CERTIFIED BALANCING AND COMMISSIONING, LLC.

TESTING, ADJUSTING AND BALANCING BUREAU
THE PROFESSIONAL'S CHOICE™

Testing, Adjusting and Balancing

Project	**Steamboat Middle School**
Address	39610 Amethyst Dr. Steamboat Springs, CO 80487
Architect	TAB Associates
Mechanical Engineer	BG Building Works
Contractor	R&H Mechanical
Balancing Supervisors	Greg Barnes // Daniel Takacs
Date	December 1, 2020
Job Number	3501

ABBREVIATION INDEX

AHU: Air Handling Unit
Motor FLA: Full Load Amperage
RTU: Roof Top Unit
S.F.: Service Factor
MAU: Make Up Air Unit
P.F.: Power Factor
FCU: Fan Coil Unit
Nom. Eff.: Nominal Efficiency
CRAC: Computer Room Air Conditioning Unit
RPM: Revolutions per Minute
VAV: Variable Air Volume
FPB: Fan Powered Box
K Factor: Correction Factor
T1: Terminal 1
T2: Terminal 2
T3: Terminal 3
AK: Area Correction
OD: Outside Diameter
CUH: Cabinet Unit Heater
UH: Unit Heater
ERV: Energy Recovery Ventilator
TDH: Total Dynamic Head
ERU: Energy Recovery Unit
PSI: Pounds per Square Inch
EF: Exhaust Fan
BV: Balance Valve
KEF: Kitchen Exhaust Fan
CS: Circuit Setter
SF: Supply Fan
Valve D.P.: Discharge Pressure
RF: Return Fan
Valve S.P.: Suction Pressure
TF: Transfer Fan
Diff.: Differential
SEF: Smoke Exhaust Fan
Design D.P.: Design Differential Pressure
SPF: Stairwell Pressurization Fan
Actual D.P.: Recorded Differential Pressure
SP: Static Pressure
Ind.Imp.Dia.: Indicated Impeller Diameter
TSP: Total Static Pressure
in.wc.: Inches of Water
ESP: External Static Pressure
HW: Heating Water
VP: Velocity Pressure
CHW: Cooling Water
SA: Supply Air
CW: Condenser Water
RA: Return Air
HX: Heat Exchanger
OSA: Outside Air
DX: Direct Expansion
OA: Outside Air
EAT: Entering Air Temperature
MA: Mixed Air
LAT: Leaving Air Temperature
SD: Supply Diffuser
EWT: Entering Water Temperature
CD: Ceiling Diffuser
LWT: Leaving Water Temperature
SWD: Sidewall Diffuser
ER: Exhaust Register
MVD: Manual Volume Damper
RG: Return Grille
OBD: Opposed Blade Damper
CFM: Cubic Feet Per Minute
NAC: No Access
FPM: Feet Per Minute
NG: Not Given
NIC: Not in Contract
E: Existing

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Method of Balancing:

Supply, Return and Exhaust diffusers, grilles and registers were measured with an Alnor Balometer EBT-721, which includes the flow hood, velgrid, pitot tube and airfoil. Heating and Chilled water flow rates were measured with an Alnor Hydronic Manometer HM-680 by obtaining pressure measurements. RPM was measured with a Shimpo tachometer. Amperage and Voltage readings were taken with a Fluke 930 meter.

Instrumentation:

Digital Manometer	Alnor Balometer EBT-721
Flow hood	Alnor Balometer EBT-721
Digital Pressure Gage	Alnor Hydronic Manometer HM-680
Tachometer	Shimpo
Digital Volt-Amp Meter	Fluke 930
Thermometer	Alnor Balometer EBT-721

Warranty Information:

This project was completed per TABB Procedural Standards.
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 TABB Procedural Standards for testing, adjusting, and balancing environmental systems. Any variances from design quantities, which exceed TABB tolerances, are noted in the Test-Adjust-Balance Report Project Summary. If a Test-Adjust-Balance Report Project Summary is not issued directly following this cover page, all measurements met the design requirements as specified by the design mechanical engineer.

This project has a one-year guarantee on all Testing, Adjusting & Balancing from the date listed on this cover page.

Greg Barnes
Owner/ TABB Supervisor
greg@certtab.com
720-201-6274

Project Summary

1. **Individual Notes, Explanations, and Deficiencies, if exist, are shown underneath the associated equipment.**

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LOCATION: STEAMBOAT SPRINGS, CO
PROJECT #: 3501

DATE: 12/1/2020
CONTACT: Brandon Wilson

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Roof Top Unit

PROJECT: STEAMBOAT SPRINGS MIDDLE SCHOOL
LOCATION: STEAMBOAT SPRINGS, CO
PROJECT #: 3501

DATE: 12/1/2020
CONTACT: Brandon Wilson

SYSTEM/UNIT: (E)RTU-01

Tested By: Brandon Wilson
Date: 11/20/2020

Test Data	
Design Outside Airflow	6000 CFM
Actual Outside Airflow	6090 CFM

SYSTEM/UNIT: (E)RTU-01/VAV-01

Tested By: Brandon Wilson
Date: 11/5/2020

Unit Data	
VAV Address	37
Box Inlet Size	14 in
K Factor	4644.00

Term Box Test Data	
Design Max Airflow	2000 CFM
Actual Max Airflow	2165 CFM
Design Min Airflow	700 CFM
Actual Min Airflow	715 CFM
Design Reheat Airflow (No fan)	700 CFM
Actual Reheat Airflow (No fan)	715 CFM

Log:				
	(E)RTU-01/VAV-01	11/5/2020	Brandon Wilson	VAV CALIBRATED @ INLET, OUTLETS PROPORTIONED USING VELOCITY.

(E)RTU-01/VAV-01 Supply Outlet Summary

System/Unit	Outlet Type	Size LxW / D	AK Factor	Design Airflow	Prelim Airflow	% Prelim Diff.	Final Airflow	% Final Diff.
Outlet-01	SR			400	380	95	415	104
Outlet-02	SR			0	110	∞	95	∞
Outlet-03	SR			400	455	114	420	105
Outlet-04	SR			400	510	128	405	101
Outlet-05	SR			400	605	151	410	103
Outlet-06	SR			400	550	138	420	105
Totals:	-	-	-	**2000**	**2610**	**131**	**2165**	**108**

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Roof Top Unit

PROJECT: STEAMBOAT SPRINGS MIDDLE SCHOOL
LOCATION: STEAMBOAT SPRINGS, CO
PROJECT #: 3501

DATE: 12/1/2020
CONTACT: Brandon Wilson

SYSTEM/UNIT: (E)RTU-01/VAV-02

Tested By: Brandon Wilson
Date: 11/12/2020

Unit Data	
VAV Address	38
Box Inlet Size	16 in
K Factor	8543.00

Term Box Test Data	
Design Max Airflow	3500 CFM
Actual Max Airflow	3565 CFM
Design Min Airflow	1000 CFM
Actual Min Airflow	1025 CFM

Log:

(E)RTU-01/VAV-02	11/19/2020	Brandon Wilson	DAMPER 100% CLOSED ON OUTLETS 9/12 WAS CAUSING SIGNIFICANT VELOCITY NOISE THROUGH REMAINING OUTLETS. LEFT 100% OPEN BRANCH SET FOR TOTAL.
(E)RTU-01/VAV-02	11/19/2020	Brandon Wilson	DAMPERS WILL NOT STAY 100% CLOSED ON OUTLETS 1 & 4.
(E)RTU-01/VAV-02	11/15/2020	Brandon Wilson	EACH BRANCH SET FOR TOTAL.

