

Zone Name / Space Name	Floor Area (ft <sup>2</sup> )	Maximum Occupants	Required Outdoor Air (CFM/person)	Required Outdoor Air (CFM/ft <sup>2</sup> )	Required Outdoor Air (CFM)
<b>Zone 1</b>					
01 ROOM 1	1467.0	22.0	7.5	0.12	341.0
02 ROOM 2	1222.0	18.3	7.5	0.12	284.0
03 CASHWRAP	308.0	5.0	7.5	0.12	75.0
04 CORRIDOR	102.0	0.3	0.00	0.06	6.1
05 RESTROOM	62.0	0.0	0.00	0.00	0.0
06 NONSALES	437.0	1.5	0.00	0.12	52.4
<b>Totals</b>					<b>758.5</b>

**OUTSIDE AIR CALCULATIONS**

**DESIGN WEATHER PARAMETERS**

City Name: Charlotte  
 Location: North Carolina  
 Latitude: 35.2 Deg  
 Longitude: 80.9 Deg  
 Elevation: 765.0 ft  
 Summer Design Dry-Bulb: 84.0 °F  
 Summer Design Wet-Bulb: 74.0 °F  
 Summer Daily Range: 17.8 °F  
 Winter Design Dry-Bulb: 18.0 °F  
 Winter Design Wet-Bulb: 14.8 °F  
 Atmospheric Clearness Number: 0.95  
 Average Ground Reflectance: 0.20  
 Soil Conductivity: 0.800 BTU/(hr-ft<sup>2</sup>)  
 Local Time Zone (GMT - N hours): 6.0 hours  
 Consider Daylight Savings Time: No  
 Simulation Weather Data: N/A  
 Current Date is: 2001 ASHRAE Handbook  
 Design Cooling Months: January to December

**HVAC LOAD CALCULATIONS**

**Air System Information**

Air System Name: ALL ZONES  
 Equipment Group: PKB00F  
 Air System Type: SCZAF

**Sizing Calculation Information**

Calculation Method: Jan to Dec  
 Sizing Data: Calculated

**Central Cooling Coil Sizing Data**

Total coil load: 18.0 Tons  
 Peak cooling: 12.84 MMBtu/hr  
 Sensible coil load: 9.17 MMBtu/hr  
 Coil CFM at 55°F: 3285 CFM  
 Max outdoor CFM: 3285 CFM  
 Sun of peak zone CFM: 3285 CFM  
 Sensible heat ratio: 0.59  
 CFM/Ton: 319.4  
 # of Tons: 36.28  
 BTU/(hr-ft<sup>2</sup>): 13.1  
 Water flow @ 18.3°F rise: N/A

**Central Heating Coil Sizing Data**

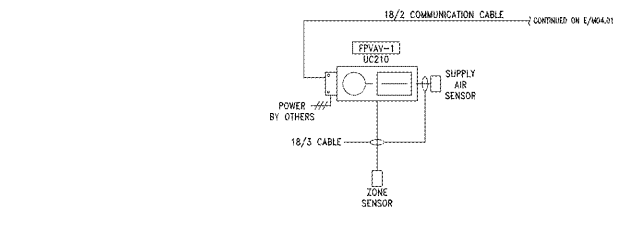
Max coil load: 65.3 MMBtu/hr  
 Coil CFM at 70°F: 3285 CFM  
 Max coil CFM: 3285 CFM  
 Water flow @ 13.0°F drop: N/A

**Supply Fan Sizing Data**

Actual max CFM: 3285 CFM  
 Standard CFM: 3147 CFM  
 Actual max CFM/FHP: 6.88 FHP

ZONE LOADS	COOLING DATA AT 55°DB		HEATING DATA AT 65°DB		Tons
	Q (MBtu/hr)	CFM	Q (MBtu/hr)	CFM	
Window & Skylight Solar Loads	227.2	1041	187.0	227.2	1.0
W. Trans. Mission	509.4	818	303.4	487	0.5
Roof Trans. Mission	203.0	2104	203.0	1021	0.1
W. Trans. Trans. Mission	237.0	2380	237.0	237.0	0.1
Roof Trans. Trans. Mission	0.0	0.0	0.0	0.0	0.0
Door Loads	42.0	2171	42.0	62	0.0
Roof Trans. Mission	362.0	0	362.0	524	0.0
Chimney	0.0	0	0.0	0	0.0
Chimney and Lighting	2487.4	2022	2487.4	0	0.0
Top Lighting	0.0	0	0.0	0	0.0
Electric Equipment	320.0	1647	320.0	0	0.0
Plumbing	0.0	0	0.0	0	0.0
Miscellaneous	0.0	0	0.0	0	0.0
Supply Fan	10.0	3285	10.0	22	0.0
Non-Fan Power	0.0	0	0.0	0	0.0
Zone Conditioning	0.0	0	0.0	0	0.0
Plenum Wall Load	0.0	0	0.0	0	0.0
Plenum Room Load	2.9	0	2.9	0	0.0
Plenum Lighting Load	0.0	0	0.0	0	0.0
Roof Fan Load	0.0	0	0.0	0	0.0
Ventilation Load	1.0	1851	7.0	4150	0.0
Supply Fan Load	3.0	0	3.0	3370	0.0
Space Fan Load	0.0	0	0.0	0	0.0
Roof Heat Load	0.0	0	0.0	0	0.0
Chimney System Load	0.0	0	0.0	0	0.0
Chimney	0.0	0	0.0	0	0.0
Chimney	0.0	0	0.0	0	0.0

