CSD-1	10	235	313	232	98.7
SGRD5	127	CSD-1	10	235	274	230	97.9
Total				1050	1182	1047	99.71%

FTU-15/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	129	CSD-1	8	200	205	205	102.5
SGRD3	134	CSD-1	6	50	52	52	104.0
SGRD3	129	CSD-1	8	200	209	209	104.5
SGRD4	129	CSD-1	8	200	201	201	100.5
SGRD5	129	CSD-1	8	200	211	211	105.5
SGRD6	129	CSD-1	8	200	211	211	105.5
SGRD7	129	CSD-1	8	200	194	194	97.0
SGRD8	135	CSD-1	6	50	51	51	102.0
Total				1300	1334	1334	102.62%

FTU-16/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	108	CSD-1	8	200	348	279	139.5
SGRD2	108	CSD-1	8	200	195	191	95.5
SGRD3	108	CSD-1	10	300	206	204	68.0
SGRD4	109	CSD-1	8	100	112	107	107.0
SGRD5	108	CSD-1	10	300	193	299	99.7
SGRD6	108	CSD-1	10	250	264	249	99.6
SGRD7	108	CSD-1	10	250	274	258	103.2
SGRD8	130	WSD-2	8X8	100	128	101	101.0
Total				1700	1720	1688	99.29%

FTU-17/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	108	CSD-1	10	275	315	281	102.2
SGRD3	108	CSD-1	10	275	299	290	105.5
SGRD3	108	CSD-1	10	300	274	294	98.0
SGRD4	108	CSD-1	10	300	319	305	101.7
SGRD5	108	CSD-1	10	275	313	298	108.4
SGRD6	108	CSD-1	10	275	273	289	105.1
Total				1700	1793	1757	103.35%

Completed By: Tyler Youells on 03/14/2025

Asset	Notes	Date	Written By
FTU-12	[1] FAN POWERED HEATER SET TO MAX SPEED, IS NOT ACHIEVING DESIGN HEAT CFM, FILTER IS CLEAN.	03/14/2025	Tyler Youells
FTU-14	[1] FAN POWERED HEATER SET TO MAX SPEED, IS NOT ACHIEVING DESIGN HEAT CFM, FILTER IS CLEAN.	03/14/2025	Tyler Youells
SGRD1	[1] (FTU-16) DIFFUSER 1 INSTALLED AS 10" SWAPPED DESIGN CFM WITH DIFFUSER 3	03/14/2025	Tyler Youells
SGRD3	[2] FTU-16 DIFFUSER 3 INSTALLED AS 8" SWAPPED DESIGN CFM WITH DIFFUSER 1	03/14/2025	Tyler Youells

National TAB

Project: Beautiful Savior Lutheran Church (Olathe, KS)

System/Unit: AHU/RTU

Asset: RTU-2 AREA:FIRST FLOOR SOUTH

Unit Data		
	Design	**Actual**
MFG	NA	DAIKIN
Serial Num	-	FBOU210201354
Model Num	NA	DPS025AHMG2DV-4
Configuration	HORIZONTAL	HORIZONTAL
Num OA Filters 1	-	3
OA Filter Size 1	-	39X20
Num PreFilter 1	-	9
PreFilter Size 1	-	18X24X2

Motor Data		
	Design	**Actual**
Motor MFG	-	BALDOR RELIANCE
Frame	-	254T
Horsepower	15	15
Motor Rpm	-	1765
Phase	3	3
Rated Voltage	208	200
Rated Amperage	40.7	41
Service Factor	-	1.15

Test Data		
	Design	**Actual**
SF CFM	8500	8940
SF RPM	1763	1577
RA CFM	5500	5808
OA CFM	3000	3132
RL Voltage	208	184
RL Amperage	40.7	24.4
OA Damper Position	-	12%/20%
Brake Horse Power	-	5.9

Performance Data		
	Design	**Actual**
MA Plenum SP	-	-0.69"
Fan Suction SP	-	-0.83"
Fan Discharge SP	-	2.39"
Total ESP	3"	3.08"
Fan Total SP	4.9	3.22"
Cooling Coil P.D.	-	0.14"

Completed By: Tyler Youells on 03/14/2025

Notes:
[1] SF Setpoint 1.5"
[2] MAX FLOW TESTED VIA TRAVERSE WITH ALL VAVs SET TO 100% OPEN DUE TO LIMITATIONS OF THE CONTROLS SOFTWARE TO KEEP VAVS AT MAX COOL.

