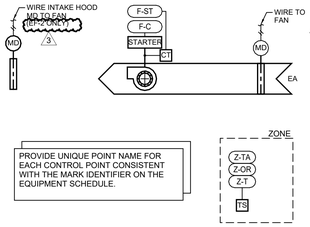
SEQUENCE OF OPERATIONS GENERAL NOTES

This sequence of operations is organized into the following main categories: operating modes, control setpoint resets, safeties, overrides and interlocks, and component control loops. The operating modes describe the criteria that either enable or disable the various modes of operation. If a mode of operation is not listed within a component control loop section then that mode of operation has no direct influence on the operation of the component. The control setpoint reset section describes the logic and reference variables that will be used to reset control setpoints to a new value within its reset range. The safeties, overrides, and interlocks section outlines the hardwired interlocks that will be required to meet life safety requirements. Safeties and interlocks take precedence over all other control strategies outlined in this document. The control responses of each component for the various modes of operation are described in the component control loop sections.

The sequence of operations, the points list and control diagrams shall be used to provide a complete description of the control philosophy for the controlled equipment. Individual setpoint values, reset ranges, and alarm action levels are listed in the points list. Components and control sensor locations are graphically depicted on the control diagram. The controls contractor shall be responsible for coordinating any necessary time delay setpoints to establish stable system operation.



SEQUENCE OF OPERATIONS THERMOSTAT CONTROLLED FANS (EF 2, EF 3, EF 6, SF 1)

GENERAL DESCRIPTION

The exhaust fan(s) described by this sequence consists of a constant speed fan and damper controlled by a thermostat to remove heat from the space as shown on the drawings.

OPERATING MODES

OCCUPIED MODE:

The fan shall be in occupied mode per the project design conditions schedule shown on the control drawings.

UNOCCUPIED MODE:

The fan shall be in unoccupied mode for all periods not included in the occupied hours of operation.

CONTROL SETPOINT RESETS

Not Used.

SAFETIES, OVERRIDES AND INTERLOCKS

LOCAL THERMOSTAT INTERLOCK

Fan shall be interlocked with local thermostat. Fan shall energize when local thermostat exceeds setpoint.

3 LOCAL THERMOSTAT INTERLOCK (EF 2 ONLY):

Fan shall be interlocked with local thermostats. Fan shall energize when average of local thermostats exceeds setpoint.

FIRE ALARM CONTROL PANEL INTERLOCK:

The fan shall be disabled via hard wired interlock at the fan start circuit upon receipt of signal from the fire alarm control panel.

ISOLATION DAMPER INTERLOCK:

Interlock the motorized isolation damper with the associated fan. Prove damper position is open and include time delay prior to starting fan. Close damper after fan is commanded OFF.

ROOF INTAKE HOOD DAMPER INTERLOCK (EF-2 ONLY) 3

Interlock the associated intake hood motorized damper with the associated fan. Prove damper position is open and include time delay prior to starting fan. Close damper after fan is commanded OFF.

COMPONENT CONTROL LOOPS

FAN CONTROL - CONSTANT VOLUME BAS THERMOSTATIC CONTROL

When in Occupied Mode:

The fan shall be enabled.

The fan motor shall cycle to provide airflow with the intent to control room temperature at setpoint as measured by local temperature sensor (Z-T) .

The ECM motor shall be used for soft start and to balance the fan for constant speed operation to achieve the scheduled airflow value.

When in Unoccupied Mode:

The fan shall operate as if in Occupied Mode.

POINTS LIST - THERMOSTAT CONTROLLED EXHAUST FAN

POINT ID	DESCRIPTION	POINT TYPE	DEFAULT SET POINT	SET POINT RESET RANGE	FAIL POSITION	ALARM STATUS	ALARM RANGE	NOTES
GLOBAL VALUES								
FA-SD	FIRE ALARM SHUTDOWN AND STATUS	BV						A
ZONE LEVEL SENSORS								
Z-T	ZONE TEMPERATURE	AI	85				Z-T > 110°F	B, C
Z-OR	ZONE TEMPERATURE OVERRIDE	BI	2 HOURS					C
Z-TA	ZONE TEMPERATURE ADJUST	AI	+/- 2 F					C
FAN								
F-C	FAN COMMAND (START/STOP)	BO						
F-ST	FAN STATUS	BI				X	EF-ST <> EF-C	

PROVIDE UNIQUE POINT NAME FOR EACH CONTROL POINT CONSISTENT WITH THE MARK IDENTIFER ON THE EQUIPMENT SCHEDULE (E.G. EF01-F-C).

