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Document Identification

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VOLUME 1 SPECIFICATIONS

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PART 1 GENERAL

1.1 GENERAL REQUIREMENTS

- .1 Read and be governed by conditions of the *Contract Documents*, including sections of Division 01.
- .2 Section includes
 - .1 Sequence of operation:
 - .1 VRF fan coil units and Air-Source Heat Pump (ASHP)
 - .2 ERV
 - .3 Fresh Air Heater
 - .4 Humidification
 - .5 IT Room Air Conditioning
 - .6 Medical Storage Room
 - .7 Vehicle Bay Radiant Tube Heaters
 - .8 Vehicle Bay Ceiling Fan
 - .9 Vehicle Bay Exhaust Fan EF-2
 - .10 CO/NOX Ventilation System for Vehicle Bay
 - .11 Vestibule Heater
 - .12 Mechanical Room Heater
 - .13 Generator Delay
 - .14 Domestic Hot Water System
 - .15 Trending

PART 2 PRODUCTS

- .1 VRF fan coil units and Air-Source Heat Pump (ASHP)
 - .1 The VRF fan coil units will operate in either heating or cooling mode (simultaneous heating and cooling not available) through a programmable thermostat to maintain room temperature at set point.
 - .2 In the mechanical room, the wall-mounted fan coil unit will serve as the first stage of heating and the first stage of cooling. If there is inadequate heating (due to extreme low temperatures leading to condenser unit lockout, or exterior door left open) the second stage of heating by electric unit heat kit will be activated and the BAS will alert the operator. Fan coil unit and electric unit heater is controlled by BAS.
 - .3 FCU-1.1 serves the write-up room, medical storage and washrooms. The fan coil unit will heat or cool based on the temperature reading from the fan coil controller located in the Write-up room. The BAS will receive the temperature reading through the fan coil's BAS communication device (Intesis Box).
 - .4 FCU-1.2 serves the Kitchen/Dining/Crew room 104 (Crew Lounge), and will heat or cool based on the temperature reading from the fan coil controller located in that space. The BAS will receive the temperature reading through the fan coil's BAS communication device (Intesis Box).

- .5 BAS to control temperature setpoint within range with local area control with high limit lockouts. Current temperature and setpoints viewable in BAS by operator.
- .6 Thermostats to be supplied and installed by the mechanical contractor. Thermostats shall have deadband of at least 3°C.
- .7 BAS will monitor the status to generate an alarm if the fan coil units or ASHP condenser unit fail to operate when commanded on.
- .8 Fan status, heating/cooling on/off and mode status is available in BAS, viewable by operator.

.2 ERV

- .1 It is expected at this point the ERV will run at all times, but not during defrost mode (controlled by ERV), when ventilation to the building cannot be provided. Fans will run with airflows set locally through ERV, so that supply is greater than exhaust airflow rate (positive pressurization). ERV on/off status is available in BAS, viewable by operator.
- .2 ERV has local controller ability via a timer switch or humidistat in each washroom to boost supply airflow and exhaust airflow for 15 minutes to exhaust humidity or smells from the washrooms in less time. (This function is not tied to BAS).

.3 Fresh Air Heater

- .1 The on/off status of the fresh air heater, after the ERV will be monitored by the BAS, hourly trending recorded.
- .2 The discharge air setpoint is provided by the BAS, set at 16°C (operator adjustable).

.4 Humidification

- .1 Humidifier is only enabled when FC-1.2 (Crew Lounge) is running during heating season.
- .2 Upon call for humidification through humidity sensor located in Crew Lounge, BAS turns on humidifier unit until fan coil turns off or set point of 30% RH (adjustable) is reached. Status on/off is available in BAS, viewable by operator.
- .3 If humidity being monitored in Write-Up Room exceeds 50%RH (adjustable), turn off the humidifier.

.5 IT Room Air Conditioning

- .1 In winter there are two stages of cooling. The BAS monitors temperature in the space. The first stage of cooling (shoulder or heating season only) is enabled when the temperature reaches 23°C (adjustable through BAS) and uses a transfer fan to blow warm air to the mechanical room. When the temperature reaches 25°C (adjustable through BAS), the second stage of cooling is enabled. The transfer fan turns off and the split air-conditioning unit turns on until the unit has run for at least 10 minutes (adjustable through BAS) and the setpoint to turn cooling off (22°C, adjustable through BAS) is reached. During cooling season, the transfer fan is not used for cooling, only the split air-conditioning unit is used. Trend fan and air-conditioner usage.
- .2 If temperature reaches 27°C (adjustable through BAS) the BAS will generate an alarm to alert building operator. Temperature of room is available at BAS, viewable by operator. Status of transfer fan and split AC unit (on/off) is viewable by operator.

.6 Medical Storage Room

- .1 The medical storage room has a dedicated modulating damper that will open/close in increments to maintain a relatively stable temperature between 20 to 25°C. The damper shall have the ability to open and close all the way. If the temperature drops below 18°C, turn on furnace heating even if main thermostat (located in Crew Lounge) is satisfied. If the temperature rises above 27°C, turn on furnace cooling even if main thermostat is satisfied. Track through BAS each time the furnace or air-conditioning is turned on to solely serve the medical storage room, the temperature of the medical storage room, and the outdoor air temperature.
- .2 If the temperature reaches below 15°C or above 30°C, the BAS shall generate alarm to alert building operator. Temperature of room is available at BAS, viewable by operator.