Written By: Tyler Youells on 03/14/2025

AHU/RTU

VAV-Fan Powered Box

RTU-2/FIRST FLOOR SOUTH

Asset												
Asset Name	MFG	Model Num	Service	Type	Inlet Size	Design Max Cool CFM	Max Cool CFM	Design Min Cool CFM	Min Cool CFM	Design Fan CFM (Heat)	Fan CFM (Heat)	Ak (max)
FTU-1	DAIKIN	MQFV15	MAIN ENTRACE	FPVAV	8	900	773	275	281	550	533	2.08
FTU-2	DAIKIN	MQFV15	118	FPVAV	8	600	581	200	209	375	401	2.12
FTU-3	DAIKIN	MQFV15	118	FPVAV	10	1100	1094	350	371	675	726	2.16
FTU-4	DAIKIN	MQFV15	117	FPVAV	8	900	884	275	279	550	508	1.95
FTU-5	DAIKIN	MQFV15	116	FPVAV	10	1100	1120	350	368	675	649	1.63
FTU-6	DAIKIN	MQFV15	114	FPVAV	12	1350	1396	425	444	825	823	1.76
FTU-7	DAIKIN	MQFV15	S HALL	FPVAV	8	750	753	225	227	475	502	1.96
FTU-8	DAIKIN	MQFV15	150-151	FPVAV	12	1350	1371	425	433	825	827	1.61
FTU-9	DAIKIN	MQFV15	161	FPVAV	6	450	432	150	156	275	291	2.17

Diffuser Supply (GRD)

FTU-1/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	132	CSD-1	8	225	213	213	94.7
SGRD3	117	CSD-1	8	225	205	205	91.1
SGRD3	117	CSD-1	8	225	150	150	66.7
SGRD4	132	CSD-1	8	225	205	205	91.1
Total				900	773	773	85.89%

FTU-2/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	132	CSD-1	8	160	161	167	104.4
SGRD3	114	CSD-1	8	150	170	145	96.7
SGRD3	113	CSD-1	8	150	143	143	95.3
SGRD4	115	CSD-1	8	140	123	126	90.0
Total				600	597	581	96.83%

FTU-3/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	109	CSD-1	8	200	191	213	106.5
SGRD3	110	CSD-1	8	215	166	207	96.3
SGRD3	110	CSD-1	8	215	228	211	98.1
SGRD4	110	CSD-1	10	235	209	238	101.3
SGRD5	110	CSD-1	10	235	238	225	95.7
Total				1100	1032	1094	99.45%

FTU-4/

Asset							
Asset Name	Location	Type	Size	DESIGN CFM	CFM(1)	FINAL CFM	% to design
SGRD1	111	CSD-1	8	215	223	221	102.8
SGRD3	111	CSD-1	10	215	174	198	92.1
SGRD3	111	CSD-1	8	235	223	226	96.2
SGRD4	111	CSD-1	10	235	221	239	101.7
Total				900	841	884	98.22%

FTU-5/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	112	CSD-1	8	215	268	227	105.6
SGRD3	109	CSD-1	8	200	175	183	91.5
SGRD3	112	CSD-1	8	215	241	221	102.8
SGRD4	112	CSD-1	10	235	258	249	106.0
SGRD5	112	CSD-1	10	235	253	240	102.1
Total				1100	1195	1120	101.82%

FTU-6/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	128	CSD-1	8	215	277	235	109.3
SGRD3	128	CSD-1	8	205	230	205	100.0
SGRD3	128	CSD-1	8	205	245	218	106.3
SGRD4	107	CSD-1	6	50	66	51	102.0
SGRD5	128	CSD-1	8	205	231	206	100.5
SGRD6	128	CSD-1	8	215	272	223	103.7
SGRD7	128	CSD-1	8	205	190	206	100.5
SGRD8	126	CSD-1	6	50	55	53	106.0
Total				1350	1566	1397	103.48%

FTU-7/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	102	CSD-1	10	325	311	311	95.7
SGRD2	102	CSD-1	10	325	346	346	106.5
SGRD3	101	CSD-1	6	100	96	96	96.0
Total				750	753	753	100.4%

FTU-8/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	105	CSD-1	10	250	278	257	102.8
SGRD3	106	CSD-1	10	250	474	273	109.2
SGRD3	109	CSD-1	12	450	305	426	94.7
SGRD4	109	CSD-1	10	400	456	415	103.8
Total				1350	1513	1371	101.56%

FTU-9/

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	107	CSD-1	8	150	122	141	94.0
SGRD3	131	WSD-2	8X8	150	97	135	90.0
SGRD3	103	CSD-1	8	150	98	135	90.0
SGRD4	160	CSD-1	6	0	53	25	-
Total				450	370	436	96.89%

