

# Barracks 101

## Building Information Model Common File

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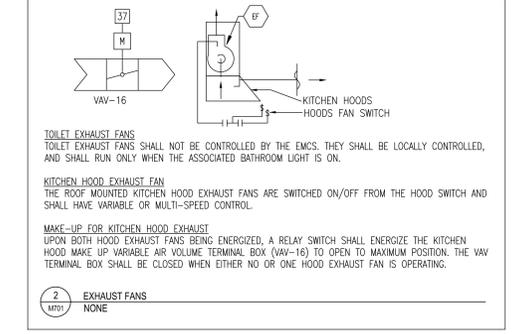
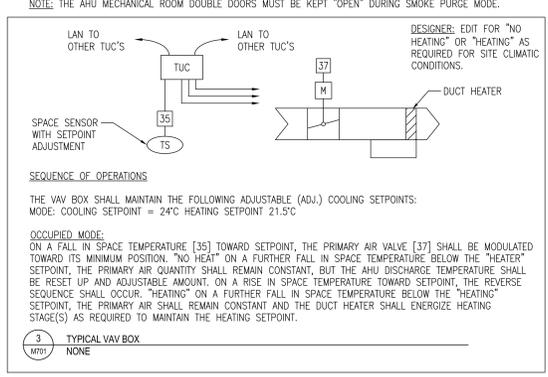
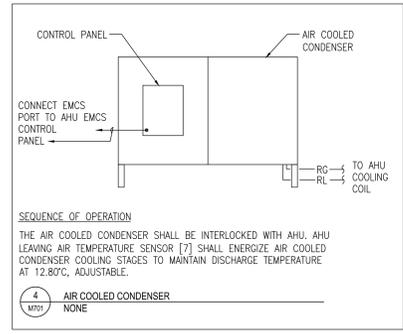
Rev Number	Description	Date

Release For Construction:	NIBS/AS	NIBS/AS
Drawing Title	<b>MECHANICAL EMCS POINTS LIST</b>	
DBO Project Name	DBO Project Name	Phase AS NOTED
CAO File Name	CAO File Name	Scale 1:1
DBO Project Name	DBO Project Name	Scale 1:1
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Project Number		
Classification	UNCLASSIFIED	