(E)RTU-01/VAV-02 Supply Outlet Summary

System/Unit	Outlet Type	Size LxW / D	AK Factor	Design Airflow	Prelim Airflow	% Prelim Diff.	Final Airflow	% Final Diff.
Outlet-01	SR		1	0				
Outlet-02	SR		1	500				
Outlet-03	SR		1	500				
Outlet-04	SR		1	0				
Outlet-05	SR		1	500				
Outlet-06	SR		1	500				
Outlet-07	SR		1	250				
Outlet-08	SR		1	250				
Outlet-09	SR		1	0				
Outlet-10	SR		1	250				
Outlet-11	SR		1	250				
Outlet-12	SR		1	0				
Outlet-13	SR		1	250				
Outlet-14	SR		1	250				
Totals:	-	-	-	**3500**	**0**	**0**	**0**	**0**

Roof Top Unit

PROJECT: STEAMBOAT SPRINGS MIDDLE SCHOOL
LOCATION: STEAMBOAT SPRINGS, CO
PROJECT #: 3501

DATE: 12/1/2020
CONTACT: Brandon Wilson

SYSTEM/UNIT: (E)RTU-01/VAV-03

Tested By: Brandon Wilson
Date: 11/5/2020

Unit Data	
Box Inlet Size	24X16 in
K Factor	8912.00

Term Box Test Data	
Design Max Airflow	4620 CFM
Actual Max Airflow	4605 CFM
Design Min Airflow	1400 CFM
Actual Min Airflow	1430 CFM
Design Reheat Airflow (No fan)	1400 CFM
Actual Reheat Airflow (No fan)	1430 CFM

Log:

(E)RTU-01/VAV-03	11/19/2020	Brandon Wilson	OUTLETS BALANCED USING OBD DAMPER INSIDE FACE OF OUTLET.

(E)RTU-01/VAV-03 Supply Outlet Summary

System/Unit	Outlet Type	Size LxW / D	AK Factor	Design Airflow	Prelim Airflow	% Prelim Diff.	Final Airflow	% Final Diff.
Outlet-01	CD	24X24	1	330	250	76	320	97
Outlet-02	CD	24X24	1	330	325	98	330	100
Outlet-03	CD	24X24	1	330	260	79	335	102
Outlet-04	CD	24X24	1	330	275	83	320	97
Outlet-05	CD	24X24	1	330	230	70	320	97
Outlet-06	CD	24X24	1	330	335	102	335	102
Outlet-07	CD	24X24	1	330	255	77	330	100
Outlet-08	CD	24X24	1	330	25	8	330	100
Outlet-09	CD	24X24	1	330	275	83	340	103
Outlet-10	CD	24X24	1	330	280	85	320	97
Outlet-11	CD	24X24	1	330	175	53	325	98
Outlet-12	CD	24X24	1	330	250	76	330	100
Outlet-13	CD	24X24	1	330	335	102	330	100
Outlet-14	CD	24X24	1	330	25	8	340	103
Totals:	**-**	**-**	**-**	**4620**	**3295**	**71**	**4605**	**100**

Roof Top Unit

PROJECT: STEAMBOAT SPRINGS MIDDLE SCHOOL
LOCATION: STEAMBOAT SPRINGS, CO
PROJECT #: 3501

DATE: 12/1/2020
CONTACT: Brandon Wilson

SYSTEM/UNIT: (E)RTU-01/VAV-04

Tested By: Brandon Wilson
Date: 11/5/2020

Unit Data	
VAV Address	35
Box Inlet Size	8 in
K Factor	1120.00

Term Box Test Data	
Design Max Airflow	600 CFM
Actual Max Airflow	585 CFM
Design Min Airflow	150 CFM
Actual Min Airflow	155 CFM
Design Reheat Airflow (No fan)	150 CFM
Actual Reheat Airflow (No fan)	155 CFM

(E)RTU-01/VAV-04 Supply Outlet Summary

System/Unit	Outlet Type	Size LxW / D	AK Factor	Design Airflow	Prelim Airflow	% Prelim Diff.	Final Airflow	% Final Diff.
Outlet-01	CD	24X24	1	300	410	137	295	98
Outlet-02	CD	24X24	1	300	355	118	290	97
Totals:	**-**	**-**	**-**	**600**	**765**	**128**	**585**	**98**

Fan Unit

PROJECT: STEAMBOAT SPRINGS MIDDLE SCHOOL
LOCATION: STEAMBOAT SPRINGS, CO
PROJECT #: 3501

DATE: 12/1/2020
CONTACT: Brandon Wilson

SYSTEM/UNIT: KEF-1

Tested By: Brandon Wilson
Date: 11/19/2020

Unit Data	
Fan Manufacturer	Acme Engineering & MFG
Fan Model Number	PNU120RF
Fan Serial Number	20G1854-6

Test Data	
Design Airflow	600 CFM
Actual Airflow	670 CFM
Actual RPM	1267
Motor Volts T1-T2	NO ACCESS Volts
Motor Amps T1	NO ACCESS Amps
Fan SP In	NO ACCESS in. wc
Fan SP Out	NO ACCESS in. wc

Motor Data	
Rated Design Airflow	675 CFM
Motor Manufacturer	Marathon
Motor Frame	48Z
Motor HP	1/4 HP
Motor RPM	1725 RPM
Motor Rated Volts	115/230 Volts
Motor Phase	1
Motor Hertz	60 Hz

Sheave Data	
Motor Sheave Model	MVL34B
Motor Sheave Bore	1/2 in.
Fan Sheave Model	AK41
Fan Sheave Bore	5/8 in.
Number of Belts	1
Belt Size	A26 OR 4L280

Log:				
	KEF-1	11/19/2020	Brandon Wilson	1231 FPM/ 0.545 SQ FT/ 671 CFM.