REFER TO SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

BAS CONTRACTOR SHALL PROVIDE POINT AND DEVICE UNLESS OTHERWISE NOTED.

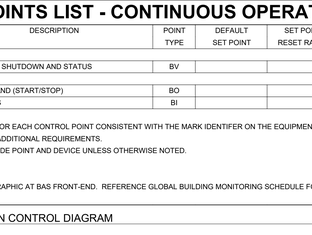
NOTES:

A. DISPLAY VALUE WITH AHU GRAPHIC AT BAS FRONT-END. REFERENCE GLOBAL BUILDING MONITORING SCHEDULE FOR CONTROL POINT.

B. REFERENCE PROJECT DESIGN CONDITIONS SCHEDULE FOR SETPOINT.

C. POINT SHALL BE ADJUSTABLE.

④ THERMOSTAT CONTROLLED EXHAUST FAN CONTROL DIAGRAM
NTS



SEQUENCE OF OPERATIONS DISHWASHER EXHAUST FAN FANS (EF 1)

GENERAL DESCRIPTION

The exhaust fan(s) described by this sequence of operations consists of an exhaust fan and motorized damper to exhaust air from the space as shown on the drawings.

OPERATING MODES

OCCUPIED MODE:

The fan shall be in occupied mode per the project design conditions schedule shown on the control drawings.

UNOCCUPIED MODE:

3 The fan shall be in unoccupied mode for all periods not included in the occupied hours of operation.

CONTROL SETPOINT RESETS

Not Used.

SAFETIES, OVERRIDES AND INTERLOCKS

3 LOCAL HUMIDITY SENSOR INTERLOCK

Fan shall be interlocked with local humidity sensor. Fan shall energize when local humidity sensor exceeds setpoint.

FIRE ALARM CONTROL PANEL INTERLOCK:

The fan shall be disabled via hard wired interlock at the fan start circuit upon receipt of signal from the fire alarm control panel.

COMPONENT CONTROL LOOPS

FAN CONTROL - CONSTANT VOLUME BAS SCHEDULED

When in Occupied Mode:

The fan shall be ON.

The EC motor shall be used for soft start and to balance the fan for constant speed operation to achieve the scheduled airflow value.

When in Unoccupied Mode:

The fan shall be OFF.

3

POINTS LIST - DISHWASHER EXHAUST FAN

POINT ID	DESCRIPTION	POINT TYPE	DEFAULT SET POINT	SET POINT RESET RANGE	FAIL POSITION	ALARM STATUS	ALARM RANGE	NOTES
GLOBAL VALUES								
FA-SD	FIRE ALARM SHUTDOWN AND STATUS	BV						A
ZONE LEVEL SENSORS								
3 Z-H	ZONE HUMIDITY	AI	SCHED	30-55 PCT		X	HRH > Z-H >55RH	C, D
FAN								
F-C	FAN COMMAND (START/STOP)	BO						
F-ST	FAN STATUS	BI				X	EF-ST <> EF-C	

PROVIDE UNIQUE POINT NAME FOR EACH CONTROL POINT CONSISTENT WITH THE MARK IDENTIFER ON THE EQUIPMENT SCHEDULE (E.G. EF01-F-C).

REFER TO SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

BAS CONTRACTOR SHALL PROVIDE POINT AND DEVICE UNLESS OTHERWISE NOTED.

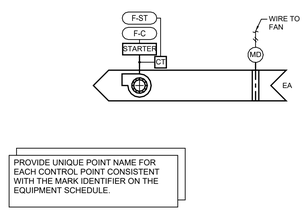
NOTES:

A. DISPLAY VALUE WITH AHU GRAPHIC AT BAS FRONT-END. REFERENCE GLOBAL BUILDING MONITORING SCHEDULE FOR CONTROL POINT.

3 C. REFERENCE PROJECT DESIGN CONDITIONS SCHEDULE FOR SETPOINT.

D. POINT SHALL BE ADJUSTABLE.

③ DISHWASHER EXHAUST FAN CONTROL DIAGRAM
NTS



SEQUENCE OF OPERATIONS CONTINUOUS OPERATION EXHAUST FAN FANS (EF 4, EF 5)

GENERAL DESCRIPTION

The exhaust fan(s) described by this sequence of operations consists of an exhaust fan and motorized damper to continuously exhaust air from the space as shown on the drawings.