EMCS POINTS LIST									
TAG	NAME/FUNCTION	A	AO	DI	DO	REMARKS	ALARM AT BAS FC	ALARM AT POST 1 AND POST 2	
[1]	AHU SUPPLY FAN ON/OFF				*				
[2]	AHU SUPPLY FAN VFD FAIL				*				
[3]	AHU SUPPLY FAN VFD SPEED INPUT		*						
[4]	AHU SUPPLY FAN VFD % (FEEDBACK)		*						
[5]	AHU SUPPLY FAN STATUS		*						
[6]	DUCT SMOKE DETECTOR		*			[6], AND [6]	*	*	
[7]	SUPPLY AIR TEMPERATURE		*				*	*	
[8]	SUPPLY AIR HUMIDITY		*				*	*	
[9]	SUPPLY AIR DUCT STATIC PRESSURE		*				*	*	
[10]	RETURN AIR DAMPER (OPPOSED BLADE REQUIRED)		*			[10], [10], [10], [10]	*	*	
[11]	OUTSIDE AIR TEMPERATURE		*				*	*	
[12]	RETURN AIR TEMPERATURE		*				*	*	
[13]	RETURN AIR HUMIDITY		*				*	*	
[14]	OUTSIDE AIR DAMPER		*				*	*	
[15]	OUTSIDE AIR DAMPER END SWITCH		*				*	*	
[16]	MIXED AIR TEMPERATURE		*				*	*	
[17]	FILTER DIFFERENTIAL PRESSURE		*			[17], [17], AND [17]	*	*	
[18]	COOLING COIL CHW VALVE (OPTION)		*				*	*	
[19]	COOLING COIL DISCHARGE TEMPERATURE		*				*	*	
[20]	SPACE PRESSURIZATION SENSOR (FIRST FLOOR)		*				*	*	ALARM AT POST 1, POST 2 IF IN ALARM FOR MORE THAN 5 MINUTES
[21]	SPACE PRESSURIZATION SENSOR (SECOND FLOOR)		*				*	*	ALARM AT POST 1, POST 2 IF IN ALARM FOR MORE THAN 5 MINUTES
[22]	SPACE TEMPERATURE SENSORS		*			[22], [22], AND [22]	*	*	
[23]	SMOKE AIR DAMPER		*				*	*	
[24]	SMOKE AIR DAMPER END SWITCH		*				*	*	
[25]	SMOKE FAN ON/OFF		*				*	*	
[26]	SMOKE FAN STATUS		*				*	*	
[27]	CARBON DIOXIDE SENSORS		*			[27]	*	*	
[28]	RELIEF AIR DAMPER		*				*	*	
[29]	RELIEF FAN ON/OFF		*				*	*	
[30]	RELIEF FAN VFD FAIL		*				*	*	
[31]	RELIEF FAN VFD SPEED INPUT		*				*	*	
[32]	RELIEF FAN VFD % FEEDBACK		*				*	*	
[33]	RELIEF FAN STATUS		*				*	*	
[34]	FIRE ALARM SYSTEM TRIP		*				*	*	
[35]	ZONE TEMPERATURES (EACH)		*				*	*	HIGH AND LOW ALARMS, ALARM AT POST 1, POST 2 IF IN ALARM FOR MORE THAN 5 MINUTES
[36]	COOLING SETPOINTS (OCCUPIED) (EACH)		*				*	*	
[37]	VAV BOX AIR VALVES (EACH)		*				*	*	
[38]	VAV BOX CFM (EACH)		*				*	*	
[39]	VAV BOX MINIMUM CFM (EACH)		*				*	*	
[40]	VAV BOX MAXIMUM CFM (EACH)		*				*	*	
[41]	UNOCCUPIED COOLING SETPOINTS (EACH)		*				*	*	
[42]	MAX. ZONE TEMPERATURE GROUP		*				*	*	
[43]	MIN. ZONE TEMPERATURE GROUP		*				*	*	
[44]	AVERAGE ZONE TEMPERATURE GROUP		*				*	*	
[45]	TOTAL GROUP FLOW		*				*	*	
[46]	EMERGENCY POWER		*				*	*	
[47]	WATER SUPPLY SYSTEM GENERAL ALARM		*				*	*	
[48]	WATER SUPPLY SYSTEM PH LEVEL		*				*	*	
[49]	WATER SUPPLY SYSTEM CL LEVEL		*				*	*	
[50]	WATER SUPPLY SYSTEM TANK LEVEL		*				*	*	HIGH AND LOW LEVEL
[51]	WATER SUPPLY SYSTEM PUMP STATUS		*				*	*	
[52]	EXHAUST FAN START/STOP (EACH)		*				*	*	
[53]	EXHAUST FAN STATUS (EACH)		*				*	*	
[54]	EXHAUST FAN DAMPER (EACH)		*				*	*	
[55]	DOMESTIC WATER METER		*				*	*	
[56]	ELECTRIC METER		*				*	*	
[57]	AHU AIRFLOW (PIEZOMETER)		*				*	*	
[58]	SPACE HUMIDITY		*				*	*	
[59]	OUTDOOR PRESSURE (EACH)		*				*	*	
[60]	FIRE ALARM SYSTEM TRIP		*				*	*	
[61]	OUTSIDE AIR FLOW		*				*	*	
[62]	SMOKE MAKE UP/100% OUTSIDE AIR DAMPER		*				*	*	
[63]	OA PRESSURE SENSORS		*				*	*	
[64]	HUMIDIFIER DATA		*				*	*	
[65]	SUPPLY AIR VOLUME (PIEZOMETER BY AHU MFR)		*				*	*	