SYSTEM/UNIT: KEF-2

Tested By: Brandon Wilson
Date: 11/19/2020

Unit Data	
Fan Manufacturer	Acme Engineering & MFG
Fan Model Number	PNU150RF
Fan Serial Number	20G1651-4

Test Data	
Design Airflow	1500 CFM
Actual Airflow	1510 CFM
Motor Volts T1-T2	NO ACCESS Volts
Motor Amps T1	NO ACCESS Amps
Fan SP In	NO ACCESS in. wc
Fan SP Out	NO ACCESS in. wc

Motor Data	
Rated Design Airflow	1500 CFM
Motor Manufacturer	Marathon
Motor Frame	48Z
Motor HP	1/4 HP
Motor RPM	1725 RPM
Motor Rated Volts	115/230 Volts
Motor Phase	1
Motor Hertz	60 Hz
Motor FL Amps	6.2/3.1 Amps
Motor Service Factor	1.35

Sheave Data	
Motor Sheave Model	MVL44B
Motor Sheave Bore	1/2 in.
Fan Sheave Model	AK64
Fan Sheave Bore	5/8 in.
Number of Belts	1
Belt Size	A31 OR 4L330

Log:				
	KEF-2	11/19/2020	Brandon Wilson	1921 FPM/ 0.785 SQ FT/ 1507 CFM.

Hydronic Pump

PROJECT: STEAMBOAT SPRINGS MIDDLE SCHOOL
LOCATION: STEAMBOAT SPRINGS, CO
PROJECT #: 3501

DATE: 12/1/2020
CONTACT: Brandon Wilson

(E) HWP-01 Balance Valve Summary

System/Unit	Manufacturer	Model Number	Valve Size	d.GPM	Design D.P.	p.GPM	a.GPM	Final D.P.	%D Des/Final	Valve Position
VAV-01	Griswold	AUTOFLOW		4.8	2-32		5	11.2		
VAV-02	Griswold	AUTOFLOW		6.7	2-32		6.7	11.9		
VAV-03	Griswold	AUTOFLOW		10	2-32		10	7.3		
VAV-04	Griswold	AUTOFLOW		2	2-32		2	10.1		
Totals:	-	-	-	**23.5**	-	-	**23.7**	-	-	-

HYDRONIC VAV AIR HANDLING UNIT SCHEDULE W/ ENERGY RECOVERY

NOTES:
A. HEATING COIL CAPACITY SIZED AT A MINIMUM FOR MORNING WARMUP. COIL TO TAKE HEATING CFM FROM 70 TO 90 °F.
B. SEE HEAT WHEEL SCHEDULE FOR INFORMATION ON INTEGRAL HEAT WHEEL
G. REFER TO CONTROL DIAGRAMS FOR ADDITIONAL INFORMATION.

				SUPPLY FAN							RELIEF FAN							COOLING							HEATING							ELECTRICAL								
MARK	SERVICE	TYPE	MIN. OUTSIDE AIR (CFM)	CFM	MIN. CFM	ESP @ SL (IN WC)	ESP @ ALT (IN WC)	RPM	BHP	HP	CFM	MIN. CFM	ESP @ SL (IN WC)	ESP @ ALT (IN WC)	RPM	BHP	HP	EAT DB/WB (°F)	LAT DB/WB (°F)	SENSIBLE MBH	TOTAL MBH	EWT (°F)	LWT (°F)	GPM	MAX WTR PD (FT HEAD)	EAT DB (°F)	LAT DB (°F)	SENSIBLE MBH	EWT (°F)	LWT (°F)	GPM	MAX WTR PD (FT HEAD)	FILTER	VOLTAGE	PHASE	FLA	MCA	MOCP	OPER. WEIGHT (LBS)	MANUFACTURER & MODEL #	REMARKS
(E) RTU-1	CAFETERIA/ CAFTORIUM/ STORAGE	ROOFTOP W/ INTEGRAL ERV	6000	10500	5700	1.92	1.60	1750	9.39	10	10500	5700	0.90	0.75	1750	1.46	2	77.0	55.0	171	171	45	55	36	12.50	35	90	365	150	120	26	4.00	2" PLEATED	480	3	19.0	22.0	30.0	5,295	AAON RN	NOTES A,B; UPSIZING SUPPLY FAN MOTOR FROM 7.5 TO 10HP ON EXISTING RTU.

ENERGY RECOVERY WHEEL SCHEDULE (INTEGRAL TO RTU-1)

		HEAT RECOVERY WHEEL DESIGN CONDITIONS					
		OUTDOOR AIR		INDOOR AIR		SUPPLY LAT	
MARK	SERVICE	DB/WB (°F) (SUM)	DB/WB (°F) (WINT)	DB/WB (°F) (SUM)	DB/WB (°F) (WINT)	DB/WB (°F) (SUM)	DB/WB (°F) (WINT)
(E) RTU-1	CAFETERIA/ CAFTORIUM/ STORAGE	91/55	19	80/51	49	78/53	57/49

TERMINAL BOX WITH REHEAT SCHEDULE

NOTES:
A: RADIATED AND DISCHARGE SOUND LEVELS SHALL NOT EXCEED NC 35 AT 1.5" INLET STATIC PRESSURE WHEN TESTED PER ARI STANDARD 885-98.
B: TOTAL AIR PRESSURE DROP OF TAB AND REHEAT COIL SHALL NOT EXCEED 0.5" CW.
C: WATER PRESSURE DROP OF REHEAT COILS SHALL NOT EXCEED 5 FT. PROVIDE REHEAT COILS SEPARATE FROM BOXES IF REQUIRED TO MEET WATER PRESSURE DROP REQUIREMENTS.

						HEATING COIL (HYDRONIC)										
MARK	SERVICE	INLET DIA. (IN.)	COOLING CFM	HEATING CFM	MIN. INLET S.P. @ S.L. (IN. W.C.)	EAT DB (°F)	LAT DB (°F)	SENSIBLE MBH	EWT (°F)	LWT (°F)	GPM	MAX. WATER P.D. (FT.)	MAX. AIR P.D. (IN. WC)	MANUFACTURER & MODEL #	CONTROL TYPE	ACCESSORIES	REMARKS
VAV-01	CAFETORIUM	14	2000	700	1.0	55	80	43	140	120	4.8	3.00	0.40	TITUS DESV	DDC	THERMOSTAT AND CO2 SENSOR	-
VAV-02	CAFETORIUM/ STAGE	16	3000	1000	1.0	55	80	64	140	120	6.7	3.00	0.40	TITUS DESV	DDC	THERMOSTAT AND CO2 SENSOR	-
VAV-03	CAFETERIA	24X16	4600	1400	1.0	55	85	119	140	115	10.0	3.00	0.40	TITUS DESV	DDC	THERMOSTAT AND CO2 SENSOR	-
VAV-04	KITCHEN	8	900	150	1.0	55	85	19	140	115	2.0	3.00	0.30	TITUS DESV	DDC	THERMOSTAT AND CO2 SENSOR	-

EXHAUST FAN SCHEDULE

NOTES:
A: PROVIDE DIRECT DRIVE FANS WITH FAN SPEED CONTROL.
B: NO EQUIPMENT SHALL BE SELECTED ABOVE 90% OF MOTOR NAMEPLATE RATING.
C: PROVIDE ROOF CURB WITH INTEGRAL DAMPER.

