

Project Number:	3220800.AC
Sheet Issue Date:	1/17/2025
Drawn By:	LEL
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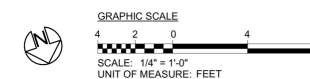
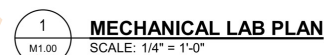
GRAPHIC SCALE



SCALE: $\frac{3}{8}" = 1'-0"$
UNIT OF MEASURE: FEET

1. AIR TERMINAL UNITS SHALL BE INSTALLED PER THE MANUFACTURERS WRITTEN INSTRUCTION. REFER TO AIR TERMINAL UNIT SCHEDULE FOR INLET DUCT SIZES UNLESS OTHERWISE NOTED.
2. HVAC IN ELECTRICAL/TELECOM ROOMS SHALL BE COORDINATED WITH ALL ELECTRICAL COMPONENTS SUCH THAT INSTALLATION IS COMPLIANT WITH NEC. REFER TO ELECTRICAL DRAWINGS FOR DETAILS.
3. CONTRACTOR SHALL COORDINATE ALL DUCT RISES WITH STRUCTURAL OPENINGS PRIOR TO ANY WORK.
4. ALL AIR DEVICES SHALL BE PROVIDED WITH A DUCT MOUNTED VOLUME DAMPER FOR BALANCING. DIFFUSER MOUNTED OPPOSED BLADE DAMPERS ARE NOT ACCEPTABLE.

1. 10"Ø EXHAUST DUCT DOWN TO FUME HOOD.
2. 6"Ø EXHAUST DUCT DOWN TO SNORKEL.
3. BALANCE RETURN AIR DAMPER TO 1855 CFM.



64 Research St
Blackville, SC 29817

SC PROJECT NUMBER: P20-9564-PD

ARCHITECTURE
LANDSCAPE ARCHITECTURE
PLANNING
INTERIOR DESIGN



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Drawing

MECHANICAL LAB
PLAN

M1.02

CONSTRUCTION DOCUMENTS

01/17/2025
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THE LINE SHOWN ABOVE IS
EXACTLY ONE INCH LONG AND
SHOULD BE USED AS A GUIDE

E

THE SPACES ABOVE ARE COLORED WITH BLACK
AND WHITE LETTERS IF PRINTED CORRECTLY

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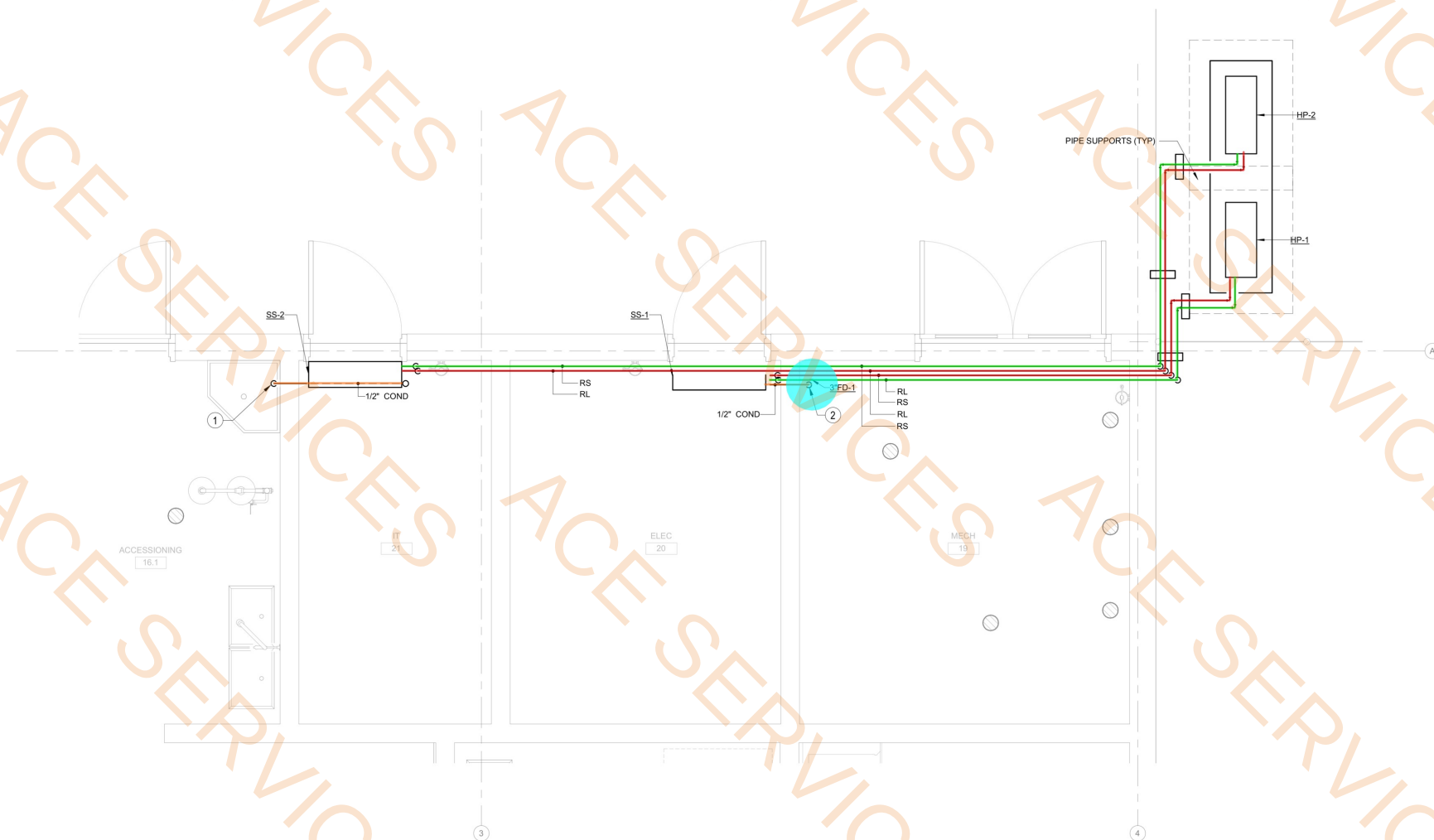
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B

A

- RL, Refrigerant Liquid
- RS, Refrigerant Suction
- 1/2" Condensate Line (Add Extra 20 Ft)
- FD-1, Floor Drain

- 52.2 FT
- 52.3 FT
- 5.7 FT
- 1.0 EA



MECHANICAL PIPING PLAN
SCALE: 1/2" = 1'-0"

GENERAL NOTES

1. INSTALL ALL REFRIGERANT PIPING PER MANUFACTURERS GUIDELINES.

DRAWING NOTES

1. ROUTE MECHANICAL CONDENSATE DOWN TO MOP SINK.
2. ROUTE MECHANICAL CONDENSATE DOWN TO FLOOR DRAIN.

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ARCHITECTURE
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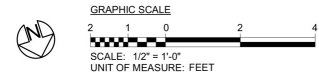
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MECHANICAL PIPING
PLAN

M2.01

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MECHANICAL AIR BALANCE PLAN

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

1

2

3

4

5

6

GENERAL NOTES

1. ALL WALL MOUNTED THERMOSTATS SHALL BE LOCATED AT THE SAME HEIGHT AS THE LIGHT SWITCH. LOCATION SHALL BE FULLY COORDINATED WITH ARCHITECTURAL CASEWORK AND ELECTRICAL.

