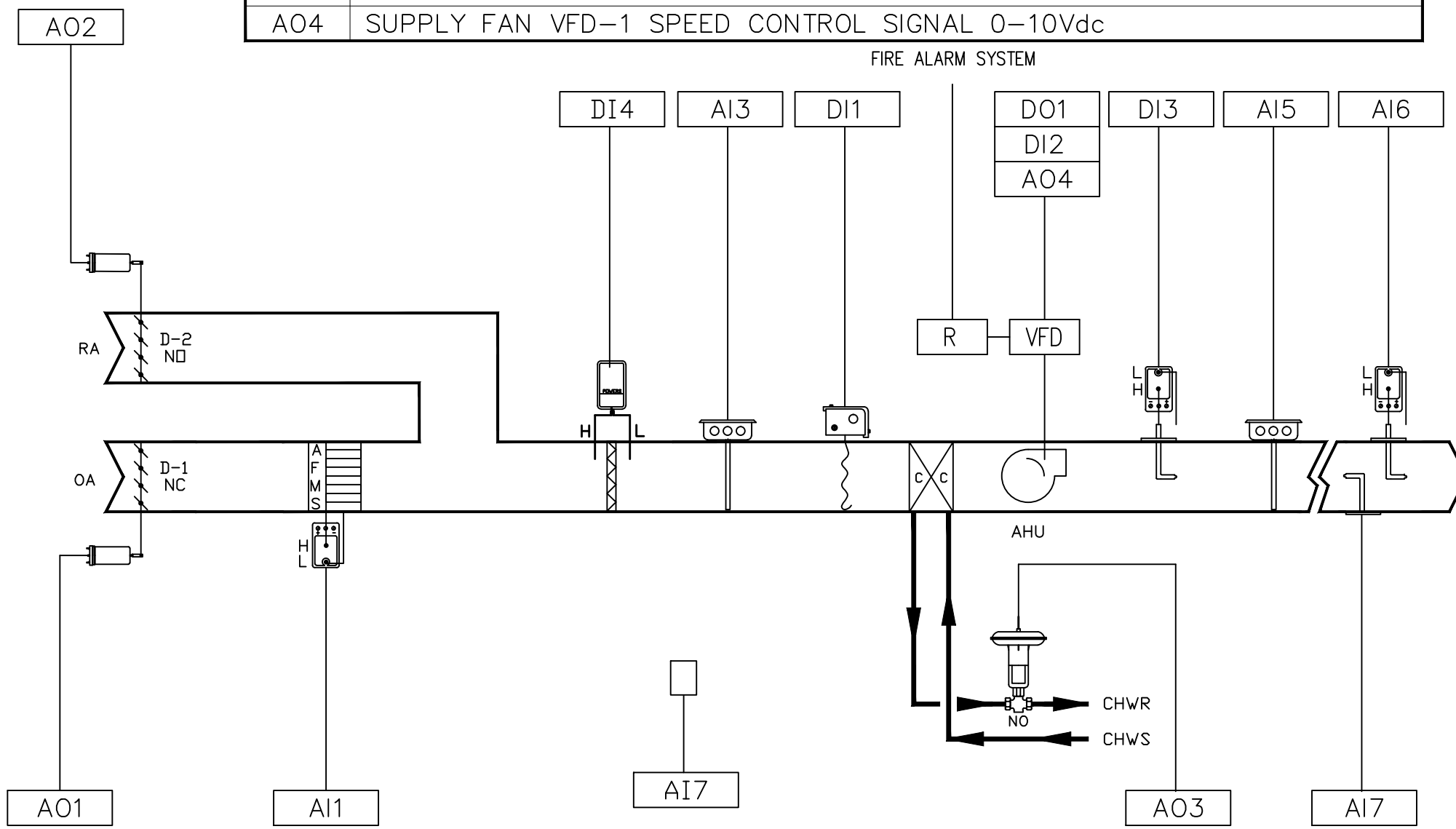


TYPE	POINT DESCRIPTION
AI1	OUTSIDE AIRFLOW
DO1	AHU SUPPLY FAN START/STOP
DI1	LOW TEMPERATURE DETECTION THERMOSTAT SET @ 40°F
DI2	SUPPLY FAN STATUS CURRENT SENSING RELAY
DI3	SUPPLY FAN DISCHARGE PRESSURE SWITCH SET @ +3.5" W.G.
DI4	FILTER DPS
AI3	MIXED AIR TEMPERATURE SETPOINT @ 55°F
AI5	SUPPLY AIR TEMPERATURE SETPOINT @ 55°F
AI6	END OF DUCT PRESSURE SENSOR
AI7	SMOKE DETECTOR
AO1	O.A. DAMPER 0-10 Vdc SPRING RETURN CLOSED
AO2	MIXED AIR DAMPER 0-10Vdc SPRING RETURN OPEN
AO3	CHILLED WATER COIL CONTROL VALVE 0-10Vdc SPRING RETURN
AO4	SUPPLY FAN VFD-1 SPEED CONTROL SIGNAL 0-10Vdc