			FAN				MOTOR					
					ESP							
MARK	SERVICE	TYPE	CFM	SONES	@ SL (IN WC)	@ ALT (IN WC)	MHP	VOLT	PHASE	MANUFACTURER & MODEL #	ACCESSORIES	REMARKS
EF-1	SPED BATHROOM	CEILING	80	3.8	0.17	0.15	13 W	120	1	GREENHECK SP-A90	INTEGRAL BACKDRAFT DAMPER	-
KEF-1	TYPE I DISH HOOD	UPBLAST	1500	10	0.60	0.40	1/4	120	1	GREENHECK CUBE-141	INTEGRAL BACKDRAFT DAMPER	-
KEF-2	TYPE II KITCHEN HOOD	UPBLAST	600	8.1	0.60	0.30	1/8	120	1	GREENHECK CUE-095-D	INTEGRAL BACKDRAFT DAMPER	-

PLUMBING FIXTURE SCHEDULE

MARK	TYPE	ADA	FINISH	MANUFACTURER* & MODEL #	FAUCET TRIM MFR* & MODEL #	ACCESSORIES	REMARKS
P1	FLOOR SINK	N/A	ACID RESISTANT CAST IRON	ZURN Z1902	-	-	-
P2	ROOF DRAIN	N/A	DURA-COATED CAST IRON	ZURN Z125	-	DECK CLAMP	-
P3	SCIENCE CLASSROOM	N/A	RESIN; RE: ARCH		CHICAGO #930-VPH	PROVIDE VACUUM BREAKER, UNDER COUNTER PROTECTION, QUARTER TURN ANGLE STOPS, SUPPLIES AND ACID WASTE TAIL PIECE. PROVIDE AND INSTALL POINT OF USE STRIEM UNDER COUNTER ACID NEUTRALIZATION TANK, MODEL LB2.	INSTALL PER MANUFACTUERR'S REQUIREMENTS
P4	GOOSNPOUT NOZZLE	N/A	RE: ARCH	ZURN Z199			
P5	MOP BASIN	N/A	TERRAZO	FLORESTONE #32 36X36	T & S BRASS #B-0665-BST-P	FLOOR MOUNT, 36"X36" DRAIN, FRONT MOP RECEPTORS	-
P6	URINAL FLUSH VALVE ONLY	EXISTING	CHROME	-	SLOAN G2 8111-1.6 3250400	EXISTING URINAL TO REMAIN. REPLACE FLUSH VALVE ONLY.	-
P7	WATER CLOSET FLUSH VALVE ONLY	EXISTING	CHROME	-	SLOAN G2 8111-1.6 3250400	EXISTING WATER CLOSET TO REMAIN. REPLACE FLUSH VALVE ONLY	-
P8	LAVATORY FAUCET ONLY	EXISTING	CHROME		DELTA 2529LF-HDF	EXISTING SINK BASIN AND DRAIN TO REMAIN. REPLACE FAUCET ONLY.	-
P9	PREFABRICATED MODULAR SHOWER SYSTEM	YES	CHROME	-	BRADLEY 1PA	PROVIDE WITH STANDARD S15 SHOWERHEAD, THERMOSTATIC MIXING VALVE, SHUTOFF VALVE, SUPPLY STOPS, LOCKABLE BALL JOINT	-
P10	COVERALL WALL SHOWER	YES	CHROME	-	BRADLEY WS-WCA	PROVIDE WITH STANDARD S15 SHOWERHEAD, THERMOSTATIC MIXING VALVE, SHUTOFF VALVE, SUPPLY STOPS, LOCKABLE BALL JOINT	-
P11	WALL MOUNTED WATER CLOSET	YES	CHROME	AMERICAN STANDARD 2856.111.020	SLOAN G2 8111-1.6 3250400	PROVIDE FLUSH VALVE WITH MANUAL OVERRIDE. PROVIDE ANTIMICROBIAL OPEN FRONT SEAT WITH HEAVY DUTY STAINLESS STEEL CHECK HINGE. PROVIDE CONCEALED ARM WALL CARRIER.	-
P12	FLOOR DRAIN	N/A	STAINLESS	ZURN Z415S	-	PROVIDE WITH SURE-SEAL TRAP GUARD AND P-TRAP	-

2

GRILLE, REGISTER, DIFFUSER & LOUVER SCHEDULE

MARK	USE	PATTERN	FINISH	MANUFACTURER* & MODEL#	ACCESSORIES	REMARKS
(E)	VARIES	-	-	-	-	EXISTING DIFFUSER TO REMAIN
A	LAY-IN CEILING SUPPLY	4-WAY	WHITE	TITUS TDC-AA	-	-
B	SIDEWALL RETURN	STATIONARY	RE: ARCH	TITUS 350RL	-	-

MULTI ZONE VENTILATION SCHEDULE

VENTILATION EQUATION VARIABLE DEFINITIONS:
BREATHING ZONE OUTDOOR AIRFLOW, Vbz
ZONE FLOOR AREA, Az
ZONE POPULATION, Pz
AREA OUTDOOR AIR RATE, Ra
PEOPLE OUTDOOR AIR RATE, Rp
ZONE AIR DISTRIBUTION EFFECTIVENESS, Ez
ZONE OUTDOOR AIRFLOW, Voz
SYSTEM OUTDOOR AIR INTAKE FLOW RATE, Vot
ZONE PRIMARY OUTDOOR AIR FRACTION, Zp
ZONE PRIMARY AIRFLOW, Vpz
SYSTEM VENTILATION EFFICIENCY, SYSTEM Ev
ZONE VENITALION EFFICIENCY, ZONE Ev

VENTILATION EQUATIONS:
Vbz = Rp * Pz + Ra * Az (EQUATION 4-1)
Voz = Vbz / Ez (EQUATION 4-2)
Zp = Voz / Vpz (EQUATION 4-5)
Ev = (Table 403.3.1.1.2.3.2)
Vou = ∑ (Vbz), ASSUMING D=1 (EQUATION 4-6)
Vot = Vou /(SYSTEM Ev) (EQUATION 4-8)

VAV-01 SUMMARY

SPACE NAME	SPACE TYPE	Az [SQ.FT.]	Rp [CFM/ PERSON]	Ra [CMF/SQ.FT.]	PEOPLE DENSITY [#/1000SQ.F...	Pz [PEOPLE]	Vbz [CFM]	Ez	Voz [CFM]	Vpz [CFM]	ZONE Zp
CAFETORIUM	EDUCATION - MULTIUSE ASSEMBLY	1400	7.5	0.06	100	124	1014	1	1014	2000	51%