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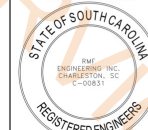
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Drawing
MECHANICAL AIR
BALANCE PLAN

M3.01

CONSTRUCTION DOCUMENTS

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THE SQUARES ABOVE ARE COLOR, WITH BLACK AND WHITE LETTERS, IF PRINTED CORRECTLY

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SEQUENCE OF OPERATION

PART 1 - MASTER HEATING AND COOLING CONTROL

- A. THE BAS SHALL COMMAND THE DEDICATED OUTSIDE AIR UNIT BASED ON THE OCCUPIED/UNOCCUPIED SCHEDULE (INITIAL SCHEDULE SHALL BE PROVIDED BY THE OWNER) AND ENABLE THE DOAU'S AUTOMATIC CONTROLS TO OPERATE AS INDICATED BELOW.
- B. THE DOAU SHALL PROVIDE AIR TO THE FACILITY TO MAINTAIN THE BUILDING PRESSURE DIFFERENTIAL AND PROVIDE VENTILATION AIR TO THE BUILDING. THE DOAU MANUFACTURER'S INTERNAL CONTROL SYSTEM SHALL MAKE ALL HEATING, COOLING AND DEHUMIDIFICATION DECISIONS IN RESPONSE TO SIGNALS FROM SPACE/RETURN AND OUTDOOR AIR SENSORS MEASURING INDOOR AND OUTDOOR TEMPERATURE AND HUMIDITY THROUGH THE BAS. THE INTEGRAL CONTROLS SHALL AUTOMATICALLY MODULATE THE DX COOLING COIL TO MAINTAIN THE REQUIRED UNIT LEAVING AIR TEMPERATURE AND HUMIDITY SET POINTS.
- C. THE BAS SHALL CONTROL THE SYSTEM HEATING AND COOLING MODES AS SELECTED IN ACCORDANCE WITH OUTDOOR AIR TEMPERATURE THROUGH THE BUILDING GLOBAL OUTDOOR AIR SENSOR. ON A RISE IN OUTDOOR AIR TEMPERATURE TO 50°F AND ABOVE, SYSTEMS SHALL OPERATE IN THE COOLING MODE. ON A FALL IN OUTDOOR AIR TEMPERATURE BELOW 50°F SYSTEMS SHALL OPERATE IN THE HEATING MODE.
- D. CONTROL POINT ADJUSTMENT FOR "HEATING" AND "COOLING" CHANGEOVER TEMPERATURE SHALL BE BY THE BAS TO THE DOAU CONTROLLER.
- E. WHERE USED TO CONTROL BOTH COMFORT HEATING AND COOLING, ZONE THERMOSTATIC CONTROLS SHALL BE CAPABLE OF PROVIDING A TEMPERATURE RANGE OR DEAD BAND OF AT LEAST 5°F WITHIN WHICH THE SUPPLY OF HEATING AND COOLING ENERGY TO THE ZONE IS TURNED OFF OR REDUCED TO A MINIMUM.
- F. THE HVAC SYSTEMS AND BAS SHALL BE CAPABLE OF MAINTAINING SPACE TEMPERATURE SET POINTS WITHIN 2°F (PLUS OR MINUS) HEAD TO FOOT AND FROM SPACE TO SPACE.

PART 2 - AIR HANDLING UNIT CONTROL

- A. SYSTEM CONTROL
1. SUPPLY FAN SHALL BE MANUALLY INDEXED TO THE AUTOMATIC MODE AT ITS RESPECTIVE VARIABLE FREQUENCY DRIVE.
 2. WHEN THE UNIT IS DE-ENERGIZED THROUGH THE BAS, ALL CONTROLS SHALL RETURN TO THEIR NORMAL POSITION READY FOR RESTARTING. THE SUPPLY FAN SHALL DE-ENERGIZE AND, AFTER AN ADJUSTABLE INTERVAL, THE OUTSIDE AIR DAMPER SHALL CLOSE.
 3. THE SUPPLY FAN SPEED SHALL BE MODULATED VIA THE VFD TO MAINTAIN SYSTEM STATIC PRESSURE SET POINT AS SEEN BY THE SYSTEM STATIC PRESSURE TRANSMITTER (SPT). THE SUPPLY FAN ARRAY SHALL BE PROVIDED WITH A HIGH LIMIT CONTROL FUNCTION WHICH SHALL LIMIT THE CFM OF THE ARRAY TO 115% OF ITS SCHEDULED QUANTITY. THE HIGH LIMIT CONTROL FUNCTION SHALL OVERRIDE SYSTEM STATIC PRESSURE CONTROL, ALARM THE BAS, AND DEENERGIZE THE SUPPLY FAN IF THE CFM EXCEEDS THE HIGH CFM LIMIT.
 4. OUTSIDE AIR ISOLATION DAMPER SHALL FAIL CLOSED. UNIT SHALL DE-ENERGIZE IF ANY OF THE DAMPERS THAT ARE REQUIRED TO BE OPEN FOR NORMAL OPERATION HAVE FAILED CLOSED.
- B. HEATING MODE CONTROL
1. THE VARIABLE REFRIGERANT CIRCUIT SHALL BE DE-ENERGIZED DURING THE HEATING MODE, THE NATURAL GAS FIRED FURNACE SHALL BE ENERGIZED AND SHALL MODULATE TO ITS MINIMUM SET POINT.
 2. OUTDOOR AIR DAMPER SHALL BE OPEN. SUPPLY FAN SHALL BE RUNNING; THE BAS SHALL SLOWLY MODULATE THE NATURAL GAS FIRED FURNACE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SET POINT (ADJ) AS SEEN BY THE DISCHARGE AIR TEMPERATURE SENSOR. UPON A RISE IN DISCHARGE AIR TEMPERATURE, THE REVERSE SHALL OCCUR.
- C. COOLING MODE CONTROL
1. UPON A CALL FOR COOLING, THE VARIABLE REFRIGERANT CIRCUIT SHALL BE ENERGIZED AND THE NATURAL GAS FIRED FURNACE SHALL BE DE-ENERGIZED. OUTDOOR DAMPER SHALL BE OPEN. SUPPLY FAN SHALL BE RUNNING. THE REFRIGERANT CIRCUIT SHALL MODULATE THE EVAPORATOR COIL TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SET POINT (ADJ) AS SEEN BY THE DISCHARGE AIR TEMPERATURE SENSOR.