Completed By: Tyler Youells on 03/14/2025

Asset	Notes	Date	Written By
FTU-1	[1] VAV DAMPER AT 100% CANNOT REACH DESIGN FLOW, LOW PRESSURE DUCTWORK IS NOT SIZED CORRECLTY.	03/13/2025	Tyler Youells
SGRD4	[1] FTU-9 GRD4 NOT SHOWN ON THE PRINTS/NO DESIGN CFM, FLOW LEFT AS FOUND.	03/14/2025	Tyler Youells

National TAB

Project: Beautiful Savior Lutheran Church (Olathe, KS)

System/Unit: AHU/RTU

Asset: RTU-3 AREA:SECOND FLOOR NORTH

Unit Data		
	Design	**Actual**
MFG	NA	DAIKIN
Serial Num	-	FBOU210200490
Model Num	NA	MPS040FG2DW1CYBVDC
Configuration	HORIZONTAL	VERTICAL DISCHARGE
Num OA Filters 1	-	8/2
OA Filter Size 1	-	20X17/12X17
Num PreFilter 1	-	8/4
PreFilter Size 1	-	24X24X2/18X24X2

Motor Data		
	Design	**Actual**
Motor MFG	-	BALDOR
Frame	-	215T
Horsepower	15	10
Motor Rpm	-	1770
Phase	3	3
Rated Voltage	208	200
Rated Amperage	29.5	29.5
Service Factor	-	1.15

Drive Data	
	Actual
Motor Sheave Size	2BK45
Motor Bore Size	1-3/8"
Motor Sheave SetPt	FIXED
Fan Sheave Size	2B5V60
Fan Sheave Bore	1-15/16"
Belt CL Distance	34"
Num of Belts	2
Belt Size	BX81

Test Data		
	Design	**Actual**
SF CFM	12000	9864
SF RPM	1166	1338 @ (100%/45 Hz)
RA CFM	7500	7294
OA CFM	3500	2570
RL Voltage	208	150V VFD
RL Amperage	29.5	20.5
OA Damper Position	-	19%/28%
Brake Horse Power	-	6.94

Performance Data		
	Design	**Actual**
MA Plenum SP	-	-0.17”
Fan Suction SP	-	-0.41”
Fan Discharge SP	-	0.98”
Total ESP	2	0.64”
Fan Total SP	3.15	1.39”
Cooling Coil P.D.	-	0.24”

Completed By: Will Turnbough on 03/13/2025

Notes:
[1] Per original TAB report in 2022, the fan speed could not be set above 45 Hz without causing the fan pulley to fly off of the shaft. Daiken instructed at that time to leave the airflow and frequency low to prevent issues.
[2] The outside air was set proportionally low. Also reduced the ratio of OA to 25% to help prevent performance issues.

Written By: Will Turnbough on 03/17/2025

National TAB

Project:Beautiful Savior Lutheran Church (Olathe, KS)

AHU/RTU

Diffuser Supply (GRD)

RTU-3/SECOND FLOOR NORTH

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	208	CSD-2	24X12	950	969	969	102.0
SGRD3	208	CSD-2	42X12	1600	1415	1415	88.4
SGRD3	206	CSD-1	8	167	129	129	77.2
SGRD4	206	CSD-1	8	167	144	144	86.2
SGRD5	208	WSF-1	24X10	1000	512	512	51.2
SGRD6	208	CSD-2	24X12	950	727	727	76.5
SGRD7	208	CSD-2	42X12	1600	1362	1362	85.1
SGRD8	208	CSD-2	24X12	950	710	710	74.7
SGRD9	208	CSD-2	42X12	1600	1581	1581	98.8
SGRD10	208	CSD-2	24X12	950	775	775	81.6
SGRD11	208	CSD-2	42X12	1600	1540	1540	96.3
Total				11534	9864	9864	85.52%

National TAB

Project: Beautiful Savior Lutheran Church (Olathe, KS)

System/Unit: AHU/RTU

Asset: RTU-4 AREA:SECOND FLOOR SOUTH

Unit Data		
	Design	**Actual**
MFG	NA	DAIKIN
Serial Num	-	FBOU210200491
Model Num	NA	MPS040FG2DW1CYBVDC
Configuration	HORIZONTAL	VERTICAL DISCHARGE
Num OA Filters 1	-	8/2
OA Filter Size 1	-	20X18/12X18
Num PreFilter 1	-	8/4
PreFilter Size 1	-	24X24X2/18X24X2

Test Data		
	Design	**Actual**
SF CFM	12000	9648
SF RPM	1166	1488 @ 50 Hz
RA CFM	7500	7186
OA CFM	3500	2462
RL Voltage	208	167 VFD
RL Amperage	29.5	21.0 VFD
OA Damper Position	-	15%/32%
Brake Horse Power	-	7.1