OPERATING MODES

OCCUPIED MODE:

The fan shall be in occupied mode per the project design conditions schedule shown on the control drawings.

UNOCCUPIED MODE:

The fan shall be in unoccupied mode for all periods not included in the occupied hours of operation.

CONTROL SETPOINT RESETS

Not Used.

SAFETIES, OVERRIDES AND INTERLOCKS

FIRE ALARM CONTROL PANEL INTERLOCK:

The fan shall be disabled via hard wired interlock at the fan start circuit upon receipt of signal from the fire alarm control panel.

ISOLATION DAMPER INTERLOCK:

Interlock the motorized isolation damper with the associated fan. Prove damper position is open and include time delay prior to starting fan. Close damper after fan is commanded OFF.

COMPONENT CONTROL LOOPS

FAN CONTROL - CONSTANT VOLUME BAS SCHEDULED

When in Occupied Mode:

The fan shall be ON.

The ECM motor shall be used for soft start and to balance the fan for constant speed operation to achieve the scheduled airflow value.

When in Unoccupied Mode:

The fan shall be OFF.

POINTS LIST - CONTINUOUS OPERATION EXHAUST FAN

POINT ID	DESCRIPTION	POINT TYPE	DEFAULT SET POINT	SET POINT RESET RANGE	FAIL POSITION	ALARM STATUS	ALARM RANGE	NOTES
GLOBAL VALUES								
FA-SD	FIRE ALARM SHUTDOWN AND STATUS	BV						A
FAN								
F-C	FAN COMMAND (START/STOP)	BO						
F-ST	FAN STATUS	BI				X	EF-ST <> EF-C	

PROVIDE UNIQUE POINT NAME FOR EACH CONTROL POINT CONSISTENT WITH THE MARK IDENTIFER ON THE EQUIPMENT SCHEDULE (E.G. EF01-F-C).

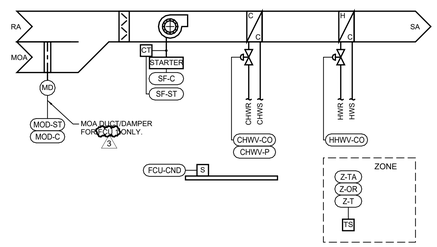
REFER TO SPECIFICATION FOR ADDITIONAL REQUIREMENTS.

BAS CONTRACTOR SHALL PROVIDE POINT AND DEVICE UNLESS OTHERWISE NOTED.

NOTES:

A. DISPLAY VALUE WITH AHU GRAPHIC AT BAS FRONT-END. REFERENCE GLOBAL BUILDING MONITORING SCHEDULE FOR CONTROL POINT.

① EXHAUST FAN CONTROL DIAGRAM
NTS



SEQUENCE OF OPERATIONS FAN COIL UNITS

GENERAL DESCRIPTION

The fan coil unit(s) described by this sequence of operations consist(s) of a constant speed supply fan, chilled water cooling coil, and hot water heating coil that operate to provide heating, ventilation, and air conditioning for the conditioned spaces as shown.

OPERATING MODES

OCCUPIED MODE:

The unit shall be in occupied mode per the Project Design Conditions Schedule shown on the control drawings.

COOLING MODE:

The unit shall be in cooling mode when the zone temperature (Z-T) rises above the dead band (Z-T-DB).

HEATING MODE:

The unit shall be in heating mode when the zone temperature (Z-T) falls below the dead band (Z-T-DB).

UNOCCUPIED MODE:

The unit shall be in unoccupied mode for all periods not included in the occupied hours of operation. Overrides of unoccupied schedule are defined at the zone level control.

CONTROL SETPOINT RESETS

Not used.

SAFETIES, OVERRIDES AND INTERLOCKS

FIRE ALARM CONTROL PANEL INTERLOCK:

The unit shall be disabled via hard wired interlock at the fan start circuit upon receipt of signal from the fire alarm control panel.