D. DEHUMIDIFICATION CONTROL

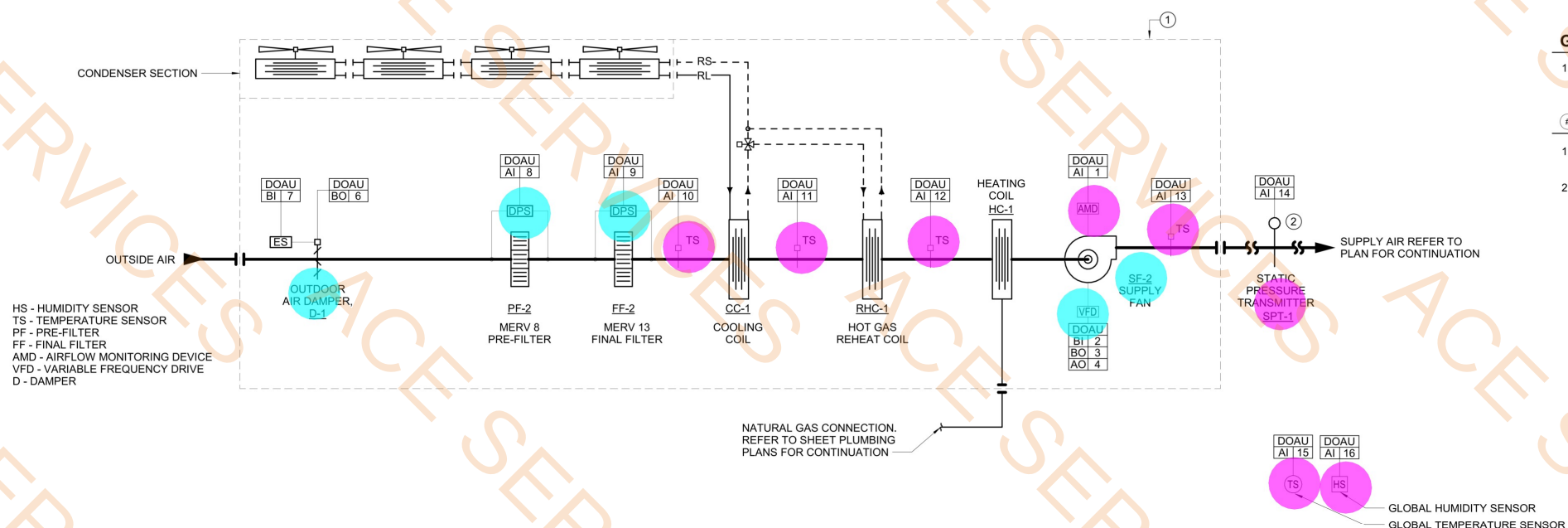
1. A SPACE DEWPOINT SETPOINT IS CALCULATED USING SPACE TEMPERATURE SETPOINT ACTIVE AND SPACE DEHUMIDIFICATION SETPOINT (RELATIVE HUMIDITY). DEHUMIDIFICATION MODE IS ENABLED WHEN THE SPACE DEWPOINT RISES ABOVE THE SPACE DEWPOINT CALCULATED ENABLE SETPOINT (2° DEADBAND) OR WHEN THE OUTDOOR AIR DEWPOINT RISES ABOVE 53° (3° DEADBAND). DEHUMIDIFICATION MODE IS TERMINATED BASED ON THE SETPOINT DEADBANDS OR IF THE SPACE TEMPERATURE DROPS MORE THAN 2°F BELOW SPACE SETPOINT.
2. DURING DEHUMIDIFICATION MODE, COOLING IS CONTROLLED TO THE DEHUMIDIFICATION TEMPERATURE SETPOINT ACTIVE, AND HOT GAS REHEAT IS CONTROLLED TO THE DISCHARGE AIR TEMPERATURE SETPOINT ACTIVE.
3. DEHUMIDIFICATION TEMPERATURE SETPOINT ACTIVE IS RESET BY COMPARING THE SPACE DEWPOINT TO THE SPACE DEWPOINT CALCULATED ENABLE SETPOINT BUT IS LIMITED TO NOT RISE ABOVE THE DISCHARGE AIR TEMPERATURE SETPOINT ACTIVE. DISCHARGE AIR TEMPERATURE SETPOINT ACTIVE IS RESET BY COMPARING THE SPACE TEMPERATURE TO THE SPACE TEMPERATURE SETPOINT ACTIVE.
4. WHEN THE SPACE RELATIVE HUMIDITY SENSOR REACHED 60% (ADJ) HUMIDITY, AS SENSED BY ANY SPACE HUMIDITY SENSOR, TEMPERATURE CONTROL SEQUENCE SHALL BE OVERRIDEN. THE VARIABLE REFRIGERANT CIRCUIT SHALL MODULATE TO MAINTAIN A TEMPERATURE CONTROL SEQUENCE OF 40°F (ADJ). AS SENSED BY THE COOLING COIL LEAVING AIR TEMPERATURE SENSOR, THE HOT GAS REHEAT COIL SHALL SLOWLY MODULATE TO MAINTAIN THE DISCHARGE AIR TEMPERATURE SET POINT (ADJ). WHEN THE CONTROLLING HUMIDITY SENSOR DROPS BELOW 50%, FOR TEN MINUTES, CONTROL SHALL BE RETURNED TO NORMAL "COOLING MODE" OPERATION.