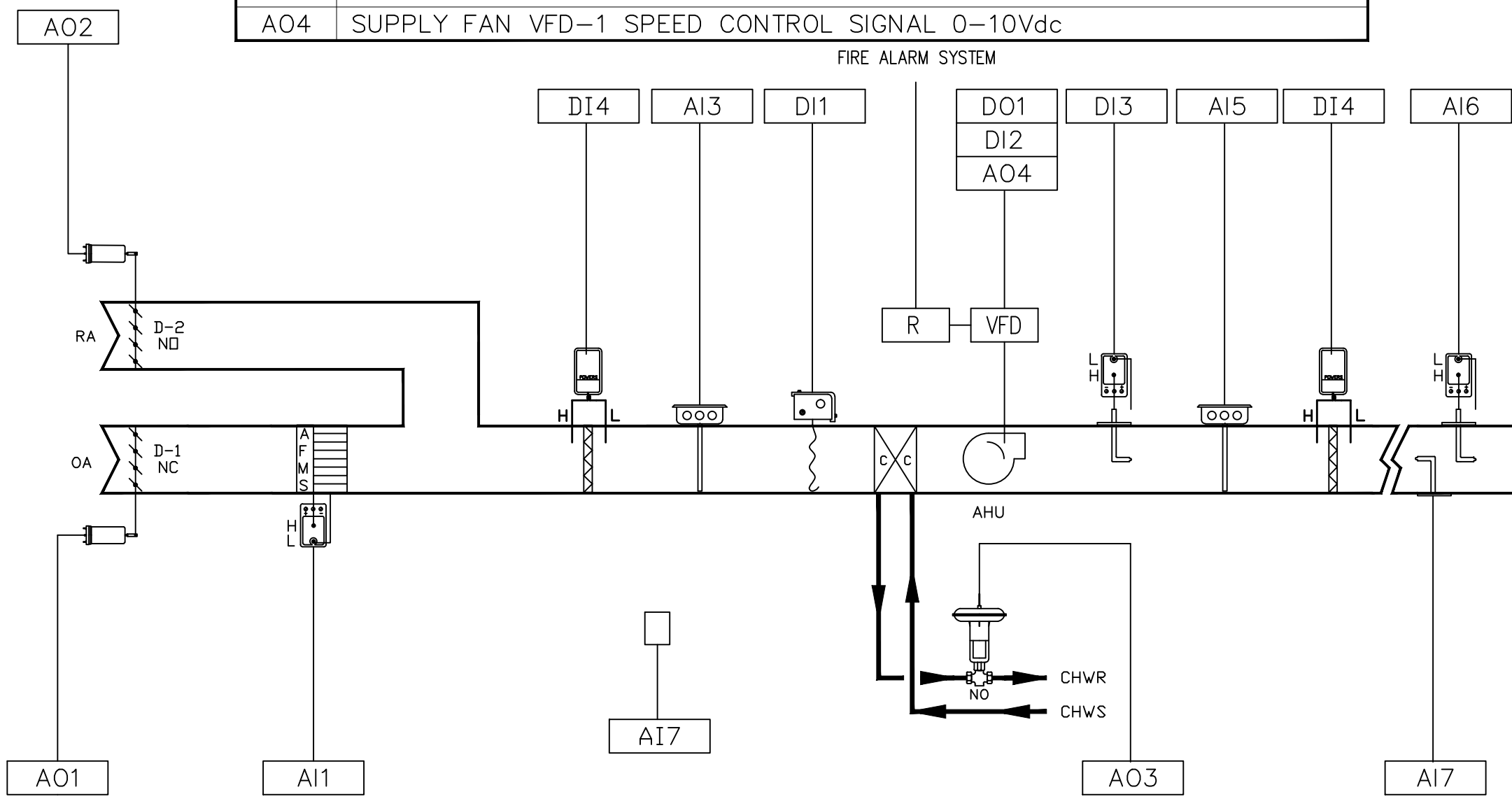
AIR HANDLING UNITS: AC-04, AC-14
AC-41, AC-42, AC-43, AC-44
AC-45, AC-46, AC-51, AC-52
AC-61, AC-62, AC-63, AC-64
AC-71, AC96-1, AC96-2

