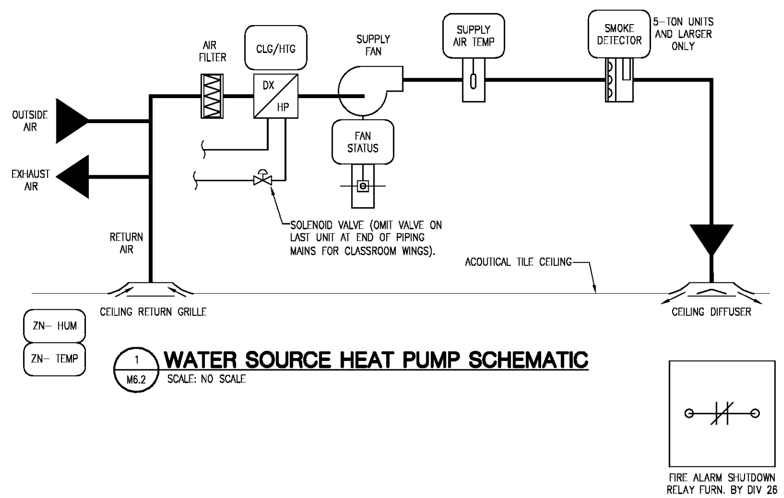
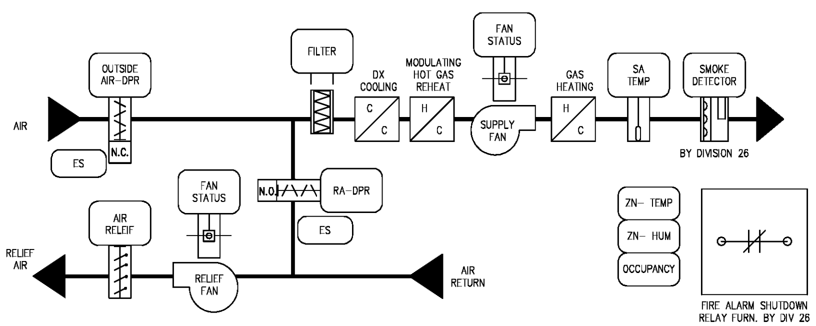


1 M6.2 WATER SOURCE HEAT PUMP SCHEMATIC

SCALE: NO SCALE



2 M6.2 CONSTANT VOLUME ROOFTOP UNIT CONTROL SCHEMATIC

SCALE: NO SCALE

WATER SOURCE HEAT PUMP POINTS LIST

INPUT/OUTPUT SUMMARY	OUTPUTS						INPUTS												SOFTWARE								NOTES
	DIGITAL				ANALOG		DIGITAL					ANALOG							ALARM		ENERGY MANAGEMENT						
	START/STOP	OPEN/CLOSE	ENABLE/DISABLE	OCCUPIED/UNOCCUPIED	DDC MODULATION	SETPOINT ADJUST	DIFF. PRESS. SWITCH	CURRENT SWITCH	ON/OFF	OPEN/CLOSE CONTACT	ALARM CONTACT	CO2 LEVEL (PPM)	STATIC PRESSURE	AIRFLOW (CFM)	TEMPERATURE	HUMIDITY	POWER (AMPS/KW/KWH)	MOTOR CURRENT	HI/LO LIMIT	STATUS ALARM	OPTIMUM START	TEMPERATURE CONTROL	TIME SCHEDULE/SETBACK	RUN TIME	TREND LOGGING	OVERRIDE PROGRAM	
WATER SOURCE HEAT PUMPS	X																										(1)
SUPPLY FAN	X							X											X								
SOLENOID VALVE		X																									
SUPPLY AIR TEMPERATURE															X												
SPACE TEMPERATURE SENSOR						X									X						X	X			X	X	
SPACE HUMIDITY						X										X											
OCCUPANCY OVERRIDE										X																	
SMOKE DETECTOR										X																	(2)
CONDENSATE OVERFLOW SWITCH										X										X							
REVERSING VALVE		X																									