**VARIABLE AIR VOLUME (VAV) AND FAN-POWERED VARIABLE AIR VOLUME (FPVAV) NETWORK WIRING AND SEQUENCE**



**FAN POWERED VAV (FPVAV) SEQUENCE OF OPERATIONS**

MANUFACTURER SHALL FURNISH AND/OR INSTALL ALL NECESSARY CONTROL DEVICES TO ACCOMPLISH THE FOLLOWING SEQUENCE OF OPERATION (REFER TO RESPONSIBILITY SCHEDULE FOR FIELD INSTALLATION REQUIREMENTS):

DURING OCCUPIED HOURS THE VARIABLE AIR VOLUME TERMINAL UNIT FAN SHALL BE ENERGIZED AND DAMPER SHALL MODULATE TO MAINTAIN THE SPACE TEMPERATURE FOR UNITS WITH HEAT/COOL CHANGEOVER CONTROL. THE DAMPER SHALL MODULATE TO MAINTAIN THE SPACE TEMPERATURE. REVERSING DAMPER OPERATION AS REQUIRED BASED ON ZONE DEMAND AND THE TEMPERATURE OF THE PRIMARY SUPPLY AIR.

IF THE SPACE TEMPERATURE DROPS ONE DEGREE BELOW SETPOINT AND THE DAMPER IS AT MINIMUM POSITION, THE UNIT'S ELECTRIC HEAT SHALL ENERGIZE. THE HEAT WILL REMAIN ON UNTIL THE SPACE TEMPERATURE IS SATISFIED.

THE TERMINAL UNIT DAMPER SHALL FULLY CLOSE AND THE FAN SHALL DEENERGIZE UPON A SIGNAL FROM THE FIRE ALARM SYSTEM.

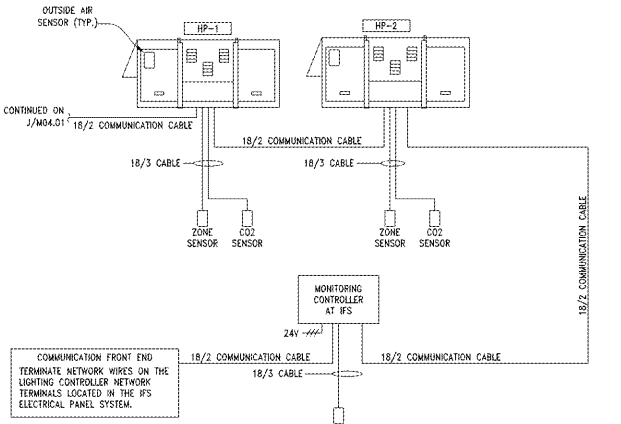
DURING THE UNOCCUPIED SCHEDULE, THE DAMPER SHALL CLOSE AND FAN/HEATER WILL DEENERGIZE. THE DAMPER SHALL OPEN AND THE FAN SHALL ENERGIZE IF UNOCCUPIED COOLING SETPOINT IS REACHED. THE FAN AND HEATER SHALL ENABLE IF UNOCCUPIED TEMPERATURE IS 2°F BELOW UNOCCUPIED SETPOINT. FAN AND HEATER SHALL STOP WHEN SETPOINT IS REACHED.