1A CONTROL SCHEMATIC – VAV AIR HANDLING UNITS WITH RETURN AIR
NOT TO SCALE

- VAV AIR HANDLING UNITS WITH RETURN AIR:
- A. THIS IS MEDIUM PRESSURE, DRAW THROUGH, VARIABLE VOLUME UNIT. THIS UNIT CONSISTS OF A SUPPLY FAN, MOTORIZED RETURN AIR DAMPER, O.A. FLOW MEASURING STATION, FILTER BANK, CHILLED WATER COIL AND A VARIABLE FREQUENCY DRIVE (VFD) ON THE SUPPLY FAN.
- B. THE DDC CONTROLLER WILL START/STOP THE SUPPLY FAN THROUGH THE COMMUNICATION PROTOCOL BOARD LOCATED IN THE VFD.
- C. ON A START COMMAND, THE DDC CONTROLLER SHALL OPEN THE MINIMUM O.A. DAMPER.
- D. OUTSIDE AIR DAMPER TO FAIL CLOSED & CHILLED WATER VALVE SHALL BE NO.
- E. THE DDC CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND MODULATE THE CHILLED WATER VALVE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT INITIALLY 55 DEGREES F (ADJUSTABLE).
- F. THE DDC CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE.
- G. THE DDC CONTROLLER SHALL MONITOR THE END OF DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FANS' VFD'S TO MAINTAIN THE END OF DUCT STATIC PRESSURE. THE DDC CONTROLLER SHALL MONITOR THE VAV TERMINAL UNIT DAMPER POSITION AND INCREASE THE DUCT STATIC PRESSURE BY 0.1" W.G. (ADJUSTABLE) ANY TIME A VAV TERMINAL UNIT DAMPER EXCEEDS 95% OPEN FOR 5 MINUTES. WHENEVER NO VAV TERMINAL UNIT DAMPER REACHES 95% FOR 5 MINUTES, THE DUCT STATIC PRESSURE SHALL BE DECREASED BY 0.1" W.G. (ADJUSTABLE). INITIAL SET POINT OF DOWNSTREAM STATIC PRESSURE SHALL BE 1.0" W.G.
- H. A LOW LIMIT THERMOSTAT SET 40 DEGREES F ON THE DOWNSTREAM SIDE OF THE FILTER SECTION SHALL SHUT DOWN THE SUPPLY FAN, CLOSE THE OUTSIDE AIR DAMPER, START THE BUILDING CHILLED WATER PUMPS AND OPEN CHILLED WATER CONTROL VALVE TO FULL FLOW THROUGH THE COIL WHEN THE SETPOINT (FIELD ADJUSTABLE) IS REACHED. THE DDC CONTROLLER SHALL MONITOR THE LOW LIMIT CONTROLLER AND SEND AN ALARM TO THE EMS OPERATOR WHEN THE LOW LIMIT IS TRIPPED.
- I. SMOKE DETECTORS FURNISHED AND INSTALLED BY DIVISION 26 UPON DETECTION OF SMOKE SHALL DE-ENERGIZE THE SUPPLY AIR FAN AND SHALL CLOSE OUTSIDE AIR DAMPER AND PROVIDE ALARM TO THE BAS...
- J. A STATIC PRESSURE SENSOR LOCATED ON THE DISCHARGE SIDE OF THE SUPPLY FAN SHALL DE-ENERGIZE THE SUPPLY FAN UPON DETECTION OF ABNORMAL DISCHARGE PRESSURE.