(1) SEE MECHANICAL FLOOR PLAN SHEETS FOR TOTAL NUMBER OF WATER SOURCE HEAT PUMPS
(2) 5-TON UNITS AND LARGER ONLY

CONSTANT VOLUME ROOFTOP UNIT POINTS LIST

INPUT/OUTPUT SUMMARY	OUTPUTS						INPUTS												SOFTWARE								NOTES
	DIGITAL				ANALOG		DIGITAL					ANALOG							ALARM		ENERGY MANAGEMENT						
	START/STOP	OPEN/CLOSE	ENABLE/DISABLE	OCCUPIED/UNOCCUPIED	DDC MODULATION	SETPOINT ADJUST	DIFF. PRESS. SWITCH	CURRENT SWITCH	ON/OFF	OPEN/CLOSE CONTACT	MANUAL OVERRIDE	CO2 LEVEL (PPM)	STATIC PRESSURE	AIRFLOW (CFM)	TEMPERATURE	HUMIDITY	POWER (AMPS/KW/KWH)	MOTOR CURRENT	HI/LO LIMIT	STATUS ALARM	OPTIMUM START	TEMPERATURE CONTROL	TIME SCHEDULE/SETBACK	RUN TIME	TREND LOGGING	OVERRIDE PROGRAM	
CV ROOFTOP UNIT			X																		X			X			
SPACE TEMPERATURE SENSOR															X							X			X	X	
SPACE HUMIDITY SENSOR																X									X		
SUPPLY AIR TEMPERATURE																			X			X			X		
OCCUPIED/UNOCCUPIED				X																							
SUPPLY FAN START/STOP	X																										
SUPPLY FAN STATUS								X												X							
RELIEF AIR FAN	X				X																						
RELIEF AIR FAN STATUS								X																			
COMPRESSOR STAGING (VARIES)	X																										
GAS HEAT STAGING					X																						
DEHUMIDIFICATION CYCLE (HOT GAS)			X		X																						

CONTROL SEQUENCES - WATER SOURCE HEAT PUMPS

WATER SOURCE HEAT PUMP UNITS

A. The water source heat pumps are packaged constant volume units. Each unit is controlled by the DDC system using electric actuation and is scheduled for automatic operation on a time of day basis with local occupancy sensor override by lighting controls. Occupied, Unoccupied and Safety modes are as follows:

B. Occupied:
   a. FAN OPERATION: The supply fan operates continuously without cycling.
   b. TEMPERATURE CONTROLS: Zone space sensors provide feedback for maintaining the space temperature set point of 74°F (adjustable) for cooling and 70°F (adjustable) for heating. Space temperature is controlled by the heat pump unitary controller based on requests for either cooling or heating from the DDC system. Temperature setpoint defaults to unoccupied mode whenever lighting occupancy sensor de-energizes overhead light fixtures.
   c. COOLING MODE: On a rise in temperature above the cooling setpoint, the tempered water solenoid valve shall open and the compressor starts after the water valve is fully opened.
   d. HEATING MODE: On a drop in temperature below the heating setpoint, the tempered water solenoid valve shall open, the reversing valve shifts to heating, and the compressor starts after the water valve is fully opened.
   e. DEHUMIDIFICATION MODE: Not Available.
   f. MORNING COOL-DOWN/WARM-UP: The water-source heat pumps shall be energized by the DDC system to achieve Occupied cooling setpoint at the start of Occupied hours. Software shall calculate unit start time based on indoor and outdoor temperatures.
   g. TEMPERED LOOP FLOW: Normally closed tempered loop water solenoid valve shall fully open before the compressor starts (both cooling and heating modes).
   h. See Input/Output Summary for the various status inputs to be monitored.

C. Unoccupied:
   a. If space temperature increases to 85°F (adjustable) or drops to 55°F (adjustable), the unit supply fan will cycle with operation of the respective cooling or heating sections until the space temperature is satisfied.
   b. Upon activation of the override switch the DDC system shall change the system status to the occupied mode for 1-hour (adjustable).