E. ALARMS

1. FAN FAILURE: A FAILURE OF THE SUPPLY FAN AS SENSED BY ITS VARIABLE FREQUENCY DRIVE SHALL BE ALARMED TO THE BAS. UPON SENSING FAILURE, THE BAS SHALL INDICATE ALARM AND DISABLE THE FAILED FAN.
2. DAMPER FAILURE: A FAILURE OF ANY OF THE DAMPERS THAT ARE REQUIRED TO BE PROVEN OPEN FOR NORMAL OPERATION SHALL BE ALARMED TO THE BAS. UPON SENSING FAILURE, THE BAS SHALL INDICATE ALARM, DISABLE THE AHU AND RETURN ALL CONTROLS TO THEIR NORMAL POSITION.
3. OUTSIDE AIR DAMPER SHALL FAIL CLOSED.
4. HIGH STATIC PRESSURE: AT A SUPPLY STATIC PRESSURE AT 6" W.G. AS SENSED BY AHU STATIC PRESSURE TRANSMITTER (SPT), THE BAS SHALL INDICATE ALARM, DISABLE THE AHU AND RETURN ALL CONTROLS TO THEIR NORMAL POSITION.
5. DIFFERENTIAL PRESSURE TRANSMITTER INSTALLED ACROSS THE FILTER SHALL ALARM THE BAS WHEN THEIR RESPECTIVE SETTINGS ARE REACHED. INITIAL HIGH DIFFERENTIAL PRESSURE SET POINTS SHALL BE PER FILTER MANUFACTURER'S RECOMMENDATIONS.

F. BAS TRENDING

1. OUTDOOR AIRFLOW, AS SEEN BY OUTDOOR AIRFLOW MEASURING STATION, SHALL BE TRENDED BY THE BUILDING BAS.



SCHEMATIC - DEDICATED OUTSIDE AIR UNIT (DOAU-1)

SCALE: N.T.S.

GENERAL NOTES

1. REFER TO SPECIFICATIONS FOR FAN TYPE

DRAWING NOTES

1. ALL ITEMS LOCATED WITHIN THE DASHED LINE ARE PART OF THE AIR HANDLING UNIT.
2. STATIC PRESSURE SENSOR SHALL BE LOCATED IN THE SUPPLY DUCTWORK AT THE POINT(S) OF MINIMUM STATIC PRESSURE (TYPICALLY 2/3 DOWNSTREAM) AND THE INITIAL BALANCE SET POINT DETERMINED THROUGH TEST AND BALANCE.

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NAN EA

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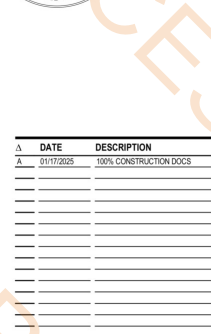
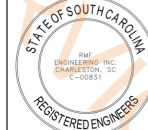
2.0 EA

2.0 EA

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1. ALL ITEMS LOCATED WITHIN THE DASHED LINE ARE PART OF THE AIR HANDLING UNIT.
2. STATIC PRESSURE SENSOR SHALL BE LOCATED IN THE SUPPLY DUCTWORK AT THE POINT(S) OF MINIMUM STATIC PRESSURE (TYPICALLY 2/3 DOWNSTREAM) AND THE INITIAL BALANCE SET POINT DETERMINED THROUGH TEST AND BALANCE.
3. SMOKE DETECTOR SHALL BE FURNISHED AND WIRED UNDER DIVISION 28 AND INSTALLED BY DIVISION 23.



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MECHANICAL
SCHEMATICS AND
CONTROLS

M5.05

CONSTRUCTION DOCUMENTS

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SEQUENCE OF OPERATION

PART 1 - GENERAL

- LABORATORY CONTROL SYSTEM (LCS) ROOM CONTROLLER SHALL SIMULTANEOUSLY MONITOR AND CONTROL AIR BALANCE, VENTILATION AND TEMPERATURE IN THE LABORATORY.
- THE LCS ROOM CONTROLLER SHALL BE CALIBRATED AND THOROUGHLY LOOP TUNED TO PROVIDE STABLE LABORATORY SUPPLY AND EXHAUST AIR TERMINAL AIRFLOW AND SPACE PRESSURIZATION CONTROL. AIRFLOW OFFSET SHALL BE CONSISTENT WITHOUT VARIATION AND SPACE TEMPERATURE SHALL BE STABLE WITHOUT FLUCTUATIONS BETWEEN THE DEAD BAND LIMITS.
- LCS ROOM CONTROLLER SHALL MODULATE THE CONTAINMENT (FUME HOOD) EXHAUST TERMINAL UNIT TO MAINTAIN ITS CONSTANT AIR FLOW SETPOINT AND MODULATE THE LABORATORY SUPPLY AND LABORATORY GENERAL EXHAUST TERMINAL UNITS TO MAINTAIN TEMPERATURE CONTROL, VENTILATION (ACH) AND PRESSURE INDEPENDENT CONSTANT FLOW OFFSET.
- THE VOLUMETRIC FLOW RATE OF SUPPLY AND EXHAUST AIR INTO AND OUT OF EACH LABORATORY AREAS AS DEFINED ON THE AIR BALANCE PART PLANS SHALL BE AUTOMATICALLY MAINTAINED REGARDLESS OF FLUCTUATIONS IN STATIC PRESSURE; I.E. FLOW RATES SHALL BE DETERMINED BASED ON TERMINAL UNIT SENSOR READINGS AND THE POSITIONS OF AIR VOLUME REGULATORS IN THE SUPPLY AND EXHAUST TERMINAL UNIT SHALL BE ADJUSTED AUTOMATICALLY TO MAINTAIN THE SET POINT FLOW RATES.
- THE BAS/LCS SHALL DETERMINE AND OPERATE THE LABORATORY ON AN OCCUPIED/UNOCCUPIED SCHEDULE WITH A 365 DAY/24 HOUR GRAPHIC INTERFACE SCHEDULE PROGRAM. DURING THE OCCUPIED SCHEDULE, OR PERIODS DURING THE UNOCCUPIED SCHEDULE WHEN THE LABORATORY IS OCCUPIED (AS DETECTED BY ROOM OCCUPANCY SENSOR) OR THE FUME HOOD IS NOT FULLY CLOSED (AS DETECTED BY ITS SASH SENSOR), THE LABORATORY EXHAUST AIR CHANGE RATE SHALL BE A MINIMUM OF 8 ACH. DURING THE UNOCCUPIED SCHEDULE WHEN THE FUME HOOD IS FULLY CLOSED AND THE LABORATORY IS VACANT, THE LABORATORY EXHAUST AIR CHANGE RATE SHALL BE A MINIMUM OF 4 ACH.
- DAILY AUTOMATED TERMINAL UNIT CALIBRATION SHALL OCCUR WITH NO INTERRUPTION OF AIRFLOW OR LOSS OF PREDETERMINED AIRFLOW OFFSET. PROVIDE AUTO-ZERO MODULES FOR LABORATORY TERMINAL UNITS TO ACCOMMODATE THIS PROVISION.