1B SEQUENCE OF OPERATION – VAV AIR HANDLING UNITS WITH RETURN AIR

TYPE	POINT DESCRIPTION
AI1	OUTSIDE AIRFLOW
DO1	AHU SUPPLY FAN START/STOP
DI1	LOW TEMPERATURE DETECTION THERMOSTAT SET @ 40°F
DI2	SUPPLY FAN STATUS CURRENT SENSING RELAY
DI3	SUPPLY FAN DISCHARGE PRESSURE SWITCH SET @ +3.5" W.G.
DI4	FILTER DPS
AI3	MIXED AIR TEMPERATURE SETPOINT @ 55°F
AI5	SUPPLY AIR TEMPERATURE SETPOINT @ 55°F
AI6	END OF DUCT PRESSURE SENSOR
AI7	SMOKE DETECTOR
AO1	O.A. DAMPER 0-10 Vdc SPRING RETURN CLOSED
AO2	MIXED AIR DAMPER 0-10Vdc SPRING RETURN OPEN
AO3	CHILLED WATER COIL CONTROL VALVE 0-10Vdc SPRING RETURN
AO4	SUPPLY FAN VFD-1 SPEED CONTROL SIGNAL 0-10Vdc



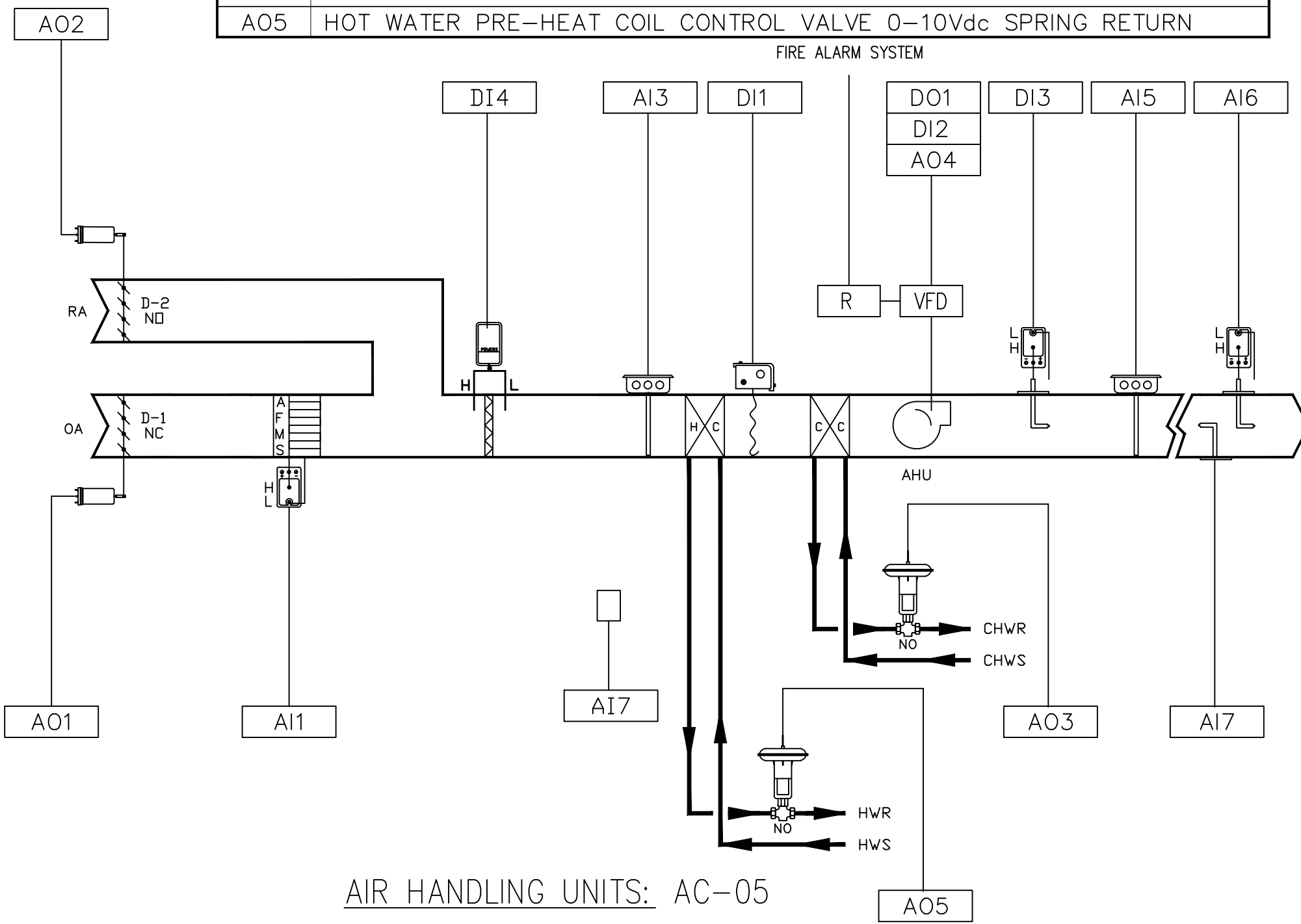
AIR HANDLING UNITS: AC-53 & AC-54

2A CONTROL SCHEMATIC – VAV AIR HANDLING UNITS WITH RETURN AIR
NOT TO SCALE

- VAV AIR HANDLING UNITS WITH RETURN AIR:
- A. THIS IS MEDIUM PRESSURE, DRAW THROUGH, VARIABLE VOLUME UNIT. THIS UNIT CONSISTS OF A SUPPLY FAN, MOTORIZED RETURN AIR DAMPER, O.A. FLOW MEASURING STATION, FIRE FILTER BANK, CHILLED WATER COIL AND A VARIABLE FREQUENCY DRIVE (VFD) ON THE SUPPLY FAN ALONG WITH A POST FILTER BANK.
- B. THE DDC CONTROLLER WILL START/STOP THE SUPPLY FAN THROUGH THE COMMUNICATION PROTOCOL BOARD LOCATED IN THE VFD.
- C. ON A START COMMAND, THE DDC CONTROLLER SHALL OPEN THE MINIMUM O.A. DAMPER.
- D. OUTSIDE AIR DAMPER TO FAIL CLOSED & CHILLED WATER VALVE SHALL BE NO.
- E. THE DDC CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND MODULATE THE CHILLED WATER VALVE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT INITIALLY 55 DEGREES F (ADJUSTABLE).