**BAS INPUT/OUTPUT SIGNALS AND ALARMS (SEE POINT LIST):**

- AIRFLOW MONITOR [57] (SUPPLIED W/AHU): SHALL SIGNAL BAS OF THE OPERATING AIRFLOW OF AHU IN L/S.
- OPERATING READING FOR VARIOUS SENSORS DESCRIBED ABOVE SHALL BE REGISTERED AT THE BAS WORKSTATION.
- FILTER PRESSURE SENSORS [17] (SUPPLIED W/AHU): DIFFERENTIAL PRESSURE SENSORS AT EACH FILTER SHALL SIGNAL THE PRESSURE DIFFERENTIAL ACROSS EACH FILTER BANK. THE BAS FLOW DIAGRAM SHALL INDICATE EACH FILTER WITH GREEN, YELLOW, AND RED INDICATOR LIGHTS. THE BAS SHALL BE PROGRAMMED WITH THE FAN 100% DESIGN AIRFLOW RATE AND THE "DIRTY" FILTER PRESSURE DROP SET-POINT AT 100% SCHEDULED AIRFLOW. THE BAS SHALL MULTIPLY THE DIFFERENTIAL PRESSURE MEASURED ACROSS EACH FILTER (BY DP SENSOR [17]) BY THE RATIO OF 100% DESIGN AIRFLOW TO ACTUAL AIRFLOW AND COMPARE THIS NUMBER WITH THE "DIRTY" FILTER PRESSURE DROP SET-POINT TO DETERMINE IF THE FILTERS ARE DIRTY. CONDITIONS SHALL BE SIGNALLED AS FOLLOWS: GREEN = "NORMAL" (LESS THAN 70% OF RANGE, YELLOW = "ORDER FILTERS" (BETWEEN 70-100% OF RANGE), AND RED = "DIRTY". REPLACE FILTERS (GREATER THAN 100% SET-POINT). IF RATIOED AIRFLOW RATE INDICATES THAT THE FILTER EXCEEDS THE MAXIMUM PRESSURE DROP SET-POINT, I.E. FILTER IS "DIRTY", THEN AN ALARM SIGNAL SHALL BE REGISTERED AT THE BAS WORKSTATION. THE HEGA FILTER SHALL ONLY HAVE A GREEN "NORMAL" AND RED "ALARM" INDICATOR LIGHT. THE ALARM SHALL BE SIGNALLED IF THE RATIOED DIFFERENTIAL PRESSURE DROP FALLS BELOW A MINIMUM LEVEL (E.G. 50 Pa). INDICATING FILTER IS MISSING) OR 20% ABOVE THE 100% SET-POINT.
- IF THE FAN CURRENT TRANSMITTER [5] DOES NOT INDICATE PROOF-OF-RUN FOR THE SUPPLY FAN MOTOR WHEN THE FAN IS COMMANDED TO RUN OR IF THE VFD REPORTS A FAILURE [2], AN ALARM SHALL BE REGISTERED AT THE BAS WORKSTATION.



**SEQUENCE OF OPERATION**  
THE AIR HANDLING UNIT IS CONFIGURED TO OPERATE YEAR-ROUND TO PROVIDE A VARIABLE VOLUME OF CONDITIONED AIR TO THE INDIVIDUAL SPACES. THE EMCS SHALL ENABLE OR DISABLE THE OPERATION OF THE UNIT IN ACCORDANCE WITH A PROGRAMMABLE SCHEDULE. THE OPERATOR SHALL ALSO BE ABLE TO OVER-RIDE THE OPERATION OF THE AHU USING A TOGGLE SWITCH OR COMMAND.

THE AHU SHALL OPERATE 24/7 UNLESS COMMANDED TO BE OFF DUE TO A FIRE ALARM TRIP OR DUCT SMOKE DETECTOR TRIP AS WELL AS FOR MAINTENANCE PURPOSES. THE OPERATION OF THIS UNIT IS CRITICAL TO THE PRESSURIZATION OF THE BUILDING.

**START-UP:**  
WHEN THE EMCS WORKSTATION HAS DETERMINED THAT THE UNIT SHOULD START, THE SUPPLY FAN [1] SHALL BE STARTED THROUGH THE VFD, SLOWLY RAMPED UP TO SPEED [3] AND THE SYSTEM SHALL OPERATE WITH RETURN AIR DAMPER [10] AT 100% OPEN WITH THE NORMAL OUTSIDE AIR DAMPER [14] CLOSED AND WITH 100% SMOKE MAKE-UP ON DAMPER [62] CLOSED. THE RETURN AIR AND NORMAL OUTSIDE AIR DAMPERS [10-1, 2, & 3, 14] SHALL BE "NORMALLY OPEN." THE AHU FAN VFD AND FAN SHALL START AND LOAD GRADUALLY OVER A PERIOD OF 30 SECONDS AT WHICH TIME IT SHALL BE UNDER THE CONTROL OF THE EMCS WORKSTATION.