LEAK DETECTION INTERLOCK (FCU-CND):

The supply fan shall automatically shut down and the cooling coil shall be disabled upon detection of water in the overflow drain pan.

COMPONENT CONTROL LOOPS

SUPPLY FAN CONTROL

When in Occupied Mode:

The fan shall be ON.

When in Unoccupied Mode:

The fan shall be OFF. On a call for cooling/heating or override signal from the zone level, the fan shall operate as in occupied mode until the call is cleared or the override is removed.

MINIMUM OUTSIDE AIR DAMPER (MOA) (DCV ONLY)

When in Occupied Mode: 3

The damper shall be open

When in Unoccupied Mode:

The damper shall be closed.

COOLING COIL CHILLED WATER VALVE - MODULATING

When in Occupied Mode:

When in Cooling Mode:
The valve shall modulate to maintain the zone temperature setpoint (Z-T).

When in Heating Mode:
The valve shall be closed.

When in Unoccupied Mode:

The valve shall be closed.

On a call for cooling or override signal from the zone level the valve shall operate as in occupied mode until the call is cleared or the override is removed.

HEATING COIL - HOT WATER VALVE - MODULATING

When in Occupied Mode:

When in Cooling Mode;
The valve shall be closed.

When in Heating Mode:
The valve shall modulate to maintain the zone temperature setpoint (Z-T).

When in Unoccupied Mode:

The valve shall be closed.

On a call for heating or override signal from the zone level the valve shall operate as in occupied mode until the call is cleared or the override is removed.

POINTS LIST - FAN COIL UNIT

POINT ID	DESCRIPTION	POINT TYPE	DEFAULT SET POINT	FAIL POSITION	STATUS ALARM	ALARM RANGE	NOTES
ZONE LEVEL SENSORS							
Z-T	ZONE TEMPERATURE	AI	SCHED.				A, B
Z-OR	MANUAL OCCUPANCY OVERRIDE	BI	2 HOURS				A, D
Z-TA	MANUAL TEMPERATURE SETPOINT ADJUST	AI	+/- 2 F				A, D
Z-T-DB	ZONE TEMPERATURE DEADBAND	BV	5 F				A
SUPPLY FAN							
SF-C	SUPPLY FAN COMMAND (START/STOP)	BO					
SF-ST	SUPPLY FAN STATUS	BI			X	SF-ST <> SF-C	
COOLING COIL - CHILLED WATER MODULATING							
CHWV-CO	CHILLED WATER VALVE CONTROL OUTPUT	AO		NO			
CHWV-P	CHILLED WATER VALVE POSITION (PERCENT)	AI			X	CHWV-P <> CHWV-CO	
LEAK DETECTION							
3 FCU-CND	CONDENSATE OVERFLOW DETECTION	BI			X	ON ACTIVATION	
HEATING COIL - HOT WATER MODULATING							
HWV-CO	HOT WATER VALVE CONTROL OUTPUT	AO		FIP			
FIRE ALARM/SMOKE DETECTORS							
FA-SD	FIRE ALARM SHUTDOWN AND STATUS	BV					

NOTES:

A. POINT SHALL BE ADJUSTABLE.

B. REFERENCE PROJECT DESIGN CONDITIONS SCHEDULE FOR SETPOINT.

D. POINT AND OPTION ONLY FOR FCU 3

② FAN COIL UNIT CONTROL DIAGRAM
NTS

SEAN O. EISLER

BUC-EE'S

A DEVELOPMENT OF

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EXPIRES 12/31/2025

ISSUE/REVISION LOG:

No.	DESCRIPTION	DATE
1	Revision 1 - Owner Changes	09/09/2024
3	Revision 3 - Owner Changes	04/23/2025

STATE OF ARKANSAS
LICENSED PROFESSIONAL ENGINEER
No. 17560
SEAN O. EISLER
4/24/2025

ISSUED FOR REVIEW:	05/14/2024
ISSUED FOR BID:	05/14/2024
ISSUED FOR PERMIT:	05/14/2024

M7.09

MECHANICAL CONTROLS

LSL PROJECT NUMBER: 2024-107.000

BENTON, ARKANSAS