Motor Data		
	Design	**Actual**
Motor MFG	-	BALDOR RELIANCE
Frame	-	215T
Horsepower	10	10
Motor Rpm	-	1770
Phase	3	3
Rated Voltage	208	200
Rated Amperage	29.5	29.5
Service Factor	-	1

Performance Data		
	Design	**Actual**
MA Plenum SP	-	-0.41”
Fan Suction SP	-	-0.67”
Fan Discharge SP	-	0.99”
Total ESP	2	0.79”
Fan Total SP	3.15	1.66”
Cooling Coil P.D.	-	0.26”

Drive Data	
	Actual
Motor Sheave Size	2BK45
Motor Bore Size	1-3/8"
Motor Sheave SetPt	FIXED
Fan Sheave Size	2B5V60
Fan Sheave Bore	1-15/16"
Belt CL Distance	34"
Num of Belts	2
Belt Size	BX81

Completed By: Will Turnbough on 03/13/2025

Notes:
[1] Per original TAB report in 2022, the fan speed could not be set above 50 Hz without causing the fan pulley to fly off of the shaft. Daiken instructed at that time to leave the airflow and frequency low to prevent issues.
[2] The outside air was set proportionally low. Also reduced the ratio of OA to 25% to help prevent performance issues.

Written By: Will Turnbough on 03/17/2025

National TAB

Project:Beautiful Savior Lutheran Church (Olathe, KS)

AHU/RTU

Diffuser Supply (GRD)

RTU-4/SECOND FLOOR SOUTH

Asset							
Asset Name	**Location**	**Type**	**Size**	**DESIGN CFM**	**CFM(1)**	**FINAL CFM**	**% to design**
SGRD1	207	CSD-1	8	200	184	178	89.0
SGRD3	208	CSD-2	24X12	950	623	644	67.8
SGRD3	207	CSD-1	8	200	174	175	87.5
SGRD4	208	CSD-2	42X12	1600	1857	1430	89.4
SGRD5	208	CSD-2	24X12	950	714	803	84.5
SGRD6	208	CSD-2	42X12	1600	1455	1427	89.2
SGRD7	208	CSD-2	24X12	950	561	839	88.3
SGRD8	208	CSD-2	42X12	1600	1605	1481	92.6
SGRD9	208	CSD-2	24X12	950	592	905	95.3
SGRD10	208	CSD-2	42X12	1600	1578	1489	93.1
SGRD11				167	277	277	165.9
Total				10767	9620	9648	89.61%

Asset	Notes	Date	Written By
SGRD11	Diffuser added in storage room. Airflow is high to this diffuser but low on other diffusers that is coming from RTU-3. There is also no damper installed on this diffuser. Left as is.	03/17/2025	Will Turnbough

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 24D-00509	6/17/2024	6/17/2025
	AIR VELOCITY INSTRUMENT	50 fpm to 3900 fpm	+/- 5 % +/- 7 fpm	Evergreen S-PVF-1 24D-00509	6/17/2024	6/17/2025
	DIRECT HOOD READING	100 cfm to 2000 cfm	+/- 5 % +/- 7 cfm	Evergreen S-PVF-1 24D-00509	6/17/2024	6/17/2025
TEMPERATURE	AIR METER	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	9/18/2024	9/18/2025
	AIR PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	9/18/2024	9/18/2025
	IMMERSION METER	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	9/18/2024	9/18/2025
	IMMERSION PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	9/18/2024	9/18/2025
	CONTACT METER	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	9/18/2024	9/18/2025
	CONTACT PROBE	-20 F to 240 F	+/- .5 % 2 F	Cooper SRH77A S/N 100516003	9/18/2024	9/18/2025
HUMIDITY	HUMIDITY PROBE	10 % RH to 90 % RH	3% of reading	Cooper SRH77A S/N 100516003	9/18/2024	9/18/2025
ELECTRICAL	VOLTAGE MEASUREMENT	0 VAC to 600 VAC	2 % reading +/- 5 digits	Klein Tools CL800 S/N 1220C-C1	9/18/2024	9/18/2025
	AMPERAGE MEASUREMENT	0 Amperers to 100 Amperes	2 % reading +/- 5 digits	Klein Tools CL800 S/N 1220C-C1	9/18/2024	9/18/2025
ROTATION	ROTATION MEASUREMENT	60 rpm to 5000 rpm	2 % reading 2 rpm	Shimpo DT 207Lp S/N D1690029R	9/18/2024	9/18/2025

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

SECOND FLOOR MECHANICAL PLAN

SCALE: 1/8" = 1'-0"

1

GENERAL NOTES

A. DRAWINGS ARE DIAGRAMMATIC ONLY AND REPRESENT THE GENERAL SCOPE OF WORK. REVIEW THE GENERAL NOTES, SPECIFICATIONS AND PLANS FOR ADDITIONAL REQUIREMENTS THAT MAY NOT BE SPECIFICALLY CALLED OUT IN THIS PORTION OF THE CONSTRUCTION DOCUMENTS. NOTIFY ARCHITECT, ENGINEER AND/OR OWNER OF CONFLICTS OR DISCREPANCIES PRIOR TO SUBMISSION OF BID.