**WHEN THE AHU IS IN "OCCUPIED" MODE, THE FOLLOWING SHALL OCCUR:**  
THE EMCS SHALL MAINTAIN THE FOLLOWING ADJUSTABLE SETPOINTS FOR THE AHU, WITH THE FOLLOWING INITIAL SETTINGS: SUPPLY AIR TEMPERATURE [7] ("SATs", 12.8°C, ADJUSTABLE), SPACE TEMPERATURE - SUMMER [22] ("SP", 24.0°C), SPACE RELATIVE HUMIDITY [8] ("RH", 50%, ADJUSTABLE), SPACE TEMPERATURE - WINTER - 21.5°C, 40% RELATIVE HUMIDITY (ADJUSTABLE).

IF THE SUPPLY AIR TEMPERATURE [7] IS GREATER THAN THE "SAT" SETPOINT, THE COOLING COIL CONTROL VALVE [18] SHALL MODULATE TO MAINTAIN THE "SAT" SETPOINT. IF THE SUPPLY AIR TEMPERATURE [7] IS LESS THAN THE "SAT" SETPOINT, THE COOLING COIL CONTROL VALVE [18] SHALL MODULATE CLOSED. SEE 4/M701 FOR CONTROL INTERLOCK WITH AIR-COOLED CONDENSER.

**FOR BUILDINGS WITHOUT HEATING:**  
AT A FURTHER DROP IN ROOM TEMPERATURE, THE SUPPLY AIR DISCHARGE TEMPERATURE SHALL RESET TO A HIGHER SETTING TO PRECLUDE THE BUILDING FROM SUB-COOLING AT MINIMUM AIR FLOW.

**GENERAL (ALL MODES OF OPERATION):**  
IF ANY FILTER DIFFERENTIAL PRESSURE SENSOR [17(1),17(2),17(3)] SENSES A PRESSURE DIFFERENCE GREATER THAN ITS SETPOINT, AN ALARM SHALL BE REGISTERED AT THE EMCS WORKSTATION INDICATING DIRTY FILTERS. SEE ADDITIONAL RELATED FILTER DPS SEQUENCE BELOW POINT LIST TABLE THIS SHEET.

IF THE FAN STATUS CURRENT TRANSMITTER [5] DOES NOT INDICATE A PROOF-OF-RUN FOR THE SUPPLY FAN [1] WHEN THE FAN IS COMMANDED TO RUN OR IF THE SUPPLY FAN VFD [2] REPORTS A FAILURE, AN ALARM SHALL BE REGISTERED AT THE EMCS WORKSTATION. ON A FAN SHUTDOWN OR A FAILURE TO OPERATE, ALL DAMPERS [10,14] AND VALVES [18] SHALL CLOSE AND AN ALARM SIGNAL SHALL BE SENT TO THE EMCS WORKSTATION. IF THE EMERGENCY SMOKE EXHAUST FAN STATUS CURRENT TRANSMITTER [26] DOES NOT INDICATE A PROOF-OF-RUN FOR THE PURGE FAN WHEN THE FAN IS COMMANDED TO RUN, AN ALARM SHALL BE REGISTERED AT THE EMCS WORKSTATION. SEE ADDITIONAL RELATED SEQUENCE BELOW POINT LIST TABLE.

THE SUPPLY AND RETURN AIR RELATIVE HUMIDITY SENSORS [8,13] SHALL REPORT THE RELATIVE HUMIDITIES TO THE EMCS FOR INDICATION ONLY. IF THE RELATIVE HUMIDITY FALLS BELOW THE DESIGN SETPOINT, 40%, ADJUSTABLE, THEN THE PACKAGE HUMIDIFIER SHALL STAGE ON TO MAINTAIN THE DESIGN [13] SETPOINT.