- F. THE DDC CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE.
- G. THE DDC CONTROLLER SHALL MONITOR THE END OF DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FANS' VFD'S TO MAINTAIN THE END OF DUCT STATIC PRESSURE. THE DDC CONTROLLER SHALL MONITOR THE VAV TERMINAL UNIT DAMPER POSITION AND INCREASE THE DUCT STATIC PRESSURE BY 0.1" W.G. (ADJUSTABLE) ANY TIME A VAV TERMINAL UNIT DAMPER EXCEEDS 95% OPEN FOR 5 MINUTES. WHENEVER NO VAV TERMINAL UNIT DAMPER REACHES 95% FOR 5 MINUTES, THE DUCT STATIC PRESSURE SHALL BE DECREASED BY 0.1" W.G. (ADJUSTABLE). INITIAL SET POINT OF DOWNSTREAM STATIC PRESSURE SHALL BE 1.0" W.G.
- H. A LOW LIMIT THERMOSTAT SET 40 DEGREES F ON THE DOWNSTREAM SIDE OF THE FILTER SECTION SHALL SHUT DOWN THE SUPPLY FAN, CLOSE THE OUTSIDE AIR DAMPER, START THE BUILDING CHILLED WATER PUMPS AND OPEN CHILLED WATER CONTROL VALVE TO FULL FLOW THROUGH THE COIL WHEN THE SETPOINT (FIELD ADJUSTABLE) IS REACHED. THE DDC CONTROLLER SHALL MONITOR THE LOW LIMIT CONTROLLER AND SEND AN ALARM TO THE EMS OPERATOR WHEN THE LOW LIMIT IS TRIPPED.
- I. SMOKE DETECTORS FURNISHED AND INSTALLED BY DIVISION 26 UPON DETECTION OF SMOKE SHALL DE-ENERGIZE THE SUPPLY AIR FAN AND SHALL CLOSE OUTSIDE AIR DAMPER AND PROVIDE ALARM TO THE BAS...
- J. A STATIC PRESSURE SENSOR LOCATED ON THE DISCHARGE SIDE OF THE SUPPLY FAN SHALL DE-ENERGIZE THE SUPPLY FAN UPON DETECTION OF ABNORMAL DISCHARGE PRESSURE.