.7 Vehicle Bay Radiant Tube Heaters

- .1 The Premium User Interface is used to connect the radiant tube heaters to the BAS. The BAS uses the temperature reading from the black bulb radiant temperature sensor and the air temperature sensor to get an average temperature. The BAS modulates the radiant gas tube heater output based on the outdoor air temperature and how far from setpoint the calculated indoor temperature is. When the outdoor air temperature is above 18°C (adjustable), the radiant tube heaters do not operate. The radiant tube heaters turn off once setpoint is reached.

.8 Vehicle Bay Ceiling Fan

- .1 This fan will be operated through local speed controller installed in the apparatus bay.
- .2 The operation of the fans shall be disabled when outdoor air temperature is below 12°C (operator adjustable through BAS; limit may be disabled through BAS. Default is for limit to be disabled).
- .3 Timer enabled on-function provided so building occupant turns on fan, which automatically shuts off after specified time (default 3 h, operator adjustable). Building occupant may also turn off fan locally.

.9 Vehicle Bay Exhaust Fan EF-2

- .1 EF-2 shall run continuously to slightly negatively pressurize the space, and on/off status shall be monitored by BAS, viewable by operator. If the fan ceases to operate, alert the operator, unless the stoppage is due to generator delay.

.10 CO/NOX Ventilation System for Vehicle Bay

- .1 CO and NO2 monitoring system shall be controlled by Honeywell model E3 Point. Upon first alarm the monitoring system shall signal the intake air louver damper and exhaust louver dampers to open. Once open, the exhaust fans (EF-1.1 and EF-1.2) will be allowed to run. If gas concentration continues to rise, upon second alarm audible buzzer will sound. Program a 3-minute relay delay-off. Gas alarm concentrations and placement heights below:

	First Alarm	Second Alarm	Sensor Height
Carbon monoxide (CO)	25 ppm	35 ppm	1200 mm AFF
Nitrogen dioxide (NO2)	0.25 ppm	2 ppm	1500 mm AFF

- .2 The CO gas concentration upon alarm will be sent to the BAS via 4-20 mA signal for monitoring time and duration of alarm events for record. If the gas detector alarms due to NO₂, use output relay to signal BAS and record that alarm was due to NO₂ event at that time.
- .3 If the BAS senses that the area local to the intake louver falls below setpoint of 17°C (adjustable), it will signal the first stage of the gas unit heater UH-1 to turn on. If the setpoint falls further to 15°C (adjustable), the BAS will signal the second stage of the gas unit heater UH-1 to turn on.

.11 Vestibule Heater

- .1 Vestibule temperature and outdoor air temperature shall be monitored by BAS, with alarm sent to operator if temperature drops below 6°C (default, adjustable). The heater will operate to maintain vestibule at heating set point (15°C default, adjustable). If outdoor air is above 7°C (default, adjustable) the heater will not turn on.
- .2 BAS will monitor the status to generate an alarm if the heater fails to operate when commanded on. Temperature of room is available at BAS, viewable by operator.

.12 Mechanical Room Heaters

- .1 Mechanical room temperature shall be monitored by BAS.
- .2 If the heat drops below 14°C (adjustable), the electric heater will operate.
- .3 The temperature of the room is provided to the BAS, viewable by operator. An alarm is generated to alert operator when temperature goes below 12°C (adjustable).

.13 Generator Delay

- .1 Upon power outage, BAS receives transfer switch signal and immediately disables the following mechanical equipment: humidifier HUM, mechanical room electric heater EUH-1. After 5 seconds of receiving the transfer switch signal, the abovementioned equipment can be enabled again.

.14 Domestic Hot Water System

- .1 There is no direct BAS connection available for the heat pump hot water heaters. BAS monitors temperature at domestic hot water tank via temperature sensors at hot water piping outlets. If the water temperature goes below 40°C (105°F) (operator adjustable), then the BAS alerts the operator there is a problem with the corresponding tank, either HPWH-1.1 or HPWH-1.2.
- .2 The BAS monitors the outlet temperature after the master thermostatic mixing valve. If that temperature goes over 10°C (operator adjustable) out of range above or over 20°C (operator adjustable) below the thermostatic set point temperature (adjustable by operator), the operator is alerted that there is a problem with the thermostatic mixing valve.
- .3 The BAS monitors the recirculation hot water temperature via temperature sensor. If the temperature goes below 32°C (90°F), operator adjustable, the recirculation pump P-DHWR starts and runs until the return temperature reaches at least 43°C (110°F), operator adjustable.

.15 Trending

- .1 Provide hourly trending of measured temperatures at each thermostat (Crew Lounge, Medical Storage room, Write-Up Room, IT Room, Vehicle Bay, Mechanical room (and relative humidity at Vehicle Bay, Crew Lounge and Write-Up Room)).
- .2 Provide hourly trending of outdoor air temperature.

2.2 RECOMMENDED BASELINE SETPOINTS

Occupied				
	Heating		Cooling	
	Temperature Setpoint	Relative Humidity	Temperature Setpoint	Relative Humidity
Crew Lounge / Living Area	22°C	30%	24°C	50%
Vehicle Bay	18°C	-	-	-
IT Room Air Conditioning	-	-	22°C	-
Medical Storage Room	20°C	-	25°C	-
Vestibule Heater	15°C	-	-	-
Mechanical Room	15°C	-	35°C	-

PART 3 EXECUTION

NOT USED.

END OF SECTION