VAV-02 SUMMARY

SPACE NAME	SPACE TYPE	Az [SQ.FT.]	Rp [CFM/ PERSON]	Ra [CMF/SQ.FT.]	PEOPLE DENSITY [#/1000SQ.F...	Pz [PEOPLE]	Vbz [CFM]	Ez	Voz [CFM]	Vpz [CFM]	ZONE Zp
CAFETORIUM AND STAGE	EDUCATION - MULTIUSE...	2470	7.5	0.06	100	186	1544	1	1544	3000	51%

VAV-03 SUMMARY

SPACE NAME	SPACE TYPE	Az [SQ.FT.]	Rp [CFM/ PERSON]	Ra [CMF/SQ.FT.]	PEOPLE DENSITY [#/1000SQ.F...	Pz [PEOPLE]	Vbz [CFM]	Ez	Voz [CFM]	Vpz [CFM]	ZONE Zp
CAFETERIA	F&B - CAFETERIA,...	3400	7.5	0.18	100	220	2262	1	2262	3600	63%

VAV-04 SUMMARY

SPACE NAME	SPACE TYPE	Az [SQ.FT.]	Rp [CFM/ PERSON]	Ra [CMF/SQ.FT.]	PEOPLE DENSITY...	Pz [PEOPLE]	Vbz [CFM]	Ez	Voz [CFM]	Vpz [CFM]	ZONE Zp
KITCHEN AND SERVING	F&B - KITCHEN (COOKING)	700	-	-	-	-	-	0.8	0	600	0%

TOTAL SYSTEM SUMMARY

SYSTEM Ev	52%
SYSTEM Vot	6000

GENERAL NOTES:
A: -
B: -
Comments

NOTES:

1. ALL STARTERS FOR MECHANICAL EQUIPMENT SHALL BE FURNISHED UNDER THIS CONTRACT AND SET IN PLACE AND WIRED BY EC. VFD'S NOT INCLUDED AS PART OF THE EQUIPMENT WIRING PACKAGE SHALL BE FURNISHED BY THE MC, AND SET IN PLACE AND WIRED BY THE EC, U.N.O.
2. NOT ALL EQUIPMENT REQUIRED UNDER THIS CONTRACT IS NECESSARILY SPECIFIED ON THE SCHEDULE SHEETS. PLAN & DIAGRAM NOTATIONS AND PROJECT MANUAL CONTAIN EQUIPMENT SPECIFICATIONS AS WELL.
3. (ASHRAE 90.1-2004 & 2007) MECHANICAL EQUIPMENT THAT IS NOT COVERED BY THE U.S. NATIONAL APPLIANCE ENERGY CONSERVATION ACT (NAECA) OF 1987 SHALL CARRY A PERMANENT LABEL INSTALLED BY THE MANUFACTURER STATING THAT THE EQUIPMENT COMPLIES WITH THE REQUIREMENTS OF STANDARD 90.1.
4. (ASHRAE 62.1) ALL AIR MOVING EQUIPMENT SUBJECT TO THE SCOPE OF ASHRAE 62.1 AND SHALL COMPLY WITH CONSTRUCTION REQ'MTS THEREIN.
5. NOT ALL CAPACITIES, CHARACTERISTICS, AND CONSTRUCTION FEATURES REQUIRED ARE NECESSARILY INDICATED IN THE EQUIPMENT SCHEDULES. RE: PLANS AND SPECIFICATIONS FOR ADDITIONAL REQ'MTS.
6. CAPACITIES, CHARACTERISTICS, AND CONSTRUCTION FEATURES OF THE SCHEDULED EQUIPMENT ARE HEREBY INCORPORATED INTO THE PROJECT REQUIREMENTS. EQUIVALENT PRODUCTS PERFORMANCE AND CONSTRUCTION FEATURES SHALL MEET OR EXCEED THAT OF THE SPECIFIED EQUIPMENT WHETHER SCHEDULED OR NOT.
7. NOT ALL EQUIPMENT AVAILABLE FROM LISTED "EQUIVALENT" MANUFACTURERS LISTED IS NECESSARILY EQUIVALENT TO THE BASIS OF DESIGN EQUIPMENT SPECIFIED. CONTRACTOR SHALL BE SOLELY RESPONSIBLE FOR ANY COSTS, RESULTANT CHANGES TO OTHER DIVISIONS, AND SPATIAL REQ'MTS FOR EQUIPMENT OTHER THAN SCHEDULED.
8. ALL MANUFACTURERS REPRESENTATIVES SHALL READ AND UNDERSTAND THE CONTROL DIAGRAMS AND COORDINATE WITH TCC TO PROVIDE A FULLY FUNCTIONING SYSTEM AS DESCRIBED IN THE CONTROL DIAGRAMS.

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Revisions:		
No	Description	Date
2	Addendum #1	04/20/20

Issue Dates:
04.06.2020
PERMIT SET

Sheet Title:
MECHANICAL SCHEDULES

Project No:
10183.00

Sheet No:
M0.1

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Project No. 10183.00

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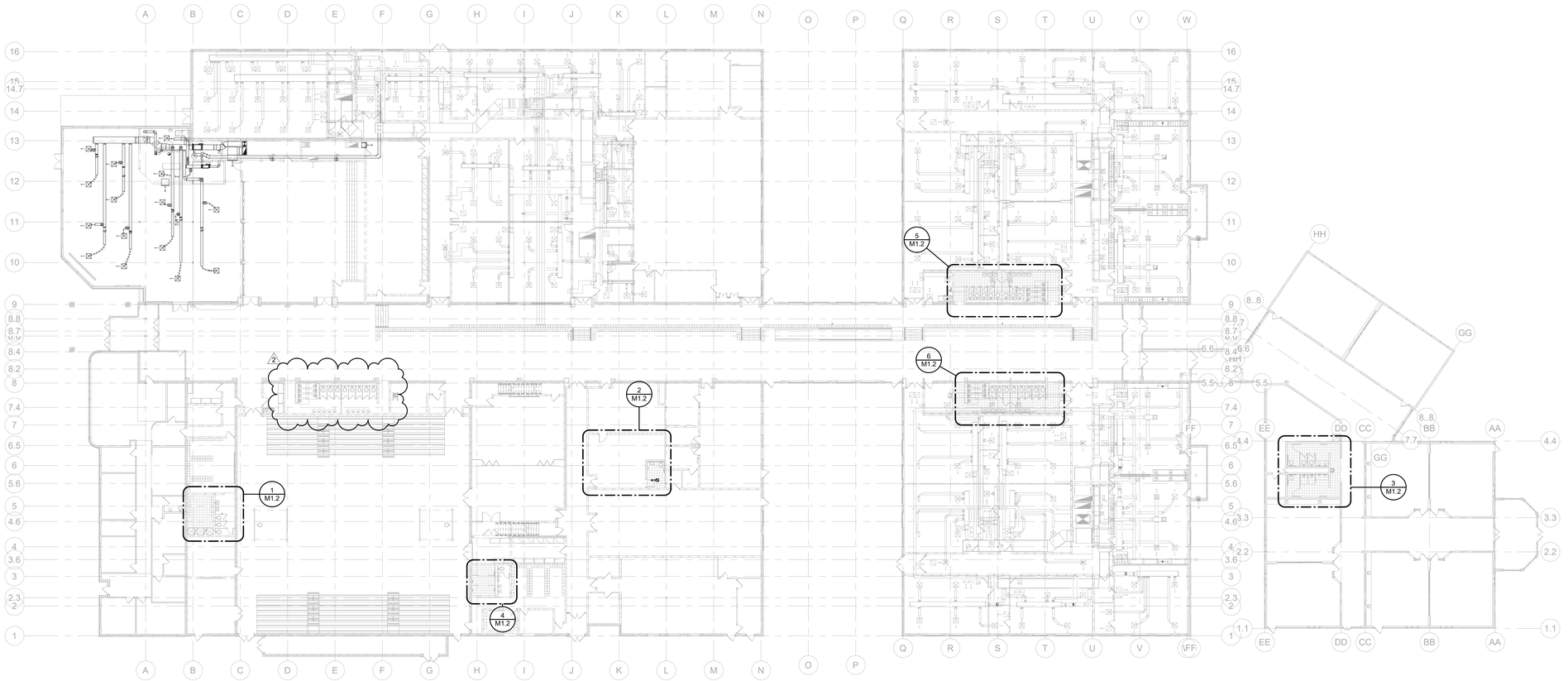