**ACTION FROM DUCT SMOKE DETECTOR TRIP:**  
IF THE DUCT DETECTOR [6] SENSES AN "ALARM" CONDITION, THE SUPPLY FAN SHALL "DE-ENERGIZE" (FIELD WIRED) AND AN ALARM SHALL BE REGISTERED AT THE EMCS WORKSTATION IN THE CHANCERY. ADDITIONALLY, OA DAMPER [14], RA DAMPERS [ALL 10'S] AND RELIEF AIR DAMPER [28] SHALL CLOSE.

**ACTION FROM FIRE ALARM SYSTEM TRIP:**  
UPON FIRE ALARM SYSTEM TRIP [60], SHUT DOWN SYSTEM AS IN DUCT SMOKE DETECTOR TRIP SEQUENCE ABOVE AND ALARM TO EMCS.

**OUTSIDE AIR AND PRESSURIZATION CONTROL SEQUENCE:**  
WHEN THE AHU IS STARTED, THE FIRST FLOOR RETURN AIR DAMPER [10-1] SHALL MODULATE TO MAINTAIN THE SPACE DIFFERENTIAL PRESSURE TO THE 2ND FLOOR AT 2.5 PA; THE SECOND FLOOR RETURN AIR DAMPER [10-2] SHALL MODULATE TO MAINTAIN THE SPACE DIFFERENTIAL PRESSURE TO ATMOSPHERE AT 5.0 PA; AND THE NORMAL OUTDOOR AIR DAMPER [14] SHALL MODULATE BETWEEN THE MINIMUM POSITION AND THE MAXIMUM POSITION TO MAINTAIN THE REQUIRED MINIMUM VENTILATION REQUIRED FOR BUILDING AND MAINTAIN BUILDING PRESSURIZATION LEVELS. THE PRESSURE RELIEF DAMPER [28] SHALL MODULATE OPEN THE BUILDING RELIEF AND STARTING THE VFD [31] FOR THE FAN MOTOR, MODULATING THE SPEED TO MAINTAIN THE FIRST FLOOR DIFFERENTIAL PRESSURE AT +2.5 PA.

THE SPACE DIFFERENTIAL PRESSURE SENSOR [20,21] SHALL MODULATE THE RETURN AIR DAMPER IN A DIRECTLY PROPORTIONAL MODULATION SO AS TO ACHIEVE A SETPOINT OF 3.5 Pa FOR THE COMMON AREAS, AND 7.0 Pa FOR THE RECREATION AREAS AND LIVING QUARTERS.

**ACTION IN RESPONSE TO CO2 SENSORS:**  
CONTROL: IF THE RETURN AIR CO2 SENSOR [27] SHOULD SENSE A READING HIGHER THAN 900 PPM, THE NORMAL OUTSIDE AIR DAMPER [14] SHALL SLOWLY OPEN TOWARDS ITS MAXIMUM POSITION TO INCREASE THE OA SUPPLY. THE RETURN AIR DAMPER FOR FIRST FLOOR [10-1] SHALL MODULATE CORRESPONDINGLY TOWARDS CLOSED POSITION TO OFFSET THE INCREASED OA, AND THE RELIEF AIR FAN SPEED CONTROLLER [31] SHALL INCREASE TO MAINTAIN THE FLOOR DIFFERENTIAL PRESSURE AT +2.5 PA. WHEN THE CO2 SENSOR [27] AGAIN SENSES A READING BELOW 900 PPM FOR 10 MINUTES, THEN THE NORMAL OUTSIDE AIR DAMPER [14] SHALL START TO MODULATE TOWARDS THE MINIMUM POSITION AND THE RELIEF FAN CONTROLLER [14] SHALL MODULATE TO LOWER SPEED TO AGAIN MAINTAIN THE BUILDING PRESSURIZATION REQUIREMENT.