2B SEQUENCE OF OPERATION – VAV AIR HANDLING UNITS WITH RETURN AIR

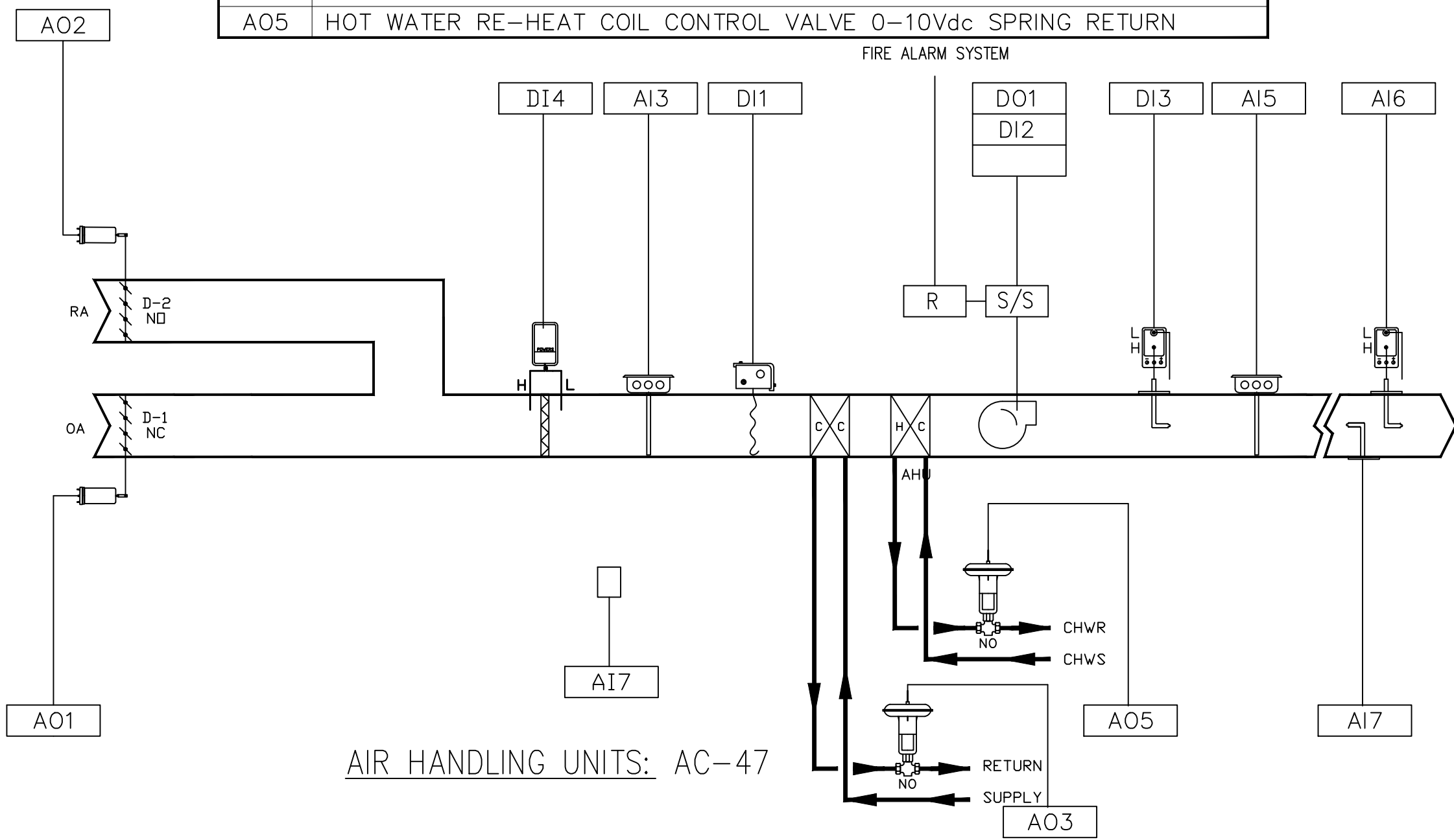
TYPE	POINT DESCRIPTION
AI1	OUTSIDE AIRFLOW
DO1	AHU SUPPLY FAN START/STOP
DI1	LOW TEMPERATURE DETECTION THERMOSTAT SET @ 40°F
DI2	SUPPLY FAN STATUS CURRENT SENSING RELAY
DI3	SUPPLY FAN DISCHARGE PRESSURE SWITCH SET @ +3.5" W.G.
DI4	FILTER DPS
AI3	MIXED AIR TEMPERATURE SETPOINT @ 55°F
AI5	SUPPLY AIR TEMPERATURE SETPOINT @ 55°F
AI6	END OF DUCT PRESSURE SENSOR
AI7	SMOKE DETECTOR
AO1	O.A. DAMPER 0-10 Vdc SPRING RETURN CLOSED
AO2	MIXED AIR DAMPER 0-10Vdc SPRING RETURN OPEN
AO3	CHILLED WATER COIL CONTROL VALVE 0-10Vdc SPRING RETURN
AO4	SUPPLY FAN VFD-1 SPEED CONTROL SIGNAL 0-10Vdc
AO5	HOT WATER PRE-HEAT COIL CONTROL VALVE 0-10Vdc SPRING RETURN