MECHANICAL OVERALL PLAN
SCALE: 1" = 20'-0"

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No	Description	Date
2	Addendum #1	04/20/20

Issue Dates:
04.06.2020
PERMIT SET

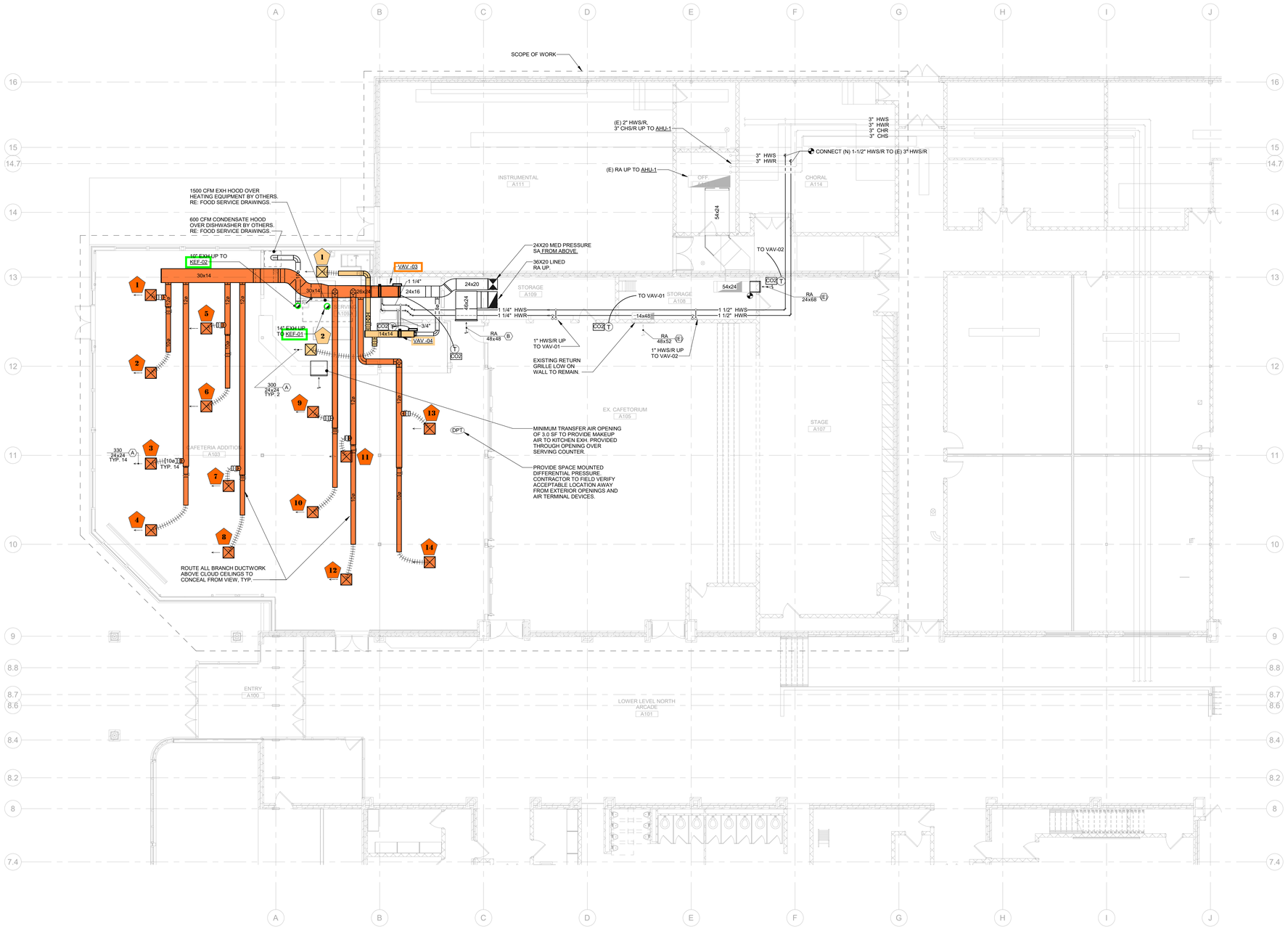
Sheet Title:
MECHANICAL OVERALL PLAN

Project No:
10183.00

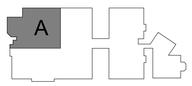
Sheet No:
M1.1

NOTES:

1. RE: M3.0 SERIES FOR MECHANICAL DIAGRAMS.
2. CEILING COORDINATION OF ALL MEP SYSTEMS (LIGHTING, DUCTWORK, DIFFUSERS, ELECTRICAL, FIRE PROTECTION, ETC.) MUST BE COMPLETED BY THE CONTRACTOR PRIOR TO THE START OF ANY INSTALLATIONS.
3. DO NOT ROUTE DUCTWORK OVER ELECTRICAL ROOMS OR ELECTRICAL PANELS; MAINTAIN N.E.C. CLEARANCES. COORDINATE ROUTINGS WITH DIV. 16 CONTRACTOR.
4. PROVIDE FLEXIBLE DUCT AND PIPE CONNECTIONS TO ALL MOTORIZED EQUIPMENT.
5. ALL DUCTWORK SHALL BE ROUTED AS HIGH AS POSSIBLE IN THE CEILING SPACE. UTILIZE JOIST SPACE WHEN POSSIBLE, ESPECIALLY WHERE CROSSING OTHER DUCTS, PIPES, AND ELECTRICAL.
6. MAINTAIN MIN. 3 FT BETWEEN ENVIRONMENTAL EXH TERMINATIONS AND OPENINGS INTO BUILDING.