B. COORDINATE INSTALLATION OF MECHANICAL SYSTEMS WITH OTHER TRADES TO ENSURE A NEAT AND ORDERLY INSTALLATION AND AVOID CONFLICTS. INSTALL DUCTWORK AND PIPING AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE INSTALLATION OF DUCTWORK AND PIPING TO AVOID CONFLICTS WITH ELECTRICAL PANELS, LIGHTING FIXTURES, ETC. VERIFY DUCT SPACE AVAILABLE ABOVE ALL CEILINGS PRIOR TO ANY FABRICATION OF INSTALLATION.

C. NEW MECHANICAL EQUIPMENT, DUCTWORK AND PIPING ARE SHOWN AT APPROXIMATE LOCATIONS. FIELD MEASURE FINAL DUCTWORK AND PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED TO FIT THE DUCTWORK AND PIPING WITHIN THE AVAILABLE SPACE. VERIFY THAT FINAL EQUIPMENT LOCATIONS MEET MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AROUND EQUIPMENT.

D. OVERHEAD HANGERS AND SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SHALL BE FASTENED TO BUILDING JOISTS OR BEAMS. DO NOT ATTACH HANGERS AND SUPPORTS TO THE ABOVE FLOOR SLAB OR ROOF.

E. PROVIDE A PREFABRICATED 45 DEGREE, HIGH EFFICIENCY, RECTANGULAR/ROUND BRANCH DUCT TAKEOFF FITTING WITH MANUAL BALANCING DAMPER AND LOCKING QUADRANT FOR BRANCH DUCT CONNECTIONS AND TAKE-OFFS TO INDIVIDUAL DIFFUSERS AND REGISTERS.

F. BRANCH DUCTWORK SHALL BE THE SAME SIZE AS NECK SIZE SHOWN UNLESS OTHERWISE NOTED.

G. REFER TO SPECIFICATIONS FOR DUCTWORK AND PIPING INSULATION REQUIREMENTS. DUCT SIZES ON MECHANICAL PLANS ARE INDICATED CLEAR INSIDE AIRFLOW DIMENSIONS. INCREASE SHEET METAL SIZES ACCORDINGLY TO ACCOUNT FOR THICKNESS OF DUCT LINER.

H. ALL ROOF AND WALL PENETRATIONS SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. PROVIDE ALL REQUIRED SLEEVES, FLASHINGS, CURBS, REINFORCED ANGLES, SUPPORTING FRAMES, ETC. UNLESS THEY ARE SPECIFICALLY CALLED OUT TO BE FURNISHED BY OTHERS.

I. THE ELECTRICAL SYSTEM DESIGN IS BASED IN PART ON THE SPECIFIED HVAC EQUIPMENT. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO COORDINATE THE ELECTRICAL REQUIREMENTS OF THE HVAC EQUIPMENT BEING FURNISHED. ANY CHANGES TO THE ELECTRICAL SYSTEM DUE TO HVAC EQUIPMENT OTHER THAN THE SPECIFIED EQUIPMENT BEING FURNISHED SHALL BE PROVIDED AT NO ADDITIONAL COST TO THE OWNER.