SETPOINTS:  
 UNOCCUPIED HEATING: 70°F COOLING: 74°F  
 UNOCCUPIED HEATING: 80°F COOLING: 85°F

**FAN POWERED VARIABLE AIR VOLUME (FPVAV) & VARIABLE AIR VOLUME (VAV) BOX RESPONSIBILITY SCHEDULE**

ITEM	FURNISHED BY			INSTALLED OR PERFORMED BY			RE-USE EXISTING	N/A	REMARKS
	LS/DAC	LANDLORD	CONTR.	LANDLORD	CONTR.	OTHER			
SERIES ARRANGEMENT FAN POWERED VAV BOX (WITH HEAT AND NO HEAT OPTIONS)	AC				MC				
NON-FAN POWERED VAV BOX									
FAN POWERED BOX ELECTRICAL DISCONNECT	AC					AC			
NON-FAN POWERED BOX ELECTRICAL DISCONNECT									
BAS CONTROLLER WITH INTEGRATED ACTUATOR	AC					AC			
SUPPLY AIR TEMPERATURE SENSOR						MC			
HEATING/COOLING CHANGEOVER TEMPERATURE SENSOR									
SPACE TEMPERATURE SENSORS	AC					MC			
TERMINAL UNIT COMMISSIONING	AC					AC			CALL HVAC EQUIPMENT SUPPLIER
CONTROL SYSTEM WIRE FOR SYSTEM COMPONENTS	AC					MC			FINAL CONN. BY MC

**ROOFTOP HEAT PUMP NETWORK WIRING AND SEQUENCE**



NOTES:  
 (1) ALL WIRE SHALL BE 18/3 UNLESS OTHERWISE INDICATED.  
 (2) NUMBER OF CABLES FURNISHED BY HVAC SUPPLIER IS INDICATED BY NUMBER OF TICK MARKS ACROSS THE LINE.  
 (3) PURPLE 18/2 WIRE IS FURNISHED BY HVAC SUPPLIER AND IS PLENUM RATED.  
 (4) SCHEMATIC IS FOR REFERENCE ONLY. AT TIME OF CONSTRUCTION, THE HVAC SUPPLIER WILL PROVIDE A COMPLETE DIAGRAM FOR INSTALLATION. SEE RESPONSIBILITY SCHEDULES, THIS SHEET, FOR A LIST OF ALL COMPONENTS AND SENSORS REQUIRING FIELD INSTALLATION.

**ROOFTOP HEAT PUMP (HP) SEQUENCE OF OPERATIONS**

MANUFACTURER SHALL FURNISH AND/OR INSTALL ALL NECESSARY CONTROL DEVICES TO ACCOMPLISH THE FOLLOWING SEQUENCE OF OPERATION (REFER TO RESPONSIBILITY SCHEDULE FOR FIELD INSTALLATION REQUIREMENTS):

DURING OCCUPIED HOURS THE SUPPLY FANS SHALL OPERATE CONTINUOUSLY, AND THE OUTSIDE AIR DAMPER SHALL OPEN TO THE MINIMUM SCHEDULED POSITION (ADJUSTABLE). WHEN THE OUTDOOR TEMPERATURE IS ABOVE 55 DEGREES FAHRENHEIT (ADJUSTABLE), THE SPACE TEMPERATURE IS 1°F ABOVE COOLING SETPOINT, COOLING SHALL BE ENERGIZED IN STAGES (WHERE APPLICABLE) UNTIL 1°F BELOW SETPOINT IS ACHIEVED. WHEN THE OUTDOOR TEMPERATURE IS BELOW 55 DEGREES FAHRENHEIT (ADJUSTABLE), AND SPACE TEMPERATURE IS ABOVE COOLING SETPOINT, COOLING SHALL DEENERGIZE, AND OUTSIDE AIR DAMPERS AND RETURN AIR DAMPERS SHALL MODULATE TO PROVIDE SUPPLY AIR TEMPERATURE TO SATISFY THE DEMAND FOR COOLING. IF THE SPACE TEMPERATURE FALLS 1°F BELOW THE HEATING SETPOINT AND THE OUTDOOR DAMPER IS AT THE MINIMUM POSITION, THE REVERSING VALVE SHALL BE ENERGIZED. HEATING SHALL BE ENERGIZED IN STAGES (WHERE APPLICABLE) UNTIL 1°F ABOVE SETPOINT IS ACHIEVED. DURING SETPOINT CYCLE, HEATPUMP HEATING SHALL DEENERGIZE, AND AUXILIARY ELECTRIC HEAT SHALL BE ENERGIZED IN STAGES (WHERE APPLICABLE).