AIR HANDLING UNITS: AC-05

3A CONTROL SCHEMATIC – VAV AIR HANDLING UNITS WITH RETURN AIR
NOT TO SCALE

TYPE	POINT DESCRIPTION
DO1	AHU SUPPLY FAN START/STOP
DI1	LOW TEMPERATURE DETECTION THERMOSTAT SET @ 40°F
DI2	SUPPLY FAN STATUS CURRENT SENSING RELAY
DI3	SUPPLY FAN DISCHARGE PRESSURE SWITCH SET @ +3.5" W.G.
DI4	FILTER DPS
AI3	MIXED AIR TEMPERATURE SETPOINT @ 55°F
AI5	SUPPLY AIR TEMPERATURE SETPOINT @ 55°F
AI6	END OF DUCT PRESSURE SENSOR
AI7	SMOKE DETECTOR
AO1	O.A. DAMPER 0-10 Vdc SPRING RETURN CLOSED
AO2	MIXED AIR DAMPER 0-10Vdc SPRING RETURN OPEN
AO3	CHILLED WATER COIL CONTROL VALVE 0-10Vdc SPRING RETURN
AO5	HOT WATER RE-HEAT COIL CONTROL VALVE 0-10Vdc SPRING RETURN



AIR HANDLING UNITS: AC-47

4A CONTROL SCHEMATIC – VAV AIR HANDLING UNITS WITH RETURN AIR
NOT TO SCALE

- VAV AIR HANDLING UNITS WITH RETURN AIR:
- A. THIS IS MEDIUM PRESSURE, DRAW THROUGH, VARIABLE VOLUME UNIT. THIS UNIT CONSISTS OF A SUPPLY FAN, MOTORIZED RETURN AIR DAMPER, O.A. FLOW MEASURING STATION, FILTER BANK, HOT WATER PRE-HEAT COIL, CHILLED WATER COIL AND A VARIABLE FREQUENCY DRIVE (VFD) ON THE SUPPLY FAN.
- B. THE DDC CONTROLLER WILL START/STOP THE SUPPLY FAN THROUGH THE COMMUNICATION PROTOCOL BOARD LOCATED IN THE VFD.
- C. ON A START COMMAND, THE DDC CONTROLLER SHALL OPEN THE MINIMUM O.A. DAMPER.
- D. OUTSIDE AIR DAMPER TO FAIL CLOSED & CHILLED WATER VALVE SHALL BE NO.
- E. THE DDC CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND MODULATE THE CHILLED WATER VALVE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT INITIALLY 55 DEGREES F (ADJUSTABLE).
- F. THE DDC CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE AND MODULATE THE HOT WATER VALVE TO MAINTAIN THE ENTERING AIR TEMPERATURE TO 55 DEGREES F (ADJUSTABLE).
- G. THE DDC CONTROLLER SHALL MONITOR THE END OF DUCT STATIC PRESSURE AND MODULATE THE SUPPLY FANS' VFD'S TO MAINTAIN THE END OF DUCT STATIC PRESSURE. THE DDC CONTROLLER SHALL MONITOR THE VAV TERMINAL UNIT DAMPER POSITION AND INCREASE THE DUCT STATIC PRESSURE BY 0.1" W.G. (ADJUSTABLE) ANY TIME A VAV TERMINAL UNIT DAMPER EXCEEDS 95% OPEN FOR 5 MINUTES. WHENEVER NO VAV TERMINAL UNIT DAMPER REACHES 95% FOR 5 MINUTES, THE DUCT STATIC PRESSURE SHALL BE DECREASED BY 0.1" W.G. (ADJUSTABLE). INITIAL SET POINT OF DOWNSTREAM STATIC PRESSURE SHALL BE 1.0" W.G.
- H. A LOW LIMIT THERMOSTAT SET 40 DEGREES F (ADA) ON THE DOWNSTREAM SIDE OF THE FILTER SECTION SHALL MODULATE THE HOT WATER CONTROL VALVE TO MAINTAIN AN ENTERING AIR TEMPERATURE (RELATIVE TO THE COOLING COIL) OF 55 DEGREES F. THE DDC CONTROLLER SHALL MONITOR THE LOW LIMIT CONTROLLER AND SEND AN ALARM TO THE EMS OPERATOR WHEN THE LOW LIMIT IS TRIPPED.
- I. SMOKE DETECTORS FURNISHED AND INSTALLED BY DIVISION 26 UPON DETECTION OF SMOKE SHALL DE-ENERGIZE THE SUPPLY AIR FAN AND SHALL CLOSE OUTSIDE AIR DAMPER AND PROVIDE ALARM TO THE BAS.
- J. A STATIC PRESSURE SENSOR LOCATED ON THE DISCHARGE SIDE OF THE SUPPLY FAN SHALL DE-ENERGIZE THE SUPPLY FAN UPON DETECTION OF ABNORMAL DISCHARGE PRESSURE.