(#) KEYED PLAN NOTES

1. INLINE EXHAUST FAN FURNISHED WITH HOOD SYSTEM. INSTALL PER MANUFACTURER'S WRITTEN REQUIREMENTS. TRANSITION DUCTWORK TO FAN AND HOOD AS REQUIRED.
2. PROVIDE 10"ø TYPE 'B' VENT DUCTWORK FOR HOOD EXHAUST.
3. PROVIDE 18"x18" LOUVER ON WALL EQUAL TO RUSKIN ELF6375DX WITH MINIMUM 0.97 SQ-FT OF FREE AREA AND INSECT SCREEN. TRANSITION DUCTWORK TO LOUVER AS REQUIRED. PAINT LOUVER COLOR TO MATCH BUILDING. COORDINATE COLOR WITH ARCHITECT.
4. PROVIDE INLINE EXHAUST FAN AT LOCATION SHOWN. INSTALL BACKDRAFT DAMPER IN DISCHARGE DUCT. TRANSITION DUCTWORK TO FAN AS REQUIRED.
5. PROVIDE CONCENTRIC VENT FOR FURNACE TO EXTERIOR WALL INSTALLED PER MANUFACTURER'S WRITTEN INSTRUCTIONS. ADHERE TO SIZE AND LENGTH LIMITATIONS. LOCATED A MINIMUM OF 10'-0" FROM OUTSIDE AIR INTAKE.
6. PROVIDE CONDENSATE DRAIN TRAP. DISCHARGE WITH AIR GAP TO MOP SINK IN ROOM.
7. OUTDOOR AIR DUCT UP TO INTAKE HOOD. SIZE PER PLANS. PROVIDE RUSKIN CDR25 ROUND CONTROL DAMPER WITH 24V SPRING RETURN ACTUATOR FOR CONTROL OF OUTDOOR AIR SUPPLY. INTERLOCK WITH FURNACE CONTROLS SO THAT DAMPER IS OPEN WHEN THE FURNACE FAN IS ON AND CLOSED WHEN THE FURNACE FAN IS OFF.
8. PROVIDE LAY-IN GRILLE WITH DUCT TO GRILLE MOUNTED HIGH ON WALL.
9. INSTALL DUCT MOUNTED DRUM LOUVER AT 30° ANGLE DOWN FROM HORIZONTAL. TYPICAL ALL LOUVERS FACING EXTERIOR WALL.
10. INSTALL DUCT MOUNTED DRUM LOUVER AT 0° ANGLE, TYPICAL ALL LOUVERS FACING INTERIOR OF SPACE.
11. PROVIDE AVERAGING SENSOR FOR INDICATED RTU THERMOSTAT. MOUNT AT 48" AFF.
12. PROVIDE 12x12 OPENING THROUGH WALL INTO ELEVATOR HOISTWAY WITH GRILLE ON STORAGE ROOM SIDE.
13. SUPPORT VERTICAL DUCTS WITH STEEL ANGLES OR CHANNEL SECURED TO THE SIDES OF THE DUCT WITH WELDS, BOLTS, SHEET METAL SCREWS, OR BLIND RIVETS. SUPPORT AT EACH FLOOR AND AT A MAXIMUM INTERVALS OF 16 FEET.

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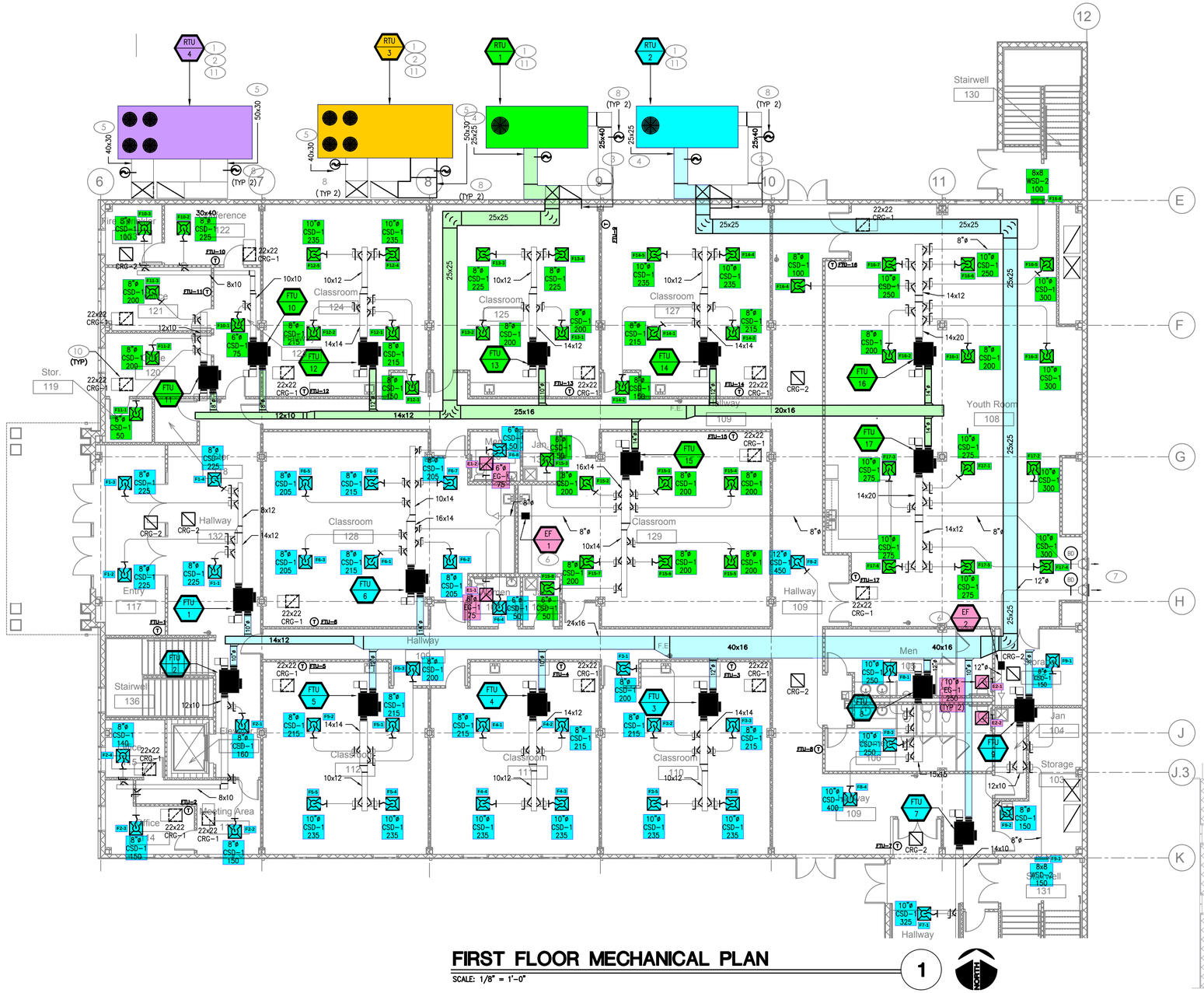
BUILDING ADDITION FOR
BEAUTIFUL SAVIOR LUTHERAN CHURCH
13105 S. BLACK BOB ROAD