PART 2 - AIR BALANCE AND PRESSURE CONTROL

- THE CONTAINMENT (FUME HOOD) EXHAUST TERMINAL UNIT SHALL MAINTAIN ITS SCHEDULED/REQUIRED AIRFLOW SET POINT AS SENSED BY THE TERMINAL UNIT AIRFLOW MEASURING DEVICE. THE AIRFLOW SETPOINT SHALL BE EQUAL TO THE AIRFLOW VALUE REQUIRED TO ACHIEVE BOTH 100 FPM THROUGH THE FUME HOOD SASH AT 18" SASH HEIGHT AND 60 FPM THROUGH THE FUME HOOD SASH AT 28" FULL OPEN SASH HEIGHT (COORDINATE WITH APPROVED FUME HOOD MANUFACTURER).
- THE LCS ROOM CONTROLLER SHALL CONTINUOUSLY TOTALIZE ALL ROOM EXHAUST AIRFLOWS INCLUDING CONTAINMENT (FUME HOOD) AND THE GENERAL EXHAUST, AS APPLICABLE TO INDIVIDUAL ROOMS, AS THE TOTAL ROOM EXHAUST AIRFLOW. THE LABORATORY ROOM CONTROLLER SHALL ALSO CONTINUOUSLY MEASURE THE ROOM SUPPLY AIRFLOW.
- WITH THE CONTAINMENT (FUME HOOD) EXHAUST TERMINAL UNIT OPERATING AT ITS CONSTANT FLOW SET POINT, THE LCS ROOM CONTROLLER SHALL CONTINUOUSLY CONTROL THE ROOM SUPPLY AIRFLOW BETWEEN ITS MINIMUM AND MAXIMUM SETPOINTS TO SATISFY SPACE TEMPERATURE SETPOINTS, AND SHALL CONTINUOUSLY CONTROL THE ROOM GENERAL EXHAUST AIRFLOW TO MAINTAIN THE DIFFERENTIAL OFFSET AIRFLOW BETWEEN THE TOTAL ROOM EXHAUST AIRFLOW AND THE TOTAL ROOM SUPPLY AIRFLOW AS INDICATED ON THE AIR BALANCE PART PLANS.
- FOR NEGATIVELY PRESSURIZED ROOMS THE TOTAL ROOM SUPPLY AIRFLOW SHALL ALWAYS BE MAINTAINED AT A LOWER VALUE THAN THE TOTAL ROOM EXHAUST AIRFLOW. THE DIFFERENTIAL OFFSET AIRFLOW, EQUAL TO WHAT IS REQUIRED TO MAINTAIN THE MINIMUM NEGATIVE PRESSURE SET POINT OF 0.015 INCHES W.G., SHALL BE MAINTAINED REGARDLESS OF ANY CHANGE IN FLOW OR STATIC PRESSURE.
- INITIAL DIFFERENTIAL OFFSET AIRFLOW VALUES ARE INDICATED ON THE LABORATORY AIR BALANCE DIAGRAM. FINAL DIFFERENTIAL OFFSET AIRFLOW VALUES SHALL BE ESTABLISHED DURING SYSTEM AIR BALANCE STARTUP AND TEST AND BALANCE, AND THEN CONFIRMED THROUGH COMMISSIONING. FINAL DIFFERENTIAL OFFSET AIRFLOW VALUES THAT ARE NOT WITHIN 10% OF THE INITIAL VALUES SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT.

PART 3 - FUME HOOD CONTROL

- THE CONSTANT VOLUME FUME HOOD SHALL HAVE AN INTEGRAL FACE VELOCITY AND AIRFLOW MONITOR AND SASH SENSOR (PROVIDED BY LABORATORY CASEWORK SUPPLIER).
- THE LCS SHALL CONNECT TO AND MONITOR THE FUME HOODS FACE VELOCITY, AIRFLOW AND SASH POSITION.
- THE HOOD SHALL BE PROVIDED WITH A FUME HOOD OCCUPANCY SENSOR. WHEN THE HOOD IS DETERMINED TO BE UNOCCUPIED AS SENSED BY THE FUME HOOD OCCUPANCY SENSOR, THE FACE VELOCITY OF THE HOOD SHALL BE LOWERED TO A MINIMUM OF 60 FPM PER THE MANUFACTURER'S WRITTEN PRODUCT DATA. WHEN THE HOOD IS DETERMINED TO BE OCCUPIED, FANCE VELOCITY SHALL INCREASE TO 100 FPM.

PART 4 - VENTILATION CONTROL

- THE LCS ROOM CONTROLLER SHALL MAINTAIN THE SUPPLY AIR VOLUME AT OR ABOVE ITS MINIMUM SETPOINT.

PART 5 - TEMPERATURE CONTROL

- THE LCS CONTROLLER SHALL CONTINUOUSLY MEASURE THE TEMPERATURE IN THE ROOM BY MEANS OF THE ROOM TEMPERATURE SENSOR.
- THE ROOM TEMPERATURE SENSOR, THROUGH THE LCS ROOM CONTROLLER AND BAS, SHALL MODULATE THE SUPPLY AIR VOLUME REGULATOR BETWEEN ITS MINIMUM AND MAXIMUM SETPOINTS TO MAINTAIN THE OCCUPIED COOLING SETPOINT. THE ROOM GENERAL EXHAUST AIRFLOW SHALL ALSO MODULATE AS REQUIRED TO MAINTAIN THE DIFFERENTIAL OFFSET AIRFLOW CFM.
- ON A RISE IN SPACE TEMPERATURE ABOVE SETPOINT, THE SUPPLY AIR VOLUME REGULATOR SHALL MODULATE TOWARD IT'S MAXIMUM POSITION SET POINT.
- ON A DROP IN SPACE TEMPERATURE BELOW COOLING SET POINT, THE SUPPLY AIR VOLUME REGULATOR SHALL MODULATE TOWARD IT'S MINIMUM POSITION SET POINT.
- WHEN THE AIR VOLUME REGULATOR REACHES ITS MINIMUM POSITION SET POINT AND THE SPACE TEMPERATURE FALLS BELOW SETPOINT THE REHEAT COIL VALVE SHALL SLOWLY MODULATE OPEN TO MAINTAIN SPACE TEMPERATURE SETPOINT.
- ON A RISE IN SPACE TEMPERATURE, THE REVERSE SHALL OCCUR.