3B SEQUENCE OF OPERATION – VAV AIR HANDLING UNITS WITH RETURN AIR

CONSTANT VOLUME AIR HANDLING UNITS WITH RETURN AIR:

THIS IS MEDIUM PRESSURE, DRAW THROUGH, CONSTANT VOLUME UNIT. THIS UNIT CONSISTS OF A SUPPLY FAN, MOTORIZED RETURN AIR DAMPER, FILTER BANK, AND A CHILLED WATER COIL.

- A. THE DDC CONTROLLER WILL START/STOP THE SUPPLY FAN UPON A CALL FOR COOLING OR UPON THE KITCHEN EXHAUST HOOD BECOMING ENABLED.
- B. ON A START COMMAND, THE DDC CONTROLLER SHALL OPEN THE MINIMUM O.A. DAMPER.
- C. OUTSIDE AIR DAMPER TO FAIL CLOSED & CHILLED WATER VALVE SHALL BE NO.
- D. THE DDC CONTROLLER SHALL MONITOR THE SUPPLY AIR TEMPERATURE AND MODULATE THE CHILLED WATER VALVE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT INITIALLY 55 DEGREES F (ADJUSTABLE).
- E. UPON A CALL FOR HEATING, THE DDC CONTROLLER SHALL MODULATE THE HOT WATER VALVE TO MAINTAIN THE SUPPLY AIR TEMPERATURE SETPOINT OF 80 DEGREES F (ADJUSTABLE).
- F. THE DDC CONTROLLER SHALL MONITOR THE MIXED AIR TEMPERATURE.
- G. A LOW LIMIT THERMOSTAT SET 40 DEGREES F ON THE DOWNSTREAM SIDE OF THE FILTER SECTION SHALL SHUT DOWN THE SUPPLY FAN, CLOSE THE OUTSIDE AIR DAMPER, START THE BUILDING CHILLED WATER PUMPS AND OPEN CHILLED WATER CONTROL VALVE TO FULL FLOW THROUGH THE COIL WHEN THE SETPOINT (FIELD ADJUSTABLE) IS REACHED. THE DDC CONTROLLER SHALL MONITOR THE LOW LIMIT CONTROLLER AND SEND AN ALARM TO THE EMS OPERATOR WHEN THE LOW LIMIT IS TRIPPED.
- H. SMOKE DETECTORS FURNISHED AND INSTALLED BY DIVISION 26 UPON DETECTION OF SMOKE SHALL DE-ENERGIZE THE SUPPLY AIR FAN AND SHALL CLOSE OUTSIDE AIR DAMPER AND PROVIDE ALARM TO THE BAS.
- I. A STATIC PRESSURE SENSOR LOCATED ON THE DISCHARGE SIDE OF THE SUPPLY FAN SHALL DE-ENERGIZE THE SUPPLY FAN UPON DETECTION OF ABNORMAL DISCHARGE PRESSURE.

4B SEQUENCE OF OPERATION – VAV AIR HANDLING UNITS WITH RETURN AIR

Revisions:		Date:	
CONSULTANTS:		ARCHITECT/ENGINEERS:	
			
Approved: Assistant Director		Approved: Chief of Staff	
Approved: Service Chief		Approved: Service Chief	
Approved: Chief, Bio-Med		Approved: Chief, EMS	
Approved: Chief, IT		Approved: Chief, M&O	
Approved: Chief, Safety		Approved: Chief	
Approved: Chief, Engineering		Approved: Chief, Infection Control	
Approved: Chief, Police		Approved: Chief	
Drawing Title		Project Name	
MECHANICAL SEQUENCES AND CONTROLS		KD AIR HANDLER REPLACEMENT (AHU) PROJECT - PHASE II	
Location		Building Number	
Kerrville Veterans Hospital Veterans Affairs 2600 Memorial Blvd. Kerrville, TX 78028		11	
Project Number		Checked	
671A4-09-119		ESW	
Date		Drawn	
07-15-13		PJR	
Drawing Number		Dwg. of	
MH700			
Office of Construction and Facilities Management		Department of Veterans Affairs	