DURING UNOCCUPIED HOURS, THE SUPPLY FANS SHALL BE DEENERGIZED IF THE SPACE TEMPERATURE IS ABOVE THE COOLING SETPOINT. THE FANS SHALL ENERGIZE, AND THE OUTSIDE AIR DAMPERS SHALL BE ENERGIZED. COOLING SHALL BE ENERGIZED, WHEN THE SPACE TEMPERATURE FALLS 1°F BELOW THE COOLING SETPOINT. COOLING SHALL DEENERGIZE, AND THE SUPPLY FANS SHALL STOP, IF THE SPACE TEMPERATURE FALLS 1°F BELOW THE HEATING SETPOINT. THE FAN SHALL OPERATE, AND THE OUTSIDE AIR DAMPERS SHALL REMAIN CLOSED. THE REVERSING VALVE AND HEATPUMP HEATING SHALL BE ENERGIZED UNTIL THE SPACE TEMPERATURE IS 1°F ABOVE THE HEATING SETPOINT. ELECTRIC HEAT SHALL BE DEENERGIZED, AND THE SUPPLY FANS SHALL STOP DURING DEWPOINT CYCLE. HEATPUMP HEATING SHALL DEENERGIZE, AND AUXILIARY ELECTRIC HEAT SHALL BE ENERGIZED IN STAGES (WHERE APPLICABLE).

POWER EXHAUST FAN (WHERE APPLICABLE) SHALL BE ENERGIZED DURING SUPPLY FANS OPERATING, AND THE UNIT IS IN THE ECONOMIZER MODE OF OPERATION. RELIEF FAN SHALL OPEN WHEN THE FAN IS ENERGIZED.

A FIELD INSTALLED CO2 SENSOR SHALL MODULATE OUTDOOR AIR DAMPER CLOSED DURING OCCUPIED OPERATION FROM SCHEDULED CFM TO CODE ALLOWED MINIMUM FROM CO2 OF 1000 PPM.

A DETECTED SMOKE DETECTOR SHALL DEENERGIZE RELIEF FAN, AND CLOSE THE OUTDOOR AIR DAMPER WHEN ACTIVATED.

SETPOINTS:  
 UNOCCUPIED HEATING: 70°F COOLING: 74°F  
 UNOCCUPIED HEATING: 80°F COOLING: 85°F

**ROOFTOP HEAT PUMP RESPONSIBILITY SCHEDULE**

ITEM	FURNISHED BY			INSTALLED OR PERFORMED BY			RE-USE EXISTING	N/A	REMARKS
	LS/DAC	LANDLORD	CONTR.	LANDLORD	CONTR.	OTHER			
ROOFTOP HEAT PUMP	AC					MC			
ROOFTOP UNIT CONNECTION TO CURB REQUIREMENTS	AC					MC			COORDINATE WITH STRUCTURAL ENGINEER
ROOFTOP CURB FOR RTU AS REQUIRED	AC					MC			
ROOFTOP ADAPTER FOR RTU AS REQUIRED									MC TO MEASURE EXISTING CURBS FOR ADAPTERS
STRUCTURAL SUPPORTS FOR HP AS REQUIRED						MC			
ECONOMIZER PACKAGE	AC					MC			SOME MODIFICATIONS BY MC REQUIRED
ECONOMIZER ACTUATOR	AC					AC			
POWER EXHAUST	AC					MC			CHANGES REQUIRED FOR BALANCE ARE PROVIDED BY MC
EVAPORATOR FAN MOTOR, SHEAVES AND BELTS	AC					AC			
NON-POWERED GROUND FAULT SERVICE RECEPTACLE	AC					AC			WIRED BY EC
NON-FUSED ELECTRICAL DISCONNECT	AC					AC			
BAS CONTROLLER	AC					AC			
SUPPLY AIR TEMPERATURE SENSOR	AC					AC			
CONDENSATE OVERFLOW SWITCH	AC					AC			
SPACE TEMPERATURE SENSOR	AC					MC			
OUTSIDE AIR TEMPERATURE SENSOR	AC					MC			ONE PER PROJECT
CARBON DIOXIDE SENSOR	AC					MC			
SINGLE ZONE VAV FAN									
ROOFTOP UNIT COMMISSIONING	AC					AC			CALL HVAC EQUIPMENT SUPPLIER
MONITORING SPACE TEMPERATURE SENSOR	AC					MC			
MONITORING CARBON DIOXIDE SENSOR									
MONITORING HUMIDITY SENSOR									
MONITORING ONLY CONTROLLERS FOR UNITS WITH AN ECONOMIZER CAPABILITY	AC					MC			INSTALL MONITORING CONTROLLER AT ITS AS REQUIRED FOR MONITORING DEVICES
CONTROL TRANSFORMERS						MC			
CONTROL SYSTEM WIRE FOR SYSTEM COMPONENTS	AC					MC			FINAL CONN. BY MC

**NOTE TO CONTRACTOR**

ITEM(S) NOT SHOWN ON ANY OF THE RESPONSIBILITY SCHEDULES ARE THE RESPONSIBILITY OF THE CONTRACTOR.