1 FIRST LEVEL AREA A MECHANICAL PLAN
SCALE: 1/8" = 1'-0"



KEY PLAN

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Revisions:		
No	Description	Date

Issue Dates:
04.06.2020
PERMIT SET

Sheet Title:
FIRST LEVEL AREA A MECH PLAN

Project No:
10183.00

Sheet No:
M2.1

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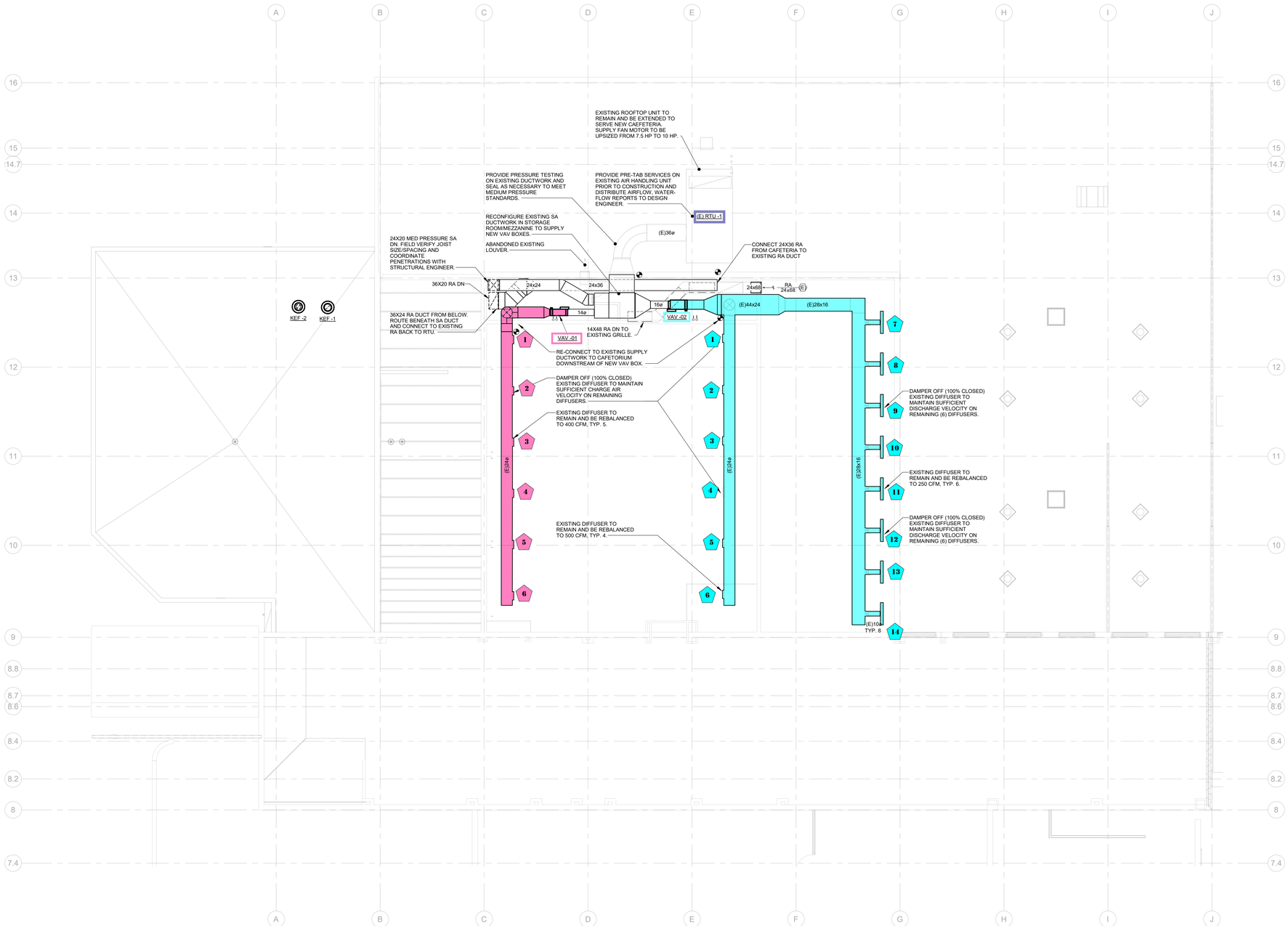

ROOF AREA A MECHANICAL PLAN

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

NOTES:

1. RE: M3.0 SERIES FOR MECHANICAL DIAGRAMS.
2. CEILING COORDINATION OF ALL MEP SYSTEMS (LIGHTING, DUCTWORK, DIFFUSERS, ELECTRICAL, FIRE PROTECTION, ETC.) MUST BE COMPLETED BY THE CONTRACTOR PRIOR TO THE START OF ANY INSTALLATIONS.
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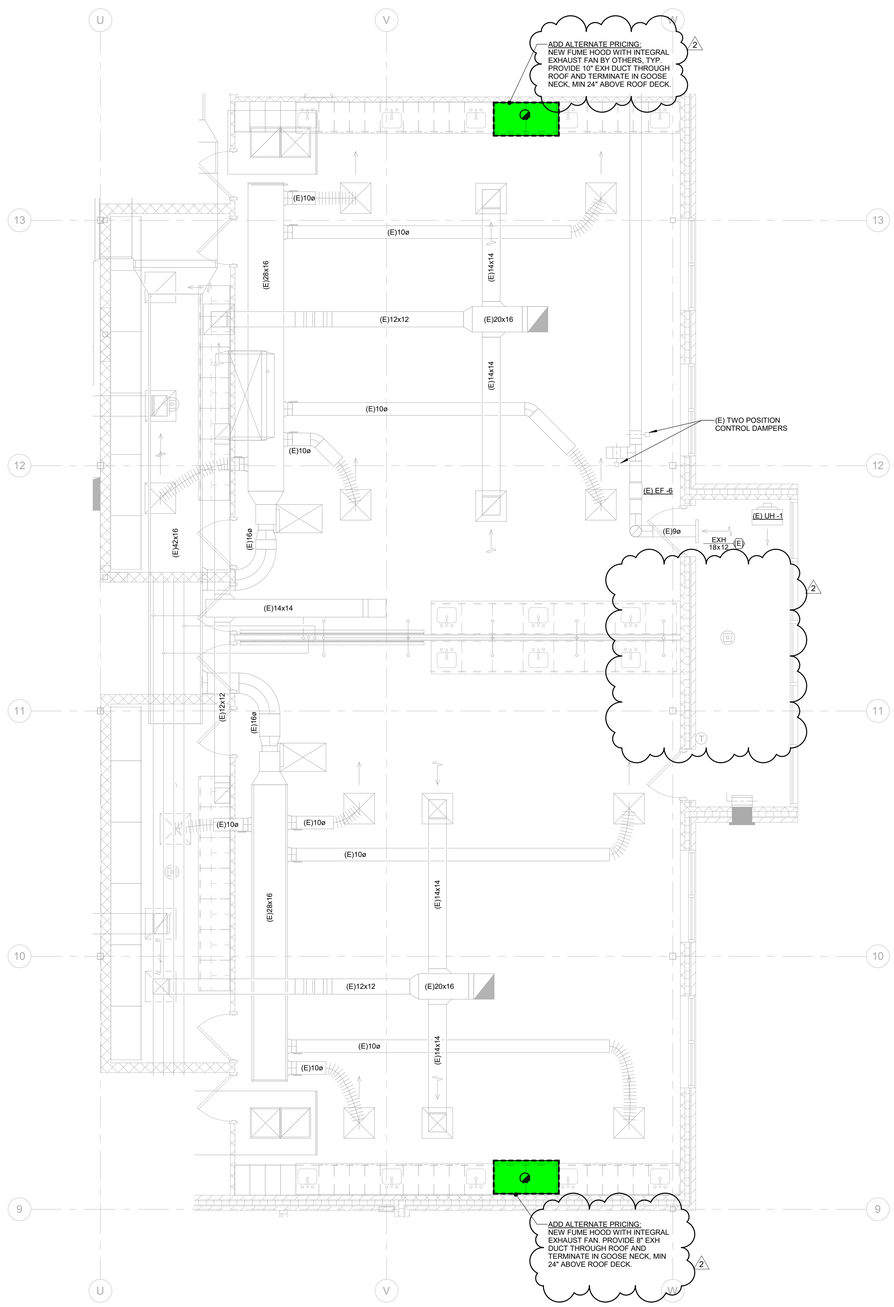
Revisions:		
No	Description	Date

Issue Dates:
04.06.2020
PERMIT SET

Sheet Title:
ROOF AREA A MECHANICAL PLAN

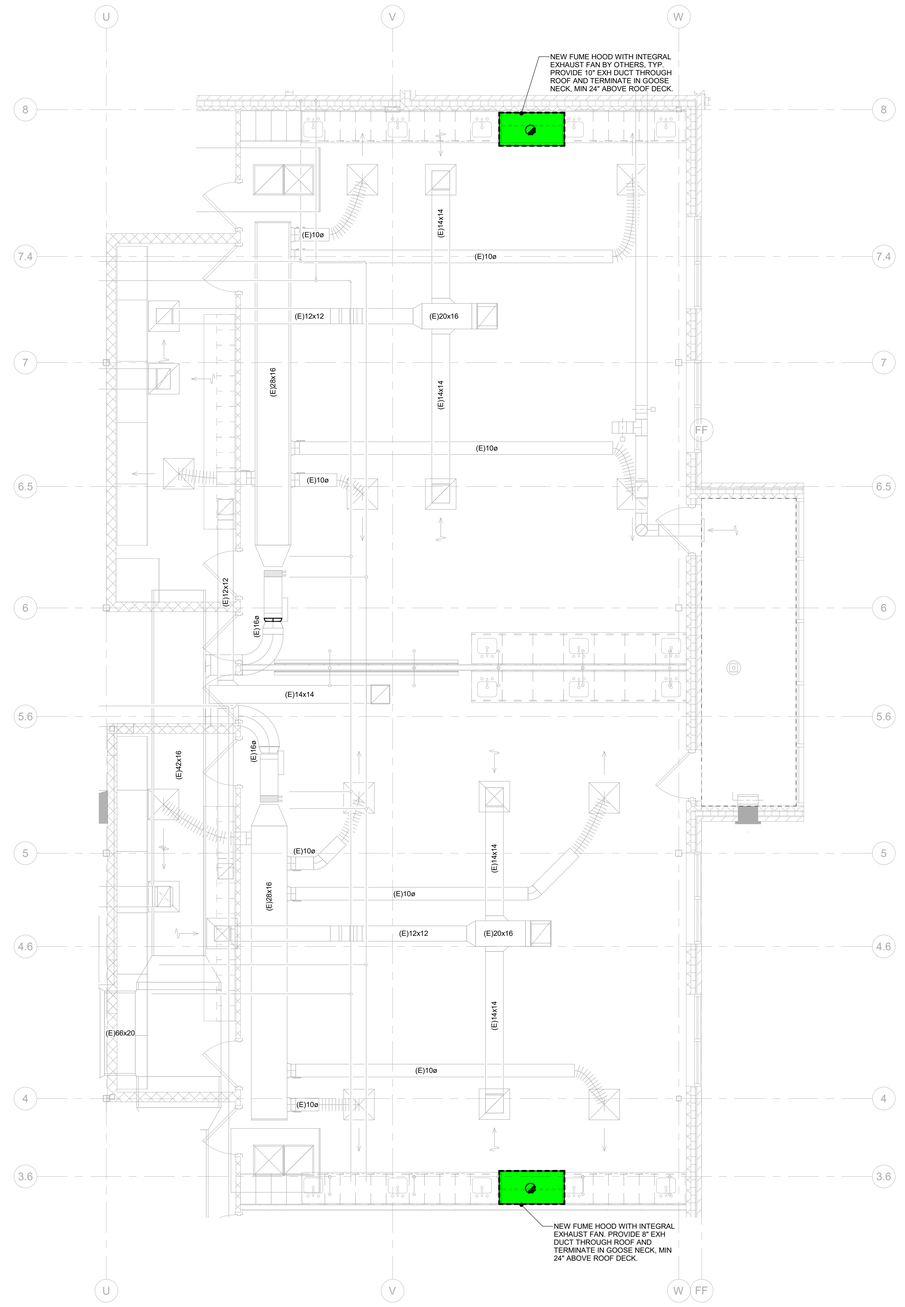
Project No:
10183.00

Sheet No:
M2.4



7TH GRADE SCIENCE ROOMS MECHANICAL PLAN

SCALE: 1/4" = 1'-0"



8TH GRADE SCIENCE ROOMS MECHANICAL PLAN

SCALE: 1/4" = 1'-0"

NOTES:

1. RE: M3.0 SERIES FOR MECHANICAL DIAGRAMS.
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No	Description	Date
2	Addendum #1	04/20/20

Issue Dates:
04.06.2020
PERMIT SET

Sheet Title:
SCIENCE ROOMS ENLARGED MECH PLANS

Project No:
10183.00

Sheet No:
M2.3