PART 6 - EMERGENCY OPERATION AND ALARMS

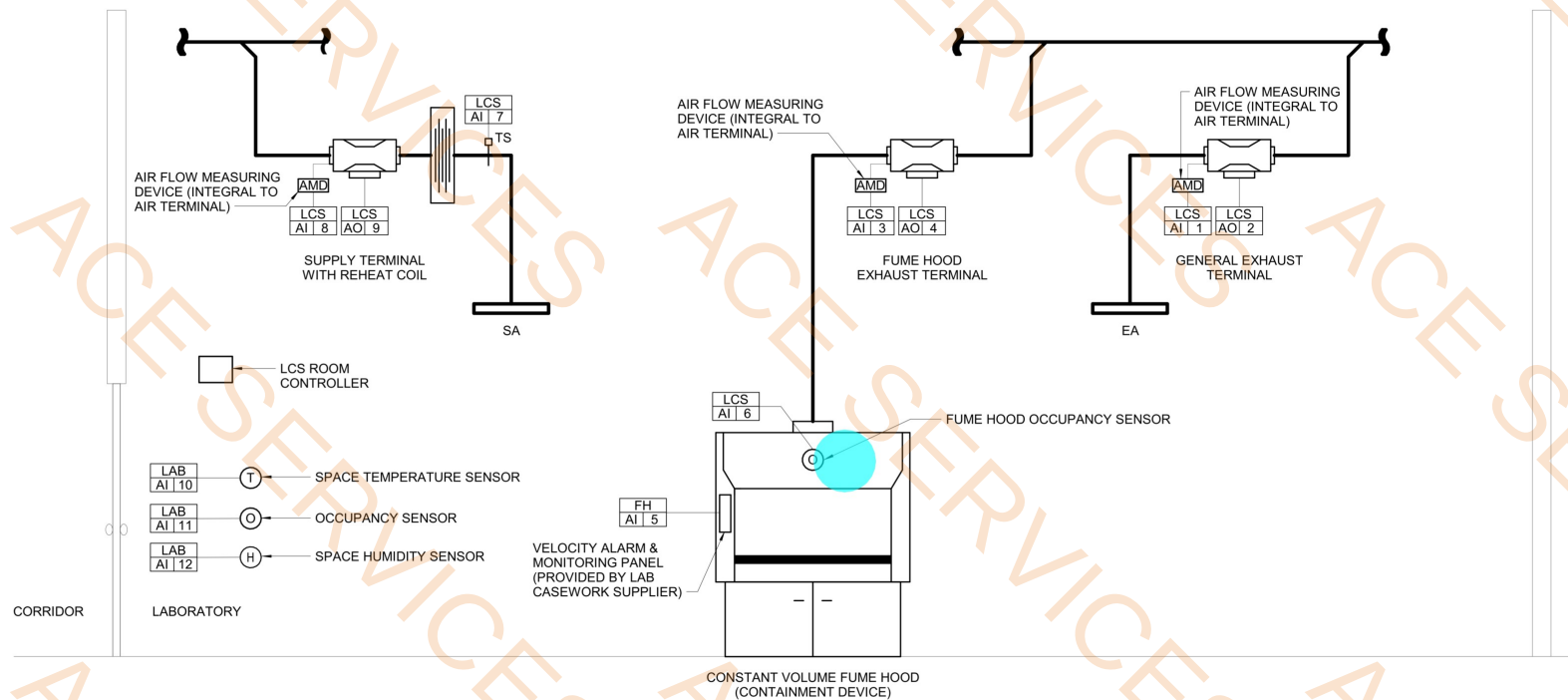
- AN ALARM THROUGH THE LCS AND BAS SHALL BE ANNUNCIATED IF THE LABORATORY CONSTANT DIFFERENTIAL OFFSET AIRFLOW OR MINIMUM DIFFERENTIAL PRESSURE IS NOT MAINTAINED FOR A PERIOD OF 30 MINUTES.
- THE FUME HOOD MONITOR SHALL ALARM IF THE MEASURED FACE VELOCITY AT 18" SASH HEIGHT FALLS BELOW THE MINIMUM ALLOWABLE FACE VELOCITY (80 FPM) OR RISES ABOVE THE MAXIMUM ALLOWABLE FACE VELOCITY (120 FPM) ALARM SETPOINTS FOR A PERIOD OF 15 MINUTES.
- ON A LOSS OF NORMAL ELECTRIC POWER TO THE BUILDING, EACH LABORATORY CONTAINMENT (FUME HOOD) EXHAUST TERMINAL UNIT SHALL CONTINUE TO OPERATE AND SHALL MAINTAIN ITS SCHEDULED AIRFLOW SET POINT. THE LABORATORY GENERAL EXHAUST TERMINAL VALVES SHALL CONTINUE TO OPERATE AND SHALL MAINTAIN A MINIMUM OF 4 ACH. THE LABORATORY SUPPLY AIR TERMINALS SHALL FAIL CLOSED.
- UPON ACTIVATION OF THE BUILDINGS FIRE ALARM SYSTEM, EACH LABORATORY CONTAINMENT (FUME HOOD) EXHAUST TERMINAL VALVE SHALL CONTINUE TO OPERATE AND SHALL MAINTAIN ITS SCHEDULED AIRFLOW SET POINT. THE LABORATORY GENERAL EXHAUST TERMINAL VALVES SHALL FULLY CLOSE.
- WHERE FEEDBACK OF THE SUPPLY AND EXHAUST AIR FLOW IS PROVIDED BY A CORRELATION TO THE DAMPER POSITION (AS IN A VENTURI VALVE), AN INPUT TO THE BUILDING AUTOMATION SYSTEM SHALL INDICATE WHEN THE SUPPLY OR EXHAUST DUCT STATIC PRESSURE IS INSUFFICIENT TO VALIDATE THIS CORRELATION.

SCHEMATIC - LABORATORY CONTROL - LAB SUPPLY, LAB GENERAL EXHAUST, AND LAB CONTAINMENT EXHAUST

SCALE: N.T.S.

GENERAL NOTES:

- FUME HOOD EXHAUST TERMINALS SHALL BE CONSTRUCTED OF ALL NON-CORROSIVE MATERIALS (STAINLESS STEEL).
- THE FUME HOOD FACE VELOCITY ALARM & MONITORING PANEL SHALL BE FURNISHED BY BAS CONTRACTOR AND FACTORY INSTALLED.
- APPLIES TO ALL SUPPLY AND EXHAUST TERMINALS CONNECTED TO LABORATORY AIR HANDLING SYSTEMS AND ALL AIR TERMINALS SCHEDULED TO BE PROVIDED UNDER SPECIFICATION SECTION 230900.