D. Safety:
   a. A smoke detector in the supply duct will shut down the unit fan when activated (selected heat pumps).
   b. The supply fan shall be de-energized upon activation of the fire alarm shutdown (hardwired, no DDC processing).
   c. Activation of the Emergency Fan Stop switch shall stop all heat pump supply fans.
   d. Activation of the overflow switch in the auxiliary drain pan shall stop the unit (where shown).

CONTROL SEQUENCES - CV ROOF TOP UNITS

1. ROOFTOP UNITS
The rooftop unit is a constant volume unitary packaged air handler with direct expansion cooling, natural gas heating and modulating hot-gas reheat. The unit is controlled by the DDC system using electric actuation and is scheduled for automatic operation on a time of day basis. Occupied, Unoccupied and Safety modes are as follows:

A. Occupied:
   a. SUPPLY FAN CONTROL: The supply fan shall operate continuously during occupied mode.
   b. SUPPLY TEMPERATURE CONTROL: Supply air temperature is modulated by the RTU unit controller based on requests for either cooling or heating from the DDC system. Zone space sensors provide feedback for maintaining the space temperature and humidity set points of 74°F/50% rh (adjustable) for cooling and 70°F (adjustable) for heating.
   c. EXHAUST/RELIEF FAN CONTROL: The exhaust/relief air fan speed shall operate during economizer mode.
   d. OUTSIDE AIR CONTROL: During supply air fan operation, the outside air damper shall open to the minimum scheduled airflow position set by test and balance.
   c. DEHUMIDIFICATION MODE: If room humidity increases above 60% relative humidity (adjustable) and the space temperature set point is satisfied, the RTU unit controller starts first stage cooling and modulates the hot gas reheat coil until space humidity is reduced to below set point.
   d. ECONOMIZER MODE: The DDC system enables economizer operation for free cooling when the outside air enthalpy is less than 23 Btu/lb of dry air (adjustable) and outside air temperature is below 60°F (adjustable). The relief air fan shall operate based on outside air damper position.

B. Unoccupied:
   a. The RTU unit remains off during unoccupied periods until the override occupancy switch is activated. Then the RTU status shall enter Occupied mode for 1 hour (adjustable).
   b. The outside air intake and exhaust/relief air dampers shall be closed when the RTU is off.

C. Safety:
   a. Supply air fan(s) are de-energized upon activation of the fire alarm system or activation of a smoke detector in the supply duct. All dampers position to their normal position after the fan(s) are de-energized. A current switch is installed in the supply fan starter/drive for confirmation or alarming of the fan operating status. Minimum compressor run/off times and stage delays shall be programmed into the unit controller per the manufacturer.
   b. RTU shall be provided with a fire alarm shutdown (hardwired, no BAS processing) interlocked with the fire alarm system to shut down upon activation. Extend wiring from unit connection to fire alarm relay and coordinate final connection with fire alarm contractor.
   c. Activation of the Emergency Fan Stop switch shall stop all unit fans.

BAS CONTROLS NOTES

1. Automatic controls manufacturer is HI Solutions. All BAS work shall be installed by Frazier Service Company.
2. I/O points and control sequences shall comply with the latest Gwinnett County Public School design guidelines.
3. Any deviations to the sequences or points listed on these drawings shall be specifically approved by Owner and Engineer with a credit issued during shop drawing submittal phase as applicable.

FOR PRICING

JSA CONSULTING ENGINEERS
Johnson, Spellman & Associates, Inc.

Revisions:

HVAC AND ROOFING RENOVATIONS FOR
BRITT ELEMENTARY SCHOOL
2503 SKYLAND DRIVE SW
SNELLVILLE, GEORGIA 30078
Facility Code # 3050

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Sheet Title: HVAC CONTROLS
Drawn By: GBP
Scale: AS NOTED
Date: 12/14/2018
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Sheet No.: M6.2