No.	Description	Date
1	OWNER ADDITIONS	01.26.21
2	OWNER CHANGE	02.03.21
3	RESTROOM ADD	09.13.21
4	GAS METER LOCATION	11.03.21
5	SITE POLE CHANGE	11.08.21

2ND FLOOR MECHANICAL PLAN

Project number 19-130
Date 11.08.2021

M102



FIRST FLOOR MECHANICAL PLAN

SCALE: 1/8" = 1'-0"

1

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B. COORDINATE INSTALLATION OF MECHANICAL SYSTEMS WITH OTHER TRADES TO ENSURE A NEAT AND ORDERLY INSTALLATION AND AVOID CONFLICTS. INSTALL DUCTWORK AND PIPING AS TIGHT TO STRUCTURE AS POSSIBLE. COORDINATE INSTALLATION OF DUCTWORK AND PIPING TO AVOID CONFLICTS WITH ELECTRICAL PANELS, LIGHTING FIXTURES, ETC. VERIFY DUCT SPACE AVAILABLE ABOVE ALL CEILINGS PRIOR TO ANY FABRICATION OF INSTALLATION.

C. NEW MECHANICAL EQUIPMENT, DUCTWORK AND PIPING ARE SHOWN AT APPROXIMATE LOCATIONS. FIELD MEASURE FINAL DUCTWORK AND PIPING LOCATIONS PRIOR TO FABRICATION AND MAKE ADJUSTMENTS AS REQUIRED TO FIT THE DUCTWORK AND PIPING WITHIN THE AVAILABLE SPACE. VERIFY THAT FINAL EQUIPMENT LOCATIONS MEET MANUFACTURER'S RECOMMENDATIONS REGARDING SERVICE CLEARANCE AROUND EQUIPMENT.

D. OVERHEAD HANGERS AND SUPPORTS FOR EQUIPMENT, DUCTWORK AND PIPING SHALL BE FASTENED TO BUILDING JOISTS OR BEAMS. DO NOT ATTACH HANGERS AND SUPPORTS TO THE ABOVE FLOOR SLAB OR ROOF.

E. PROVIDE A PREFABRICATED 45 DEGREE, HIGH EFFICIENCY, RECTANGULAR/ROUND BRANCH DUCT TAKEOFF FITTING WITH MANUAL BALANCING DAMPER AND LOCKING QUADRANT FOR BRANCH DUCT CONNECTIONS AND TAKE-OFFS TO INDIVIDUAL DIFFUSERS AND REGISTERS.

F. BRANCH DUCTWORK SHALL BE THE SAME SIZE AS NECK SIZE SHOWN UNLESS OTHERWISE NOTED.

G. REFER TO SPECIFICATIONS FOR DUCTWORK AND PIPING INSULATION REQUIREMENTS. DUCT SIZES ON MECHANICAL PLANS ARE INDICATED CLEAR INSIDE AIRFLOW DIMENSIONS. INCREASE SHEET METAL SIZES ACCORDINGLY TO ACCOUNT FOR THICKNESS OF DUCT LINER.

H. ALL ROOF AND WALL PENETRATIONS SHALL BE COORDINATED WITH THE GENERAL CONTRACTOR. PROVIDE ALL REQUIRED SLEEVES, FLASHINGS, CURBS, REINFORCED ANGLES, SUPPORTING FRAMES, ETC. UNLESS THEY ARE SPECIFICALLY CALLED OUT TO BE FURNISHED BY OTHERS.