•• Fume Hood Occupancy Sensor(6 Qty)

1.0 EA

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BUILDING DESIGN COMMISSIONING DATA

1. OUTSIDE DESIGN CONDITIONS:	94.6°F DB / 75.2°F WB 82.8°F DB / 76.0°F WB 24.1°F
SUMMER SUMMER (DEHUMIDIFICATION): WINTER:	
2. GENERAL BUILDING CRITERIA:	0.084 0.027 0.65 0.25
WALL U-FACTOR: ROOF U-FACTOR: GLASS U-FACTOR: GLASS SHADING COEFFICIENT:	
3. GENERAL BUILDING DESIGN LOAD REQUIREMENTS:	1.0 - 2.0 W/SF 1.5 - 6.0 W/SF 245 BTU/PERSON 155 BTU/PERSON 250 BTU/PERSON 200 BTU/PERSON
LIGHTING: EQUIPMENT: PEOPLE (OFFICE-SENSIBLE): PEOPLE (OFFICE-LATENT): PEOPLE (LAB-SENSIBLE): PEOPLE (LAB-LATENT):	
4. COMFORT HEATING:	70°F ±2°F 70°F ±2°F 70°F ±2°F
INTERIOR SPACES (OFFICE) INTERIOR SPACES (LAB) ELECTRICAL, IT, MECHANICAL ROOMS	
5. COMFORT COOLING:	74°F ±2°F / 50% RH 72°F ±2°F / 50% RH 80°F
INTERIOR SPACES (OFFICES) INTERIOR SPACES (LAB) ELECTRICAL, IT, MECHANICAL ROOMS	
6. MINIMUM BUILDING POSITIVE PRESSURE: MINIMUM LABORATORY NEGATIVE PRESSURE:	0.05" WG 0.05" WG
7. GENERAL EXHAUST CRITERIA:	70 CFM/FIXTURE 50 CFM/FIXTURE
TOILETS/URINALS: CUSTODIAL:	
8. CODES:	INTERNATIONAL BUILDING CODE, 2021 INTERNATIONAL MECHANICAL CODE, 2021 INTERNATIONAL PLUMBING CODE, 2021 INTERNATIONAL ENERGY CONSERVATION CODE, 2009 NATIONAL ELECTRIC CODE, 2020 NATIONAL FIRE PROTECTION ASSOCIATION STANDARDS (LATEST EDITIONS)

AIR HANDLING UNIT SCHEDULE

DESIGNATION	LOCATION	SERVICE	AIRFLOW			SUPPLY FAN	COOLING COIL	HEATING COIL	PREFILTER	FINAL FILTER	WEIGHT (LBS)	ELECTRICAL DATA				BASIS OF DESIGN	REMARKS
			CFM	DESIGN OA CFM	MINIMUM OA CFM							VOLTS	PHASE	HERTZ	MCA	MOC	
AHU-1	WEST MECHANICAL YARD	OFFICE	3750	820	820	SF-1	CC-1	-	PF-1	FF-1	2565	208	3	60	74	100	TRANE
DOAU-1	WEST MECHANICAL YARD	LABS	8665	8665	8665	SF-2	CC-2	HC-1	PF-2	FF-2	6000	208	3	60	263	300	TRANE

AIR HANDLING UNIT FAN SCHEDULE

DESIGNATION	SERVICE	TYPE	TOTAL CFM	NO. OF FANS	TSP (IN H2O)	ESP (IN H2O)	FAN RPM	MOTOR BHP (PER FAN)	MOTOR HP (PER FAN)	DRIVE	VARIABLE FREQUENCY DRIVE			ELECTRICAL			REMARKS
											REQUIRED	ENCLOSURE	BYPASS	VOLTS	PHASE	HERTZ	
SF-1	AHU-1	SUPPLY	3750	1	1.95	1.8	1300	2.425	3	DIRECT	YES	WEMA 4X	NO	230	3	60	
SF-2	DOAU-1	SUPPLY	8665	1	4.25	2.0	2500	9.05	10	DIRECT	YES	WEMA 4X	NO	230	3	60	

COOLING COIL SCHEDULE

DESIGNATION	SERVICE	AIRFLOW		EAT (°F)		LAT (°F)		MBH	MAXIMUM H2O PD (IN H2O)	MAXIMUM FACE VELOCITY (FPM)	NO. OF COILS	MAXIMUM AIR PD (IN H2O)	MAX NUMBER OF ROWS	FLUID	REMARKS
		CFM	OA CFM	DB	WB	DB	WB								
AHU-1	AHU-1	3750	820	80	67	55	54	107.69	134.74	0.5	1	0.5	6	R-454B	
DOAU-1	DOAU-1	8665	8665	94.6	75.2	50.5	50	274	780.1	0.5	1	0.5	-	R-454B	

HEATING COIL SCHEDULE

DESIGNATION	SERVICE	AIRFLOW		EAT (°F)		LAT (°F)		INPUT MBH	OUTPUT MBH	MAXIMUM FACE VELOCITY (FPM)	MAXIMUM AIR PD (IN H2O)	FLUID	REMARKS
		CFM	OA CFM	DB	WB	DB	WB						
DOAU-1	DOAU-1	8665	8665	25	76.7	600	486			500	1.30	GAS	

FILTER SCHEDULE

DESIGNATION	SERVICE	APPROXIMATE BANK DIMENSIONS (IN) (WxHxD)	NUMBER OF CARTRIDGES	CARTRIDGE SIZE (IN) (WxHxD)	CFM	MAX FACE VELOCITY (FPM)	MEDIA AREA PER CARTRIDGE (SQ FT)	MAXIMUM INITIAL PD @ 500 FPM (IN H2O)	MERV RATING	REMARKS
FF-1	AHU-1	80"x96"	4	20"x24"x2"	3750	500	MERV 13	0.5	13	
FF-2	DOAU-1	160"x200"	8	20"x25"x2"	8665	500	MERV 13	0.5	13	
PF-1	AHU-1	80"x96"	4	20"x24"x2"	3750	500	MERV 8	0.5	8	
PF-2	DOAU-1	160"x200"	8	20"x25"x2"	8665	500	MERV 8	0.5	8	

EXHAUST AIR VALVE UNIT SCHEDULE

DESIGNATION	AIR FLOW (CFM)		INLET SIZE	OUTLET SIZE	MINIMUM INLET SP INCH WG	MAXIMUM NC VALVE @ 1.0 INCH WG INLET SP	BASIS OF DESIGN	REMARKS
	MAX	MIN						
EAV-1	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	1
EAV-2	700	35	8"Ø	8"Ø	0.5	30	PHOENIX	
EAV-3	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	1
EAV-4	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	1
EAV-5	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	1
EAV-6	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	1
EAV-7	700	35	8"Ø	8"Ø	0.5	30	PHOENIX	2
EAV-8	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	1
EAV-9	700	35	8"Ø	8"Ø	0.5	30	PHOENIX	2
EAV-10	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	1
EAV-11	1500	90	12"Ø	12"Ø	0.5	30	PHOENIX	
EAV-12	1500	90	12"Ø	12"Ø	0.5	30	PHOENIX	
EAV-13	1000	50	10"Ø	10"Ø	0.5	30	PHOENIX	