**LOCAL AREA REQUIREMENTS**

YES	NO	1	SMOKE EVACUATION	YES	NO	5	SPECIAL CURB HEIGHT REQUIREMENTS
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	2. CARBON DIOXIDE MONITORING	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	6. TEN MILE COASTAL PROXIMITY
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	3. HURRICANE ZONE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	7. OTHERS, I.E. METHANE, CARBON MONOXIDE, SOUND SENSITIVE, ETC. DESCRIPTION
<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	4. SEISMIC ZONE	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	8. TYPE B COMMISSIONING
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	9. TYPE C COMMISSIONING
				<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	10. TYPE C COMMISSIONING

**ABBREVIATIONS, RESPONSIBILITY SCHEDULES**

AC	HVAC EQUIPMENT SUPPLIER	GC	GENERAL CONTRACTOR
AHJ	AUTHORITY HAVING JURISDICTION	LC	LANDLORD CONTRACTOR
BAD	BUILDING AUTOMATION SYSTEM ELECTRICAL CONTRACTOR	LD	LOADING DOOR DISTRIBUTOR
EC	ELECTRICAL CONTRACTOR	LL	LOADING DOOR CONTRACTOR
FAC	FIRE ALARM CONTRACTOR	LM	LOADING DOOR DESIGN & CONSTRUCTION
		MC	MECHANICAL CONTRACTOR

**HVAC RESPONSIBILITY SCHEDULE**

ITEM	FURNISHED BY			INSTALLED OR PERFORMED BY			RE-USE EXISTING	N/A	REMARKS
	LS/DAC	LANDLORD	CONTR.	LANDLORD	CONTR.	OTHER			
ROOFING CUT & PATCH, INSULATED ROOFING CONTRACTOR				MC		MC			HIRE LANDLORD APPROVED ROOFING CONTRACTOR
DUCT SMOKE DETECTOR				FAC		MC			POWER WIRING PROVIDED BY FAC
SMOKE SYSTEM ACCESSORIES, ETC.				MC		MC			UNLESS FACTORY INSTALLED
DIFFUSERS AND GRILLES				MC		MC			
DIFFUSERS/GRILLES FIRE DAMPERS									
WALL FIRE DAMPERS									
COMBINATION FIRE/SMOKE DAMPERS									
LOW PRESSURE DUCTWORK				MC		MC			
RECTANGULAR TO ROUND DUCT ADAPTER				MC		MC			
HIGH/MEDIUM PRESSURE DUCTWORK									
DUCT SUPPORTS				MC		MC			
SEISMIC BRACING				MC		MC			
HURRICANE WIND BRACING									
DUCT HEATER(S)									
UNIT HEATER(S)									
INLINE AND CEILING EXHAUST FAN(S)				MC		MC			
ROOF AND WALL MOUNTED EXHAUST FAN(S) AND CURB									
EXHAUST FAN ROOF CURB				MC		MC			
TOILET EXHAUST DUCTWORK WALL OR ROOF CAP				MC		MC			
PIPING AND PIPING SUPPORTS/BRACKETS (CABINET SETTERS, ETC.)									AABC OR NEBB CERTIFIED
BALANCE CONTRACTOR REPORT				GC					
AS-BUILT DRAWINGS				MC					
LANDLORD REQUIRED TEMPERATURE CONTROL SYSTEM COMPONENTS									HIRE LL REQUIRED CONTRACTOR WHEN REQUIRED BY LL
TEMPERATURE CONTROL SYSTEM WIRE FOR LL REQUIRED SYSTEM COMPONENTS									HIRE LL REQUIRED CONTRACTOR WHEN REQUIRED BY LL
YOUNG REGULATOR W/ BOWDEN CABLE				MC		MC			
LOCKING QUADRANT VOLUME DAMPER				MC		MC			
PNEUMATIC TUBING									
FIRE ALARM SHUTDOWN RELAY				FAC		FAC			WHERE APPLICABLE FOR FIRE ALARM SYSTEMS
RELIEF AIR DAMPER AND ACTUATOR									
RELIEF AIR FAN OR RETURN AIR FAN									
SMOKE EVACUATION									
OUTSIDE AIR INTAKE HOOD/LOUVER WITH DAMPER									
OUTSIDE AIR INTAKE DAMPER ACTUATOR									
FIELD AIR WORK OR TUBING WITH COUNTER-BALANCED BACKDRAWT DAMPER									
DAMPERS FOR FIELD BUILT ECONOMIZER									
DAMPERS ACTUATORS FOR FIELD BUILT ECONOMIZER									
OUTSIDE AIR DAMPER									
OUTSIDE AIR DAMPER ACTUATOR									