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(#) KEYED PLAN NOTES

1. GROUND MOUNTED PACKAGED AC UNIT. INSTALL ON CONCRETE EQUIPMENT PAD PROVIDED BY OTHERS.
2. UNDER UNIT PROVIDE 36" TALL INSULATED SUPPLY/RETURN AIR PLENUM CURB. CONNECT SUPPLY AND RETURN AIR DUCTS TO CURB AS REQUIRED.
3. ROUTE 40x25 RETURN DUCT INTO BUILDING THEN UP TO ELEVATION OF PLENUM SPACE. EXTEND 36" INTO PLENUM AND TERMINATE WITH OPEN END. AT EXTERIOR WALL COORDINATE WITH GENERAL CONTRACTOR TO NOTCH STEM WALL FOR DUCT. SEAL WEATHER TIGHT.
4. ROUTE 25x25 SUPPLY DUCT INTO BUILDING THEN UP TO ELEVATION OF PLENUM SPACE. ROUTE DUCT AS SHOWN WITH MAIN TRUNK DOWN CORRIDOR. AT EXTERIOR WALL COORDINATE WITH GENERAL CONTRACTOR TO NOTCH STEM WALL FOR DUCT. SEAL WEATHER TIGHT.
5. ROUTE DUCT FROM UNIT TO INSIDE OF BUILDING THEN UP TO SECOND FLOOR. SEE M102 FOR CONTINUATION. AT EXTERIOR WALL COORDINATE WITH GENERAL CONTRACTOR TO NOTCH STEM WALL FOR DUCT. SEAL WEATHER TIGHT.
6. PROVIDE INLINE EXHAUST FAN AT LOCATION SHOWN. INSTALL BACKDRAFT DAMPER IN DISCHARGE DUCT. TRANSITION DUCTWORK TO FAN AS REQUIRED.
7. PROVIDE 18"X18" LOUVER ON WALL EQUAL TO RUSKIN ELF6375DX WITH MINIMUM 0.91 SQ-FT OF FREE AREA AND INSECT SCREEN. TRANSITION DUCTWORK TO LOUVER AS REQUIRED. PAINT LOUVER COLOR TO MATCH BUILDING. COORDINATE COLOR WITH ARCHITECT. VERIFY DISCHARGE IS A MINIMUM OF 10'-0" FROM RTU OUTSIDE AIR INTAKE.
8. PROVIDE NEMA 4 RATED SMOKE DETECTOR IN RETURN AND SUPPLY AIR DUCTS IN COMPLIANCE WITH NFPA 72. DUCT SMOKE DETECTOR SHALL BE CONNECTED TO THE FIRE ALARM SYSTEM. DUCT SMOKE DETECTORS SHALL BE INTERLOCKED TO SHUT DOWN ALL "RTU" UNITS UPON DETECTION OF SMOKE.
9. CONDENSING UNIT LEVEL AT GRADE ON PREMANUFACTURED PAD. INSTALL PER MANUFACTURER'S INSTRUCTIONS MAINTAINING RECOMMENDED SERVICE CLEARANCES. ROUTE REFRIGERANT LINES THOUGH WALL 18" AFG. WEATHER SEAL REFRIGERANT LINE PENETRATIONS OF BUILDING. PROVIDE ALL RECOMMENDED VALVES, FILTERS, FITTINGS, ETC. AND MAKE ALL NECESSARY CONNECTIONS TO CASED COILS AT FURNACE. SIZE, ROUTE AND SLOPE REFRIGERANT LINES PER MANUFACTURE'S WRITTEN INSTRUCTIONS.
10. PROVIDE RETURN BOOT OR FLEXABOOT PER SCHEDULE WITH 16"ø DUCT. TYPICAL ALL RETURNS WITH THIS SYMBOL.
11. SUPPORT VERTICAL DUCTS IN BUILDING WITH STEEL ANGLES OR CHANNEL SECURED TO THE SIDES OF THE DUCT WITH WELDS, BOLTS, SHEET METAL SCREWS, OR BLIND RIVETS. SUPPORT AT EACH FLOOR AND AT A MAXIMUM INTERVALS OF 16 FEET.

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BUILDING ADDITION FOR
BEAUTIFUL SAVIOR LUTHERAN CHURCH
13105 S. BLACK BOB ROAD

No.	Description	Date
1	OWNER ADDITIONS	01.26.21
2	OWNER CHANGE	02.03.21
3	RESTROOM ADD	09.13.21
4	GAS METER LOCATION	11.03.21
5	SITE POLE CHANGE	11.08.21

1ST FLOOR MECHANICAL PLAN

Project number 19-130
Date 11.08.2021

M101