1. FUME HOOD VALVE.
2. SNORKEL VALVE.

SUPPLY AIR VALVE UNIT SCHEDULE

DESIGNATION	AIR FLOW (CFM)		BALANCED AIRFLOW		INLET SIZE	OUTLET SIZE	MIN SP	MAX NC	REHEAT COIL				ELECTRICAL			BASIS OF DESIGN	REMARKS
	COOLING		OCCUPIED (CFM)	UNOCCUPIED (CFM)					EAT (°F)	LAT (°F)	CAPACITY (BTU/HR)	HEATING KW	VOLTS	PHASE	HERTZ		
	MAXIMUM	MINIMUM															
SAV-1	1000	50	620	475	10"Ø	10"Ø	0.5	30	55	85	20088	6.3	208	3	60	PHOENIX	DUAL
SAV-2	700	35	240	135	8"Ø	8"Ø	0.5	30	55	85	7776	4.4	208	3	60	PHOENIX	
SAV-3	3000	180	2525	1010	12"Ø	12"Ø	0.5	30	55	85	81810	18.9	208	3	60	PHOENIX	
SAV-4	1500	90	1415	1101	12"Ø	12"Ø	0.5	30	55	85	45846	9.5	208	3	60	PHOENIX	
SAV-5	3000	180	2525	1010	12"Ø	12"Ø	0.5	30	55	85	81810	18.9	208	3	60	PHOENIX	DUAL
SAV-6	1000	50	720	475	10"Ø	10"Ø	0.5	30	55	85	23328	6.3	208	3	60	PHOENIX	
SAV-7	1000	50	720	475	10"Ø	10"Ø	0.5	30	55	85	23328	6.3	208	3	60	PHOENIX	

SUPPLY VAV UNIT SCHEDULE

DESIGNATION	AIRFLOW (CFM)				INLET SIZE	OUTLET T SIZE	MINIMUM INLET SP (IN H2O)	MAXIMUM NC	MAXIMUM AIR PRESSURE DROP (IN H2O)	REHEAT COIL PERFORMANCE				ELECTRICAL DATA			BASIS OF DESIGN	REMARKS
	COOLING		HEATING	UNOCCUPIED MINIMUM						EAT (°F)	LAT (°F)	CAPACITY (BTU/HR)	HEATING KW	VOLTS	PHASE	HERTZ		
	MAXIMUM	MINIMUM																
VAV-1	2000	1000	1000	667	16"ø	24"x18"	0.50	30	0.30	55	85	32443	18.2	208	3	60	TITUS DESV	
VAV-2	450	400	400	267	10"ø	14"x12"	0.50	30	0.30	55	85	12977	6.1	208	3	60	TITUS DESV	
VAV-3	500	250	250	167	8"ø	12"x10"	0.50	30	0.30	55	85	8111	5.7	208	3	60	TITUS DESV	
VAV-4	300	150	150	100	6"ø	12"x8"	0.50	30	0.30	55	85	4866	2.5	208	3	60	TITUS DESV	

FAN SCHEDULE

DESIGNATION	SERVICE	TYPE	CFM	SP INCH H2O	APPROX RPM	HP	WHEEL DIAMETER	DRIVE	ELECTRICAL			BASIS OF DESIGN	REMARKS
									VOLTS	PHASE	HERTZ		
EF-1	TLT 049	CEILING	150	0.25	1000	-	-	DIRECT	115	1	60	GREENHECK/SP-A	
EF-2	JANITOR 000	CEILING	115	0.25	1000	-	-	DIRECT	115	1	60	GREENHECK/SP-A	
EF-3	TLT 050	CEILING	155	0.25	1000	-	-	DIRECT	115	1	60	GREENHECK/SP-A	
LEF-1	LAB	STACK	8500	6	2480	15	20"	BELT	230	3	60	GREENHECK/VEKTOR-CD	
LEF-2	LAB	STACK	8500	6	2480	15	20"	BELT	230	3	60	GREENHECK/VEKTOR-CD	

SPLIT SYSTEM AIR CONDITIONING UNIT SCHEDULE

DESIGNATION	INDOOR UNIT	OUTDOOR UNIT	MOUNTING	FAN		EAT (°F)		COOLING LAT (°F)		BTU/HR		ELECTRICAL			BASIS OF DESIGN	REMARKS
				NOM AIRFLOW	FLA	WB	DB	WB	DB	SENSIBLE	TOTAL	VOLTS	PHASE	HERTZ		
SS-1	HP-1	WALL		425	0.65	90	73	67	57	1375	1661	208	1	60	TRANE	
SS-2	HP-2	WALL		425	0.65	90	73	67	57	748	963	280	1	60	TRANE	

AIR DEVICE SCHEDULE

NUMBER	DUTY	TYPE	CFM		FACE/MODULE SIZE (IN)	NOMINAL DUCT SIZE (IN)	BLOW	MAX TOTAL AIR PD (IN H2O)	MAX NOISE CRITERIA VALUE	MATERIAL	BASIS OF DESIGN		REMARKS
			MIN	MAX							MANUFACTURER	MODEL	
A1	SUPPLY	A	0	150	24"x24"	6"Ø	4-WAY	0.1	25	STEEL	TITUS	TDC	
A2	SUPPLY	A	151	275	24"x24"	8"Ø	4-WAY	0.1	25	STEEL	TITUS	TDC	
A3	SUPPLY	A	276	375	24"x24"	10"Ø	4-WAY	0.1	25	ALUMINUM	TITUS	TDCA-AA	
A5	SUPPLY	B	215	325	100"x12"	10"Ø	4-WAY	0.1	25	STEEL	TITUS	ML	
B1	RETURN	E	701	1100	24"x24"	18"x18"	PERF	0.1	20	STEEL	TITUS	PAR	
C1	EXHAUST	H	151	250	24"x24"	8"x8"	PERF	0.1	20	ALUMINUM	TITUS	TDCA-AA	
C2	EXHAUST	H	251	400	24"x24"	10"x10"	PERF	0.1	20	ALUMINUM	TITUS	TDCA-AA	

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