WHEN THE AIR HANDLING UNIT SUPPLY FAN [1] IS OPERATING, THE OUTSIDE AIR DAMPER [14] SHALL INITIALLY OPEN TO ITS MINIMUM POSITION, RETURN AIR DAMPERS [10-1] AND [10-2] SHALL INITIALLY OPEN FULLY AND THE DAMPERS SHALL MODULATE AS FOLLOWS:

IF RETURN AIR CO2 SENSOR [27-1] SHOULD INDICATE A READING HIGHER THAN 900 PPM, OUTSIDE AIR DAMPER [14] SHALL SLOWLY OPEN TOWARD ITS MAXIMUM POSITION. IF ANY ZONE DIFFERENTIAL PRESSURE SENSOR [20 OR 21] SENSES A LOWER DIFFERENTIAL PRESSURE THAN ITS SET POINT, THE CORRESPONDING RETURN AIR DAMPER [10-1] OR [10-2] SHALL SLOWLY MODULATE CLOSED UNTIL THE ZONE DIFFERENTIAL PRESSURE SET POINT HAS BEEN SATISFIED, UNLESS THE RETURN AIR CO2 SENSOR [27-1] INDICATES A READING ABOVE ITS SETPOINT. IF ANY ZONE DIFFERENTIAL PRESSURE SENSOR [20 OR 21] SENSES A HIGHER DIFFERENTIAL PRESSURE THAN ITS SET POINT, THE CORRESPONDING RETURN AIR DAMPER [10-1] OR [10-2] SHALL SLOWLY MODULATE OPEN UNTIL THE ZONE DIFFERENTIAL PRESSURE SET POINT HAS BEEN SATISFIED. IF RETURN AIR CO2 SENSOR [27-1] INDICATES A READING BELOW 900 PPM, RETURN AIR DAMPERS [10-1] AND [10-2] SHALL BE UNDER THE CONTROL OF THE CORRESPONDING ZONE PRESSURIZATION SENSORS [20 OR 21]. IF ZONE DIFFERENTIAL PRESSURE SENSORS [20] SENSES AN INCREASING PRESSURE ABOVE SET POINT WHEN CO2 CONTROL INCREASES THE OUTSIDE AIR THE RELIEF DAMPER [28] AND RELIEF FAN VFD SPEED [3] SHALL BE CONTROLLED AS DESCRIBE ABOVE.

**MANUAL SMOKE PURGE MODE**  
A BUILDING POST-FIRE SMOKE "PURGE" MAY BE MANUALLY INITIATED VIA A PANEL-MOUNTED SWITCH LOCATED AT THE AHU OMS PANEL. UPON A "PURGE" COMMAND, THE AHU SUPPLY FAN [1] SHALL STOP. RETURN AIR DAMPER [10-3] SHALL CLOSE. RETURN AIR DAMPERS [10-1 & 10-2] SHALL FULLY OPEN. NORMAL OA DAMPER [14] SHALL CLOSE AND SMOKE PURGE 100% OUTSIDE AIR DAMPER [62] SHALL FULLY OPEN. SMOKE PURGE DAMPER [23] SHALL OPEN. SMOKE EXHAUST FAN [25] SHALL BE ENERGIZED. AHU SUPPLY FAN [1] SHALL BE RE-ENERGIZED UPON DAMPERS BEING PROVEN BY END SWITCHES. SEQUENCE WILL BE MANUALLY DEACTIVATED BY THE SAME PANEL-MOUNTED SWITCH LOCATED IN ROOM 105, AFTER WHICH NORMAL OPERATION SHALL RESUME.

**NOTE: THE AHU MECHANICAL ROOM DOUBLE DOORS MUST BE KEPT "OPEN" DURING SMOKE PURGE MODE.**

**LEGEND**

CT	CURRENT TRANSMITTER
ESF	EQUIPMENT DESIGNATION
M	DAMPER ACTUATOR (MOTOR)
NC	NORMALLY CLOSED
NO	NORMALLY OPEN
SMK	SMOKE DETECTOR
HT	HUMIDITY TRANSMITTER
TT	TEMPERATURE TRANSMITTER
CO2	CARBON DIOXIDE SENSOR
3	POINT LABEL
DPS	DIFFERENTIAL PRESSURE SENSOR
CHS/R	CHILLED WATER SUPPLY/RETURN
PT	PRESSURE TRANSMITTER
TUC	TERMINAL UNIT CONTROLLER
TS	TEMPERATURE SENSOR
AFS	AIRFLOW STATION

